



National  
Defence

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ISSUE 3, 2016

# FLIGHT

# COMMENT

## DOSSIER

The Clean Aircraft Concept

## MAINTENANCE IN FOCUS

If not now...When?

## VIEWS ON FLIGHT SAFETY

1 Canadian Air Division Flight Safety Officer

Canada 



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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 Lieutenant-Colonel Ken Bridges, 1 Canadian Air Division Flight Safety Officer, Winnipeg

Throughout my career in the Canadian Armed Forces (CAF), I have heard many slogans, mottos and catchphrases, but there is one above all that has made an impression upon me: *Everyone has a flight safety role, but first and foremost: flight safety is a leadership responsibility.* Both of these statements are foundational to maintaining the high level of aviation safety we enjoy within our military. Therefore, with the CAF involved in multiple deployments and exercises year-round, it is important that these maxims are forever on the minds of CAF members while operating domestically and abroad.

Conducting operations while keeping flight safety in mind has long been a balancing act in military aviation. How far can we go and not exceed an acceptable level of safety? Herein lays the concept of risk mitigation. Risk acceptance is the purview of our commanders: they understand the priority of the mission and what risks they are willing to tolerate to achieve the objective. For the rest of us, it is our responsibility to conduct our jobs effectively and safely and to inform the chain of command of concerns and hazards. It is expected that we will continue to work and contribute to the maximum extent possible, but mission accomplishment at all costs is not the goal; rather we strive for mission accomplishment at an acceptable level of risk.

There are times when tunnel vision takes us down a path whereby mission accomplishment becomes our only objective. This has led in the past to a breach of safety for a perceived operational gain. At what cost though, do we continue to break rules or refrain from following standard operating procedures? Mission centric deviations are done with the best of intentions, but as witnessed, the cost is deadly. The question we should constantly remind ourselves then is: "If I continue to take shortcuts or willfully break a rule, will I be putting this mission or future missions in jeopardy, or perhaps further risk CAF resources or lives?"

If you believe that rules and procedures are inhibiting your ability to work at peak efficiency, then those rules or procedures should be examined. By not reporting this to the chain of command, there is no way of probing the reasons behind that particular rule or procedure let alone knowing that there is a concern in the first place. Each of us, from aircrew to maintainer, scheduler to planner must be able to communicate freely to our chain of command if we do not have the necessary time and/or resources to complete our task. Equally, leaders need to recognize their subordinate's limitations and be mindful that at times, some CAF members can remain quiet on their limits which could lead them to adopt an attitude of getting the job done –

whatever the cost. Therefore success in operations is achieved when all personnel involved are engaged in dialogue.

Flight safety cannot be separated from operations. Leaders must believe in the fact that flight safety is not a hindrance to mission accomplishment – rather it enables it. Leaders must establish effective communications and be supportive of subordinates raising concerns. For the remainder of us, we must understand that completing risk assessments and evaluating tasks for hazards while following procedures is the basis of mission accomplishment. Rather than considering this aspect of the mission as 'getting in the way' or 'taking up valuable time', we must see this as part of proper task planning and execution. It is the key to operating at an acceptable level of risk. Remember: most of our rules are written in blood and it is our responsibility to maintain a strong flight safety culture so that we do not relearn lessons of the past. Everyone has a flight safety role, but first and foremost: flight safety is a leadership responsibility! ✈️





# The Editor's Corner

Welcome to the final issue of *Flight Comment* (FC) for 2016. Some of you may have noticed that we have been producing only three issues per year for some time now. Unfortunately it will likely remain like this until such time that our staffing levels permit us an ability to bring it back up to four. Regardless, we are striving hard to ensure that the issues published remain filled with the same informative content that FC has brought you over the last 60 years.

On that note, I think it would be fitting to mention a few milestones that FC and other promotional material within the Directorate of Flight Safety (DFS) has achieved since the beginning. In regard to FC, it was 45 years ago that color was first introduced on our covers. More importantly, it was 30 years ago that the magazine first began publishing in both official languages.

FC hasn't been the only promotional material to evolve over the years. Little do people know that in 1966 we began issuing parchment scrolls along with the 'Good Show' award. Other than minor changes to the layout in 1978, the 'Good Show' scroll has retained overall the same look ever since. This time around, the latest change to the award is not within the appearance but rather in the additional staffing that will occur. I am pleased to announce that in addition to every 'Good Show' awarded by DFS, the same nomination will be submitted to the Royal Canadian Air Force (RCAF) Directorate of Air Personnel Management for consideration of a RCAF Commander's Commendation.

Moving on to our current issue, I invite you to have a good read of the 'Check Six' section. In light of the Commander 1 Canadian Air Division's

comments which appeared in last issue ('Views on Flight Safety', FC 2-2016) and the impending winter season that is upon us, I thought it fitting to republish the investigative report on a crash that occurred 20 years ago this fall of a Griffon helicopter in the icy waters off the coast of Nunavut. One concern that stood out amid the findings was the inclination of our personnel at times to unnecessarily push the flight safety envelope for perceived operational gain; in this case, poor weather and a limited crew capability were pitted against the perceived necessity to rescue a sick crewman off a fishing vessel.

For those who will find themselves involved in de-icing operations this winter, check out our 'Dossier' section. An overview of de-icing products and hold-over procedures is discussed. Although the types mentioned may not apply to your particular fleet, hopefully the article will nevertheless encourage you to 'brush-up' on your own fleet-specific products and procedures.

Finally, once again I would like to thank all those who have made a contribution to the magazine this past year. For all others who haven't yet but would like to share their views in an article or blurb, don't be shy — send it to me! If it's something that will further the flight safety cause or benefit air operations in general, I'll be more than happy to publish it. (This includes those amongst you whose talents are better suited in sketching safety-related scenarios or caricatures!)

I wish you all Happy Holidays and the very the best in the coming year.

*Volare tute*

**Major Peter Butzphal**

**For all flight safety personnel, it's the season for the Director's road show visits. Tentative dates for the upcoming months are as follows:**

## January 2017

10-12	Comox
13	Pat Bay
16	Abbotsford (Cascade Aerospace)
18-20	Kelowna (KF Aerospace)

## February

7	Petawawa
8	North Bay
21-24	Trenton
28 Feb	Winnipeg

## March

1	Winnipeg
2	Portage La Prairie
3	Moose Jaw
7-9	DFS Annual Flight Safety Training Workshop - Ottawa

## April

3	Edmonton
4-6	Cold Lake
7	Yellowknife
18	Goose Bay
19	Gander
27	Kingston

## May

2	Gagetown
3-5	Greenwood
16	Cornwall
National Capital Region as required	



# Good Show

*For Excellence in Flight Safety*

## United States Air Force 332<sup>nd</sup> Expeditionary Civil Engineer Squadron – Fire Emergency Services Flight

On the 14 May 2015, two CF188 Hornets were tasked with a night operational mission. Both aircraft were in a heavy weight configuration, comprised of a mixed load of both air-to-air and air-to-ground weapons. During the takeoff roll, the lead aircraft had an afterburner malfunction resulting in a high speed abort. The pilot initiated the abort just prior to the maximum allowable abort speed with approximately 6500 ft. of runway length remaining. The pilot was able to stop the aircraft on the runway, and then he proceeded to the de-arm area for de-arming. While taxiing back to the ramp from the de-arm area, he noticed that the aircraft was pulling to the right. The pilot brought the aircraft to a stop on the side of the taxiway and declared a 'Hot Brakes' emergency to air traffic control. The pilot then noticed that the right main gear assembly was on fire. He shut down the aircraft and conducted an emergency ground egress.

The combat load of the CF188 included an air-to-air missile on the number six fuselage station just above the right main landing gear assembly. The missile contains rocket propellant and an explosive fragmentation warhead. In this incident, the gear assembly fire was located directly below the missile. The post fire analysis revealed that the missile had incurred heat damage.

Upon arrival at the scene, firefighters from the United States Air Force (USAF) 332<sup>nd</sup> Expeditionary Civil Engineer Squadron Fire Emergency Services Flight

were unable to determine if the pilot was still in the cockpit or in close proximity as the aircraft was enveloped in smoke in night time lighting conditions. They were however, able to discern that a missile was engulfed in the fire and therefore immediately proceeded inside the 4000 ft. safety distance even though armament orders stipulate that a 4000 ft. safety cordon be established around any air-to-air missile that has been enveloped by fire. They commenced by spraying the missile, bomb, and fuel tanks with water to keep them cool, while another fire fighter section readied the appropriate agent suitable for extinguishing magnesium brake fires. The metal fire was subsequently extinguished without further incident.

The USAF fire-fighting crews acted with extreme professionalism during this incident, putting their lives in danger in support of the pilot who was suspected to be still inside the aircraft. Although the pilot was safely clear, the firefighters action's nonetheless prevented the loss of a valuable asset. Had the crews simply cordoned off the burning aircraft as per the regulations, the fire could have continued to expand, igniting the missile's rocket propellant, and warhead. In addition, the expanding fire could have engulfed the loaded air-to-ground stores, causing explosions, which could have caused significant damage to the airfield. For their actions, the 332<sup>nd</sup> Expeditionary Civil Engineer Squadron Fire Emergency Services Flight are certainly deserving of this Good Show Award. 🇺🇸





# For Professionalism

For commendable performance in flight safety

## Captain Sean Remeika

Capt Sean Remeika, a 408 Tactical Helicopter Squadron pilot and acceptance test pilot, was tasked to recover a CH146 Griffon helicopter at a contractor facility following a 600-hour airframe inspection.

While performing his pre-flight inspection, he noticed that one of the tail rotor blade assemblies was showing increased wear and damage. Closer inspection revealed a separation of the blade skin from the spar at the leading edge. It should be noted that a 12.5 hour inspection of the tail rotor blades was carried out as a part of the 600-hour airframe inspection, and it was found serviceable. Neither the Field Service Representative nor the company test pilot noticed the defect during the acceptance or anyone else who was involved with the ground runs and test flights which had been performed on it throughout the previous four hours of flight time. The CH146's checklist for the

pre-flight verification only stipulates "*Tail rotor blade: Remove tie-down, check condition and cleanliness, and check blades for cracks*".

Capt Remeika's extensive experience, professionalism, keen attention to detail and willingness to look beyond his assigned task

were instrumental to the discovery of the skin separation and prevented a hazardous situation from occurring. Capt Remeika is fully deserving of this For Professionalism Award. 🦅



Photo: DND

## Warrant Officer Carlos Oliveira

On 2 November 2015, WO Carlos Oliveira, a flight engineer from 408 Tactical Helicopter Squadron detected a significant abnormality while performing a pre-flight inspection on a CH146 Griffon aircraft recently returned from contracted maintenance. WO Oliveira observed that the push-pull rod end for the droop compensator appeared to have more exposed threads than normal.

The droop compensator push-pull rod has an inspection hole provided to ensure that the rod end has proper thread engagement following the rigging of the engines; a properly threaded assembly would not allow lock wire to pass. Although checking these rods is not an item in the CH146 pre-flight checklist, WO Oliveira took the initiative to verify the proper thread

engagement and found that he was able to insert lock wire through the push-pull rod inspection hole.

Upon further inspection, he discovered that the rod end was one-eighth of an inch longer than allowed for in *Canadian Forces Technical Orders*. The CH146 *Operator's Manual* indicates an improperly rigged push-pull rod could lead to significant main rotor overspeed or droop with flight control/collective manipulation. Thus control of the main rotor RPM would be very challenging with the potential of causing a significant in-flight incident and endangering the crew.

WO Oliveira's extensive experience, keen attention to detail and tenacity in looking beyond his assigned tasks were instrumental to the

discovery and rectification of a major maintenance deviation. His actions that day undoubtedly averted a hazardous situation and as such, WO Oliveira is highly deserving of the For Professionalism Award. 🦅



Photo: DND

# For Professionalism

For commendable performance in flight safety

## Warrant Officer Patrick Valognes

While working at the Aircraft Life Support Equipment (ALSE) section, WO Valognes detected inspection cycle recording discrepancies with the CF188 Hornet ejection seat after coming across a seat that had recently been inspected at the ALSE section. At that time, it had been aboard another CF188 whilst undergoing a periodic inspection. He discovered that the component history record did not reflect the inspection due date time.

