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Flight Comment



ISSUE 1, 2020

VIEWS ON FLIGHT SAFETY

CWO Benoit Laliberté

LESSONS LEARNED

Perceived Pressure: An Actual Thing

MAINTENANCE IN FOCUS

Missed Maintenance Inspections: They are on the Rise!

Canada

Cover – Master Corporal Michel Houde and Corporal Luca Urbani, Aviation Systems Technicians, maintain and inspect the augmentor tube at the engine test cell of 3 Air Maintenance Squadron at 3 Wing Bagotville on November 4th, 2019.

Photo: Cpl Dominic Duchesne-Beaulieu



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Flight Comment



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Views on Flight Safety

by CWO Benoit Laliberté, Directorate of Flight Safety, Ottawa

In the big picture, flight safety applies to any Accredited Maintenance Organizations, no matter how small or large the size of the squadron or organization. As technicians, we are responsible for the safety and lives of others while we are performing airworthiness activities during maintenance, repair or overhaul of aeronautical assets. At all times, we need to take the right precautions to minimize risks and reinforce flight safety.

As part of managing how we perform maintenance, we routinely use the defined processes of Maintenance Deviations and flight safety investigations to help us conduct our work especially when technical issues arise. It is important to note, however, that there is often confusion associated with the term “deviation” because it has two very different meanings depending on the context of its use.

Within flight safety, a “deviation” is a deliberate action, omission or process that occurs when an individual intentionally does not follow a sanctioned procedure or regulation. A flight safety deviation is considered an unauthorized action and, in some countries, is referred to as a violation. In contrast, a “Maintenance Deviation” is an approved procedure outlined in the AF9000 Plus manual that authorizes a specific departure from an approved maintenance program. In this context, a Maintenance Deviation has been authorized by engineers or manufacturers and implemented by technicians to solve a technical issue. A Maintenance Deviation is NOT a flight safety deviation.

An Approved Maintenance Program involves practical steps that protect our people and our aeronautical assets from harm and promotes the growth of our flight safety culture. Good practices in Maintenance Deviations make

sense and involves the maintenance, repair or inspection performed in accordance with Canadian Forces Technical Orders (CFTOs). This implies that under no condition can a technician deviate from these orders. However, in my six months as the Directorate of Flight Safety Chief Warrant Officer, I have seen a stupefying number of flight safety maintenance related incidents in our Flight Safety Information Management System whose cause was directly related to a failure to follow authorized procedures.

Voluntary, deliberate unauthorized deviations must not be tolerated by anyone performing maintenance - from the floor up to the senior leadership within the organization. It is important to consider maintenance actions as part of the airworthiness program, and to consider that the cumulative safety of flight risk of unauthorized deviations could potentially lead to a fatal consequence.

From a flight safety perspective, understanding why a deviation occurred is essential to solving the issue and preventing it from happening again. If a flight safety investigation determines that someone wilfully acted in contrary to established procedures because they were personally trying to gain something, it is classified as a person-centric deviation. An example of this is someone skipping a procedural step in the CFTO so that they can leave work early for a sporting or social event. At this point, the investigation is no longer considered a flight safety matter and its resolution is turned over to the chain of command to be addressed. These circumstances are quite rare.

Alternatively, it is much more common for a flight safety investigation to discover that an individual or a team performed an unauthorized deviation because they were motivated

by the desire to ensure success of the mission. This is classified as a mission-centric deviation and is often seen in circumstances of high operational tempo. This is not new. While on deployment to Iceland in the early 2000s, I recall seeing an apprentice inspecting and performing servicing tasks and inspections such as Before flight (B Check), After flight (A Check), and Daily Inspections (DI) on the CF-188 Hornet without being fully qualified and authorised to do so. In this circumstance, the Level A technicians were signing the CF-335 on behalf of the apprentice and mission readiness was clearly motivating those actions.

Understanding the cause of what has led to an unauthorized deviation allows the appropriate organizations to accept responsibility and to implement measures to fix the issue. This is why the flight safety just culture is so important in allowing people to freely report their concerns or observations without fear of reprisal. We can only fix problems if we know about them. Once issues are identified, flight safety can educate our personnel and we can learn from each other. This allows us to recognize the conditions or pressures that cause deviations and we can stop and act in a proper manner.

If compliance is at risk, stop and inform your supervisors. They can start the appropriate review and approval process and they can transfer the decision and risk to the appropriate level. An authorized Maintenance Deviation may well be the outcome, but in any case we all will be the safer for it. The factors of improvisation, short cuts, unapproved deviations, and inappropriate “can-do” attitudes all lead to gambling with safety and puts people’s lives at risk. 🔥

The Editor's Corner

This issue of Flight Comment is dedicated to the teams of technicians operating in behind the scenes. Without them our operations would cease. They work under great pressure, tight timelines, limited resources and difficult working conditions. They are mandated to follow their CFTOs and work packages but are also required to be creative in their problem solving when reality throws curve balls into the mix.

Technicians take their jobs seriously and their professional pride takes a huge hit when something goes wrong. I know this because I get to read all their Lessons Learned articles submitted as a prerequisite before a flight safety course and technicians often express dismay at themselves for taking short cuts to get a job done. One especially poignant article talked about a challenging time at a unit when mentorship and experience was limited. Things were not running smoothly and Level A Maintenance Releasers were finding issues when checking critical junctures and doing independent checks. A group meeting was held and a senior corporal, whose partner flew on the aircraft, put things into perspective. She said, "Guys, complacency isn't an excuse. Follow your CFTOs. If you are unsure of something, stop and ask. Don't carry on. These are our coworkers, friends, husbands, and wives who trust their lives with our work to keep them safe and get them home in one piece."

This comment applies to us all. It's also a reminder that none of us operate in isolation. Our comments and actions influence the people around us. Applying pressure on a technical crew to get a job done more quickly may actually cause more disruption to the overall operation... there's nothing like a flight safety occurrence to slow things down! Assigning a job, prioritizing it with the team and then providing the space, time and resources for our technicians to do the work is a matter of professional respect. To reinforce this message, I've chosen a few other Lessons Learned articles that focus on our ground

crew's perspective. Hopefully a glimpse into their world will serve as a reminder to all about the challenges and pressures that affect our team mates.

Continuing on with this theme, the DFS Chief, CWO Ben Laliberté, has contributed the Views on Flight Safety article and MWO Fred Boutin has written an article for the Maintenance in Focus section. Feedback and collaboration is being requested, so if you have input, we would very much like to hear it!

Providing insight into other areas of flight safety, this issue includes an article about Flight Data Monitoring from LCol (Retd) Martin Leblanc and an article about Mandatory Routings from Captain Chris Filiatreault. M. Benoit Gagnon has contributed an article on Air Weapons and Ammunition Safety and Major Rich Kinner has presented a piece on the initiative taken by 14 Wing to address UAV concerns.

I would especially like to draw attention to the excellent article written by Captain Scott Boer in which he discusses his issues about dealing with an incident after it occurred. We here at DFS would sincerely like to thank him for taking the time to compose this article. It serves as an excellent reminder about the importance of mental resiliency training for our personnel. Challenging people to think about how things could go wrong, before they do, leads towards better preparedness – not just in handling the emergency itself but also in dealing with the emotions afterwards.

To introduce a note of levity into the magazine, we thought you might enjoy our "Find the Difference" challenge located on the Back Page. The serious side of this exercise is to highlight the challenges that our personnel face when doing daily inspections or maintenance work. It's challenging enough to find the differences when given two photos to compare. Remove the comparative image, throw in some poor lighting conditions or an awkward viewing angle and some tired eyes and then see how hard it is to



find the missing or improperly installed piece. Many of our For Pro flight safety award recipients did just that. Kudos for their extra diligence in finding something unusual, trusting their intuition and then actually following through to address the issue.

Regarding follow through, you can now find the answer to the message hidden in the flight safety stereogram poster released in issue 1-2019, at <http://www.rcaf-arc.forces.gc.ca/en/flight-safety/index.page>.

My final note is rather bitter sweet. The time has come for me as Editor of Flight Comment to pass on the electronic quill. The past few years have been so very interesting and I've learned a great deal. Who knew there was a difference between the various kinds of dashes?! It truly has been an honour to try and be your voice and to create a resource that is interesting, informative and nice to look at. I could not have done this job without the huge help of the DFS-3 staff, translators, design and printing support and, of course, you for providing the rich material (text and images) that this magazine is all about. My thanks to you all! The message of flight safety is an incredibly important one to share. Keep passing it on! 🍀

**Claire Maxwell, Major, DFS 3-3,
Flight Comment Editor**

For Professionalism

For commendable performance in flight safety

Corporal Peter O'Brien, Mr. Marius Vanderlinde, Major Gerald Fraser and Master Corporal Julien Renaud



On 5 February 2018, having just returned to Trenton, Hercules CC130J614 was parked on the west ramp and aircrew and maintainers were offloading gear using the crew entrance door of the shut-down aircraft. Aviation Systems Technician Cpl Peter O'Brien was waiting in his vehicle to perform post-flight duties. When Cpl O'Brien saw the aircraft start to slide forward, he started honking his vehicle's horn to try and alert the crew on-board the aircraft. This action was repeated by the crew shuttle bus driver, Mr. Marius Vanderlinde, who was also parked nearby.

Concurrently, Aircraft Commander Maj Gerald Fraser and Technical Crew Member MCpl Julien Renaud were collecting their gear from the cockpit. Hearing the horns, MCpl Renaud

checked his surroundings and saw that the aircraft was moving forward. He immediately climbed into the right hand seat and applied the brakes. Seeing MCpl Renaud's action and ascertaining what was happening, Maj Fraser turned on the auxiliary hydraulic pump so that the brakes could work. MCpl Renaud reapplied the brakes and brought the aircraft to a full stop. In just a few seconds, the aircraft had rolled forward 16 feet, reducing the separation to 20 feet from another CC130J from which it was initially parked nose to nose. The open crew door narrowly missed a ground power unit and the #1 propeller came to a rest inches short of the servicing truck. To avoid a collision, Mr. Vanderlinde had maneuvered the crew bus out of the way.

