



National  
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ISSUE 3, 2014

# Flight Comment



Canada 



Cover – A CH147F *Chinook* helicopter prepares to land on Parliament Hill in Ottawa, Ontario on May 8, 2014 in preparation for the National Day of Honour to mark the end of our country's military mission in Afghanistan.



Photo: Cpl. Marc-Andre Gaudreault



Visual Protection 8



Always the Unexpected 18



Flight Safety Coin 21



The Strength of an Idea 24



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Flight Comment

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Photo: Cpl Doug Burkie

## Views on Flight Safety

By Lieutenant-Colonel Martin Leblanc, DFS 2 Chief Investigator, Directorate of Flight Safety, Ottawa

After a few years away from Flight Safety (FS), I now have the immense privilege to come back as the Chief Investigator at DFS. I am a pilot from the tactical aviation community with experience flying the CH136 *Kiowa* and the CH146 *Griffon*. I'm glad I can link most of my tactical level tours and operations with FS. With a tour as an instructor pilot, international deployments to Bosnia-Herzegovina and Afghanistan, as well as a series of domestic operations like the Saguenay floods (1996), the Ice Storm (1998), and G8 Summits (2002), I have seen my share of FS occurrences and lived the challenges of conducting operations while keeping flight safety in mind. With my recent tour as Division Commander at the Leadership and Recruit School in Saint-Jean, the link to FS would be quite a stretch but the leadership experience was invaluable. I now see my posting as DFS 2 Chief Investigator as extraordinary opportunities to support the RCAF operational and technical communities conduct operations safely.

I am not hiding the fact that I am absolutely thrilled to come back to FS but the excitement goes beyond that. The FS Program has truly evolved over the past few years. The transformation of how we do business had already started during my time as DFS 2-4 but now, 3 years later, I've already witnessed that

you have all kept that momentum going. It is no secret that our original FS Program was created in peace time, but since, we have learned tremendously supporting our operations at home and deployed away in Afghanistan, Libya, Philippines and Haiti (just to name a few). Unfortunately, some of those lessons were learned the hard way and, sadly we've lost valuable members of the team along the way.

Examples of the evolution in FS are the new version 3.0 of the Human Factors Analysis Classification System which is more tailored to our current realities and much easier to navigate through; and a modernization of our occurrence database, FSOMS, which is undergoing a major overhaul with an expected release sometime in 2015. We are also looking at the way we conduct FS surveys with a view to improve their effectiveness and provide enhanced feedback to the Unit Commanding Officers and Wing Commanders. Some work is being done on developing metrics that will help us better determine the effectiveness of our Preventive Measures. There is now a better understanding of Operational Risk and Airworthiness Risk and how the two relate to each other. Have you heard about fatigue risk management system or military flight operations quality assurance? While these are still in the concept phase, these initiatives are being shaped for possible future implementation.

Indeed, these are exciting times for all of us involved in FS. Not only because we are developing tools that will help us provide better advice to Commanders at all levels, but also because I truly believe that Flight Safety and the Operational/ Technical communities have never been so closely aligned. I also believe in the FS Program's aim to prevent the accidental loss of aviation resources while accomplishing the mission at an acceptable level of risk. But hey, let's be honest, there will be the odd time where we will have slightly diverging views and/or opinions. Together however, our business is conducting operations and dealing with risk management, not risk avoidance. FS enhances operational capabilities and I believe that in the end we are all working towards the same goal; to conduct flight operations effectively and safely. ✈

LCol Leblanc previously held the position of DFS 2-4 (Helos/UAVs/Air Cadets gliders) from 2007 to 2010, before deploying to Afghanistan as the Joint Task Force (Air) Air Wing Flight Safety Officer in 2011. He investigated a total of 13 accidents of various severity and aircraft type; some of which sent him and his investigation team to exotic places such as Afghanistan, Los Angeles, Yuma, San Diego, and Kingston (Jamaica). He is a graduate of Cranfield University and holds a Master of Science (MSc) in Safety and Accident Investigation

## The Editor's Corner

Welcome to the third edition of *Flight Comment*. I hope everyone had a great summer and posting season. I would like to begin by thanking our entire readership for their dedication. As published in issue 3 of 2013, the Directorate of Flight Safety (DFS) no longer sends individual subscriptions by mail. However, a new separate website has been stood up to publish current and past copies of *Flight Comment* magazine in PDF and ePub formats. Refer to [www.flightcomment.ca](http://www.flightcomment.ca) to retrieve the most recent issues of *Flight Comment* and enjoy the reading. Circulate the link to your peers and friends. Do not be afraid to provide us with feedback so we can improve the product.

As the annual posting season comes to an end, The Director of DFS will begin his Flight Safety roadshow next month. The DFS roadshow is a cornerstone event for Flight Safety in the Canadian Armed Forces, as it provides a face-to-face opportunity between the Director and the users of the Flight Safety (FS) Program. This interaction is vital for the proper maintenance of the program and allows us at DFS to gauge what's working and what's not. Please take the opportunity to actively engage the Director when he is at your unit to raise your concerns, comments and suggestions. We are always striving to make a better, more relevant product. We rely on you the reader for your input, impression and ideas.

With the recent deployment of air assets into the Middle East, Command and Control questions with regard to the FS reporting chain have once again become a hot topic. As a previous Strategic Planner at 1 Canadian Air Division, I know that command relationships at the operational level can be a complex and sometimes heated topic. As a result, I decided to write an article for the issue, in an attempt to address the 'ideal' scenario for FS reporting in a deployed Air Component Command; regardless of whether that is into a domestic or foreign operation.