Upon further investigation it was determined that the ejection seat had been swapped between two aircraft but their component history records were not updated, leading to the possibility of an overflowed inspection. To prevent this situation from re-occurring, WO Valognes recommended adding the ejection seat's inspections in the component history record independently of

the aircraft periodic inspections. Once that was implemented, it immediately reduced the risk of overflying inspections within the fleet.

WO Valognes' vigilance and direct action to resolve this tracking issue reduced the potential for a serious incident and he is therefore highly deserving of this For Professionalism Award. 🚀



## Sergeant Martin Fiset

In December 2015, Sgt Martin Fiset, an airborne electronic sensor operator, was stationed at the radar system display onboard a CP140 Aurora while transiting on an Instrument Flight Rules (IFR) clearance in high-level Class A airspace. Class A airspace is an area where traffic guidance and de-confliction are provided by Air Traffic Control (ATC).

Despite ATC monitoring, Sgt Fiset elected to continue a vigilant radar scan of the surrounding airspace and alerted the pilots of a traffic conflict shortly after leveling off. The target was transiting on the same airway, at co-altitude and closing in on their position. The pilots did not see any aircraft lights on the horizon, nor were there any contacts on the CP140's traffic collision avoidance system display. In fact traffic information provided by ATC

did not indicate a conflict whatsoever. Due to the lack of corroborating evidence and the nature of the airway, a conflict was considered unlikely and the crew initially assessed the target as an erroneous indication. Based on Sgt Fiset's continued updates and experience operating the sensor, the pilots initiated a turn to create lateral separation from the target as it closed to within 10 nautical miles. While advising ATC of their deviation, the pilots received a rushed reply to descend immediately. Within seconds, the crew saw the dim lights of an aircraft passing by – an aircraft later identified as an unmanned aerial vehicle operating on an IFR clearance.

Sgt Fiset's foresight to maintain a radar watch even though he wasn't expected to do so, coupled with his skillful manipulation of the sensor, undoubtedly

prevented an incident which could have had catastrophic results. Displaying remarkable dedication and unyielding commitment to the principles of flight safety, Sgt Fiset is highly deserving of the For Professionalism Award. 🚀





## Master Corporal Marco Roussel and Corporal Dan Comeau

Upon completion of a ground-run leak check on a CH146 Griffon helicopter, MCpl Dan Comeau noticed excess oil on the engine deck under the reduction gearbox. Assisting him in the check was MCpl Marco Roussel who, while cleaning the engine deck, discovered very small flakes of greyish-yellow metal amongst the oil. He immediately brought this finding to the attention of MCpl Comeau and together, they began a search for the source of the metal debris.

MCpl Comeau then further discovered the oil cooler blower had two missing blades and a number of them were cracked. Had this gone unnoticed, an additional start of the aircraft engines may have potentially resulted in complete failure of the oil cooler blower. This failure could have led to damage or penetration of the oil cooler, and potentially, an emergency shutdown of the no. 1 engine on the next flight that night.

MCpls Comeau and Roussel's attention to detail and perseverance in addressing this potentially serious safety issue averted a possible threat to personnel and serious damage to aircraft. They are truly deserving of this For Professionalism Award. 🦅



# For Professionalism

For commendable performance in flight safety

## Corporal Dominique Beauregard-Douaire

**O**n 22 September 2015, Cpl Dominique Beauregard-Douaire, a CP140 Aurora Flight Engineer, was conducting an external pre-flight inspection prior to a mission. This was the aircraft's first flight after a #4 propeller change due to a malfunction on a previous flight and resultant shutdown of the engine. His inspection, which calls for a general examination of the prop for dents, leaks and heating elements, Cpl Beauregard-Douaire noticed that the lock wire securing the step-adjusting screw was not as visible as it was on the other propellers. At the time, the #1 blade was at the 12 o'clock position. Cpl Beauregard-Douaire

proceeded to rotate the prop, positioning #1 blade to the 9 o'clock position allowing for better visibility. Upon closer inspection, he determined that the spinner appeared to be incorrectly installed. He immediately notified his supervisor and called for a propeller technician.

During the inspection, the propeller technician was able to remove the spinner by hand with very little effort. Had this installation error gone undetected, the spinner would have separated during the pre-flight run up tests, or worse, during the subsequent mission. Damage to the spinner, prop and possibly the airframe would

have been inevitable and significant, potentially endangering the crew and certainly removing the airframe from operational service.

Cpl Beauregard-Douaire consistently displays a high level of operational performance and unmatched regard for Flight Safety. Cpl Beauregard-Douaire's professionalism and attention to detail during his pre-flight inspection averted a situation that had the potential to cause serious damage to the aircraft and significant negative consequences to overall mission support. As such Cpl Beauregard-Douaire is highly deserving of this For Professionalism Award. ✦





## Corporal Chris Johnston

While carrying out a replacement of a radio altimeter antenna on a CH146 Griffon helicopter, Cpl Chris Johnston, an avionics technician apprentice at 400 Tactical Helicopter Squadron, noticed a discrepancy with the hardware that came with the replacement antenna and the associated hardware that he drew from supply.

Prior to receiving the antenna from supply, Cpl Johnston obtained the mounting hardware required for installation using the appropriate publications however; when the new antenna was received, he noticed that the screws were significantly shorter.

Seeking the advice of a level A technician, Cpl Johnston was advised that the screws accompanying the antenna were the correct ones. Cpl Johnston came to the conclusion that if



the much shorter screws were used, the antenna would not be properly secured and could cause a failure in the system from damage to the antennas.

Cpl Johnston decided he would check other aircraft in the hangar. He found three other aircraft with the same shorter hardware screws that accompanied the part. Cpl Johnston then sought confirmation from the Life Cycle Material Manager (LCMM) as to

what the correct hardware was. The LCMM's response confirmed that Cpl Johnston was correct to use the hardware from the publication and not the hardware accompanying the part as it was non-conforming. Cpl Johnston's professionalism and determination to ensure the correct hardware was used was above and beyond that expected of an apprentice. He is most deserving of this For Professionalism Award. 🏆

## Corporal Jeffery Neal

On 24 February 2015, Cpl Jeffery Neal, an avionics system technician at 440 Transport Squadron was tasked to carry out a wire repair on the TANIS Engine Heater System located in the tail section of the CC138 Twin Otter aircraft.

While conducting this task he noticed something that abnormal in the area located directly underneath the aircraft's primary aft flight control pulleys and cables. Investigating further, Cpl Neal discovered a tool resting near the pulley and cable assembly. He then conducted a detailed FOD check of the area and ensured that the tool was removed. The tool, found to be an uncontrolled scriber, was in a poorly lit and difficult-to-access section of the

tail. Had the tool continued to go undetected, it is possible that it could have shifted into a position where it would have interfered with the flight controls. Had this happened in flight, the results could very well have proven disastrous.

Cpl Neal's professionalism, attention to detail, and outstanding initiative were instrumental in the prevention of a dangerous scenario and are truly worthy of this For Professionalism Award. 🏆



# For Professionalism

For commendable performance in flight safety

## Commissionaires Arthur Burke and Alan McDonald

**O**n 30 July 2015, a CC150 Polaris aircraft stationed at 8 Wing Trenton was preparing for a flight to Ottawa. It began its taxi for departure when Commissionaire Alan McDonald, who was supervising construction work on the airfield approximately 90 metres away, noticed from his position that something out of the ordinary was hanging from the fuselage of the aircraft. As it approached, he became increasingly convinced that the situation was definitively abnormal. Since he could not clearly distinguish what the object was, he radioed his partner, Commissionaire Arthur Burke, who at that time was standing on the opposite side of the taxiway.

Commissionaire Burke confirmed that the dark flapping object was an open aircraft panel. Commissionaire McDonald immediately contacted the Tower controller who in turn, instructed the pilot to return to the tarmac. The panel was secured and the flight continued without incident. Had the CC150 departed with the fuel panel door open, it almost certainly would have detached from the aircraft and caused damage to the fuselage, requiring significant and costly post-flight maintenance.

Commissionaires Burke and McDonald demonstrated exceptional situational awareness and teamwork in first recognizing and then making sure the aircrew were advised of their unsafe aircraft configuration. Their actions prevented a potentially serious ground or in-flight incident from occurring. Commissionaires Burke and McDonald are therefore highly deserving of the For Professionalism Award. ✈



Photo: DND





## CLOSING ACTION REPORT

**'A' Category Aircraft Accident – CH14621 Griffon, Killiniq Island, Nunavut  
12 November 1996**

**EDITOR'S NOTE:** The following is a reprint of the Closing Action Report<sup>1</sup> then produced on the Category 'A' accident that occurred 20 years ago this November on a CH146 Griffon helicopter off the northern tip of Labrador. Although most of the findings were focused primarily on the lack of supervision and proper training, this occurrence also highlighted the danger that results when we focus on mission accomplishment above all else, regardless of the associated risk(s). Thankfully, the crew survived albeit the risk of succumbing to exposure was ever present – from the onset of the accident up until the point at which they were rescued 34 hours later.

### Description of Occurrence

Rescue 421(R421), a 444 Combat Support (CS) Squadron Griffon, was tasked by Rescue Coordination Centre (RCC) Halifax to medevac a critically ill sailor (patient condition described as bleeding ulcer, coughing up blood) from a fishing trawler near Resolution Island (Medevac Vesturvon). The mission involved a six hour transit flight with two enroute fuel stops, a one hour station time, and a one hour transit to hospital (Iqaluit). R421 departed Goose Bay 12 Nov 96 at 1040 hours (all times local), but returned ten minutes later with an engine chip light. Following maintenance action the aircraft launched again at 1246 hours and proceeded to the first re-fueling stop at Nain. The aircrew departed Nain after a short station stop and donned their Night Vision Goggles (NVG) for the flight to the fuel cache at Port Burwell. Enroute they encountered turbulence and deteriorating weather and climbed above a broken cloud layer at 8000 feet ASL. Approaching the entrance to Grenfell Sound they descended through a hole in the clouds to proceed up McLellan Strait. Reduced visibility in snow showers forced the crew to execute a 180- degree turn and land at Cape Labrador. Ten minutes later, they took off again and were forced to return to Cape Labrador a second time where they shut down to conserve

fuel. They contacted Rescue 311 (Hercules top cover) prior to shutting down and agreed to re-establish communications at 2100 hours. The Hercules advised they were proceeding to the fishing boat to para-drop two SAR Techs into the water in order to board the trawler and treat the patient. A short time later the crew observed a significant improvement in the weather and elected to attempt the flight to Port Burwell (17 NM). This flight was conducted without contacting the Hercules

aircraft or any other control agency. As they approached the western end of McLellan Strait they experienced a rapid reduction of visibility due to snow showers. While transiting to an apparent landing site on the south shore of Killiniq Island, visual reference was lost and the aircraft impacted the water. The crew successfully executed an underwater egress and swam to shore. They spent the next thirty-four hours struggling to survive the sub-zero conditions while awaiting rescue.

*Continued on next page*



**Figure 1: Killiniq Island, Nunavut**



# CHECK SIX

## Investigation Results

Analysis of the Flight Data Recorder (FDR) and interviews with the aircrew indicated the aircraft was serviceable prior to impact. The investigation therefore focused on personnel and systemic errors which contributed to the accident. This was a complex investigation involving active errors at the aircrew level and widespread latent errors at various levels of command. The FSBOT concentrated primarily on the active failures but identified many systemic problems that were subsequently investigated by the FSSI. In order to fully appreciate the scope of the problems and subsequent recommendations for corrective action it is necessary to review each contributory factor to the accident.

The CS Squadron in Goose Bay is a small unit tasked to provide utility support to 5 Wing Goose Bay as well as maintain a standby posture for the local rescue of downed aircrew. At the time of the medevac tasking only three pilots were on squadron strength. One was a second tour pilot and the other two were on their first operational posting. The more experienced pilot was the acting CO and felt he had to remain behind to coordinate activity despite the fact that his previous tour had been with an operational SAR squadron.

The two less experienced pilots were assigned the mission and preceded with the planning following a cursory briefing and verbal authorization from the acting CO (third pilot).