The ensuing investigation determined that the aircraft had rolled forward due to plastic chocks rendered ineffective from the cold temperature, a slightly sloped ramp and a strong tail wind.

The combined actions of Cpl O'Brien, Mr. Vanderlinde, MCpl Renaud and Maj Fraser prevented an impact between two aircraft and other resources nearby. Their quick response, team work and strong situational awareness prevented serious damage and potential injury and makes them most deserving of this For Professionalism flight safety award. 🏆

Captain Brian Stobbart

On 14 October 2018, Capt Brian Stobbart, a pilot with 436 (T) Squadron deployed on OP RENAISSANCE in Indonesia, was verifying his flight plan while his Hercules CC130J was being loaded for the day's mission. After loading operations were completed, Capt Stobbart noticed, from the cockpit, that the nose of the aircraft was abnormally high. Receiving confirmation from a ground technician that this seemed to be the case, Capt Stobbart and the Loadmaster proceeded to the back of the cargo compartment to verify the documentation on each of the pallets. Noticing the weight of the last pallet to be incorrect, Capt Stobbart had it removed from the aircraft. Capt Stobbart immediately initiated a Flight Safety Occurrence Report which placed the pallet under quarantine and had the aircraft weight and balance amended. The mission continued without further incident.

The pallet weight was verified the following day with the discovery that there was a one thousand pound discrepancy between the pallet and its actual documentation.

Capt Stobbart's ability to recognize this anomaly from his seat in the flight deck demonstrates exceptional attention to detail and a high regard for safety. Had this problem gone unnoticed or been ignored, the aircraft would have flown in an unbalanced configuration. Being tail heavy may have resulted in a tail strike or much worse. Without a doubt, the



actions of Capt Stobbart prevented a hazardous condition that could have had serious consequences. For these actions he is most deserving of the For Professionalism award. 🇺🇸

For Professionalism

For commendable performance in flight safety

Sergeant Ghislain Rivard



Sergeant Ghislain Rivard is currently employed as a Loadmaster Training Sergeant with 437 Squadron in Trenton. On 28 March 2019, Sgt Rivard was conducting static training for cabin crew members on a CC-150 Polaris. While demonstrating the emergency procedure to don a crew oxygen bottle with the associated mask, Sgt Rivard noticed one of the operational crew oxygen mask adapters was different. This mask adaptor, still in its original packaging, was missing the metal adapter found on the demonstration mask.

After a failed attempt to reach the maintenance contractor, Sgt Rivard reported his concern to 437 Squadron Operations who then directed the contractors to inspect all of the operational oxygen masks. Several were found missing a critical fitting rendering them completely unusable in an actual emergency situation.

It is not listed as a requirement in the cabin crew checklist for the Loadmaster or any of the other crew members to check for this particular fitting. The mask typically remains

sealed in its original packaging until required for use. Sgt Rivard's attention to detail, insistence on practical training and professionalism allowed 437 Squadron to recognize that aircraft were flying with multiple oxygen masks that would not have functioned in a real emergency. Sgt Rivard's dedication went above and beyond his normal duty and possibly prevented a life threatening situation. He is highly deserving of this For Professionalism award. 🇨🇦

Master Corporal David Dumais



Master Corporal David Dumais, an Aviation Systems Technician in Bagotville, is to be commended for his extensive actions taken to understand and rectify issues that were discovered after a broken digital Vernier caliper was received into his care. His questions initiated a flight safety investigation that showed poorly applied procedures were compromising the traceability and validity of specific

measurements gathered when inspecting CF18 F404 engines. Identifying that several technicians were misinterpreting the P04 maintenance policy publication, he initiated a survey that clarified general understanding of the publication and improved the management of out of tolerance tools.

MCpl Dumais demonstrated a superior level of professionalism in his analysis and actions into rectifying this issue. He considered all areas

potentially affected by this problem and kept his chain of command informed throughout the resolution process. MCpl Dumais is considered a very deserving recipient of the For Professionalism award. 🇨🇦

For Professionalism

For commendable performance in flight safety

Master Corporal Sammy Kenol



While performing his duties as a CH147F Chinook tow crew supervisor while deployed on OP PRESENCE, MCpl Kenol exhibited remarkable professionalism and outstanding situational awareness of his crew when he prevented a potentially dangerous situation from happening.

On 10 March 2019, after receiving a MEDEVAC call, MCpl Kenol and his team ran to a CH147F helicopter to tow it outside the hangar. Identifying the unusual circumstance that the aircraft would be towed with aircrew onboard,

MCpl Kenol secured a safe towing path and began moving the aircraft. Once it was towed outside, a tow crew member went underneath the aircraft's cargo ramp to remove the tow bar assembly from the aft right wheel. As the tow crew member was removing the bar, one of the on-board aircrew announced that they were lowering the cargo ramp and reached for the actuation lever. Immediately recognizing the danger, MCpl Kenol firmly declared "STOP" and the aircrew ceased the ramp lowering process. The remainder of the task was carried out without further incident.

Initiation of a MEDEVAC call creates a heightened sense of urgency for all personnel involved. Knowing that there are lives to be saved results in a lot of personnel rushing to start their assigned individual tasks. MCpl Kenol overcame all these distractions. By paying meticulous attention to his surroundings and the roles of his crew, he averted what could have resulted in a Canadian Armed Forces member being seriously or fatally injured. ✨

Master Corporal Matthew Kean

While conducting towing operations on 9 July 2019, MCpl Matthew Kean, an Avionics Systems Technician with Task Force Mali, found a bolt on the tarmac where ground runs are carried out. Not knowing where the part came from, MCpl Kean quickly led a search party of all CH146 Griffon helicopters and found that there was a bolt missing on the aft cross-tube of Griffon 436's landing gear.

A quick survey of the same aircraft revealed another loose bolt on the aft cross-tube. If the first bolt had been attributed to general Foreign Object Debris (FOD) and no further actions taken, the situation could have resulted in a landing gear failure with catastrophic consequences.

For his attention to detail, quick thinking and subsequent follow up action, MCpl Kean is very deserving of this For Professionalism award. 🇺🇸



For Professionalism

For commendable performance in flight safety

Master Corporal Scott Lindsay



Photo: Cpl Mitchell Paquette

From left to right: LCol Cory Kwasny, CO 423 (MH) Sqn, MCpl Scott Lindsay, MWO Ian Manson, 423 (MH) Sqn, D/ASO.

On the 9th of August 2018, while familiarizing himself with newly granted Aircraft Life Support Equipment (ALSE) authorizations, Master Corporal Scott Lindsay, an Aircraft Structures (ACS) technician employed at 423 Maritime Helicopter (MH) Squadron discovered ten emergency floatation bags from eight different CH148 Cyclone helicopters that had expired or were near expiration.

MCpl Lindsay's quick reaction allowed 12 Wing to ensure appropriate aircraft were available for the flying program without overflying the inspections and to address the hazardous condition. All deficiencies were addressed with mitigations put in place by the maintenance organization.

MCpl Lindsay's keen attention to detail, thoroughness and quick reaction prevented potentially unsafe conditions to exist across multiple aircraft. His quick identification

highlighted a major flaw in the ALSE reporting procedures within CMMS on the CH148 Cyclone fleet. His dedication, superior level of professionalism and initiative to go above and beyond resulted in the rectification of a potentially dangerous situation for CH148 aircrew. MCpl Lindsay prevented a potentially serious occurrence from taking place and is therefore highly deserving of this For Professionalism award. 🇨🇦

Master Corporal Garrett Logan



Photo: Cpl Rob Stanley

On 12 June 2019, MCpl Garrett Logan, a maintenance technician with 436 (T) Squadron, was performing a post flight inspection on a CC130J Hercules at CFB Trenton. During the number four engine inspection he noticed that one of the inlet guide vanes appeared to be out of alignment and brought it to the attention of the 436 Squadron maintenance team.

After several hours of troubleshooting, the maintenance team and Rolls Royce Field Service Rep confirmed that the number four engine had an internal failure of the inlet

guide vane ball and arm assembly. The complexity of this failure meant the engine had to be replaced.

MCpl Logan is to be commended for his discovery. The post flight inspection requires technicians to perform a visual inspection of the inlet for signs of damage and corrosion. MCpl Logan was able to recognize an internal engine failure when there were no other signs or symptoms of this problem despite the fact that he is an Avionics vice Aviation Systems Technician and had only been on the CC130J Fleet for 10 months.

MCpl Logan's keen attention to detail and sound technical judgment prevented what could have been a catastrophic engine failure. It is unknown how long the aircraft had flown with the misaligned inlet guide vane but MCpl Logan certainly demonstrated the importance of a thorough inspection despite the fact that the propulsion system is not within the scope of his trade. MCpl Logan is highly deserving of this For Professionalism flight safety award. 🏆

For Professionalism

For commendable performance in flight safety

Corporal Kaytlynn Nobles



Photo: LS Darren McDonald

Cpl Kaytlynn Nobles is an Avionics Systems Technician with the Aerospace Engineering Test Establishment (AETE) in Cold Lake, Alberta.

On 8 April 2019, Cpl Nobles conducted an Out of Sequence Inspection (OSI 325) on the Underwater Acoustic Beacon (UAB) for Tutor CT114166. While reviewing the Automated Data for Aerospace Maintenance (ADAM) tool to ensure that this inspection was captured properly, she discovered that this same inspection was missing from another

Tutor aircraft's OSI register. Further research indicated that this second aircraft had missed its last two UAB inspections over a 12 month period. Ever vigilant, Cpl Nobles initiated a review of OSI 325 on the rest of the Tutor fleet at AETE.

Cpl Nobles' actions led to an ADAM audit of the Tutor and Griffon helicopter OSI registers which further uncovered a Griffon OSI that was not being tracked in ADAM. The discovery of these discrepancies are important because C-releasers review the registers for upcoming

OSI's before they release aircraft for flight. If the registers are not properly updated, C-releasers can unknowingly release aircraft with expired inspections.