Lastly, I would like to take this opportunity to address some of the difficulty concerning the recent rash of French language translation errors. I take full responsibility for these errors and would like to apologize to the francophone community. Our normal procedure for translations has been to submit all of our content through the Translations Bureau; however, a couple of phrases that were supposed to only be used to gauge space requirements ended up not being replaced with an official translation. Also, as I have learnt the hard way, our industry uses jargon to express industry themes that do not directly translate into French. For example, the term "Broken Checklist," while is a universal term in the aviation in English, literally translated to French has a nonsensical meaning. We are

implementing higher standards for translation vetting process and this issue will have reprints of the "Broken Checklist" poster with corrections made.

I would like to thank all of you that took the time to submit to the magazine; as I have said before this is your magazine, we read everything that we get and publish as much as we are able. So continue to write in and we will continue to provide quality content.

**Fly Well**  
**Lt T.J. Baker**



# Good Show

*For Excellence in Flight Safety*

## Captain Henrik Schulte-Bisping

On July 18th 2013, Capt Schulte-Bisping was conducting a solo instructor proficiency sortie in a CT155 *Hawk* from 15 Wing Moose Jaw. Capt Schulte-Bisping had just completed several traffic pattern sequences and shortly after lift off from a Touch and Go and while the landing gear and flaps were coming up, the aircraft struck a large bird. The bird entered the right engine intake causing a compressor stall and complete loss of thrust. A large bang was heard from the Control Tower and a 30-40ft flame was witnessed coming from the exhaust.

Capt Schulte-Bisping quickly diagnosed the engine problem and in a split-second decision between an ejection and a forced landing, he assessed the remaining runway available to be sufficient to land the aircraft straight ahead despite having the gear and flaps on their way up. He quickly selected the landing gear back down and

declared an emergency. Due to the nature of the engine problem, any attempts to regain power by increasing the throttle only resulted in repeated loud bangs with large flames coming out the back end of the aircraft. The landing gear locked with three green indications approximately one second before the aircraft touched down. The drag chute was selected to help the aircraft decelerate quicker. Capt Schulte-Bisping was unaware of the flames coming out the exhaust and the drag chute was quickly engulfed by the flames shortly after deployment. The aircraft stopped approximately 750 feet from the end of the runway and Capt Schulte-Bisping conducted an emergency ground egress.

Capt Schulte-Bisping's quick thinking and timely actions prevented the loss of an aircraft. For his actions, Capt Schulte-Bisping is deserving of a Good Show Award. 🇨🇦



# Good Show

*For Excellence in Flight Safety*

## Master Corporal Aaron Reid

MCpl Reid, an aviation technician with 1 Air Maintenance Squadron (Sqn), second line seat shop is a truly exceptional member of the CF188 *Hornet* community. His outstanding technical skill, Aviation Life Support Equipment (ALSE) knowledge, and professionalism have been instrumental in the identification and rectification of many critical Flight Safety hazards.

On 11 Nov 2013, he reported to 410 Tactical Fighter Operational Training Squadron CF188 Phase to tell the periodic crew that the ejection seats for their aircraft were ready for pick up. When he approached the aircraft he noticed that they were in the middle of installing a robbed non inter-changeable front ejection seat in the rear position of a dual aircraft. Had this condition not been identified and corrected it is questionable that an ejection would have been successful from this aircraft.

A few weeks later while supporting Sqn ALSE shops with a back log of maintenance, he noticed that the CF188 parachute seat assemblies that were being sent to him for inspection/overhaul were installed in the wrong seats. There are three types of chute assemblies with three different serial numbers, they are not interchangeable, and having the wrong assembly installed would jeopardize the pilot in the event of ejection. On his own initiative MCpl Reid performed an extensive aircraft maintenance record set inspection and found numerous areas of inconsistency in the maintenance practices dealing with CF188 parachute assembly installations. MCpl Reid took it upon himself to inform the squadrons and prepared an Aircraft Maintenance Information Bulletin #2014-02. 409 Tactical Fighter Squadron followed up with a local Tech Awareness Bulletin to clarify the importance and potential safety implications that can arise from ALSE complacency.

MCpl Reid is commended for his exemplary level of diligence and professionalism exhibited while performing routine inspections. His impressive focus and outstanding attention to detail while performing his duties removed several hazardous conditions from CF188 escape systems. MCpl Reid is truly deserving of this Good Show Award. 🇨🇦





# Good Show

*For Excellence in Flight Safety*

## Mr Trevor Kendell and Mr Denis Riverin

On 28 January 2014, Trevor Kendell, a civilian CC130J Hercules Aviation Technician (AVN) supporting 436 Transport Squadron maintenance as a member of the contractor field team (CFT), was conducting a close-out inspection just aft of the left hand paratroop door on aircraft CC130610. Although not part of the close-out inspection (and located in a poorly lit, difficult to see area above the rear cargo door), Mr Kendell noticed the rudder control strut assembly support arm had become detached from the rudder boost package.