The mission involved flight over some of the most rugged, unforgiving terrain in the country, a patient transfer at night and transit to a medical facility requiring extended over water flight. This would have been a challenging task for a primary SAR unit. For a pair of relatively inexperienced first tour pilots with minimal SAR and NVG experience it was a daunting task. There was insufficient life support equipment for the mission parameters, the weather was marginal for day operations and below limits for NVG use, and crew day would be violated due to the mission delays. The crew was not qualified to perform a boat hoist yet were going to attempt a night boat hoist should the planned rendezvous at Resolution Island fall through. Why did this crew press on with the mission when there were so many obvious reasons to cancel? The "Good Samaritan Syndrome", a phrase first coined by Daniel Buston, explores the notion of who will come to the aid of another person and why. Review of the aircrew transcripts, especially the aircraft commander, suggests that they felt an extra impetus to complete the

mission due to the "press" of the medevac nature of the task. In the mind of the crew there was no one else available to undertake the mission, there was a critically ill patient awaiting transit, and SAR Techs were planning to jump into the ocean at night. All of these factors could well contribute to a decision to undertake and complete this mission despite the risks to the crew, the lack of protective equipment and crew day hours available (*Pressing*).

The crew was not very experienced on NVGs and their currency was questionable. They were not trained or experienced in low level NVG flight yet flew the last leg of the trip towards Port Burwell at 200-300 feet over water. Flight critical visual cues such as motion and height are lost or degraded over low contrast terrain such as water. Reduced contrast manifests itself primarily as reduced visual acuity. Reduced visual acuity in turn reduces distance estimation. This loss of visual acuity is further exacerbated if the NVGs are poorly adjusted prior to flight. The visual acuity of the unaided eye at night is approximately 20/200. If the pilot adjusts his goggles in flight using random objects in the environment, the only reference he has to determine if the NVGs are focused is the unaided 20/200 visual acuity prior to donning the NVGs. Proper adjustments to focus should be done prior to flight using high contrast objects in a controlled environment such as an eye lane or ANV 20/20 focus kit. The crew of R421 focused their goggles in flight and therefore were more susceptible to all the misrepresentations and illusions characteristic of NVG operations. The projected illumination levels were well below recommended minimum millilux (measure of available ambient light). This caused the goggles to work harder, producing the video noise characteristic of low level light conditions. The forecasted and actual weather included reduced visibilities in snow showers. This type of obscuring phenomena can cause the same video noise created when using the goggles under low light conditions. Just prior to impact,

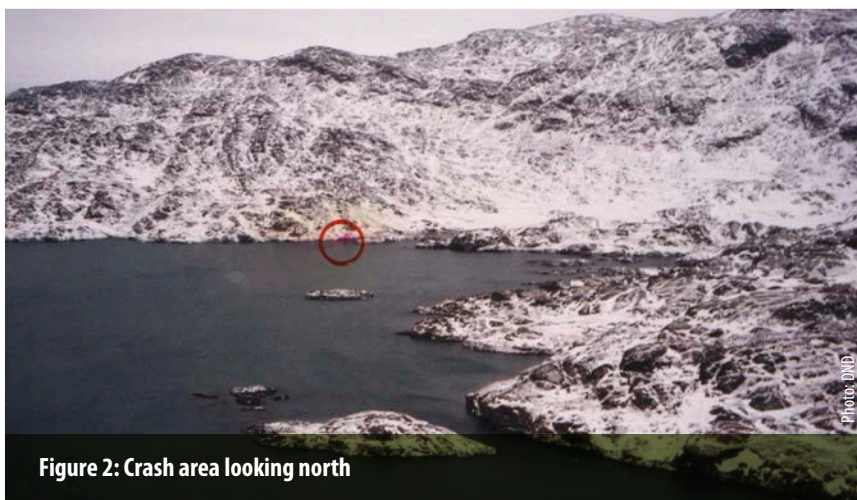


Figure 2: Crash area looking north



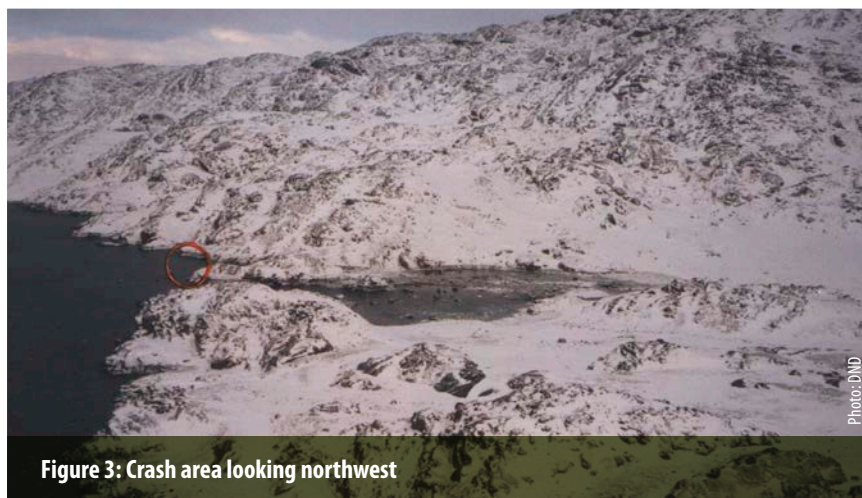


Figure 3: Crash area looking northwest

R421 transitioned from the relatively confined space of McCelan Strait with peripheral cues provided by the steep contours to an open bay with minimal cues. This sudden loss of contrast, compounded by the video noise and poor focus severely restricted the pilot's acuity. Defence and Civil Institute of Environmental Medicine (DCIEM)<sup>2</sup> stated that while limited, there were adequate cues to maintain stable flight with the exception of loss of altitude (*Visual Limitations*).

Both pilots set their RADALT to 200 feet prior to the final flight to Port Burwell. The instrument is designed to emit an audible tone whenever the aircraft descends below the selected altitude. The helicopter was flown plus or minus that altitude for some distance as the tone could be heard on the cockpit voice recorder several times. The warning tone re-arms itself only if the aircraft climbs above the programmed height. If the aircraft remains below the selected altitude then the crew will not receive another warning tone. The AC flew the final minutes of the flight below 200 feet effectively disarming the warning tone. The co-pilot kept the RADALT in his crosscheck as you can hear him call off the altitude periodically. The last altitude callout was 120 feet. The AC did not respond to the altitude warnings of the co-pilot so he re-selected his RADALT to 100 feet but did not

relay this to the AC. The RADALT warning tone responds to the higher of the two settings. This mismanagement of the RADALT system precluded the audible tone from sounding at the anticipated 100 foot altitude. In the last seconds of the flight the pilot's visual acuity rapidly deteriorated (para 7) and he began a transition for landing on the adjacent shoreline. Coincident with this, the co-pilot dropped the RADALT from his crosscheck as he confirmed their position on the map and responded to calls from the AC to operate the landing lights. The loss of visual acuity and lack of altitude cues left the pilot in a virtual black void. This ultimately caused the aircraft to impact the water (*Information and Communication*).

The active failures on the part of the aircrew describe the events which resulted in the aircraft hitting the water. The underlying systemic issues explain the reasons for some of the action or in-action that they exhibited. The unit did not accurately record NVG qualifications in the aircrew training files. Currency requirements were not vigorously enforced. The unit made changes to the NVG training syllabus which were tacitly approved but not validated by Group. The casual nature of NVG training in the unit downplayed the degree of respect required for safe NVG operations. This likely

resulted in the aircrew's reduced appreciation for the limitations of the goggles and an inflated sense of confidence in what they could do with them (*Supervision/Unit*).

The helicopter crews of Fighter Group's CS squadrons enthusiastically embraced the employment of NVGs. Unfortunately, the implementation of the training was not as enthusiastically pursued by the Group. Within Fighter Group, NVG implementation was essentially left to the discretion of the CS Squadrons with minimal oversight and consequently resulted in a varied standard. Although two of the CS Griffon squadrons had been using them operationally, at no time were any external proficiency checks conducted to confirm the effectiveness of their NVG training (*Supervision/Group*). The development of a continuation training program was not put in place to ensure that aircrew were aware of the proper employment of the NVG in the unit's operational role. With minimal assistance from higher headquarters, each CS Griffon squadron was left in virtual isolation to train, regulate and evaluate itself. The guidance and regulations that define operational capability were deficient and along with an absence of explicit restrictions for some procedures and maneuvers, placed an additional burden on the aircrew when deciding to accept a SAR mission (*Group/Information*).

The crash of R421 cannot be solely attributed to poor airmanship and pressing by a pair of first-tour pilots. While they remain ultimately accountable for their actions, it is also apparent that the system sent an ill-trained, unprepared crew out on a demanding mission which, though theoretically feasible for a CS Griffon and crew, was in fact well beyond this crew's capabilities (ref B).

### Peripheral issues

The Flight Safety Board Of Inquiry (FSBOI) expressed concern over the delay in launching the SAR response for R421. In retrospect, the gradual degree of concern over the status of

*Continued on next page*



# CHECK SIX



**Figure 4: Depiction of overhead view of submerged wreckage**

R421 is understandable. RCC understood that the helicopter was safely on the ground at Cape Labrador with the intention of staying the night. The flight plan had been closed through Iqaluit Radio by R311 (Hercules aircraft). When the Hercules could not contact R421 by radio at 2100hrs (0100Z) an assumption was made that their battery may be dead. RCC knew the crew had a satellite phone (satphone) with which they could summon help. There was no ELT transmission due to the low impact forces. During the night RCC attempted to contact R421 on the satphone and conducted a radio search of the area. The Hercules proceeded to look for R421 once their SAR Techs had been recovered from the Vesturvon. A full scale search was initiated once the Hercules confirmed that R421 was not at the last known point. This was approximately 17 hrs past the 2100hrs arranged radio check-in time. Commander Air Command ordered a review of secondary SAR operations to address this concern (ref C).

RCC controllers treat and task secondary SAR aircraft commanders in the same manner as an aircraft commander of a primary SAR aircraft. However, primary SAR aircraft commanders have extensive risk management training through a lengthy and comprehensive

on-the-job training programme, frequent exposure to numerous SAR cases, and the benefit of larger, more experienced crews to participate in the 'GO/NO-GO' decision. Because the aircraft commander is ultimately responsible for the conduct of the mission, the RCC controller assumes a basic level of competence and prudence that may not always be valid. RCC controllers need to be aware of the limited SAR experience of secondary SAR resources and the potential of these crews to succumb to the 'Good Samaritan' syndrome.

Once again this accident raised issues of aviation life support equipment (ALSE) deficiencies. Some of the problems were due to the inefficiency of unit personnel, but several issues were equipment deficiencies that have been loitering in the 'system' for years. Recent visits to line units emphasized the degree of dissatisfaction with the ALSE support to flying operations. Whether it be no gloves, inadequate winter gloves, cold weather boots, immersion suits, or personal locator beacons, the consensus was that the system is either not reacting or far too slow to react to requests for equipment. Two unit commanding officers were contemplating grounding aircrew due to the lack of proper life support equipment.

Currently there is one full time major (aircrew) in the Directorate of Air Requirements and a part time captain (non-aircrew) in 1 Canadian Air Division (1 CAD) which staff the ALSE issues through the two headquarters. One could argue that ALSE needs a stronger voice at both 1 CAD and Chief of the Air Staff in order to ensure the aircrew get what they need. Perhaps it is time to re-visit the process by which this important aspect of flying operations is funded and staffed.

## Director Flight Safety (DFS) Comments<sup>3</sup>

This accident can be directly attributed to a lack of supervision at several levels. The Air Force has traditionally counted on experience, 'time in' and advanced professional courses to prepare individuals for the responsibilities of senior rank. This may have provided the requisite training for the administrative aspects of command but neglected the operational requirements. Historically, our junior supervisors, Operations Officers, Detachment Commanders, Deputy Flight Commanders and arguably even Flight Commanders have not received any formal training in how to oversee flight operations. We regularly put our personnel in positions of authority without the benefit of proper training in risk management and operational decision making. With the bleeding off of our 'time in' personnel this lack of supervisory oversight will become more problematic. There is an urgent requirement for the implementation of an operational flying supervisor course.