Cpl Nobles' initiative to review the OSI register and her action to flag the discrepancy has directly led to two fleets correcting their OSI registers in ADAM and eliminated the risk of aircraft flying with expired Out of Sequence Inspections. Cpl Nobles' actions are exemplary and make her very deserving of this For Professionalism flight safety award. 🏆

Corporal Scott Warren



Corporal Scott Warren is an Aviation Systems Technician with 439 Combat Support Squadron in Bagotville.

On 15 April 2019, while inspecting the new tail rotor of a CH146 Griffon helicopter during a 25 hour inspection, Cpl Warren discovered an extremely small crack in the paint on the tail rotor grip plate. The tail rotor was removed,

further testing was conducted and a flight safety investigation was launched. The subsequent investigation spurred inspections by other Griffon operators of the new tail rotor assembly and revealed similar tail rotor cracks on seven aircraft across Canada, including a blade that was still in its shipping container. Cpl Warren's exhaustive attention to detail

meant that a significant flaw affecting three of the four Search and Rescue/Combat Support Squadron Griffon units in Canada was discovered before any potential degradation of the part could affect crew and aircraft safety. Cpl Warren is fully deserving of this For Professionalism award. 🇨🇦

For Professionalism

For commendable performance in flight safety

Mr. Edward McNulty



Mr. Edward McNulty is an IMP Aerospace maintenance planner at 19 Wing Comox. Although he is not responsible for auditing electronic records, Mr. McNulty did an in depth examination of the record set of a CH149 Cormorant helicopter that had been grounded for three weeks in Powell River, BC. During this review, he discovered a part number discrepancy with a gear box shaft installed during an earlier maintenance action. Suspecting that an incorrect part may have been fitted, Mr. McNulty interviewed the technicians and confirmed his suspicions were correct.

In light of this discovery, management decided to have the main gear box gearbox disassembled where it was discovered that not only was the incorrect shaft installed, but that other components had sustained major damage due to also being incorrectly assembled.

Prior to Mr. McNulty's findings, numerous ground runs and ferry flights had been attempted with each being terminated due to a hot oil condition in the main gear box. Many maintenance actions to rectify the hot condition had been performed without success. The main

gear box was being considered for removal and overhaul and it was thought that the helicopter would have to be barged back to Comox.

Mr. McNulty went well above and beyond his normal responsibilities and is to be commended for his superior diligence and attention to detail. His perseverance in identifying the issue prevented further gearbox damage to this helicopter and highlighted maintenance practices that needed to be improved. 🚀

Mr. Theodore Romanick

Mr. Theodore (Ted) Romanick has been involved with the CC150 Polaris program at CFB Trenton since 1992 and is presently employed as the Person Responsible for Assignment of Authority at L3 MAS.

On 17 October 2018, after conducting a paperwork audit and discovering a missing signature on a maintenance check, Mr. Romanick left his office to find out whether the maintenance action had actually been completed. During his inspection, he noticed that the #1 engine thrust reverser door on Polaris CC150003 was not fully stowed and was protruding into the airflow. Mr. Romanick immediately declared the aircraft unserviceable and it was towed to a hangar where an in-depth inspection was carried out. Damage to an upper flex shaft assembly was found, with one end broken and the other twisted, resulting in the entire upper and lower flex shaft assemblies needing to be replaced. The aircraft had been scheduled to depart within the hour prior to the defect being discovered.

Although Mr. Romanick has many years of experience as an Airbus A310-304 Aircraft Maintenance Engineer, his current job description does not include doing daily inspections on aircraft. The discovery and actions taken by Mr. Romanick certainly averted the potentially dangerous situation of the thrust reverser door separating from the aircraft during flight. In recognition of his outstanding dedication and work, Mr. Romanick is considered a very deserving recipient of the For Professionalism award. 🏆



Photo: Cpl Rob Stanley



From the
Flight Surgeon

Emotional Brain vs Logical Brain...

by Captain Scott Boer, 403 Operational Training Squadron

Editor's Note: The following article is a follow up to the "Oh No, We're Going Over" article written by Capt Scott Boer and published in the Lessons Learned section of Flight Comment 2-2019. The first article described his experience of encountering a whiteout condition while trying to land a CH146 Griffon helicopter at night in a snow covered confined area.

This article deals with how his "brain became trapped and how [he] escaped from the emotional response loop" after the near crash.

Trigger

Nights...NVG's...Whiteout... Thump...
Lurch... Rolling right... grab controls...
hard left cyclic... 7...14...23 degrees of roll...
Pull power... A/I oscillating left and right...
Whiteout... ½ rotor from trees... Pull harder...
focus on the A/I... breakout at 40 feet...
Survival.

As the incident unfolded my limbic system dumped a massive amount of adrenaline into my system as it martialled my body for the fight or flight reflex. I went into a split personality, where my sub conscious took control of the eye-hand coordination and my logical brain observed from almost a third person perspective.

Emotional Brain response

Concerned...surprised...fear...hyper focused...
fight...fight...relief...focused.

Logical Brain response

I felt like time expanded from seconds to minutes and I flashed through scenarios in milliseconds.

As we rolled right I could visualize the rotor blades nearing the ground... Would the blades snap? Would the transmission rip free of its mounts? Would we catch on fire? I really don't want to burn. Can we get out? Where is the FE? He's not strapped in. Will he get hung up on his monkey tail? Can I lift them out their window? Can I kick out the top or front window? I really don't want to burn.

Ok, we're off the ground. A/I is oscillating. Where is the tree line? It was about ½ rotor off the right. There is a light blinking in my HUD... am I over torqueing? OK, remember to check for the over torque. Keep the A/I level. Where is that tree line? I don't want to crash into the trees... will I hear the blades hit? Where is lead aircraft? I'm climbing. Light is still flashing.

I'm visual with the trees and lead aircraft. My legs, arms and core are shaking like I'm cold... can't speak in full sentences... Suppress the emotional response... focus... Think what's my next priority?

Post Event

I thought that since we landed safely back home and the crew was uninjured that the event was behind me, but it was just beginning.

Night 1- Replay

As soon as I closed my eyes, my mind's eye began a detailed replay of the event, my heart rate increased and I began to sweat. Thump...roll...fear...fight...fight...breakout... Thump... roll...fear...fight...fight. After 2 hours, I got up, turned on the TV and stayed up until exhaustion overtook me. A quick sleep was interrupted by Thump, roll, fight, fight... Get up before dawn, grab a coffee and head to work.

Week 1 – Rinse. Repeat.

During waking hours I was busy with paperwork, researching, flight safety reports, and admin. I talked on the side with my co-workers as I explained the lessons I had learned and I continued flight operations. During the night though, I would enter the same fight or flight replay over and over, but now I would spend more time living out the worst case scenarios that I had feared during the event.



Photo: Sgt. Matthew McGregor

- We rolled, the blades would snap, and we would climb out...
- We rolled, the transmission ripped off and came into the cabin, we did not get out...
- We would roll, the aircraft caught fire, we could not get out...
- We drifted into the trees, the blades snapped, we fell to the ground...
- We drifted up into lead aircraft...

All of the dreams were accompanied by physical and emotional body responses... elevated heart rate, sweat, tightness of the chest...and the adrenaline dump.

Weekend – Comfortably numb and dumb

So the weekend is here, and I celebrate with a bottle of wine, the 2nd bottle opens up within 20 minutes and I move through that one quickly and figure I should round it off with a scotch on the rocks...now comfortably numb I just want to sleep. 6:30pm and I'm in bed.... 1 am: Thump...roll... fight... awake, ugh, I'm so dumb! Now I have a hangover to add to the mix. My wife steps in, says no more alcohol and insists that I go to the flight surgeon on Monday morning.

Monday – Turnaround

Monday morning I presented myself to the MIR and asked for help. The staff were very professional and guided me to the mental health nurse. She did a quick interview and determined what resources I would require. They ensured that I would not leave without having an actionable treatment plan laid out.

Over the next week the staff showed me how to move the incident from the emotional brain response to the logical brain through written exercises and other means. Once I had the accident into my logical brain, I could process it and remove the fear response. My sleep patterns returned to normal and I no longer triggered the adrenalin dump.

Within two weeks, I was back on the flying program and felt great. I dodged two bullets that winter. The first was the incident and the second was stopping the entrenchment of poor coping strategies.

The mental health clinic is a valuable resource for keeping you in top performance; and ensuring a robust, healthy, and balanced, flying career.

Notes From Major Ajiri Ikede, DFS Flight Surgeon:

There can be significant differences in the way people respond to the same incident. In some cases, events that may appear to be fairly minor (i.e. little or no physical damage to aircraft or personnel) may in fact cause significant distress and disability. It is important that all personnel within the chain of command maintain an open mind and remain vigilant for any signs and symptoms of distress. All members are encouraged to seek help among their health care providers whenever they have any concerns regarding their physical and/or mental health and well-being. As outlined in this article, the Canadian Armed Forces has a robust health care team that is dedicated to providing timely and effective support to all members requiring care. 📌

Maintenance

IN FOCUS

Missed Maintenance Inspections: **They are on the Rise!**

by MWO Fred Boutin, DFS 2-5-2, Maintenance Specialist

It is no secret that over the past several years, the number of fatal accidents in the Royal Canadian Air Force (RCAF) has been on the decline. This is great news! Our robust Flight Safety Program, our Just Culture mantra and our ability to report without fear of reprisal plays a huge role in this success. In fact, the RCAF Flight Safety Program is recognized worldwide and is the envy of many other countries running similar programs. Everyone knows the importance of reporting but what happens when the information is gathered into our Flight Safety Information Management System (FSIMS)? At the Directorate of Flight Safety (DFS), desk officers and investigators spend a great deal of time navigating through FSIMS looking for areas of concern. Unlike any individual Squadron or Wing, DFS investigators have a holistic view of the RCAF fleets, at home and abroad, and this vantage point creates a very unique opportunity to identify trends that may arise.