Mr. Kendell discussed the situation with Denis Riverin, also a civilian AVN Tech and the two reviewed the maintenance record set for open work orders applicable to the rudder boost system. Finding none, they returned to CC130610 and carried out a detailed inspection of the rudder area. The inspection, and follow-on in-depth damage assessment, completed with assistance from additional CFT technicians, Field Service representatives and on-site Lockheed Martin engineering staff, revealed some severe

damage which effectively rendered the rudder free from it's control linkages. The only positional indicator available to the aircrew for the CC130J Hercules rudder is sent via a transducer signal to the Digital Flight Data Recorder. Meaning, the aircrew would receive feedback from the rudder pedals due to the cable linkage to the rudder boost package but would have no way to confirm the actual position of the rudder without the use of a spotter. Had this damage gone undiscovered and the aircraft taken off, the crew would have experienced a complete loss of rudder control. The discovery of the damage on aircraft CC130610 led to a fleet wide Special Inspection of all CC130J flight control surfaces.

Extensive experience, professionalism and willingness to look beyond the assigned task were instrumental to the discovery of this failure and to the prevention of an extremely dangerous scenario. As such, Mr. Kendell and Mr. Riverin are very deserving of this Good Show award. 🏆



# Good Show

*For Excellence in Flight Safety*

## Corporal Angela Hildrum

On the 27th of September 2013, 424 Transport and Rescue Squadron had been hosting its 70th Anniversary of the formation of the squadron. The servicing crew that was working was in charge of servicing the Search and Rescue (SAR) aircraft including aircraft CC 130319 Hercules that had dropped SAR technicians for a demonstration for the anniversary. On return of CC 130319, checks were carried out as well as fuelling operations. On the flight deck there was a supervisor and an apprentice who were completing training on the fuel job that had been carried out. There were also an additional five technicians that were completing after flight (A) checks on/around the aircraft. Just prior to all checks being completed and post-fuelling operations, Cpl Hildrum who had been training another technician on an interior A check heard a loud popping noise come from the under-deck of the flight deck. She looked into the area where the noise came from and discovered that there was now smoke and smouldering in the aft right hand side of the under-deck rack. Utilizing her training, she quickly raised the alarm yelling "Fire, Fire, Fire" and grabbed the Halon extinguisher located at flight station 245 bulkhead of the aircraft. She doused the fire with two quick bursts from the extinguisher while the supervisor turned off the power on the flight deck and all remaining technicians vacated the aircraft. It was later discovered that the #1 main DC bus TRU had blown its internal capacitors for a reason unknown. All personnel were exposed to electrical smoke inhalation and halon exposure, none of which were serious.

Cpl Angela Hildrum had recently returned to 424 T&R Sqn after completing a 6 month Aircraft Structures (ACS) Aircraft Life Support Equipment (ALSE) training course. She maintained calmness and professional composure during this dangerous circumstance. Her swift actions helped to ensure the safety of both



personnel and aircraft from severe and possible catastrophic damage. Her performance is an example to her peers and supervisors at her unit and displays the courage and knowledge she has gained from her Canadian Armed Forces career.

Cpl Hildrum's quick and decisive actions demonstrated outstanding skill, knowledge, judgement and situational awareness in exceptional circumstances, and is fully deserving of a Good Show. 🏆





## From the Flight Surgeon

# Vision Protection

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

### Sunglasses are cool

Let's admit it. In winter or summer, sunglasses on the flight line look cool. Aircrew and ground crew alike seem to enjoy their sunglasses and the association with flying!

But sunglasses and flying go together for good reason: vision is the most important sense in aviation, and it needs to be protected.

Aviators are constantly told: "don't fly by the seat of your pants" and "trust your instruments." However, in order to properly use aircraft instruments, aviators must be able to see them. Likewise, aircraft maintenance personnel carry out detailed work on small and sometimes moving parts. They also must be able to see what they are doing to complete these complex tasks.

And while vision is the most vital sense in aviation, the flying environment is full of threats to eyesight.

### Hazards to vision

There are many types of hazards to vision in the flying environment.

"Mechanical hazards" to vision are the most obvious. They can be thought of as "eye FOD" (Foreign Object Debris) and can include any of the following:

- Debris, such as dirt, dust and metal fragments, stirred up from shop sweeping to helicopter downwash.
- Chemicals, including solvents, fumes and fuel.
- Bird-strikes, 16% of which hit canopies or windscreens.
- Canopy Fragments from bird-strikes, collisions or ejection.
- Blast, especially during ejection.

"Light hazards" are another important group of hazards to vision in flying. These include:

- Glare, which is any unwanted light entering the eye. It usually causes distraction and discomfort, but it can even be disabling.
- LASERs (Light Amplification by the Stimulated Emission of Radiation), which are high energy light sources used in consumer products (ex. laser pointers), industrial equipment (ex. surveying levels), and weapon systems (ex. range finders). They can cause temporary distraction or permanent eye damage.
- Solar Damage, caused by exposure to bright sunlight. Damage can be caused by long-term exposure (ex. cataracts) or short-term exposure (ex. snow blindness).

### Protection from hazards to vision

Nothing can provide total protection from all the hazards to vision. However, transparent barriers – that is, windscreens, canopies, visors and glasses – placed in front of the eyes provide multiple layers of protection for various threats.

For instance, aircraft windscreens or canopies protect crew from the wind and debris of the outside flying environment. Helmet visors (either clear or tinted) protect from light hazards, such as glare and solar damage. Specially designed visors can protect against specific LASER threats. Visors also provide general protection from mechanical hazards, such as debris from door-open operations, windscreen failure or ejection. Safety glasses and sunglasses protect crew both on the ground and in the air from debris, glare, and solar damage.