NVGs can greatly enhance the safety of night operations provided there is a healthy understanding of their limitations and a tight system of regulation and oversight. The advent of NVGs within the Air Force was primarily a 10 Tactical Air Group/1 Wing function and Air Command followed the implementation with limited oversight. The use of NVGs spread into the CS Squadrons, SAR units, and Sea King fleet, before a standard set of regulations,





training policies or operational procedures was established for the Air Force as a whole. The crash of R421 typifies the consequences of an ill-conceived NVG implementation plan that is not backed up by continuation training and regulatory oversight. New 1 CAD Orders will include specific guidance with respect to NVG training, standards and operations. To achieve a satisfactory degree of safety and consistency throughout the Air Force, it is essential that 1 CAD headquarters continue to play a leading role.

The crew of R421 flew the last part of their mission without a clear plan in place if they inadvertently encountered instrument meteorological conditions. The tragic outcome of that final flight once again emphasizes the importance of having pre-set 'triggers' for mission abort. Aircrew must discuss in pre-flight briefings what these warning flags will be for any given mission and what actions are to be taken in the event one of these flags presents itself.

### Final Cause Factor Assignment

**PERSONNEL/ FLIGHT CREW/ PILOT/ PRESSING** – In that the pilot was unduly influenced by the perceived urgency of the mission. The pilot proceeded with the task despite indicators that he had insufficient ALSE, weather, crew day and NVG experience for safe mission completion and in the process he violated flying orders.

**PERSONNEL/ FLIGHT CREW/ PILOT/ VISUAL LIMITATIONS** – In that the pilots visual cues were lost and unrecognised as such due to the use of NVG beyond their capabilities with respect to weather, lighting conditions, flight over water and focus.

**PERSONNEL/ FLIGHT CREW/ PILOTS/ INFORMATION AND COMMUNICATION** – In that the pilots did not employ proper crew resource management technique. The crew initially agreed to set their RAD ALTS at 200 ft. The AC flew the last minutes of the flight below 200 ft., effectively disarming the warning tone. The AC failed to respond to

the co-pilot's altitude warnings so the co-pilot re-selected his RAD ALT to 100 ft. but failed to communicate this to the AC. This mismanagement of the RAD ALT allowed the aircraft to descend through 100 ft. to impact without the pilots receiving the expected warning.

**PERSONNEL/ SUPERVISION/ UNIT/ TRAINING** – In that the unit did not properly implement and supervise NVG operations, failed to recognise the unit's limited capability and subsequently authorised a mission for which the crew was not properly trained and experienced.

**PERSONNEL/ SUPERVISION/ GROUP/ TRAINING** – In that no formal evaluations were conducted to confirm regulatory compliance and procedural competence with regard to NVGs.

**PERSONNEL/ MANAGEMENT/ GROUP/ CHQ/ INFORMATION AND INFORMATION** – In that higher headquarters did not provide adequate direction and guidance for CS squadrons SAR/ NVG training and standards support.

### Chief of the Air Staff's comments <sup>4</sup>

This was a preventable accident. Long term systemic breakdown of the training and regulatory oversight of CS Griffon operations directly contributed to the crash of R421. Deficiencies in the supervision of flight operations, the lack of a centralized policy on NVG usage and the differences between primary and secondary SAR resources all played a contributory role in the accident. In the short term, many initiatives were implemented to ensure the safety of CS Griffon operations. Additional organizational changes are about to be implemented which will ensure the long term health of these units. 📌

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1. Closing Action Reports (CARs) at that time were derived from Flight Safety Board of Inquiry reports. In brief, they covered a synopsis of the accident and indicated cause factors from which preventive measures were then raised. It was prepared for the chain of command and used to document the actions taken by the units or groups responsible for the implementation of those preventive measures (PM). They are no longer in use today and have since been replaced by the Epilogue which essentially contains the same information as a CAR minus the list of actions taken in response to the PMs. These are now located in a separate document called an Action Directive, which is sent out by the Airworthiness Authority and gives direction to various Action Organizations to implement the PMs assigned.
2. Now named Defence R&D Canada – Toronto (DRDC Toronto).
3. Then Brigadier-General R. Bastien, Director of Flight Safety from 1996-1998.
4. Then Lieutenant-General D.N. Kinsman, Chief of the Air Staff from 1997-2000.



## From the Flight Surgeon

# Are you *tired* of feeling tired?

by Major Tyler Brooks, Medical Advisor, Directorate of Flight Safety, Ottawa

**A**re you tired of feeling tired? Good news! The Royal Canadian Air Force (RCAF) is implementing a Fatigue Risk Management System (FRMS) in 2017. Here are some quick frequently asked questions to help you understand and support this vital program.

### What is fatigue?

Fatigue is physical and/or mental tiredness that reduces alertness and performance.<sup>1</sup>

### Is fatigue common?

Yes! Approximately 60% of Canadians report feeling tired most of the time.<sup>2</sup>

### Is fatigue a safety problem?

Yes! Fatigue is the largest preventable cause of accidents in safety sensitive operations worldwide.<sup>3,4</sup>

The National Transportation Safety Board reports fatigue as a factor in nearly 20% of its major accident investigations.<sup>5</sup>

### What causes fatigue?

Fatigue results from insufficient sleep<sup>6</sup> and/or being awake during normal sleep hours.<sup>7</sup>

Extended work hours, shift work, commuting, family life, and medical disorders can all contribute to fatigue.<sup>8,9</sup>

### Is fatigue a threat to the RCAF?

Yes! Fatigue degrades operational capability, flight safety, and the retention of trained personnel.

The Directorate of Flight Safety has identified fatigue as a factor in numerous flight safety occurrences.

### How is the RCAF planning to manage fatigue?

The Commander of the RCAF has ordered the adoption of the RCAF FRMS.<sup>10</sup>

### What is the RCAF FRMS?

It is a system that provides RCAF leaders with the process and tools to identify, assess, and manage fatigue risks.



**Figure 1: The Swiss Cheese model of accident causation. Multiple layers of defense increase the likelihood of preventing accidents. The RCAF FRMS is a multi-layered approach to preventing fatigue and managing fatigue-related risk.**

It is science-driven and responsive to the chain of command.

It applies to all personnel (air and ground) working with RCAF units.

It results in a multi-layered approach to preventing fatigue and managing risk (figure 1).

### With so many types of aircraft and roles in the RCAF, how will the FRMS meet the needs of the different flying communities?

The RCAF FRMS is based on a *top down* – *bottom up* approach (figure 2).

The centralized FRMS framework provides the ‘top-down’ structure, guidance and tools to assure a standardized approach to fatigue across the RCAF.



**Figure 2: The RCAF FRMS is based on a *top down-bottom up* approach, allowing the different flying communities to develop customized fatigue solutions that suit their unique operational need.**



Within the standardized framework, the various RCAF communities develop fatigue risk control measures from the 'bottom-up' to accommodate their unique operational needs.

### How can I help?

- Watch your personnel for signs of fatigue (figure 3)
- Report fatigue hazards and incidents
- Take action to reduce the risks of fatigue
- Watch for direction on FRMS implementation
- Share your creative ideas on fatigue management with your Chain of Command! 🗣️

**Figure 3: Signs of fatigue<sup>11</sup>**

Physical Signs	Cognitive Signs
Fidgeting	Increased errors
Rubbing eyes	Impaired attention
Yawning	Impaired memory
Frequent blinking	Negative mood
Staring blankly	Reduced communication
Long blinks	Impaired problem solving
Difficulty keeping eyes open	Increased risk taking
Head nodding	Impaired situational awareness

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Space shuttle *Challenger* breakup, 28 January 1986.

Photo: National Aeronautics and Space Administration



Exxon Valdez oil spill in Prince William Sound, Alaska on 24 March 1989.



Photo: Office of Response and Restoration, National Oceanic and Atmospheric Administration

# Maintenance IN FOCUS

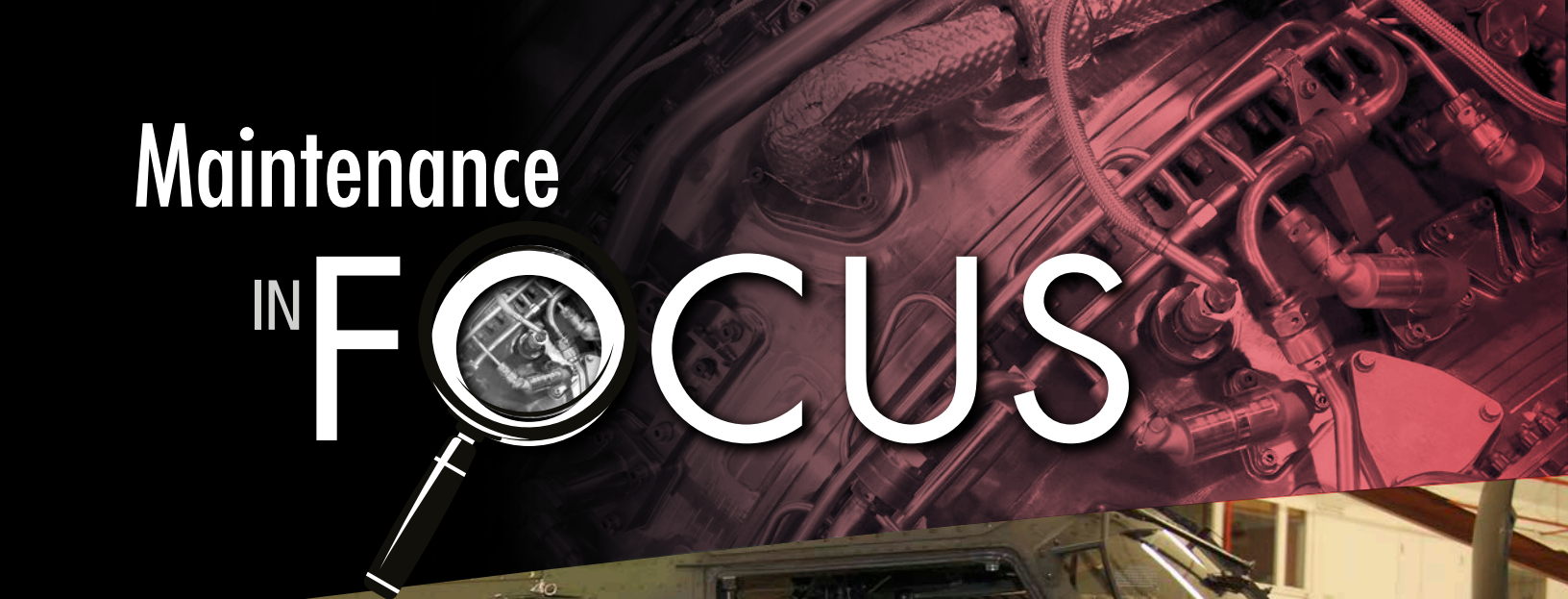


Photo: Cpl Marie Dumas

## If not now...when?


by Master Warrant Officer Francois Dutil, Senior Aircraft Maintenance Superintendent, 438 Tactical Helicopter Squadron, Montreal

Our unit has not seen such a low journeyman to apprentice ratio in living memory, our ranks having been filled in the past 18 months with more than our fair share of young qualification level (QL) 3 aviators straight out of the Canadian Forces School of Aerospace Technology and Engineering. It was at or below 1:1 on any given day on our hangar floor. Although these recent arrivals

were of the highest quality and eager to contribute, managing the time required to properly mentor them all the while readying safe, quality aircraft to meet the needs of the flying schedule was producing an unacceptable level of stress on the maintenance echelon. As a senior aircraft maintenance superintendent, I try hard to create a work environment with as minimal a level of stress as possible.

Supported by our local chain of command, the decision was made for the training of our apprentices to be the utmost priority of our squadron. We felt this was our responsibility not only to the Royal Canadian Air Force in the short and long term, but to the members themselves in providing them with all of the tools necessary throughout their initial stages of professional development. I think most





readers will remember just how influential their first posting was in molding them for the remainder of their careers. The outstanding relationship between our maintenance flight and our operations section has proven to be crucial; they fully appreciated and accepted that a given maintenance procedure would take much longer to accomplish (for training) and that aircraft availability would consequently suffer.

Still, even with the best of intentions and with the entire local chain of command aboard with the idea, we still sensed what we considered to be undue stress among our maintenance personnel. We noticed an increase in the number of incidents such as breaches in tool control, lack of personal protection equipment being used during maintenance tasks, paperwork errors, etc. Not that they affected operations in a major way, but their increased frequency was enough to solicit a reaction from the leadership. How could these incidents increase in regularity when we, the managers, were spending so much time and effort in ensuring the work environment was as stress-free and conducive to training as possible?