Since there are less accidents, DFS accident investigators find themselves spending more time on accident prevention. However, when a

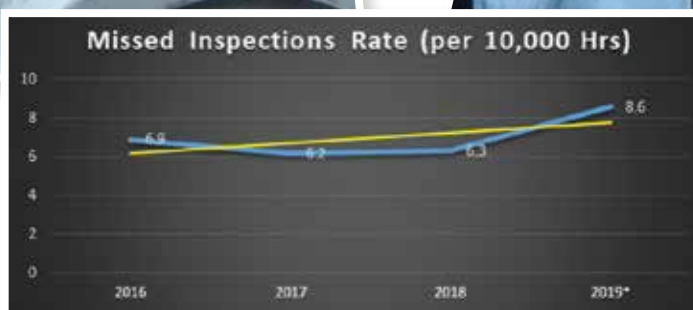
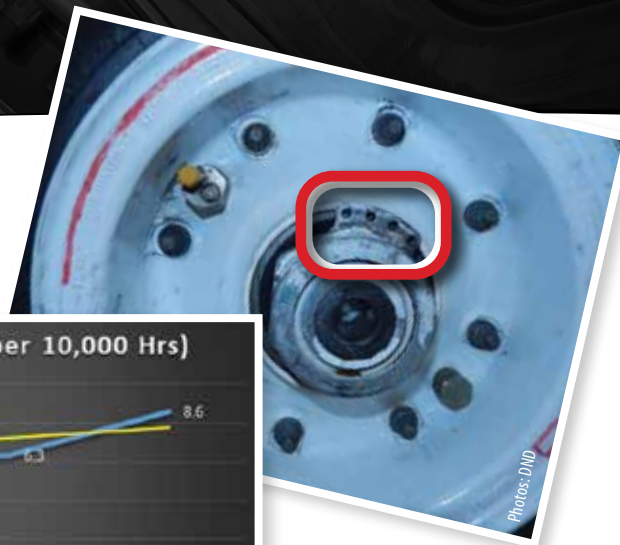
trend appears to be developing in FSIMS, much work and data mining still needs to occur to paint an accurate and complete picture. This allows us to take a measured response to the perceived risk and prevents us from over reacting. In addition to the countless hours of data extraction and analysis, this task requires finesse and intuition. Having a qualified and experienced analyst at DFS greatly assists our investigators when we suspect a trend is emerging.

As a maintenance specialist, I reached out to Shannon Saunders, the DFS analyst, for assistance last August when I suspected an increase in "Missed Inspections." I was interested in finding out why multiple people were missing multiple safeguards following maintenance tasks and scheduled inspections. Since the DFS analyst position had been vacant for a few years prior to Shannon's arrival, there was no standardized process for her to follow and so we developed a plan of attack on how to confirm whether or not my suspicions were correct. Moreover, we wanted to identify the cause of the potential increase and whether

it stemmed from a specific Fleet, Wing or Squadron. We envisioned this to be a three step process: raw data extraction, analysis and then Fleet/Wing/Squadron Drilldown.

We began the first step of raw data extraction by identifying the key words related to "Missed Maintenance Inspection" occurrences in FSIMS. This was much easier said than done. Shannon discovered that key word searches were prone to false returns due to spelling mistakes entered into the FSIMS descriptor fields (example: Maintenance vs Maintenance, Independent vs Independant, Overtorque vs Over-Torque). Extraction was further challenged by the system which limits searches to specific words but not for words in the same family, i.e. a search for "missed" did not yield returns for words such as "missing" or "miss."

For the analysis step, we planned a holistic view of the RCAF from 1 Jan 2016 to 31 Oct 2019. We first established a missed inspection occurrence rate by normalizing the data per 10,000 Flying Hours and then broke down the percentage of missed inspection types and



portrayed the results in a pie graph. Next, we created a bar graph depicting the total number of missed inspections per fleet and then we began the Fleet Drill Down step. The overall national increase seemed to be distributed evenly amongst all the fleets (6.3% to 8.6% from 2018 to 2019, see graphic). We also found that the increase identified in one specific fleet was not causal to the national increase. In all, we were able to confirm that no single fleet was responsible for the overall national increase in missed inspections.

Because we did not find that one single fleet was responsible for the national increase, we did not engage individual unit flight safety officers (UFSO) to discuss a mitigation plan tailored to their unit.

Most alarming to me, is that the issue of missed inspections often involves more than one individual. This is not a new phenomenon, far from it. Since I started working in DFS in 2017, the “multiple people missing the same thing multiple times” subject has been highlighted many times on the DFS Roadshow

and on the Air Maintenance Superintendent course in Borden. Some of you will recall the example in which a CF188 flew 44 times before it was discovered that both the nose landing gear wheel nuts were missing their locking tabs, bolts and lock wire (see photos). How was this task originally carried out and why was it not properly verified? How many Daily Inspection (DI), Before Flight (B) and After Flight (A) Checks, and walk arounds were conducted in that five month period? Why was it missed by so many people on so many different occasions? Most importantly, why were the built-in redundancies of having multiple checks not effective in preventing this from happening? So, what were the cause factors? Complacency, distractions, training, lack of experience, heightened Op Tempo and/or fatigue? It is one thing to assign cause factors to one or two individuals but another to a whole group of people over such a long period of time.

When looking at the rising trend of missed inspections across the RCAF, it becomes even more challenging to determine the cause and

to develop mitigating factors. Especially when all Wings and Squadrons have different ongoing challenges and some of their cause factors may or may not apply to all.

This is why we are reaching out to you, the reader, for help. You are the air and ground crews that are in the trenches everyday doing the work in the front lines. Which trends are you observing in your Squadron? What do you think some of the cause factors may be? What steps would you take to improve your work environment? We would love to hear your ideas and, as always within DFS, your comments and suggestions will be treated as privileged information and will remain anonymous. Let me be clear, this is not the platform to point fingers but rather an excellent opportunity to work collectively; to mitigate a trend that could lead to catastrophic consequences if left unattended. 🔥



Technician's Creed

Upon my Honour, I swear that I hold in sacred trust the rights and privileges conferred upon me as a qualified technician. Knowing full well that the safety and lives of others are dependent upon my skill and judgement, I will never knowingly subject others to risks which I would not be willing to assume for myself.

In discharging the trust, I pledge myself never to undertake work or approve work which I feel to be beyond the limits of my knowledge; nor will I allow anyone to

persuade me to approve aircraft or equipment as serviceable against my better judgement, nor will I permit my judgement to be influenced by personal comforts or advantages; nor will I approve as serviceable aircraft or equipment about which I am in doubt, either as a result of direct inspection or uncertainty regarding the ability of others who have worked on it to accomplish their work satisfactorily.

I realize the grave responsibility which is mine as a qualified technician, to exercise my judgement on the condition of aircraft and

equipment. I, therefore, pledge unyielding adherence to these precepts for the advancement of aviation and for the dignity of my profession. ✦

Adopted from the Mechanic's Creed (1941) written by Jerome Lederer.



Photo: Cpl Dominic Leclerc - Beaulieu

ON TRACK

Mandatory IFR Routes

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

This edition of On Track will discuss Mandatory IFR Routes and was written by Captain Chris Filiatreault, ICP School Reservist Instructor.

Mandatory IFR routes?!? Perhaps you're very familiar with these routes and their requirements to be filed, or perhaps this is the first you're hearing of them. Use of mandatory IFR routes (where possible) in the Canadian airspace system is now mandatory and this article will hopefully orient you to their use or at least serve as a good refresher.

So what are Mandatory IFR routes? Prior to October 2018, they were referred to as 'Preferred' IFR routes, but were changed to 'Mandatory' as a result of increased airspace demands. Where possible, it is expected that pilots will file a mandatory IFR route in Canadian airspace to ensure an orderly and predictable flow of traffic¹. The need to "aid

in the efficient and orderly management of air traffic between selected aerodromes"¹ is a key priority of the routes, and they also satisfy the particular demands of each Flight Information Region (FIR). Although they are designed solely for Canadian airspace use, some routes do begin and end in U.S. territory, notably in the Vancouver, Toronto, and Montreal FIRs and are a result of an agreement between Transport Canada (TC) and the Federal Aviation Authority (FAA). The FAA has maintained the nomenclature of 'Preferred IFR routes' for their operations.

So what happens if you cannot file them due to aircraft limitations or operational needs? Will you be denied IFR clearance? The short answer is no. The GPH 204A mentions that you can make 'alternate arrangements' if required; however, you may experience handling delays or unexpected routing changes, especially at high-density airports². For those of us who might not have the fuel 'legs' to complete mandatory routing across multiple FIRs, it is still important, for sequencing and flow control, to refer to the mandatory route listing of our departure or arrival airport, and to file any logical segment which may apply to us in order to assist ATC. In short, if you can file a mandatory routing, even just part of one, do so.

So how does the CFS present these routes and how do we make sense of them? You can find these routes in the PLANNING section of the Canada Flight Supplement (CFS). First, on page C114, there is an overall pre-amble that gives the pilot a conceptual

and operational look into the Mandatory Route system. There are a couple of important points in the general preamble that must be highlighted.

1. The routes do not include a Minimum Enroute Altitude (MEA) or Minimum Obstruction Clearance Altitude (MOCA) and therefore the pilot is required to ensure an appropriate altitude is flown.
2. Class F airspace avoidance is the pilot's responsibility! While many FIRs point out specific airspace hazards in their FIR notes, you must ensure that appropriate charts and NOTAMS are consulted.

With these important notes in mind, let's expand on the routes themselves.

Routes are presented in a table format and divided into their respective FIRs, which include overflight routings (flights passing through an FIR) at the end of the table where applicable. Each FIR (except Vancouver) has a preamble section explaining their particular procedures prior to listing their routes, therefore, it is important to read each FIR's requirements if you will be flying in that airspace (see Figure 1).