Unfortunately, windscreens, visors and glasses can also create problems. Each additional layer of transparency has the potential to reflect light, create new sources of glare, and reduce how well the crew can see. Poorly manufactured or dirty transparencies can even produce unwanted magnification, distortion and even visual illusions.

### Try this!

Here is an experiment that you can try which demonstrates how a poorly manufactured set of sunglasses can produce the Pulfrich effect.

The Pulfrich effect is a visual illusion that makes an object which is moving from side-to-side falsely appear to be moving in a circular path. This can be described as a 3-dimensional illusion, and can make judging distance difficult.

The Pulfrich effect occurs when the brightness of an object reaching each eye differs by more than ten percent.

You can observe the Pulfrich effect using an ordinary set of sunglasses. Hold the sunglasses sideways with one lens over one of your eyes (leaving the other eye uncovered). Have another person stand in front of you and move an object (such as a ruler) quickly from side to side. You should perceive a slight depth change in the object as it moves. Rather than moving in a straight line from side-to-side, you will perceive the object to be moving in a slightly circular path.

There are many good video clips demonstrating the Pulfrich effect using the sunglasses technique on the internet.

The Pulfrich illusion shows why it is important to use only high-quality transparencies (particularly sunglasses) in the flying environment.

### Protecting your vision

With all of this in mind, here are a few tips to help you protect your vision.

- Keep your transparencies clean. Windscreens, visors and glasses need to be well-maintained for you to see properly and to avoid unwanted glare or distortion.
- Wear your visors. Helmet visors must be properly and consistently worn to be useful. Even on overcast days, be in the habit of flying with the clear visor in place. Bird-strikes and ejections still happen on cloudy days.
- Don't use equipment that is damaged or substandard. Even minor scratches can reduce how well you can see or how much protection equipment might afford. Also, when it comes to sunglasses, don't assume that price corresponds to quality. Sometimes expensive consumer sunglasses have surprisingly poor optical quality. Remember the Pulfrich Effect demonstration.
- Gently remind your colleagues about vision protection if they forget, and encourage them to return the favour if you forget. Flight Safety is a team effort!

Whether you are on the ground or in the air, your vision is your most important sense. Do all you can to protect it! ♦



Photo: Sgt Norm Mclean

Photo: MCpl Shilo Adamson

Photo: MCpl Robert Bottrill

Photo: Cpl Darcy Lefebvre

Photo: MCpl Robert Bottrill

#### References:

1. Ernsting's Aviation Medicine. Edited by David J Rainford and David P Gradwell. London: Oxford University Press, 2006.
2. Pulfrich Effect demonstration adapted from the following webpages: [http://pulfrich.siu.edu/Pulfrich\\_Pages/explains/expl\\_txt/explaint.html](http://pulfrich.siu.edu/Pulfrich_Pages/explains/expl_txt/explaint.html) and [https://www.youtube.com/watch?v=1mnWI\\_u\\_zBg](https://www.youtube.com/watch?v=1mnWI_u_zBg)



# Maintenance IN FOCUS

## Indirect Effects on Flight Safety

By Captain André Lessard, 3 Air Maintenance Squadron, 3 Wing Bagotville

I have not been in the military very long. Nor have I been in situations where my actions directly resulted in a loss of safety, whether it was my own, other's or to flying assets. It's hard to jeopardize a mission or the safety of flight sitting behind a desk and simply overseeing certain aspects of the squadron. Or so I once believed.

While I was a freshly new Lieutenant at the CF188 operational squadron, a significant amount of my time was spent dealing with the infamous red folders used for flight safety reports. Helping the FS investigators, giving my point of view on issues, pushing to end aircraft quarantines; all these were an almost daily occurrence in a high tempo operational squadron.

And maintenance was almost invariably affected, which meant they became part of my daily struggle as a maintenance officer. Every time something went wrong, I always thought it was a technician's fault or a paperwork issue. I mean, how could it have been me? I never touched the aircraft, it wasn't my job.

Problem is, I was part of a greater decision making chain. That aircraft that was backed-up into a hydraulic stand? Probably wouldn't have occurred if I hadn't reduced the crew that day. Ejection carts were forgotten to be installed just prior to the aircraft taking off?

If only I had told the pilots more time was required between missions, as I had been suggested. The paperwork was incorrect when the aircraft was airborne, possibly leading to something being missed? I was giving orders to the desk sergeant when he was completing it. I have other situations such as these that I can recall from my past. Luckily, none of them ever ended worse than a few hours of repair being required.

The thing is, I mattered. My decisions mattered. I affected the work of my subordinates, even if it was indirectly. I learned from these experiences, grew from them and hopefully will not repeat them. The point is, no matter where you are, you should think about the effect your actions and decisions have on safety. Especially if you are close to operations. 🔥



Photo: DND



Photo: Cpl Pierre Habib



Photo: Pte Jay Kennedy





# CHECK SIX



## Air Frame Icing

By Mr. R.B. Dickinson, Senior Meteorological Officer, R.C.A.F. Station Catham.

Reprint from *Flight Comment* August 1960

In March 1957 a T-33 climbing westward out of Chatham through a solid deck of cloud encountered liquid precipitation in cloud between 16 and 22 thousand feet. The crew began to check their airframe for ice formation, but found none. The temperature was obviously freezing. Why no ice? This incident was referred to the DOT Meteorological Branch's Research and Training Division, who replied, "The skin temperature of a high speed aircraft is considerably elevated above the ambient temperature..." The significance of the relationship between airspeed and dynamic heating of the airframe to jet aircraft operations in potential icing conditions seemed to warrant a deeper search into the phenomenon, and a study of the implications.