We've all heard of the 'can do' attitude – many of us have lived by it for most of our professional lives. Whether it's personal, crew, squadron or service pride: we never want to cancel a mission for lack of serviceable aircraft. As commendable as it was, this attitude was proving to be self-defeating in our situation whereby the junior-level supervisory personnel were using the next day's flying schedule as a template for the current day's workload. I fully

encourage initiative and respect devotion to duty, but as in life, any action will have an effect, and that effect will be the cause of something else. Meeting the next day's flying schedule by sidelining an apprentice's development to speed up an aircraft's return to service was not acceptable. In no time at all, it would have too easily become the rule and not the exception. This led us to seriously consider restricting the access to our flying schedule to senior supervisory and managerial personnel only. I've repeated many times "the

***"How could these incidents increase in regularity when we, the managers, were spending so much time and effort in ensuring the work environment was as stress-free and conducive to training as possible?"***

aircraft will be ready when it's ready – period!" We still do the extra hours when required; we are after all, paid to put serviceable aircraft on the ramp but not at the expense of our technicians' professional development.

Another area where we encountered undue stress at the junior supervisory level was the frustration at not being able to produce as many serviceable aircraft as before. Our daily

serviceability rate, being our pride for so many years, made it challenging for all involved to comprehend that for the time being, it was no longer the determining factor for success. Our new goal was the *timely and by the book* development of our apprentices towards their QL5. The rather small size of our unit precluded any other course of action if acceptable levels of flight safety, long term capabilities and our relevance as a maintenance organisation were to be upheld.

As experienced members leave the maintenance organization, and the level of corporate knowledge wanes, I cannot think of a greater responsibility than the mentoring and development of skillfully-trained personnel who will take up the torch – even if, at times, this must occur at the expense of operations. ✈

# ON TRACK

## Field Departures

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.

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This edition of ‘On Track’ will address some questions about field departures, or as they are called in the Royal Canadian Air Force’s *Flight Operations Manual* (FOM): ‘Special Take-Off Requirements – Rotary-Wing’.

The answer comes from Captain Michael Girard, ICP Instructor.

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**H**ave you ever found yourself trying desperately to get out of Wainwright after a long exercise, but the weather is below visual flight rules (VFR) limits? Maybe you are in the process of carrying out a rescue in a remote area when unexpected rain showers and low visibility move in. This article will hopefully answer any questions you have about field departures, as well as provide a quick guide as to how to safely carry one out.

In order to conduct a field departure, you must first be in a situation that meets at least one of three conditions. You are either:

- at an aerodrome with no instrument flight rules (IFR) approach procedure;
- at an aerodrome that doesn’t provide meteorological reports (METARs); or
- at a field location.

If you happen to be at an aerodrome without an assessed departure, but there is an approach and the airport provides METARs, you have a few options. For an aerodrome like Airfield 21 in Wainwright (CFP7), you could potentially fly into the Wainwright Training Area and then carry out a field departure.

Another option that was proposed in a previous ‘On Track’ article (see *Flight Comment* issue 1-2014) is to climb up to circling altitude

while maintaining VFR and remaining within sight of the aerodrome then carry out the published missed approach procedure. A more complex option is to fly the approach backwards, but this will require calculating a minimum climb gradient for each section of the approach.

When preparing to fly a field departure, there are four main rules to follow in order to ensure it is safe and effective. For the exact wording of the rules, see FOM 2.3.5.3. They are, in brief:

- A clearance is obtained prior to entering controlled airspace;
- The weather (estimated or actual) must be at least 300 ft. and 1 statute mile (SM);
- The aircraft must be able to meet the departure obstacle clearance climb gradient described in para. 611 of the Department of National Defence *Flight Planning and Procedures Canada and North Atlantic* publication (GPH204A) with one engine inoperative (OEI); and
- There is a usable alternate within one hour (or 2 hours for the CH149 Cormorant) at OEI airspeeds.

The first two rules, as well as the last one, are pretty straight forward. Obtaining a clearance can be done in several ways, including over





the phone while on the ground or once airborne if taking off into uncontrolled airspace. When looking at the weather, ensure there is a high enough ceiling and visibility to maneuver onto your departure track and attain a safe flying speed prior to entering IMC. For the last rule, there is a caveat listed as a note in FOM 2.3.5.3: Category 1/Restricted aircraft captains (AC) must add 300 ft. and 1 SM to the departure alternate weather criteria for the estimated time of arrival plus 1 hour thereafter.

The second rule is more complex and is the focus of this article, as it is the most important one to understand. After all, nothing else matters if you hit a tower or terra firma on your way out.

First, all obstacles in the departure path must be identified, as well as their height above and distance from the departure point. What is left unwritten is that good local area knowledge is extremely important, as not all towers are guaranteed to be on the map, and VFR navigational charts (VNC) don't always depict rolling terrain very well.

The width of the departure path is not defined, so it is therefore left up to the AC's discretion. Some factors when considering width of departure path include: type of course guidance (GPS, VOR, NDB, or dead reckoning), weather (especially crosswind), and crew comfort/experience level. One suggestion, expanded from the *Terminal Instrument Procedures* manual and assuming good positive course guidance (GPS or nearby VOR) with a positively identified departure point, is to assess obstacles within an area

beginning from 1000 ft. of either side of the departure point then splayed out 15 degrees until 2.5 nautical miles (NM) either side of departure path (figure 1). A simpler method, or if using less reliable course guidance, is to assess all obstacles up to 5 NM from either side of the departure path.

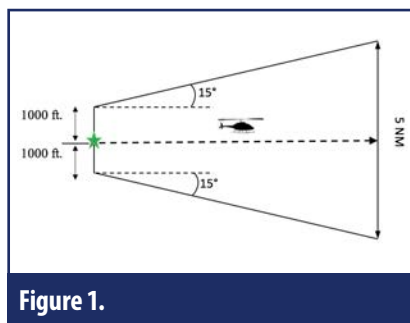


Figure 1.

Once the obstacles are identified, the required obstacle clearance (ROC) and climb gradient can be calculated. The ROC that shall be met is 48 ft. /NM. So, for every mile flown, you must clear all obstacles by at least 48 ft. cumulatively. For easier math, I will round up to 50 ft. /NM:

$$ROC (ft.) = distance \times 50 \left( \frac{ft.}{NM} \right)$$

To figure out the required climb gradient, the ROC is added to the obstacle's height above departure point, and then divided by the distance to the obstacle:

$$Required \text{ climb gradient } \left( \frac{ft.}{NM} \right) = \frac{ROC + \text{obstacle height}}{\text{obstacle distance (NM)}}$$

The last part is determining if the aircraft can meet the required climb gradient while OEI. The OEI climb rate at the density altitude of the obstacle will have to be found in the

aircraft charts. After that, the expected groundspeed will be used to convert the climb rate to climb gradient:

$$Actual \text{ climb gradient } \left( \frac{ft.}{NM} \right) = \frac{\text{climb rate (ft./min)}}{\text{ground speed (kt)}/60}$$

Let's go over an example of this concept correctly put into action. Imagine you have landed on the shoreline of Williston Lake in northeastern British Columbia at an altitude of 2000 ft. to perform a rescue. On the way in, you had a good look at the terrain. It is as depicted on the VNC and there aren't any towers on the mountain tops. While the search and rescue technicians are working on the ground, weather rolls in, severely reducing ceiling and visibility, so you start planning a field departure to get the patients to Fort St. John (figure 2).

Looking at the VNC, one obvious departure route is to the southeast along the lake, but there are two peaks within a 15° departure path. For this example, we will use the 4694 ft. peak that is 10 NM away. Applying the ROC of 50 ft. /NM, you must be able to clear the hill by 500 ft.:

$$ROC = 10 \text{ NM} \times 50 \frac{ft.}{NM} = 500 \text{ ft.}$$

Adding the 500 ft. ROC to the obstacle height above departure point (2700 ft.), you realise you will have to achieve a climb gradient of 320 ft. /NM on OEI:

$$Required \text{ climb gradient} = \frac{(2700 + 500)}{10} = 320 \frac{ft.}{NM}$$

*Continued on next page*

## Continued...

The aircraft charts say the OEI climb rate at the hill's density altitude will be 400 ft./min. (You are able to use the current temperature and pressure altitude to figure out the density altitude at 4700 ft.) With an expected groundspeed of 70 kt, the actual climb gradient on OEI will be 342 ft./NM :


$$\text{Actual climb gradient} = \frac{400 \text{ ft./min}}{70 \text{ kt}/60} = 342 \frac{\text{ft.}}{\text{NM}}$$

Looking at the spot heights on the VNC, as well on the Enroute Low Altitude charts, you determine 7000 ft. will be a safe initial enroute altitude (considering it is a mountainous region) for flying direct to YXJ while in uncontrolled airspace. Using the SAT phone,

you determine that the weather in CYXJ is suitable as both a departure alternate and as the destination. You put a spot slightly east of the hill in your GPS in order to provide positive course guidance. You also note a small peninsula just southeast of your location that will give you a good visual spot to start the climb after accelerating (figure 3). You will be taking off into uncontrolled airspace, so a clearance is not required until airborne. Shortly after takeoff you begin calling Edmonton Centre, while squawking 1000, to get a clearance prior to entering the controlled airspace around CYXJ.

The main purpose of the above scenario is to illustrate how to apply ROC. It is a fairly

extreme and complex example. Most field departures will take place over relatively flat terrain, and will be much simpler to plan. Nevertheless, if you do find yourself having to carry out a field departure over obstacles, remembering to apply the ROC of 50 ft./NM will ensure you are able to carry it out safely.

In summary, field departures are designed to increase the flexibility of helicopter operations. Your knowledge of how to use them can enhance your ability to accomplish the mission; however, they do rely on a high degree of airmanship to carry out safely. Remember, just because you can, doesn't always mean you should. Fly safe! 

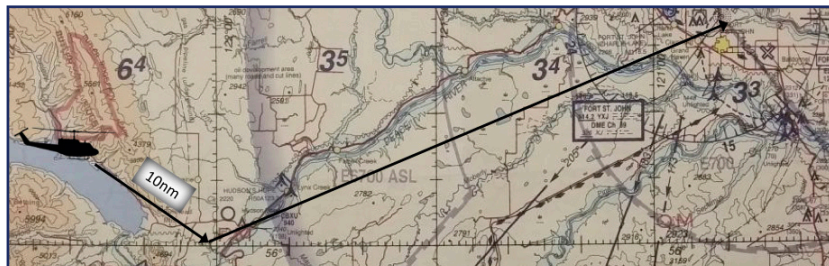


Figure 2.

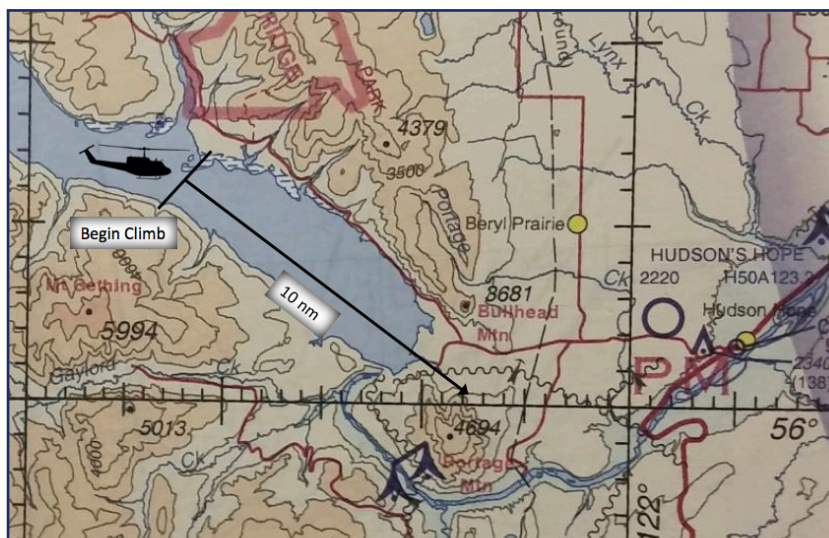


Figure 3.