Routes originate/terminate from an aerodrome or waypoint in that FIR ('Overflight' routes can begin or end at FIR boundaries), and are classified as either High or Low level. In Figure 2, an arrival (ARR) or departure (DEP) indication in the 'DIRECTION' box directs the pilot to file a certain route depending on if they are

Continued on next page

departing or arriving at the aerodrome listed at the far left. In some cases, there are aerodromes listed as the destination in the second 'AD' box, but where no aerodrome is listed there is a cardinal sector for which the aircraft would depart to or arrive from (Figure 2).

Pay attention to the limitations listed (Figure 2) – this may be a limitation based on aircraft type, navigation requirements, altitudes, etc. If a limitation precludes you from using that particular route, keep looking in the list for something that works. Under the column PROC, note if you need a particular navigation type, "by default, mandatory routes are applicable for all route types unless specified otherwise"². In many FIRs there is a note in their preamble discussing what you can do if you cannot follow the RNAV routes.

Finally, 'ROUTE OF FLIGHT' is listed as the specific routing you can file and expect to take. We will discuss this with respect to phases of flight: departure, enroute, and arrival.

Departures. Ensure that if your mandatory route uses a Standard Instrument Departure (SID) (shown by using DEP after the SID name in the routing), you file the SID in the standard manner at the beginning of the route in the flight plan, but also ensure you look at the associated SID description for the appropriate transition as listed in the mandatory route. For example – in Figure 2 we are departing from Toronto/Billy Bishop Airport (CYTZ). If we look at the PERLO SID (Figure 3), we find that it would be written in the flight plan as PERLO3. However, if we look further down the page we discover how it is linked to the GENTRY waypoint (as shown in the mandatory routing) by writing it as: PERLO3.GENTRY.

If your mandatory routing does not have an associated SID, then file as shown in the routing. For example, flying out of Billy Bishop (CYTZ) and landing in Barrie-Orilla (CYLS) Apt:



Fig 1. Example of an FIR's pre-amble/lead-in information. GPH 205.

FROM LOCATION TO LOCATION OR DIRECTION (Cont'd)							CZYZ
AD	ALT	DIRECTION	AD	LIMITATIONS	PROC	ROUTE OF FLIGHT	
CYZT	H&L	DEP TO SW		F260 & ABV	RNAV	PERLO DEP GENTRY	

Fig 2. Example of a route departing from Toronto to the South West. GPH 205.

Fig 3. Ensure you have the correct SID written down by confirming with the mandatory routing. GPH 200 Vol 6.

If your intended route does not have a mandatory routing then comply with the FIR's preamble, which is usually a directive to file your first enroute waypoint.

Enroute. When planning to fly through an FIR enroute or into an adjoining FIR, it is very important to ensure the connecting FIR's preamble is read and complied with. Many FIRs will have restrictions and preferences as well as follow-on notices for connecting FIRs, noting any particular entry and exit points, for example. Once you follow any associated restrictions, it's a matter of choosing the most appropriate/most logical routing that pertains to your flight and filing it as such.

Arrivals. Predictably, I'm going to tell you to refer to the FIR's preamble again... however this cannot be stressed enough as various arrival procedures and Standard Terminal Arrivals (STARs) in a FIR may have more restrictions on 'IN' routes and initial fixes. For example – if you're arriving in Edmonton from the west:

And subsequently when you look at what routing and STAR is mandated if you're arriving from the west, you'll find a routing that complies with the preamble:

File your STAR as usual in the flight plan and ensure that the appropriate transition is noted as per the STAR page; this is especially important when crossing between FIRs where the destination

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airport may have a STAR commencing at the FIR boundary.

So what happens if there is no STAR or mandatory arrival associated with the route? If you take a look at the Winnipeg FIR preamble it says "If no mandatory Arrival route or STAR is published, file direct to the airport"³. This is a common note in most preambles; however, it is absent from Vancouver and Edmonton FIRs, but it is probably still good sense to file direct to the airport and pass along your approach intentions as you speak with ATC. What if you cannot fly RNAV STARS? First, have you checked for arrival routes at your airport that rely on traditional navigational aids? For arrivals at centers where RNAV is more common, many FIRs have a note in their preamble for aircraft that are not RNAV capable, as shown below for the Toronto FIR:

Let's complete an example to illustrate what we have just reviewed. We will plan a trip departing from Edmonton International (CYEG) to Saskatoon International (CYXE) – we will assume an RNAV-capable aircraft with no restrictions (however, my example will include a conventional navigation aid routing for those communities who do not have RNAV to ensure the process shows this aspect). First, we review the mandatory routing preamble (GPH 205) for the Edmonton FIR. Notice there are no particular notes about departures out of Edmonton Int'l. We then look at the list of mandatory routings and find that there is no route listed as having an end point of CYXE, therefore we will consider ourselves to be departing generally to the East and will choose the associated departure (Figure 8), noting that the associated departure requires RNAV.

Looking at the SIDs available to us we find that the Edmonton One Departure (CYEG1) is roughly easterly and will involve radar vectors to our enroute, so this one looks like a good transition to our enroute phase via RILEY. At this point we can write our SID and initial routing waypoint into our flight plan (see Figure 9).

CYTZ	L	DEP TO	CYLS		RNAV	SEDOG TANGI
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Fig 4. Departing Billy Bishop airport where no SID is associated with the mandatory routing. GPH 205.

CYEG ARRIVALS
From the WEST, CYEG arrivals are permitted between ROMRA and YZU via ESKIE ESKIE ARR

Fig 5. An example of restrictions to arrivals shown in a FIRs pre-amble. GPH 205.

CYEG	H	ARR FR W			RNAV	ROMRA Q949 ESKIE ESKIE ARR
CYEG	L	ARR FR W			RNAV	ROMRA T789 ESKIE ESKIE ARR

Fig 6. CYEG arrival from West with STAR. GPH 205.

RNAV Routes
- If unable to fly the listed RNAV routing, file an alternate routing via nav aids and/or airway, adhering as closely as possible to the mandatory route and include RMK/NON RNAV.
- If unable to fly an RNAV SID and/or an RNAV STAR, file via the RNAV fixes within the procedure and include: RMK/NO RNAV SID and/or RMK/NO RNAV STAR.

Fig 7. Some FIRs explain what to do if you are not RNAV capable. GPH 205.

CYEG	H&L	DEP TO E			RNAV	RYLEY
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Fig 8. Appropriate departure out of Edmonton Intl to go towards Saskatoon Intl. GPH 205.

15 CRUISING SPEED / VITESSE DE CROISIÈRE	ALTITUDE / LEVEL / NIVEAU	ROUTE / ROUTE
N 0 1 2 0	A 0 6 0	CYEG1. RYLEY V350 YWV/N0120AD95 V302 WILKY
KEBRU, KEBRU5		

Fig 9. ICAO Flight Plan filled out for routing as shown in example.

Next, since we know we're crossing between the Edmonton FIR and the Winnipeg FIR, we have to consult the preamble for the Winnipeg FIR. Note that the preamble directs us to file a STAR if there is one. Looking further down the mandatory routing into Saskatoon, we find that if we are arriving from the West it is expected we will file the KEBRU Five Arrival. Therefore, we can expect to file this arrival into Saskatoon, and when looking at the KEBRU Five Arrival STAR in the GPH 200, we see that it will be written as KEBRU.KEBRU5 in the flight plan. So, now we know how we're departing Edmonton and how to expect our arrival into Saskatoon. How do we figure out our enroute track? Simply look at what is between RYLEY and KEBRU at this time - our track comes closest to the V350, Wainwright VOR, and then the V302, which leads into Saskatoon. This is, therefore, our enroute portion; see Figure 9 for how this would be

written. On a final note, there's nothing preventing you from flying DIRECT from RILEY to KEBRU, and in fact ATC may direct you to do so; however, if you were an aircraft that needed conventional navigation aids, then this enroute process helps illustrate that consideration as well.

Hopefully this helped to clear the process up for those of you who haven't flown these routes much (or at all). If any questions pop up that you can't find an answer to in the pubs, feel free to ask one of your local ICPs or even give us a call at the school! 🍷

References

1. AIM, 3.16.6; GPH 204A, Art 413, Item 15, Note 2.
2. CFS, C114
3. CFS, C128

FLIGHT DATA MONITORING – The Next Logical Step (Part I)

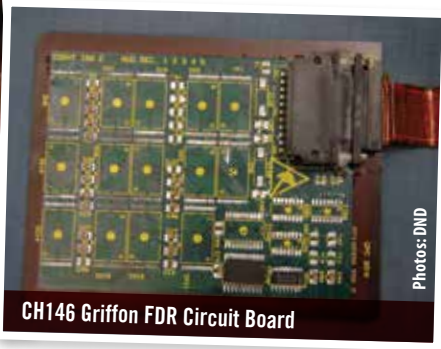
by LCol (Retd) Martin Leblanc, D/DFS 2 - Senior Investigator

It is obvious that aircraft technology has greatly evolved over the last century, and with it came an increase in safety systems and a corresponding decrease in aircraft accidents. In the early years of aviation, accident investigators relied heavily (if not solely) on witness testimony, including survivors' recollection of events, and physical evidence (i.e. the damaged aircraft) to conduct their investigation. Physical evidence is great in that it tells the investigators the modes of failure of specific components. Testimony, on the other hand, whether it comes from witnesses or survivors, is highly subjected to human biases. Investigators constantly have to consider these biases to assess the validity of the information they are presented with.

To avoid using subjective information, aircraft accident investigators prefer to use information that is descriptive, accurate and reliable and typically turn to the technical resource of flight data to answer this objective need. Flight data is the information gained through onboard recording devices that sample various aircraft parameters (e.g. airspeed, altitude, aircraft configuration, etc...). Flight data is extremely valuable to investigators as it provides objective information pertaining to an event. Although flight data is not perfect since it can be prone to recording errors, it is vastly preferred over the subjective data also available to investigators.



CC130 Herc FDRs



CH146 Griffon FDR Circuit Board

Photos: DND

Keeping in mind that the goal of any safety program is to prevent an accidents, how do we move from reactive accident investigation into pro-active accident prevention using flight data? The answer is Flight Data Monitoring!