Approximately one year later, after a tentative guide to the expected temperature increase had been extracted from the available literature on the subject, an excellent opportunity arose to test the effect of dynamic heating on airframe icing. An F86 pilot on a weather-check at Chatham, 4 March 1958, agreed to experiment with icing conditions. Cloud conditions were 400 to 600 overcast, tops 4300, surface temperature 29°F, visibility 1 to 3 miles in light freezing drizzle, occasionally 3/4 mile in light snow grains (frozen drizzle). Conditions were ideal for airframe icing. Temperatures in the cloud were computed to be -3°C at 600 ft, -9.5°C at 4000 ft.

On a 30 second climb through cloud at 180 knots no icing was encountered. The aircraft reentered cloud at 170 knots, began to accumulate ice after 1 to 3 minutes at 4000 ft, then climbed out of the cloud. Re-entering cloud the second time at 250 knots, the aircraft picked up ice within 30 seconds. Remaining at 4000 ft, the pilot increased the airspeed until, at 340 knots, the ice began to melt and break off (A - A', Fig 1).

Before landing, the pilot flew around close beneath cloud in the vicinity of the aerodrome, where freezing drizzle was being reported, at airspeeds 180 to 250 knots, but did not pick up any ice (B - B', Fig 1).

The results of this experiment were carefully analyzed with respect to theoretical computations, and all phases of the experiment agreed closely with the anticipated results.

Another chapter in this episode was added on 25 October 1959. A T-33 approaching Chatham from the west at 20,000 ft, TAS 360 knots, entered a solid cloud deck, encountered liquid precipitation, and began to rapidly accumulate a layer of ice. In 2 to 3 minutes a layer of ice half an inch thick had formed, and descent was immediately begun at 395 knots to 15,000 ft. The ice ceased accumulating before 15,000 ft was reached, and within 10 minutes had all melted. Temperatures were -17°C at 20,000 ft, -10°C at 15,000 ft (C - C' Fig 1). Following the T-33 was a CF100 on descent from 39,000 ft, The CF100 encountered light icing from 26,000 ft which decreased to an insignificant amount by 12,000 ft. Airspeed on descent decreased from 450 knots to 340 knots (D - D', Fig 1).

The significant data from these trials are plotted on Figure 1, Temperature - airspeed combinations which result in freezing temperatures are in the shaded area. Note that melting in each reported incident occurred while air temperatures were still well below freezing. The close agreement of these results with theoretical computations seem to justify the application of special operating techniques for jet aircraft in icing conditions-techniques which involve judicious use of the throttle. The following points should be borne in mind:

- Layers of ice over one half an inch thick may take a considerable length of time to discharge, since the temperature cannot increase above 0°C until the melting process is complete;
- If it is not operationally feasible to maintain an airspeed high enough to prevent ice from forming, decrease airspeed. While icing continues, increasing airspeed only serves to sharply increase the icing rate. This was evident in the F86 encounter.

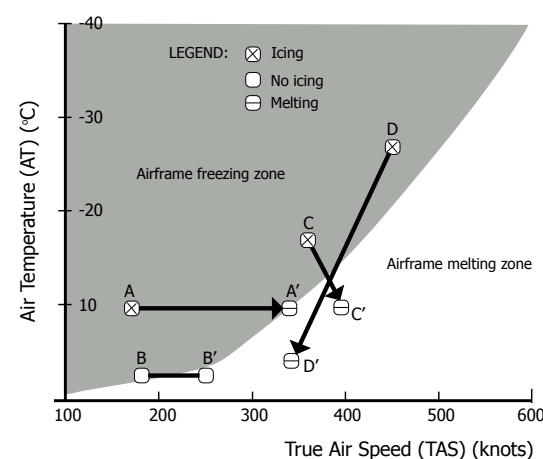


Figure 1. AT vs TAS Freezing Zone

Operational use of this relationship should be as an anti-icing procedure, not primarily as a de-icing procedure. The most obvious application of this physical relationship is during descent, or while holding an altitude where icing conditions exist. For example, on a descent through cloud at 450 knots TAS, icing would be encountered only above levels where the temperature was -20°C, but if the descent was made at 300 knots TAS ice would accumulate down to the level where the temperature was -6°C. Bearing in mind that serious icing is rare at temperatures below -18°C, because of the predominance of ice crystal cloud, there should be no significant icing in the first case. Even more obvious is the influence of the changes in TAS for an aircraft required to hold an altitude. With the ambient temperature at holding altitude say -12°C, serious icing may be encountered if the airspeed is 350 knots, but none if the airspeed is 380 knots.