## THE CLEAN AIRCRAFT CONCEPT

Photo: Cpl Murphy

by Captain Eddy Carmichael, 430 Tactical Helicopter Squadron, Valcartier

**O**n December 7, 1996, I was preparing to leave the Quebec City Airport on board a CT114 Tutor. I was accompanied by another instructor from the 2 Canadian Forces Flying Training School. We simply had to get to Montreal – another step in our cross-country flight in the area. It was snowing heavily, but fortunately the aircraft was nice and warm in a hangar. My knowledge of the factors affecting surface contamination was quite limited at that point. My four years on the CH136 Kiowa helicopter and my two years as a flight instructor in Moose Jaw had little prepared me for this situation.

The instructor who was with me was on his first tour had more time on the Tutor than I, but he still hadn't been in a situation like this very often. After assessing the situation, we agreed to do our pre-flight check, stow our travel bags in the compartments at the wing roots and strap in while in the warmth of the hangar before moving the aircraft outdoors. In doing so, we were limiting the aircraft's exposure to snow, while starting quickly and travelling without delay. Our flight clearance, in accordance with Instrument Flight Rules, had also been obtained while inside the hangar.

While taxiing to runway 06, I clearly remember seeing the wings completely covered in snow. The precipitation had become so intense that it was now accumulating on the initially warm surface of the wings. I was not convinced that taking off was the best option for us, but I did not want to cancel this flight just before applying takeoff power. I checked that my ejection seat pin was pulled out and in view on the dashboard, and we began takeoff. Was my subconscious telling me that my ejection seat was my only escape

*Continued on next page*

in the event of contaminated wings? One has strange thoughts sometimes... Luckily, everything went well, including the rest of the flight to Montreal.

Since then, I have often thought about that takeoff. I was obviously not well prepared for this type of situation. I had never de-iced an aircraft using a de-icing fluid, and I had never used an anti-icing fluid either. I knew that the snow would surely melt on the warm wings initially; but at what point would it freeze and affect the wings' aerodynamic performance? These are questions that I was able to tackle later in my career.

In addition to being a reservist at Valcartier, I now also work as a civilian aircraft captain on a Challenger MEDEVAC, operating flights across Quebec, 24/7, in all kinds of weather. Our aircraft stay in the hangar when on base, and we have to deal with surface contamination on a regular basis - for nine months out of the year!

For a departure straight from inside of the hangar, we use a procedure in which we apply a coat of *Type IV* anti-icing fluid to the wings and tail before towing the aircraft outdoors for fuelling and departure. We obviously have to consult the holdover time (HOT) guidelines

to make sure the protection will still be effective at takeoff. If we are on a layover and the aircraft has become contaminated by precipitation, we do what other commercial operators do: we use a *Type I* de-icing fluid (red; applied hot) to clean the wings and tail, followed by a *Type IV* anti-icing fluid (green; applied cold) to provide protection until rotation speed, at which point the fluid runs off the wings to allow proper lift.

The Transport Canada website provides an annual list of HOT guidelines (<http://tc.gc.ca/eng/civilaviation/standards/commerce->

## Transport Canada Holdover Time Guidelines

Winter 2015-2016

TABLE 4-C-MF-04

### TYPE IV FLUID HOLDOVER TIME GUIDELINES CLARIANT MAX FLIGHT 04

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER

Outside Air Temperature <sup>1</sup>		Type IV Fluid Concentration Neat Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours:minutes)							
Degrees Celsius	Degrees Fahrenheit		Freezing Fog or Ice Crystals	Snow, Snow Grains or Snow Pellets <sup>2</sup>			Freezing Drizzle <sup>4</sup>	Light Freezing Rain	Rain on Cold Soaked Wing <sup>5</sup>	Other <sup>6</sup>
				Very Light <sup>3</sup>	Light <sup>3</sup>	Moderate				
-3 and above	27 and above	100/0	2:40 – 4:00	2:00	2:00 – 2:00	1:25 – 2:00	2:00 – 2:00	1:10 – 1:30	0:20 – 2:00	CAUTION: No holdover time guidelines exist
		75/25								
		50/50								
below -3 to -14	below 27 to 7	100/0	0:50 – 2:30	2:00	1:10 – 2:00	0:35 – 1:10	0:25 – 1:30 <sup>7</sup>	0:20 – 0:40 <sup>7</sup>		
		75/25								
below -14 to -23.5	below 7 to -10.3	100/0	0:20 – 0:45	0:40	0:30 – 0:40	0:15 – 0:30				

#### NOTES

- 1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
- 2 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 5) is required.
- 3 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain.
- 4 Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
- 5 No holdover time guidelines exist for this condition for 0°C (32°F) and below.
- 6 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 7 provides allowance times for ice pellets and small hail).
- 7 No holdover time guidelines exist for this condition below -10°C (14°F).

#### CAUTIONS

- The only acceptable decision-making criterion, for takeoff without a pre-takeoff contamination inspection, is the shorter time within the applicable holdover time table cell.
- The time of protection will be shortened in heavy weather conditions, heavy precipitation rates, or high moisture content. High wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.



holdovertime-menu-1877.htm). The tables seem simple enough to read however; a number of areas require close reading in order not to miss subtle distinctions.

First, *Type I* fluid offers a short period of protection however; there are two tables for this type of de-icing. The one to consult depends on what the aircraft's wings are made of – aluminum or composite.

Second, the *Type IV* HOT guidelines indicate two different holdover times. Generally speaking, for takeoffs after the shorter time indicated, a visual inspection of the wings is required; for takeoffs delayed until after the *longer* time indicated, a tactile inspection of the wings is required.

Third, according to note 2 to all of the Type IV tables, Table 5, "Snowfall Intensities as a Function of Prevailing Visibility" must be used to determine snowfall intensity.

The following example illustrates the importance of referring to this table. Even if a meteorological terminal air report (METAR) indicates a visibility of 2 statute miles in light snow, with a temperature of 0 degrees Celsius at night, according to this table, the intensity to use is "Moderate" when looking at the HOT guidelines for the fluid used. This will have a definite impact, as it decreases the fluid's holdover time.

The manufacturer's recommended procedures must be adhered to in order to know the specifications applicable to each type of aircraft. The same principle applies to helicopters. The rotor blades must be clean before takeoff; however, cleaning them can be difficult, and not all manufacturers allow the use of de-icing fluid on helicopter blades.

The clean aircraft concept is not a theoretical concept; it must be applied in practice to ensure safe takeoffs. It is equally important to familiarize yourselves with de-icing and anti-icing procedures and to know how to use the HOT guidelines for these fluids. This way, you'll never have to look back on a time when your ejection seat was your only escape. ⚡

## Transport Canada Holdover Time Guidelines

Winter 2015-2016

TABLE 5  
SNOWFALL INTENSITIES AS A FUNCTION OF PREVAILING VISIBILITY<sup>1</sup>

Lighting	Temperature Range		Visibility in Snow in Statute Miles (Metres)			
	°C	°F	Heavy	Moderate	Light	Very Light
Darkness	-1 and above	30 and above	≤1 (≤1600)	>1 to 2½ (>1600 to 4000)	>2½ to 4 (>4000 to 6400)	>4 (>6400)
	Below -1	Below 30	≤¾ (≤1200)	>¾ to 1½ (>1200 to 2400)	>1½ to 3 (>2400 to 4800)	>3 (>4800)
Daylight	-1 and above	30 and above	≤½ (≤800)	>½ to 1½ (>800 to 2400)	>1½ to 3 (>2400 to 4800)	>3 (>4800)
	Below -1	Below 30	≤¾ (≤600)	>¾ to 7/8 (>600 to 1400)	>7/8 to 2 (>1400 to 3200)	>2 (>3200)

<sup>1</sup> Based on: *Relationship between Visibility and Snowfall Intensity* (TP 14151E), Transportation Development Centre, Transport Canada, November 2003; and *Theoretical Considerations in the Estimation of Snowfall Rate Using Visibility* (TP 12893E), Transportation Development Centre, Transport Canada, November 1998.



Photo: Cpl Genevieve Lapointe

## CANADIAN ARMY: Clearing the air on unmanned aerial system operations

by Captain Ian Haliburton, The Royal Regiment of Canadian Artillery School, Gagetown

During my last five years working with Unmanned Aircraft Systems (UAS), including an operational experience within a joint environment, I have encountered a consistent lack of understanding across the breadth of Canadian Armed Forces personnel regarding UAS operation. This gap in understanding is specifically regarding how we manage the safe operation of UAS in conjunction with other airspace users. As the Senior Instructor at the Centre of Excellence for Canadian Army

(CA) UAS, at The Royal Regiment of Canadian Artillery School (RCAS) in Gagetown, I would like to share a brief overview of the procedures employed by UAS operators. The RCAS is responsible for training CA personnel in the operation of UAS, and the intent of this article is to help educate and inform the members of the flight community who interact with military UAS. The community's knowledge and awareness is growing, and I hope to aid this growing understanding.

The first concern voiced by many I've spoken with is the fear of UAS operators "losing control" of the air vehicle (AV). This concern is generally based on an imperfect understanding of UAS planning and operation. There are many safeguards in place to prevent this occurrence, and these safeguards are found in the combination of detailed mission planning, mandatory operator procedures, and in the equipment design itself. Each AV is programmed with actions to follow if there is a loss of link with the ground control station



(GCS) and the operator can no longer send inputs to the AV. For example, with the Raven-B Mini UAS (MUAS), the maximum safe operating altitude is pre-programmed, a safe flight path is pre-programmed, and these can be updated during a mission as the situation changes. If there is a loss of link, we have not “lost control” of the AV, as it will follow the safe and planned actions we have programmed into it. This includes remaining in its assigned airspace throughout the entire process as accounting for possible loss of link is part of the mission planning for a UAS, taking into consideration all other airspace users. Additionally, we plan our launch site and flight path to avoid situations that risk loss of link due to line of sight concerns and outside electromagnetic interference.

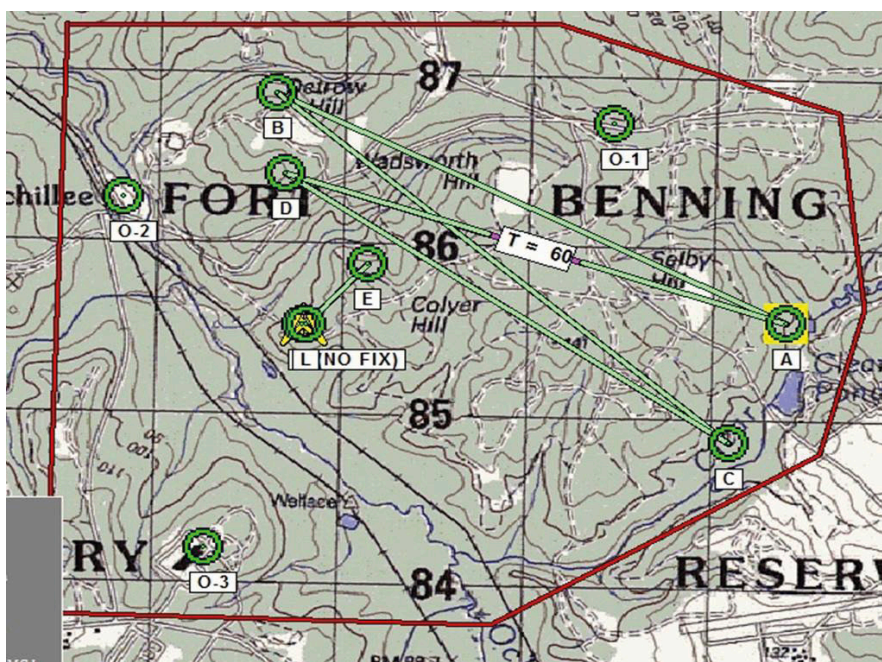
The second common topic of conversations I’ve had is UAS airspace use. There is a perceived notion that UAS are constantly violating the airspace of other users, and I can say that this is categorically not the case. Based on Flight Safety reports, there is no higher incidence of UAS breaking airspace relative to other aircraft, and it is often significantly lower. The reason for this is the levels of control that are placed on UAS. When UAS operate, it is either under procedural airspace control measures or positive control, which ensures that other aircraft are aware of when and where UAS are operating. UAS will not fly without some type of airspace control measure in place; in the case of the Raven-B, a restricted operation zone (ROZ) is put in place for the MUAS to operate in. This ROZ is mapped on the GCS computer and is visually represented to the operators throughout the mission. Furthermore, the exact GPS location of the AV is constantly transmitted to the GCS; UAS do not depend solely on ground features or a paper map, we have a constant visual representation of our position on a digital map that is also used to control the AV. Based on the fact that the AV is controlled from a highly accurate digital map

*“There is a perceived notion that UAS are constantly violating the airspace of other users, and I can say that this is categorically not the case. Based on Flight Safety reports, there is no higher incidence of UAS breaking airspace relative to other aircraft, and it is often significantly lower.”*

showing each control measure, I would place the UAS detachment’s positional awareness at least equal to other aircraft crew.