The pro-active analysis of flight data carries many labels. Flight Data Analysis (FDA) is the ICAO nomenclature, Flight Operations Quality Assurance (FOQA) is the U.S. nomenclature, and Flight Data Monitoring (FDM) is the Canadian and sometimes European nomenclature. For the purpose of this article, the term FDM will be used.

What is FDM? (...And what it's not!)

FDM is a program for the proactive analysis of flight data to detect precursors to aviation accidents with a view to identify mitigation measures. It consists of the routine collection

and analysis of digital flight data generated during flight operations to provide more information about, and greater insight into, the total flight operations environment.

FDM is not a punitive program, often erroneously referred to as "Big Brother is watching." Its sole purpose is to improve aviation safety through events-based continuous learning. In fact, to ensure the non-punitive aspect of FDM, the majority of airlines use trusted personnel called "Gatekeepers" who communicate with the crew if data analysts have questions that need to be clarified. This measure prevents the identity of the crew from being revealed to management and reinforces the message that the focus is not on "who did what" but "what" happened.

However, FDM is not the “ultimate” safety solution. FDM is only one of many “reporting nodes” and all are needed to create a robust flight safety program. Other reporting nodes include voluntary reports, results of flight safety assistance visits, inspections and audit results, as well as incident/accident investigation reports.

What can FDM do for me?

The benefits of FDM are many but, in a nutshell, it monitors trends in fleet performance and transforms clean, objective data into a comprehensive suite of operational and safety decision tools. A proper FDM program will enhance both **flight safety** AND **operational effectiveness**.

FDM supports the goal of the safety program which is the preservation of aviation resources through improved safety, operations, maintenance, and training practices. The results of an FDM program frequently yield operational savings, and one example that is often cited in literature is savings gained through more efficient fuel use. In terms of the RCAF, it can make flight operations more effective, reduce unnecessary maintenance, and can improve the overall readiness of the RCAF aircraft.



Sample FDR Data

FDM effectively:

- Identifies unsafe trends and precursors to accidents,
- Monitors trends with respect to fleet performance,
- Identifies human factors issues within and across all fleets,
- Enhances operational readiness and improved targeted maintenance,
- Enhances and enables better risk assessment, and
- Facilitates the development of Evidenced-Based-Training to focus training on real life issues as opposed to the current traditional prescriptive approach.

FDM is all about providing accurate and timely information to enhance decision making. It enables management to make operational and

safety decisions that will prevent accidents and improve operational efficiency. In the end, if you don't measure it, you won't know about it. If you don't know about it, you can't fix it. If you don't fix it, it is a matter of time before it evolves into a costly and unfortunate accident.

Conclusion

You now have been exposed to what FDM consists of (or not) and what it can do for you and your operation. Stay tuned for the next edition of *Flight Comment* where we will describe an actual event where having FDM could have identified and reduced the factors that were negatively impacting an aircraft fleet. ✈️

References

1. ISASI Forum, July-September 2004, Accident investigation without the accident, pages 17-21
2. 2019-DFS-001, Flight Data Monitoring Program - Proactive Use of Flight Data For Accident Prevention, Plane Sciences Inc. & Applied Informatics & Research Inc.



CH149 Cormorant CVR/FDR Memory Assembly




CH149 Cormorant FDR Circuit Board

DOSSIER



Ammunition and Explosives Safety Program: building a “Just” culture.

by Mr. Benoit Gagnon



Ammunition and explosives (A&E) under the direction or control of the Minister of National Defence are exempt from the provisions of the *Explosives Act*. Notwithstanding, the Department of National Defence (DND) and Canadian Armed Forces (CAF) have an obligation to oversee the spectrum of their A&E-related activities to ensure safety through the effective control, management and use of this strategic commodity during its life cycle.

The Ammunition and Explosives Safety Program (AESP) plays a vital role towards enhancing combat effectiveness by preserving operational capability and by preventing, or at least minimizing, accidental loss of life, injury or loss of materiel and/or facilities.

A&E Scale and Scope

A&E represent half of the DND \$6 billion inventory holdings with an annual procurement between \$175 and \$180 million. The CAF expends approximately 38 million rounds of small arms ammunition in training yearly. With 353 ammunition storage and processing

facilities and over 700 lock-ups located in 23 sites across the country, the importance of a healthy AESP cannot be overstated.

One Building Block at a Time

As part of its mandate, the Director Ammunition and Explosives Regulation (DAER) is responsible for managing the DND/CAF AESP. Committed to re-invigorating the programme within the department, DAER has initiated a comprehensive review of A&E safety policies. Consequently, DAOD 3002-3, *Ammunition and Explosives Safety Program* and DAOD 3002-4, *Reporting of Ammunition or Explosives Accidents, Incidents, Defects and Malfunctions* have been amended to clearly reflect the requirement to maintain independence between occurrence investigations with the sole purpose of capturing lessons learned, and investigations that could lead to disciplinary measures. Free and open sharing of critical safety information between managers and operational personnel, without the risk of punitive action, represents the basis of the AESP's fundamental principle of a "Just" culture.

An investigation must be directed towards fact finding for prevention with personnel able to report occurrences, hazards or safety concerns as they arise, free of sanction or embarrassment.

Introduced in April 2017, the Ammunition and Explosives Safety Information System (AESIMS) is DND's and the CAF's system of record for A&E occurrence reporting, providing next to real-time safety information to Groups and Commands. While departmental implementation of AESIMS has had its challenges, the system's design reflects the spirit of a "Just" culture, remaining mission focussed on fact-finding and occurrence prevention.

Influencing a reporting culture is no small feat and a successful outcome will require a consolidated and sustained effort by DND employees and CAF personnel alike. We are in this for the long haul! 🚀

A member of 408 Tactical Helicopter Squadron fires a GAU-21 .50 caliber machine gun on board a CH-146 Griffon helicopter during Exercise STRIKING BAT at Marine Corps Air Ground Combat Centre Twentynine, Palms California on 11 November 2019.

Photo: Cpl Desiree T. Bourdon, Royal Canadian Air Force Public Affairs Imagery

IT'S A BIRD, IT'S A PLANE, IT'S A NEAR MISS WITH A... **UAV?!?**

by Maj Rich Kinner, Wing Flight Safety Officer, 14 Wing Greenwood

On 18 January 2019, a local CP140 Aurora was on approach to land on runway 08 in Greenwood (CYZX), Nova Scotia. When the aircraft was on short final at approximately 150ft above ground level (AGL), one of the crew members noticed a UAV (drone) in close proximity (200' lateral and 100' below) to the aircraft. Luckily there was no contact between the two but the incident highlighted a relatively new threat to flight safety at 14 Wing Greenwood.

The drone was a medium size quadcopter roughly one foot in diameter, with a camera pod underneath, and was operating in the vicinity of a public park located less than a kilometer away from the button of runway 08. The operator remains unknown in spite of efforts to locate them.

Since the Transport Canada (TC) regulations for drone operators are still in their infancy, many retailers and drone operators are not aware of the existing TC rules and regulations, especially because many drones are given as gifts to inexperienced operators. Unless prior permission has been granted, TC regulations dictate that drones must not be operated within 3 nautical miles (5.6 km) of an airport and also must not be operated in a control zone. In regards to 14 Wing Greenwood, the control zone extends from the surface of the earth to 5000 feet AGL and extends out from the centre of the airport to 7 Nautical Miles (12.9 km). This means that a large part of the area surrounding 14 Wing Greenwood is considered a "No Drone Zone."

A few weeks later, another drone was reported to be stuck in a tree just outside the base. In this instance, the operator had lost sight of their drone while flying it in high winds. When asked questions, the drone operator was totally unaware of any TC regulations pertaining to operating a drone.

At the time of these incidents, 14 Wing did not have a specific drone incident reporting procedure, response checklist, or an answer to the education gap to address the relatively new concern of drones flying inside the control zone. A truly collaborative effort was the solution, with the 14 Wing flight safety team creating partnerships between numerous 14 Wing units and local community organisations to create effective Preventative Measures. 14 Wing Flight Safety coordinated with Wing Operations (WOPS), Air Traffic Control, Military Police (MP), 14 Air Maintenance Squadron (AMS), Wing Imaging, the Wing Public Affairs Officer, and village offices in Greenwood and Kingston to establish local procedures for reporting drone activity in the control zone. All observed drone activity within the control zone is now reported to the air traffic control tower who notifies aircraft in the control zone. ATC also notifies WOPS, who in turn informs MPs to liaise with local RCMP if required.

The 14 Wing team maintained a focus on education and public awareness as a pillar of preventing further incidents. 14 Wing Imaging created a map of the restricted area (Figure 1) as well as promotional material explaining that drones cannot be flown in the control

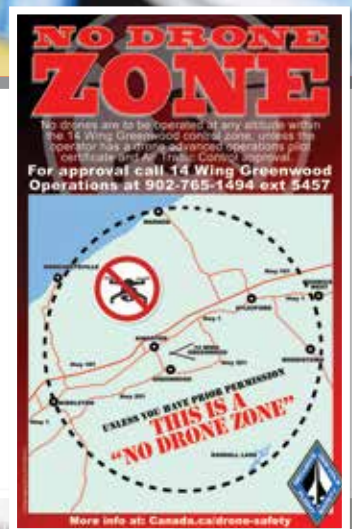


Photo: MCpl Rory Wilson



Photo: Sara White, Editor of Aurora

zone without a permit, and then published this information in the local paper. 14 AMS also produced signs that the village offices of Greenwood and Kingston kindly agreed to display in areas where flying drones were of greatest concern (Figure 2).