Much icing of significance to jet aircraft occurs on approach patterns. As variations in approach patterns are operationally feasible, this suggests a means of avoiding icing during the approach. Obviously an approach to minimums cannot be made at high airspeed; however in many cases the icing zone does not extend to within 1000 ft above ground. In fact ceilings themselves may be 1000 ft or better, permitting a visual circuit before landing, in which case high airspeed could be maintained to the cloud base. In cases where GCA controlled landings are necessary, special icing let-downs can be designed to permit the airspeed to remain high as long as possible. Figure 2 shows a normal approach and suggested revisions for use under icing conditions. In the normal approach, 280 knots LAS during descent, an airframe temperature of 0°C is not reached until 6000 ft (typical temperature distribution as shown on letdown diagram). Furthermore, the last 9 miles of the approach is done at 160 knots, at 1500 ft to the glide-path, which would permit icing to persist for 3-1/2 minutes. Using the revised letdown, 0°C airframe temperature would be reached at 10,000 ft, where the ambient temperature is assumed to be -14°C. Experience indicates that some ice would have begun to form prior to then, even in layer cloud, due to the rapid rate of accumulation at high airspeeds, but the ice

should be very thin, and melt off below 10,000 ft. To about 8 miles out, 330 knots can be maintained. At this point two choices are possible:

1. If the cloud base is above 500 ft, descent can be made to that altitude, and the approach made under GCA surveillance, if freezing precipitation is occurring, the airspeed can be kept at 280 knots, and the landing completed from a low level visual circuit.
2. If the cloud base is below 500 ft or visibility less than 1 mile, the aircraft can approach at 1000 ft under GCA control, reduce airspeed to 160 knots at 5 miles, lower undercarriage, intersect the glide-path at 3 miles and do a full stop GCA. Icing would be possible once the airspeed reached 160 knots, but the accumulation would be slow and the time element brief.

Such procedures are deemed necessary for operation of the T-33 not because that a small amount of ice on the airframe itself is particularly dangerous, as a few extra knots at touchdown will compensate for the normal effects of airframe ice, but because a thin layer of ice on the windscreen is a definite hazard. Restricted vision due to windscreen icing has been the cause of many an overshoot, and the downfall of more than one runway light.

The basic principle is simple; the complications many. The cooling effects of evaporation and sublimation, the heating effects of air compression

and friction, unit rate of water catch, unit conductance of the airframe itself, and other factors must be carefully assessed in deriving the exact answer at each airspeed, under various atmospheric conditions. The co-operation of aircrew, in carefully noting the behaviour of airframe icing when it occurs will be required as further experimentation continues on the icing problem. Care should be taken to note location, airspeeds, altitudes, and the time elements involved, and report them as soon as possible to the nearest Met office. Co-operation such as that already evidenced at Chatham will provide further links to the solution of this fascinating problem.

### Acknowledgements

Co-operation of Flight Lieutenants W.S. Deacon and F.G. Fowler, and the assistance of Flight Lieutenant F.E. Sylvester, OC Instrument Flight, Station Chatham, in designing the icing letdown, is greatly appreciated.

### Editorial Note

*As the author suggests, much more information is needed before this "theory" can be developed into an operational procedure. It does, however, illustrate how flying techniques grow out of co-operation and exchange of information. Whether or not this becomes a new technique will depend on the proofs produced by continued study.*

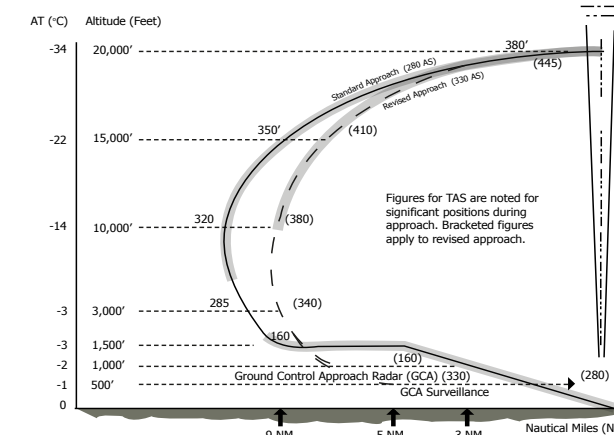
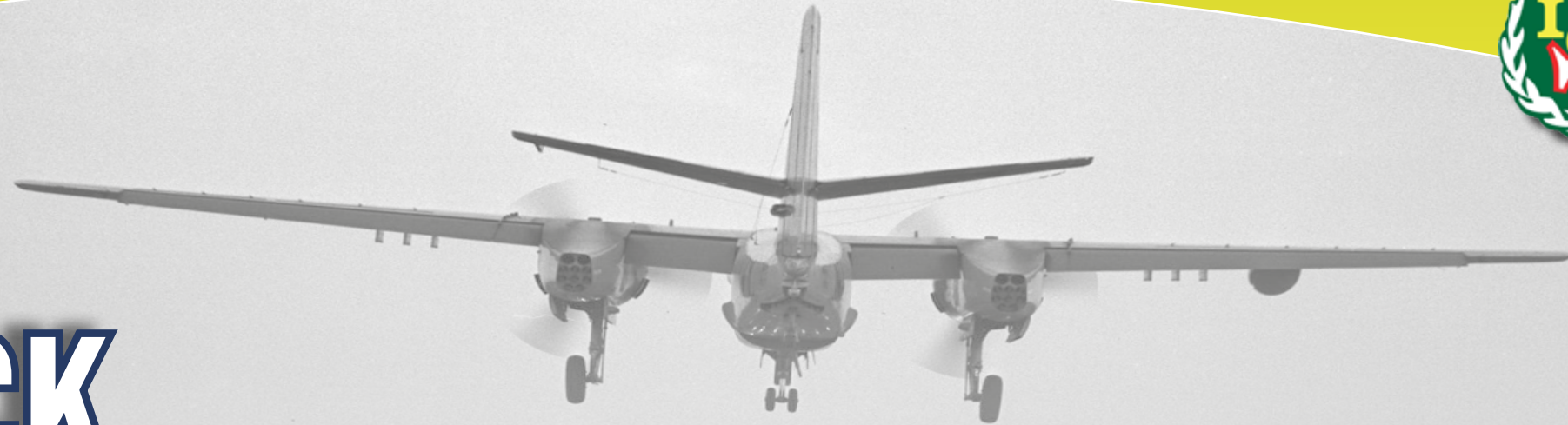