The concluding point is that of flight safety. I would like to reinforce that each and every Unit in the CA operating a UAS has an established

flight safety team. As a qualified Unit Flight Safety Officer and as an Instructor-in-Gunnery at the RCAS, I know that each MUAS operator student is introduced to the concept and practice of flight safety, which continues throughout their training and employment. Even though our operators are not physically present within their AV, we are certainly members of the aerospace team, and we understand the impact our AV could have on others. Safety is paramount, and something we hold in the highest regard; we aim to prevent all accidental loss of aerospace resources in both training and operation. 🚀



Screen capture of ground control station showing a restricted operation zone, waypoints and flight path.

Photo: DND



## HELICOPTER-TRIGGERED LIGHTNING STRIKE

by Captain Rob Campbell, 417 Combat Support Squadron, Cold Lake



**B**efore it happened to me, I had never heard of helicopter-triggered lightning and perhaps you haven't either. I have frequently encountered people who have caught wind of my experience<sup>1</sup> and assume that I was carelessly flying near a thunderstorm which was not the case. It's been a while since it happened, so some of the facts are difficult to recall but I feel compelled to share my story nevertheless.

On 4 October 2012, I was flying a CH146 Griffon helicopter on an instrument flight rules (IFR) round-robin training mission from Cold Lake to Lloydminster and back with a co-pilot who had just arrived on squadron. This mission was part of his unit check-out and it was just the two of us; we did not have a flight engineer on board as is the case often on IFR training flights. We were on the return leg, approximately half way between airports when we encountered reduced visibilities in a mix of wet snow and rain. We had asked air traffic control (ATC) for the same lower altitude that worked well on the leg from Cold Lake to Lloydminster. It allowed

us to remain below cloud and because I had been monitoring the outside air temperature (OAT) regularly throughout the mission, it also kept us on the positive side of 0 degrees Celsius. The Griffon is not equipped with radar so I wasn't sure how extensive the precipitation we were encountering was going to be but I was expecting

*"At that time, I had been flying for 14 years, logging close to 4000 hours. I had never heard of a lightning strike occurring in a snow shower in the month of October."*

it to be of a short duration. We had seen small patches like this on the first leg and assumed it was more of the same however, this cell was larger and the precipitation rate had increased. With more glances at the OAT gauge and various other indicators to see if we were

accumulating ice, I was seriously considering cancelling IFR and descending to warmer air which I knew was below us.

It was at that moment we experienced a bright flash of light immediately followed by a very loud bang. We were surprised to say the least and unsure of what had just occurred. At that time, I had been flying for 14 years, logging close to 4000 hours. I had never heard of a lightning strike occurring in a snow shower in the month of October. I knew icing was still a threat and since we couldn't find any problems resulting from whatever the flash was, we quickly returned our attention to it. We called ATC to cancel IFR and descended to warmer air. The snow shower passed soon thereafter which returned us to perfect Griffon winter IFR conditions (read: clear skies). I elected to complete the planned approach and we recovered without further incident. We had no indication of damage from the cockpit.





Photo: Pre Daisy Hiebert

After landing, I climbed up on the roof of the helicopter to see if we had been involved with what I possibly suspected was a lightning strike. It didn't take long to find coin-sized burn marks near the root of all four rotor blades and their associated exit marks near the blade tip. The bonding straps from the blades to the hub assembly had been stripped of their insulation and the tail rotor had similar burn marks to the main rotor. Of course, none of this was apparent in flight. Here is what I have learned after doing some research:

I should have declared an emergency and landed. I mistakenly thought that a lightning strike would only affect electronics and since we didn't have any avionics malfunctions, we were safe. What I learned was that hidden and dangerous damage occurs in gearboxes. The current flows through them causing gears to briefly fuse together before breaking apart again. The main rotor blades and tail rotor blades can also be weakened

which may not be immediately noticeable. (I've heard the main rotor blades are back in service following inspection and repair but the tail rotor blades are not). You can read further information about the damage that can occur in the accident reports cited in the link below.<sup>2</sup>

2. This type of helicopter triggered lightning generally occurs in the following conditions which were mostly all present in my situation save for the cumulonimbus cloud (Cb) – I'm not convinced it was one but rather a lesser developed cumulus type cloud. Nevertheless here they are:

- OAT at flight level near freezing :  $0 \pm 2^\circ\text{C}$ ;
- Frozen precipitation in the form of snow, snow grains, hail and/or ice crystals;
- Altitude: 1000–3000 ft. (the study didn't specify AGL or ASL but it was focusing on incidents over the North Sea where both altitudes would be the same);

- Winter season: October to April;
- In-cloud or immediately below clouds, and
- Within 5 nautical miles of a Cb cloud.

Hopefully by sharing my experience, you can be better prepared to act should you ever happen upon weather conditions similar to those listed above. My co-pilot and I would prefer to maintain the honour of being the only Griffon pilots to have been struck by lightning in flight! ⚡

## References

1. FSIMS Case no.154289.
2. Wilkinson, J. M., Wells, H., Field, P. R. and Agnew, P. (2013), *Investigation and prediction of helicopter-triggered lightning over the North Sea*. Met. Apps, 20: 94–106. doi: 10.1002/met.1314 <http://onlinelibrary.wiley.com/doi/10.1002/met.1314/full>





Photo: Mgt Jeff D. de Molitor

## Putting the Brakes on Winter Ops – When enough is enough

by Sergeant Ken Moore, 407 Long Range Patrol Squadron, Comox

**T**he day started out normal enough. It was early spring in Greenwood, Nova Scotia and a light rain had been falling all morning. The temperature hovered around 10 degrees and the morning's flight had been launched without incident.

That afternoon, a strong cold front swept in from the north and the mercury plummeted below zero. The wind picked up and was blowing around 25-30 knots from the north. What was a wet tarmac only hours before had flash frozen into a skating rink.

Around 5 p.m. the servicing desk radio crackled to life. The aircraft that we had launched that morning was due to touchdown in fifteen minutes. I was tasked with marshalling them

in so I grabbed my gear and headed out to meet the aircraft. It only took a few steps out the door to realize that this was going to be a tricky parking job. However, I was tasked to park the plane, and being a keen young Private, that is what I was bound and determined to do.

Finally, the aircraft that I was tasked to marshal comes lumbering up the tarmac. As the pilot began his turn to line up with the parking spot, the howling wind grabbed the tail of the CP140 Aurora and swung the plane around 90 degrees. I gave the brakes signal and they slid another 10 ft. downwind! We should have stopped right there, but I was determined to get him on the spot. So, I started marshalling him forward and gave him a left turn to line up again. No sooner than the tail had turned

across the wind stream, around they went again. At that moment both the aircrew and I had the same thought; just shut it down and chock the wheels.

What led to this mental requirement to accomplish the task without proper assessment of the risk? Mission accomplishment. When we are given a task to complete, we will push against incredible odds to succeed, often at risk to personal safety. Nobody wants to fail. Supervisors and managers need to be the external oversight of these tasks and determine when the level of safety is being compromised. When individuals are left to gauge their own acceptable level of risk, they will often accept more risk than they would expect someone else to do in the same situation. ⚡



## A *riveting* story of inattention

by Sergeant Frédéric Lanouette, 10 Field Technical Training Squadron, Cold Lake

It was a beautiful, sunny summer day—27 degrees, light wind—perfect for playing outdoors... More particularly, though, it was Friday and the end of the shift. At the squadron, the Friday shift change takes place at noon. An experienced technician and I, still an apprentice, had been working for nearly two weeks on a major repair of the rear fuselage of an engine bay. That day, we had decided to stay a bit longer, just to be able to say that together we had completed a complex and challenging repair job during our shift, which is better than finishing earlier since, as you all know, there is always a bit of competition among maintenance teams in the Canadian Armed Forces—and we like it that way!

We were repairing a major crack, discovered during a routine inspection, on the skin of a CF188 Hornet, installing the last rivets on a metal patch.

The more experienced technician, a career sheet metal tech, was working inside the engine compartment, and I was working on the outside. To install our patch, we had to use rivets of various widths, lengths and types: flush rivets, universal head rivets and round head rivets. The procedure when you have to rivet another technician hidden inside is, to tap on the fuselage, in code, to let the other person

know you are ready to rivet, and to give that person time to position himself for the next rivet. Everything was going well. The more experienced technician worked fast and was anxious to finish the work. Being less experienced, I had a bit of difficulty keeping pace, but out of pride I struggled to keep up. I had the rivet gun, and he had the bucking bar.



I had to change the snap almost every time I installed a rivet, since all rivet heads were different. That's engineers for you!

We were nearly done. We had about five or six rivets left when BANG! The snap flew off of my rivet gun like a C7 bullet, ricocheted off the roof of the hangar, pierced the aileron of a

CF188 parked nearby, and hit a door on the opposite side of the hangar. The sheet metal technician was again tapping the fuselage in code, informing me that he was ready for the next rivet; but I stood there frozen and unable to answer, in shock and still trying to understand what had just happened.

The technician eventually realized that something was wrong and came out of the right engine compartment to ask me what the problem was. I answered, "I'm not sure..." However, I had just realized that I had had my finger on the trigger when changing the snap and that a critical flight safety error had been committed. While searching to see where the projectile had landed, we saw the damage caused to a flight control surface and an aileron. We immediately filled out a flight safety report.

An investigation of the event in question revealed deficiencies and human error, including fatigue, the temperature, time of day, unsafe use of the tool, and lack of experience and technique using the tool, all of which could have been avoided, had we taken our time and worked more cautiously. ⚡

## *There I was...*

by Brian Fahy, civilian flight instructor, 3 Canadian Forces Flying Training School, Southport

I was the chief helicopter instructor at a busy helicopter flight school in Toronto. I was reasonably experienced with over two thousand hours of instructional time and a Transport Canada Class 1 instructor rating (Military A cat instructor equivalent), so I knew what I was doing... or so I thought!

On the day of the incident, I was scheduled to fly with a student in a Robinson R44 helicopter. The student had about fifty hours of total flying time on type. We briefed for the mission and carried out the preflight inspection. The preflight was carried out in the hangar and the aircraft was then moved outside.

Our hangar faced northwest. Facing in front of it was a runway, approximately one hundred meters away. Our helicopter pad/ apron was right in front of the hangar and was 50 meters by 30 meters in size. It would often get quite congested, with up to four helicopters parked at any one time requiring one's level of situational awareness to be heightened in

those instances. On the day in question however, there was just one aircraft, our R44, which was towed in front of the hangar and facing it. This was our standard operating procedure, in that while parked, we had the runway behind us, the hangar to our front and the rest of the helipad to our left.

During the pre-flight briefing I talked to the student about notice to airmen messages (NOTAMs) and the weather. As we got outside, we discussed the wind and its strength; it was out of the northwest at twenty knots so we would be starting with a tail wind.

The start procedure and pre-takeoff brief went without incident. At this time, I re-emphasized to the student that the winds were from behind us at 20 knots and that the helicopter would want to turn around on its own into wind (weathercock) as we came up into the hover. After the student acknowledged this, we cleared all around and the student began raising the collective to bring the aircraft into a

hover. We came up nice and stable and maintained a four foot hover. The helicopter's center of gravity and controls were confirmed normal and all parameters were met and within limits.

At this time things deteriorated rapidly!

As the student was stable in the hover, I relaxed and moved away from the controls... and then it happened.

The student applied left pedal (and I mean left pedal!) and the aircraft rotated three hundred and sixty degrees before I could even blink. As we came around to face the hangar again, the student now applied full aft cyclic and raised the collective. Over the noise of the aircraft I heard a dull thud, which I thought was the tail rotor stinger contacting the ground. The hangar disappeared from view below the bottom of the aircraft chin bubble and the low rotor horn started screaming through the head sets.