It has been just over a year since that first incident. Our collaborative efforts to improve flight safety have created opportunities for the community and military organisations to work together. Although our military control zones have defining parameters, the very fact that backyards, parks and school yards are included in our zone means that we share our airspace with civilians. This means that we cannot act in isolation to fix our issues. Partnerships, ingenuity and creativity go a long way to gather a community that collectively shares in the responsibility of creating a robust flight safety culture. ✈️

For more information on drone safety, fines and regulations, please see: <https://www.tc.gc.ca/en/services/aviation/drone-safety/flying-drone-safely-legally.html>



Photo: Avr Tanner Musseau-Seaward

Perceived Pressure: *An Actual Thing*

by Corporal Karen Niebergall, 417 Combat Support Squadron, Cold Lake

It's coming on 1730 hours and the day has been a long one, my fourth late one in fact. I have been working on the 300 hour inspection all day, and now our only other Griffon helicopter has been deemed unserviceable with a tail rotor snag. There are upcoming operational requirements and we need to get this bird serviceable. Let me interject with a few stats, we are undermanned due to the wild fires in British Columbia, personnel are on leave, and because we are a small unit we are already at critical manning levels. My Aircraft Maintenance Control and Records Officer (AMCRO) Sergeant has volunteered to stay late with me, and I am now tasked with replacing the tail rotor gear box on this fine evening.

Fast forward through many curse words, knuckle busters and general malaise, and we tumble towards the end of our job. It's now a few hours later and we have been receiving many questions of "How much longer?", "When do you think it will be done?" and even fielded a phone call directly from the Wing Commander asking whether we thought we

were good to go. Looking back, it's as if you can see all the holes of our beloved "Swiss Cheese Model" lining up because I am physically and mentally exhausted, I am stressing myself out with worry that I am not working fast enough, and the phone calls and external questions are not helping.

Having just finished the maintenance task, including the paperwork, we get ready for our test flight. All looks great to us and we think "Wow, we really banged this one out!"

In hindsight, all I can say is thank god for another set of eyes. Our independent check saved the day. Had that final walk around and check not happened, we would have gone flying with an improperly torqued tail rotor flight control bolt. The bolt was loosely seated in its housing with only two threads engaged. Because of the applied pressure, implied time constraints and distractions, I had completely forgotten to go back and torque the bolt.

I will never forget that devastating feeling.

Fatigue and pressure (both perceived and actual), caused me to make a mistake that I would never have dreamt of making.

It is something that has never left me, and I hope it never will.

Note from Col (Retd) Steve Charpentier, DFS3:

In 2016, then MWO François Dutil, Senior Aircraft Maintenance Superintendent from 438 Sqn, wrote an article for the third issue of Flight Comment about the importance of shielding the tech from ops pressure. He wrote, "...As a senior aircraft maintenance superintendent, I try hard to create a work environment with as minimal a level of stress as possible." This buffer is incredibly important because without it:

Unbalanced Pressure plus Perception of Importance of the task coupled with Fatigue and 'Can do' attitude are the ingredients leading to a sure recipe for disaster. 🚫

Trust Your INSTINCTS

by Master Corporal Matthew Lewis, 443 (MH) Sqn, Esquimalt

It was the spring of 2013, and the ship, the HMCS Algonquin, was conducting Operation Trident Fury with an embarked helicopter air detachment. The ship was executing numerous exercises such as maneuvering, antisubmarine warfare, live firing at the range, and damage control scenarios at random times throughout the day. The Air Detachment crew was flying nights into early morning sorties, and trying to get their rest during the day while these activities were taking place. Needless to say, we were pretty exhausted the whole time and, due to the occurring events, morale was at a low.

During a routine "A Check"¹ on the Sea King helicopter (while trying to hold on while tired, soaked in water, under poor lighting conditions, and with the ship swaying forward and backwards, rolling left and right), I inspected the area under the helicopter driveshaft, directly below the hydraulic pumps. This area is always filled with water and other substances because the Sea King leaks and we give it a wash at the end of each flying day before it comes into the hangar. This time, I noticed a thicker, darker than normal, puddle.

Not thinking too much of this at first, I conducted the rest of my check. Everything looked normal and the fluids were within range. I went to the opposite side of the helicopter and was in a better position to see where the fluids were potentially coming from. Looking around, there was no real evidence of a leak but, to be sure, I began physically grabbing the lines. After confirming a few lines were secure, I grabbed the pressure line that came off of the primary hydraulic pump. Without any strength, I had no problem pulling the fitting out and



Photo: Sgt. Frank Hudec

discovered that the actual threads of the fitting had been completely stripped. This was not good. Even though there was a back-up hydraulic system, flying without the primary hydraulic system was considered an emergency situation.

The routine “A Check” conditions, coupled with fatigue and operational pressures, could have led to us easily overlooking that little extra hydraulic fluid in the water. This oversight could have caused a loss of controls during flight potentially resulting in an accident.

Editor’s Note:

The extra precautions taken by Cpl Lewis to assuage his concerns about the abnormal puddle meant that he discovered the hydraulic fluid leak. The take away from this article is to always trust your instincts and to take the time to address concerns in spite of pressures, fatigue and challenging conditions. 📌

References

1. A Check – Post-flight inspection

LESSONS LEARNED



Photo: MCpl Edmund Tatchell

Hold Your Ground... Even if it's Snow Covered

by Master Corporal Megan Tost, 19 Wing Mission Support Squadron, Comox

During the winter of 2018-2019, I was employed as the primary Snow and Ice Removal (SNIC) Crew Chief for 19 Wing Comox. Although the winters are quite mild and Vancouver Island generally receives very little snow, I quickly learned that this would present some unique challenges that I hadn't experienced in my previous postings. One of the biggest challenges I noticed was that airfield snow removal was not necessarily second nature to most of us. This was not due to a lack of training, but rather because of a lack of practice due to the environment we lived in. Without snow, we couldn't gain the same real life experience that other Wings might gain in a winter season. To counter the lack of practical experience, we worked diligently throughout the summer months to train on our equipment to try and prepare for snow.

In February 2019 we finally got some snow and it was time to put our training to the test. My crew was the first to be called in. Everyone showed up quickly and we were eager to get the show on the road. What we didn't realize was how long the storm would last. We started on 12 hour shifts that first day, and that carried on for the next six days. Over this time, our kit ran 24 hours a day without a break and we started falling behind on our regular maintenance.

It didn't take long before we started to pay the price. Engines were overheating, diesel exhaust fluid was not being replenished, engines were being run almost dry, and sweeper brooms were wearing down.

The biggest issue we had was exploding sweeper caster wheels. This was cause for huge concern, because the exploding rubber was flying all over and becoming buried in the snow. Luckily, the first few times this issue happened, it occurred either on the ramp or very close to it and we were able to keep aircraft coming in and out without any major delay while ensuring all foreign object debris (FOD) was removed. On the 6th day, another caster wheel exploded. This time it happened on the button of our main runway while a member was doing sweeper training with an instructor. Unfortunately – due to poor visibility, fatigue, and perhaps a lack of operational experience - the sweeper crew did not notice the issue. It wasn't until I came along on an inspection that I noticed a few pieces of rubber halfway down the runway. Without knowing what had initially happened, I radioed the sweeper in question to ask if they had noticed rubber anywhere else. They then pulled over to check their equipment and realized they had blown another caster wheel. By this time they had spread a lot of FOD over a large area of the runway.

I radioed the control tower to inform them of the situation; but, to compound matters, a West Jet plane had taxied up to the button of our runway and was preparing to take off. There was a lot of pressure with everyone pushing us pretty hard to BOTH get the runway cleared AND for us to vacate it so the plane could depart. It was at this moment that I had to make a decision: to either assume the runway was "good enough" and hope for the best, or to further delay the plane and ensure the runway was in fact FOD free. Needless to say, the plane sat at the button of the runway staring at myself and a co-worker running around on foot picking up rubber pieces. When I knew we had cleaned up the runway effectively, I gave the all clear to Ground Control. We exited the runway and the plane departed without issue.

Even though I'm pretty confident that we could have given the thumbs up and not delayed the West Jet flight, that small ounce of uncertainty was not worth risking the lives of the passengers or crew. What I learned during this incident was that even though we may not have the same experience as other Wing SNIC operators, the practical training we received from multiple lessons during that period definitely stuck with everyone. ✦

From the Investigator

TYPE: Hercules CC130J608
LOCATION: Near the Sadovo Airfield, Bulgaria, N 42 07.005 E 024 58.797
DATE: 17 June 2019

The occurrence flight was part of Exercise Swift Response 2019, a joint multinational airborne field training exercise led by the United States. The exercise involved a total of 5,600 troops from eight different nations, including Canada. The exercise was taking place at various locations in Bulgaria, Croatia, and Romania and was running from 11 to 24 June 2019.

Aircraft CC130J608 departed Ramstein, Germany, enroute to the drop zone near the Sadovo Airfield Bulgaria (Cheshnegirovo Air Base). The mission was to conduct a night static line paratroop jump. The troops were dispatched from an altitude of 1000 feet above ground level (AGL) using both the starboard and port side paratroop doors. During the jump, a paratrooper on the starboard side

became hung-up outside the aircraft and subsequently experienced a sudden static line failure which resulted in an uncontrolled descent. The paratrooper sustained fatal injuries.

The investigation is focusing on materiel and human factors. 



Parachute static line

Photos: DFS



From the Investigator


TYPE: Tutor CT114071
LOCATION: 10 NM east of Peachtree City, Georgia, USA
DATE: 13 October 2019

The accident involved a CT114 Tutor aircraft from the Canadian Armed Forces Air Demonstration Team (Snowbirds) enroute to the Atlanta Air Show being held at the Atlanta Motor Speedway in Hampton, Georgia.

Following a routine check while inverted, the pilot rolled level and applied full power to rejoin the formation. Shortly after the pilot experienced a loss of thrust. Losing altitude and unable to recover engine power, the pilot elected to eject as the aircraft was too

low to attempt a safe recovery to an airport. The pilot successfully ejected from the aircraft however reported anomalies with the ejection sequence.

The aircraft was destroyed upon impact and the pilot received minor injuries as a result of the ejection sequence.

The investigation is focussed on materiel cause factors for the engine mechanical failure, as well as the ejection sequence. 