Figure 2. Standard Approach Procedure vs Modified Procedure under Assumed Icing Conditions





# ON TRACK

## Hazard, Threat and Error Management

Article prepared by the Instrument Check Pilot (ICP) School. The author, Capt Scott Anningson, is a pilot who instructs on the ICP course and Human Performance in Military Aviation (HPMA) course at the Air Force Standards Advanced Performance Centre, 1 Canadian Air Division, Winnipeg.

When anyone asks me how I can best describe my experience in nearly forty years at sea, I merely say, uneventful. Of course there have been winter gales, and storms and fog and the like. But in all my experience, I have never been in any accident... or any sort worth speaking about. I have seen but one vessel in distress in all my years at sea. I never saw a wreck and never have been wrecked nor was I ever in any predicament that threatened to end in disaster of any sort." (Edward John Smith, 1907, Captain of the RMS Titanic.)

The aim of older human factors training was to eliminate human error. Lofty - yes. Possible - no. You might think you are now quite proficient and free of mistakes. However, there's always the one working beside you...

None of us is perfect. We need to manage error, both our own and others. Military aviation is characterized by complex tasks, often with

severe time constraints. The nature of our work means that we must deal with a variety of hazards on a daily basis. In order to prevent these hazards from affecting the mission, or becoming losses (mishaps), we must develop and employ effective system defences. These defences come in a variety of forms such as rules, regulations, orders, checklists, standard operating procedures, tactics, training, or supervision. These defences may seem redundant or inconvenient. There is a simple reason for this - one magic bullet is not the solution to all our problems. We must have additional defences in case a threat or hazard gets past the first line of defence. Unfortunately, in order to get the mission done, it is often tempting to bypass some layers of defence. Failure to follow established procedures is often found as major cause in aviation occurrences. Multiple layers of defence help ensure hazards do not result in losses. This is where HPMA becomes

important. No matter how effective the defences, we are still the last line of defence. We must be disciplined and alert to problems, intervening when required.

### AVOID, TRAP, MITIGATE MODEL

Since error is inevitable, HPMA offers a countermeasure, with three levels:

- **Avoid.** First and foremost, attempt to eliminate hazard, threat or error through the application of HPMA skills, such as effective planning, communication, task and workload management, individual skills, rules, SOPs, etc. Most of our work should be done in the avoid area.
- **Trap.** Catch and correct hazards, threats or errors as they happen and before they have an operational impact. Supervision, team skills and checklists are good trapping mechanisms. So are automated

warning systems. (That is, unless you disable them intentionally. Then they won't be there for you.)

- **Mitigate.** Reduce the effects of threat or error once they have occurred. Essentially, this step involves recovering from an earlier error or stopping it from becoming worse. Emergency procedures, quarantines, and ejection seats tend to mitigate the effects of error.

### Example of Elimination of a Hazard

A high mounted aircraft engine has an oil filler cap that aircrew cannot access during pre-flight inspections. The locking mechanism for the cap is also poorly designed in that it is difficult to lock properly. It may seem locked at times but it isn't and it can work itself loose in flight, resulting in oil loss and engine failure on this twin-engine aircraft.

- Maintenance supervisors drew up oil cap "security" training and instituted an independent check by a second technician to verify oil cap security when the engine reservoir was being refilled with oil. Hazard, Threat and Error Management strategy employed here: Avoid.
- Six months later, a technician added 4 L of oil to the engine and replaced the cap, but it wasn't seated properly and wasn't locked securely. The second technician assigned for the independent check found the anomaly and secured the cap properly, pointing out the problem to the first technician. Hazard, Threat and Error Management strategy employed: Trap.

- Three months later, engine oil cap security was missed by both technicians assigned to an oil top up. An hour into flight, the oil cap came loose, spraying oil all over the inside of the engine nacelle. The aircrew

noticed the significant drop in oil pressure and rise in engine temperature. They shut down the affected engine in flight, declared an emergency and landed single engine at the nearest suitable airport without further incident. Hazard, Threat and Error Management strategy employed: Mitigate.

- After another 3 incidents of a similar nature in the next 2 years, the oil cap and locking mechanism were redesigned. There have been no further problems in the last 10 yrs. Hazard, Threat and Error Management strategy employed: Avoid.

*Continued on next page.*



## ON TRACK Hazard, Threat and Error Management

...Continued

### Conclusion

Our first priority should be to try to avoid hazards, threats or error all together. We do this by developing the highest level of skill, developing a strong team that communicates freely, and by anticipating “areas of risk” and being prepared before entering these areas. If we were unable to avoid, we must be able to trap before something happens or becomes consequential. Finally, when a hazard, threat or error has gone undetected and something bad happens, it is our responsibility to react appropriately to prevent the situation from getting worse. We can do that by always having a way out. That requires a back-up plan that identifies what you will do if things go wrong. ⚡

With each “On Track” article, an ICP School instructor replies to a question that the school received from students or from other aviation professionals in the RCAF or comments on a HPMA topic or interest. If you would like your question featured in a future “On Track” article, please contact the ICP School at: [+AF\\_StdS\\_APF@AFStdS@Winnipeg](mailto:+AF_StdS_APF@AFStdS@Winnipeg).