I attempted to grab the cyclic but my first try was thwarted by the sudden aft motion that the student had implemented, causing my body to be thrown forward against the seatbelt as the aircraft rotated. The cyclic caught on my jacket sleeve but I managed to grab the controls on the second attempt and took control of an aircraft that now did not want to fly. I had applied full right pedal to stop the rotation and the aircraft was now facing north - we had completed one and a half rotations to the left (540 degrees). As my brain was trying to compute what had happened, we were at approximately twenty feet in the air, moving aft and to the right and descending rapidly.

Still having trouble figuring out just what had happened, I decided that I had to stop the aft movement as I knew the hangar at this point was behind me but did not know how close it was. I applied cyclic opposite to the direction of drift to stop the movement, but now we

were descending rapidly as the rotor rpm (Nr) had decayed. I did not have time to look at what it was, but I knew that the horn sounds at 97% Nr or less. It had been going off for what seemed like ages.

***"As the student was stable in the hover, I relaxed and moved away from the controls... and then it happened."***

We were still descending and gaining momentum but because of the low Nr, I knew I had to wait before raising the collective to cushion the landing. When we got close enough to the ground for me to see the imperfections in the surface, I raised collective in an attempt to cushion the landing. As we touched down, we

were now in a pronounced left toe low situation because of the amount of cyclic I had applied to stop the aft right movement. Contacting the ground, we rolled around the left toe, pivoting towards the rear right ski, and bounced rearwards, back into the air. At this time, things became very clear and calm to me, in that I realized that I was just about to roll a perfectly serviceable aircraft over in front of the hangar.

We came crashing back down and momentarily the aircraft teetered, on the brink of rolling over, but settled back on to its skids. I took a breath for the first time in what now seemed like ages and I realized what had just transpired. Not much was said in the aircraft as we went through the shutdown procedure.

What happened?

The student, thinking that we were going to rotate to the right because of my emphasis on loss of tail rotor effectiveness and weather cocking, applied lots of left pedal. We rotated so fast that the student had no time or awareness to move the cyclic control from back pressure (into wind) to forward pressure to compensate for the wind as we rotated. As a result, the wind pushed us towards the hangar. Seeing what was happening, the student then applied aft cyclic and simultaneously raised the collective. In the interim and without thinking, the student mistakenly rolled the throttle to idle, which accelerated the already rapid turn to the left. (The thud I heard was the student's elbow hitting the window as he applied the aforementioned aft cyclic.)

So what did I learn from this? First off, anything is possible in flight - never let your guard down. Second, if it can be done, a student will try to accomplish it at some point. Lastly, if you instruct for long enough, you'll begin to appreciate that they will also take a crack at things that can't be done! 🦅





Photo: Christophe Jonniaux

## The *Effects* Caused By *Routine*

by Captain Christophe Jonniaux, French Air Force exchange pilot, 419 Tactical Fighter Training Squadron, Cold Lake

Every year, every French fighter squadron is deployed to Corsica, an island in the Mediterranean sea, for an air-to-air combat exercise.

During the deployment, multiple launches are performed every day in order to qualify all pilots in a short period of time. The first wave would take off very early, with the last of the aircraft landing by 7 p.m. Therefore pilots experience very long days.

During the second week of the exercise, a routine sets in as we would fly the same type of mission once or twice a day. On one particular day, I was scheduled on the first wave so I had a pre-flight brief at 7 a.m. After completing the pre-brief, I made my way to the servicing desk to sign out my jet. The maintenance records indicated that I had a full internal fuel load.

During the walk around I noticed that I had also an external fuel tank mounted under the fuselage. I knew it was empty because of

the maximum fuel load that had been indicated to me in the maintenance records couldn't include fuel in that tank. (On a side note, operations asked us to come back swiftly after the exercise given the number of waves that needed to be completed throughout the day; there was no time to waste between launches.)

Once the exercise was complete, I saw that I was still a bit on the heavy side to land right away so I decided to go supersonic over the sea to burn up my fuel faster and land as soon as I could. This was not uncommon. In fact, I performed the exact same manoeuvre the day before.

Although the manoeuvre was the same, my jet's configuration wasn't. Despite the fact that I had exactly the same fuel remaining as the day prior, I forgot that this time I had an external fuel tank. With an external fuel tank mounted, my jet was limited to an airspeed of 625 knots. At that moment, the aircraft was flying closer to 700 knots!

I only came to this realization when I called my wingman to slide into close formation while on our way to the initial point and noticed his external tank.

I landed immediately and reported the over-speed to servicing. The fuel tank was removed and checked. Unfortunately, because of my oversight, we had to operate a jet without an external fuel tank for the remainder of the day.

With anything routine in your life, complacency can easily set in, making you take shortcuts that sometimes can be disastrous. When you go flying, never assume that any two missions will be the same; stay focussed and be aware of even the smallest changes that can occur between 'routine' missions. ⚡



# From the Investigator

TYPE: SZ23 C-GFMB

LOCATION: 19 Wing Comox, B.C.

DATE: 15 August 2016

The Cadet Pilot (CP) was conducting the 8th solo training flight under the Air Cadet Gliding Program (ACGP) at 19 Wing Comox Airport.

The CP completed upper air work then joined the left hand downwind for landing on the grass runway 30, known as the Primary Landing Area (PLA). The CP turned base leg slightly later than ideal, angled in towards the PLA, and selected half spoilers.

The Launch Control Officer (LCO) assessed the glider's overall energy state as sufficient to land within the PLA, but the glider's forward speed was slower than ideal. The LCO advised the Solo Monitor (SM) to closely monitor the CP.

The CP turned final, closed spoilers, and attempted to regain airspeed. The CP was assessed by the LCO and SM as descending below profile and flying slow. The SM made a radio call to the CP to pitch the nose forward. The SM radio call went unheard by the CP.

Shortly after, the LCO and SM saw the glider's nose pitch upwards and the left wing drop towards the ground. The glider then descended rapidly and impacted the ground approximately 850 feet short of the PLA threshold.

The CP was extracted from the cockpit and transported to the Comox General hospital. The CP was seriously injured and the glider was very seriously damaged.

The investigation is currently focussing on the following six areas:

- the CP's circuit management;
- the CP's training;
- the construction of the ACGP glider circuit;
- solo monitoring;
- spoiler paint scheme; and
- aircrew strap-in procedure. 🚫



# Epilogue

**TYPE:** Schweizer 2-33 C-GCSK  
**LOCATION:** Lachute, QC  
**DATE:** 16 May 2015

The accident occurred during a training flight in support of the Air Cadet Gliding Program. The flight was to be part of the Annual Proficiency Check for a pilot working towards becoming a passenger-carrying qualified cadet. The accident occurred during the initial climb out on aero-tow with an O-1 Superdog and a Schweizer 2-33A glider used for training and familiarization of cadets.

The initial take-off sequence progressed normally until the aircraft reached a position above the Alpha-taxiway, at which time a momentary partial loss of power was felt. When they reached 100 feet AGL, the tow plane experienced another partial loss of power and felt a reduction in climb rate.

The glider was too low and too far for a 180° turn back to the runway and there were no good options for an off field landing. A soccer field was noted off to the right and the glider instructor opted to release at a speed of about 45 mph and a height of around

100 feet AGL, less than 50 feet above the trees, to try for the field. Immediately following the release, the soccer field was hidden behind the tree tops. The glider instructor turned in the direction of the soccer field when the right wing suddenly dropped. The glider instructor tried to apply opposite aileron but there was no reaction from the glider. The glider made contact with the trees, dropped nose down towards the ground and came to a sudden stop when the nose of the glider impacted the soft earthen floor of the wooded area.

Once the glider released, the tow plane was able to return and land at the airfield. Communication with the glider was established quickly and the glider instructor confirmed they were "OK". The glider damage was assessed as very serious (Category-B), and one of the glider crew suffered minor injury.

The investigation determined two possible causes for the tow plane loss of power. First, the carburetor flapper valve rigging was such

that it allowed the hinge assembly in the heat box to open, essentially activating the alternate air (heated air) to be fed to the carburetor, causing a loss of power.

Second, the tow plane was operated under various icing conditions throughout the day, and carburetor icing may have caused a loss of power. It could not be determined with certitude in what proportion each of the two scenarios actually contributed to this accident.

Preventive measures included a modification on the entire Superdog fleet to replace the carburetor heat box, and tools are to be developed to better equip tow plane pilots to assess conditions of icing during operations.

The occurrence involved a glider and a tow plane, and this report includes a review of the entire sequence of events involving both aircraft. ✈





# Epilogue

TYPE: CH146 Griffon  
LOCATION: Mahone Bay, NS  
DATE: 29 September 2014


**4** 27 Special Operations Aviation Squadron (SOAS) were on deployment to 12 Wing Shearwater, NS to conduct a Canadian Special Operations Forces Command (CANSOFCOM) Maritime Security Operations (MSO) training mission. The mission entailed three CH146 Griffon helicopters simulating the insertion of Special Operations Force (SOF) assaulters aboard a simulated Vessel of Interest (VOI). This was a “dry run” meaning that there were no assaulters aboard the helicopters and no one would be rappelling down to the ship. As such, the plan was to simulate the insertion by simply holding a steady hover over the ship for several seconds prior to returning to base. The Canadian Coast Guard Ship (CCGS) Sir William Alexander was used as the VOI.

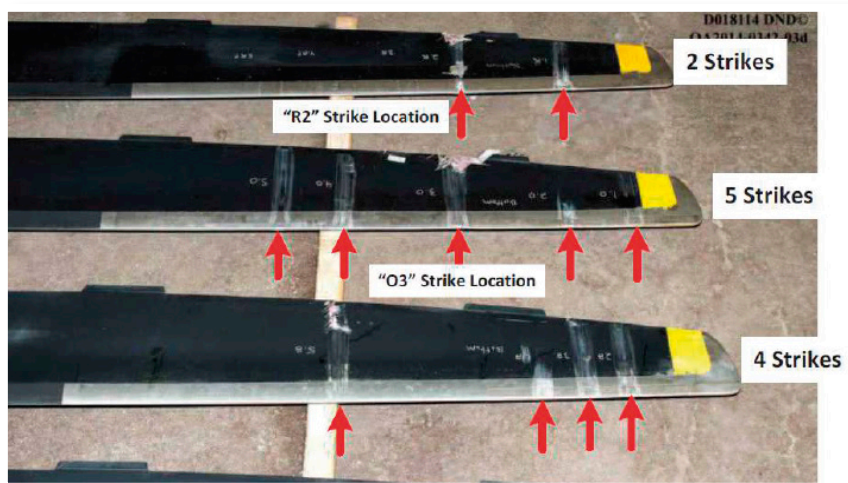
Leading up to the simulated insertion, the 3-ship formation of Griffon helicopters was operating tactically over the water at 100 feet (ft) Above Sea Level (ASL) off the coast of Chester, NS. The crews, visually aided with Night Vision Goggles (NVG), initiated the manoeuvres running in towards the ship from approximately ninety degrees off the starboard side of the ship.

As the First Officer (FO) of the number 1 helicopter settled into a hover over the forward section of the ship, vibrations were felt when the main rotor blades made contact with one of the ship’s antennas located towards the forward edge of the ship’s bridge.

The FO immediately initiated an overshoot, departing forward and away from the ship. The Aircraft Commander (AC) then took control of the helicopter and headed for nearby land to find a safe place to make an emergency landing. A safe landing was made in the backyard of a residence on an island 1 Nautical Mile (NM) from the ship.

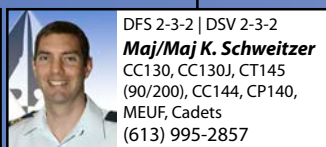
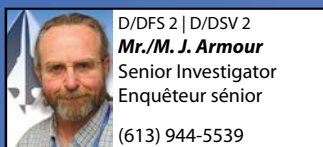
The helicopter suffered serious damage to the main rotor blades as a result of the contact with the ship’s antenna as well as minor damage to the tail rotor blades that made contact with tree branches during the emergency landing into the confined area.

The preventive measures recommend changes at the supervisory and organizational levels, including the implementation of a formal risk assessment tool such as a Mission Acceptance and Launch Authorization mechanism (MA-LA) and better Standard Operating Procedures (SOP). It also includes recommendations for enhanced training in Human Performance in Military Aviation (HPMA). 





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