From the Investigator

TYPE: Polaris CC15001

LOCATION: 8 Wing, Trenton ON

DATE: 18 October 2019

On 18 October 2019 a CC150 Polaris was towed from the North ramp to 10 hangar. This space is not normally used by the CC150, and the D-14 tow tractor normally used is too large for the limited space available inside 10 hangar. Before entering the hangar, the ground crew were required to stop and swap the tow tractor from the bigger D-14 to the smaller D-12.

Once the aircraft reached a position in front of 10 hangar, the tow crew stopped the aircraft, set the chocks and the parking brake. During the tow tractor change, while no tractor was attached, the aircraft started moving forward and over the chocks. Attempts to stop the aircraft by the tow crew were unsuccessful. The right engine struck the D-12 tow tractor parked

inside the hangar, before the nose contacted the hangar far wall structure, finally stopping the aircraft. The aircraft sustained very serious damage ("B" category).

The investigation will focus on material and human factors. 🚧



Starboard engine

Photo: Cpl Bev Dunbar



Photo: Cpl Lisa Fenton

Epilogue

TYPE: Griffon CH146477
LOCATION: Cold Lake, AB
DATE: 13 December 2018

The crew of the CH146 Griffon was tasked to transport a replacement generator into a repeater antenna site within the 4 Wing Cold Lake Air Weapons Range.

The crew disembarked a team of five technicians at the repeater antenna site and then proceeded to pick up the replacement generator at a location approximately seven nautical miles away. The generator, contained within a netted pallet, was transported to the repeater antenna site via slung load with the use of an approximately 80 foot sling.

The generator was temporarily put on the ground so that personnel on the ground could attach two guidelines to help move the load (generator) to its final location. The helicopter then lifted the load with the intention of moving it to the base of the tower.

As the helicopter was manoeuvred into position to deliver the load, the main rotor blades made contact with the obstruction lights and support bracket at the top of the 96 foot tower. After the impact the crew

conducted an emergency landing in the field adjacent to the tower. The helicopter's four main rotor blades were seriously damaged. There were no injuries to the crew nor the personnel on the ground.

The investigation determined that there were no technical issues with the helicopter and focussed on human and organizational factors. The preventative measures recommend changes to standard operating procedures and Royal Canadian Air Force Flight Operations Manual, including the modification of flight training profiles and the clarification of flight rules and regulations that govern Combat Support Squadron and Search and Rescue safe training practices. ✈



Photos: LS Erica Seymour

Epilogue

TYPE: Bellanca Scout
BL28 (C-GSSV)
LOCATION: Gimli, MB
DATE: 17 July 2018

The accident flight was part of the Air Cadet Gliding Program in Gimli, MB and in support of the summer glider pilot training. The Bellanca Scout aircraft is used to tow gliders to altitude where the glider would release from the tow plane and conduct their training mission. After the second successful tow flight, the tow plane pilot completed the pre-landing checks and joined the circuit in preparation for landing. Once established on base leg, the pilot noticed that the aircraft was slightly higher than normal but the approach was still manageable by increasing flap selection. While on final, the pilot

noticed that the rate of descent was not sufficient to maintain a normal approach angle. After selecting full flaps early in an attempt to correct the glide path, the pilot realized that the plane could not get back to the normal glide path and therefore moved the aim point further down the landing strip and subsequently focused entirely on a specific landmark as a final stop point. Upon touchdown the pilot applied excessive braking, enough that the aircraft rotated forward allowing the propeller to contact the ground. The aircraft then rotated past vertical and ended up on its back.

The aircraft sustained very serious damage and the pilot received minor injuries.

The investigation did not reveal any evidence of technical issues with the aircraft and focused on human factors. Due to self-imposed pressure, the pilot became focused on stopping prior to a safety cone and applied brakes while the tail wheel was still off the ground. The preventive measures recommended modifications to the tow plane conversion training course. 4



Photo: Capt Bonnie Gillrie, Gimli FSO

Epilogue

TYPE: Harvard II CT156106
LOCATION: 20NM southwest of CYMJ
DATE: 24 October 2018

A student pilot from 2 Canadian Forces Flying Training School was conducting training on the CT156 Harvard II aircraft as part of the Phase II pilot training course in the NATO Flying Training in Canada program in Moose Jaw, Saskatchewan. This was the student's first solo mission to the Moose Jaw training area, located approximately 20 nautical miles south of the airfield.

The training consisted of aerobatic manoeuvres and the student pilot carried out a G awareness exercise prior to initiating a loop as the first manoeuvre. During the pull up into the loop, the student pilot recognized the symptoms of a G induced almost-loss of consciousness and reacted by reducing the flight control back

pressure to regain visual acuity. The aircraft was in a near vertical attitude with airspeed decreasing rapidly. An initial attempt at an unusual attitude recovery was carried out, however the roll to the nearest horizon seemed ineffective. The student pilot carried out the Inadvertent Departure from Controlled Flight emergency procedure. The Power Control Lever was reduced to idle and the flight controls were centralized. The aircraft floated for a period of time then adopted a nose low attitude while gaining airspeed. The student pilot recovered the aircraft and returned to base without further incident.

The investigation found that the student had limited training during phase II regarding G forces. It was also found that there is confusion between nose high unusual attitude and a departure from controlled flight condition. The investigation recommends to formalise G training at the beginning of phase II ground training and clarify procedures with regard to the G awareness manoeuvre and departure from controlled flight with the CT156 Harvard II. ✈



Photo: Christian Coulombe



Photo: DND

Epilogue

TYPE: CF188 Hornet ALSE
LOCATION: 3 Wing Bagotville
DATE: 24 August 2018

On 24 August 2018, it was discovered that an Aviation Life Support Equipment (ALSE) technician at 433 Tactical Fighter Squadron, at 3 Wing Bagotville, Quebec, had shared their Maintenance Release (Level A) personal identification number with technicians in the section, on numerous occasions, in order for other members in the ALSE shop to sign for, and certify as airworthy, ALSE equipment work processes within the unit.

Technicians in the ALSE shop employed a shared password system in order to conduct and document unsupervised inspections on personal use safety equipment, safety system supply independent checks, and associated aircrew personal equipment fittings.

The use of the technician's personal identification number was conducted with and without direct supervision of the authorized technician and often utilized in the authorizing technician's absence from the ALSE shop in order to support continued squadron operations.

Aircrew had utilized and stored personal survival safety equipment that had been fitted, inspected and certified for use by ALSE technicians who did not possess the qualifications nor authorizations to release such equipment. Given the equipment was not certified according to technical publications and orders, the integrity and airworthiness of the survival safety equipment was in question. As a result, there were no guarantees that unit aircrew survival safety equipment would operate when required.

The investigation revealed that the 433 SQN ALSE shop operated for an extended period of time with inadequate resources and supervision to effectively support squadron operations.

The preventative measures recommended involve a top-down approach that provides easily locatable and accessible ALSE documentation, in concert with an effective communication scheme to all stakeholders to ensure global ALSE education and support is provided at all levels of operations. 🔥



Epilogue

TYPE: Twin Otter CC138803
LOCATION: Pelly Island, NT
DATE: 10 March 2019

The crew departed Tuktoyaktuk, NT with three scientists on board for a mission requiring the aircraft to land on unprepared sea ice surfaces. After completing an uneventful landing on sea ice near Tuktoyaktuk for scientific research, they flew the aircraft to Pelly Island located 50 miles to the West. The crew first completed two reconnaissance patterns above the sea ice surface to assess wind and surface conditions. The crew then conducted a final pass and chose an into-wind approach for landing on the sea ice, approximately 1 nautical mile from the island. The aircraft touched down on a

smooth area of sea ice but then bounced into the air after contacting a drift perpendicular to the aircraft's heading. The aircraft impacted the base of a larger drift once it settled back onto the sea ice. The nose landing gear collapsed and the aircraft came to a stop shortly thereafter.

The aircraft sustained very serious damage, with damage to multiple major components as a result of the impact with the snow drifts. No personnel were injured in the accident and all were subsequently evacuated to Inuvik, NT by civilian helicopter.

The investigation concluded that the crew did not see the drifts during the two reconnaissance patterns, during the final pass, nor when on approach for landing. The high cirrus cloud layer that obscured the sun contributed to the difficulty in assessing the sea ice surface. The investigation recommends modifications to the Standard Manoeuvre Manual (SMM) and the Mission Acceptance Launch Authority (MALA) worksheets for ski operations. ❄️



Photo: Cpt Mathew-Allan Sage

Photo: Capt Scott Bennett

Epilogue

TYPE: Tutor CT114009
LOCATION: Comox, BC
DATE: 26 April, 2019

The occurrence involved a CT114 Tutor aircraft from the Canadian Armed Forces Air Demonstration Team (Snowbirds) practicing a show routine in preparation for the upcoming air show season.

The Tutor was flying at 600 ft. above ground level in a formation of 4 aircraft. One of the wingman aircraft was rolled into inverted flight as part of the setup for the *Double-Take* maneuver. Having rolled-out lower than normal in plane to the lead aircraft, the pilot lost visual contact with Lead. The pilot executed a barrel roll to regain level attitude while maneuvering clear from the lead aircraft and the rest of the formation. The aircraft landed safely without further incident.

The investigation determined that the pilot became spatially unaware following the roll to inverted flight; that is, the pilot did not know their exact position in space relative to Lead or the horizon. The pilot felt they had started drifting underneath the lead aircraft. This illusion was strong enough that the pilot felt uncomfortable executing a negative G push on the control column due to the perceived feeling they would contact Lead. The horizon appeared in the pilot's visual periphery and judging this as the safest method of escaping the formation, the pilot then executed a positive G barrel roll towards the horizon and away from the perceived, last-known position of Lead.

The investigation recommends that the 431 Air Demonstration Squadron flying training plan is amended to ensure multiple breakout scenarios are explored and exercised for pilots flying inverted flight routines. The investigation also recommends that the 431 Air Demonstration Squadron Standard Manoeuvres Manual include additional scenarios whereby sight of the preceding aircraft is lost while in close formation and provide the guidance required on how to recover safely under those circumstances. ✈



THE BACK PAGE

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