# From the Image Technician

By Corporal Daisy Hiebert, Imagery Technician, Directorate of Flight Safety, Ottawa

As an Image Technician on a Wing, there is a possibility you will be tasked to be a member of an aircraft incident investigative team. Once the firefighters have cleared the site the investigation will start and you’ll be expected to know what your doing and how to protect yourself. There are many potential hazards on an accident site, and the best way to protect yourself is to have and utilize the proper personal protective equipment (PPE).

The hazards on site are environmental, physical, biological and psychological. Environmental hazards can be as simple as being in a remote location, hilly terrain, swamp or a busy airport. Make sure you wear proper attire for the conditions. In the summer months dehydration can become a main concern especially if the situation requires you to wear PPE for an extended amount of time. The heat conditions when wearing coveralls and a hood is much the same as experienced when wearing CBRN gear, be prepared. The main physical hazards from an aircraft accident are usually obvious; things such as fire, explosive structures and pressurized gases should be cleared by first responders before you attempt to enter the scene. Some of the not-so-obvious hazards include the safety equipment in aircraft; ejection seats and parachutes, can be highly unstable especially if the aircraft has sustained serious damage. Actually, it is advised to avoid touching anything or entering the site until you have permission. In some cases there is biological hazards present in which case you will be donning your PPE. It is also important to mention that biological hazards may lead to psychological impacts; you need to mentally prepare yourself for what you may see. It is an unfortunate reality that in aircraft accidents there may be fatalities which are difficult to prepare for and those images can stay with you.



As mentioned previously PPE is a requirement for some scenes. A kit that should be available for any type of aircraft accident should contain the following:

- Full cover protective suit
- Latex gloves
- Work gloves
- Face masks
- Dust/mist HEPA/P3 masks
- Goggles
- Shoe covers
- Protective boots
- Disinfecting chemical and wipes
- Biological hazard disposal bag
- Hard hat
- First aid kit
- Insect repellent
- Drinking water

#### In marine environments you may need:

- Footwear for deck operations
- Sun protection
- Motion sickness medication

Once PPE has been contaminated it cannot be used again and needs to be disposed of immediately.

While protecting yourself is paramount it is important to know what you may be protecting yourself against so that you can be efficient in the use of your PPE. There are some courses available which will teach you about these hazards and how to protect against them. Some valuable courses would be Bloodborne pathogen awareness training and how to properly use PPE. This information can be found in the Flight Safety Course at 1 Canadian Air Division Headquarters in Winnipeg.

The image tech on site is a valuable part of the investigation. Protecting yourself will allow you to be a functioning member of the team. Being informed of possible hazards, PPE and Aircraft Accident Investigations will help in getting the job done without risking your own safety and jeopardizing the integrity of the investigation. The goal of every investigation is to find the cause of the accident and to find ways to prevent further ones, protecting yourself while conducting an investigation is key in finding the answers quickly and efficiently. ⚡



# Always the Unexpected

By Mr. Collin Fraser

*Mr. Fraser has flown for over 35 years in many types of aircraft, at all levels of civil aviation, across Canada and abroad.*

*Mr. Fraser flies with a major airline and contributes regularly to the Flight Comment.*

Normally, we engage in aviation through a sequence of procedures and maneuvers. They are all well-reasoned, and many are the result of hard lessons. We abide by regulations and use standard operating procedures. We follow the flight plan, employ checklists, and rehearse our emergency drills. We especially take pride in flying our machine as taught.

We believe that by adhering to procedures and maintaining skill with maneuvers, we are providing the foundation of safe and efficient flight operations. In fact, our disciplined efforts are normally rewarded with pleasant flights and successful missions.

Still, as everyone involved in aviation would point out, "There is always something new, especially in this business". You also know that many of our publications slip a little note onto page one saying basically, "We might not have thought of everything".

So, we must consider the possibility of encountering situations without clearly pre-determined maneuvers or procedures to apply. Plus, in flight, there might be very little time for us to produce an answer to a challenge which is both sudden and unexpected.

The previous two paragraphs link the words "always" and "unexpected" through a lot of chain-of-events terminology. Clearly, here is a

threat to flight safety. But, it seems difficult to guard against the unknown. It sure would help if we could organize our thinking in some way.

We can ask three questions. What if our aircraft exhibits behavior which we have not seen? What if our procedure conflicts with someone else's procedure? What if our procedure is impinged upon in such a way that it will not succeed?

## Let's look at an example of each.

Way back in the twentieth century, I was completing my first Captain upgrade.

My final check was with my Chief Pilot. I would fly a light twin-engine airplane from Winnipeg to a small northern airport. My boss would merely observe, to the limits of his patience, or fear for his life.

Hoping for a good evaluation, I followed every procedure to the letter. I did a more thorough walk around than the folks who built the airplane. I even checked my comm radio squelch, and nav receiver accuracy.

Cleared for takeoff, away we went. It was a fine spring morning, with the sun rising into a blue sky. While the temperature was still below zero, it was forecast to be a warm afternoon, as it had been yesterday.

Forty miles north of the airport, we exited radar coverage into uncontrolled airspace. Navigating by reference to an actual paper chart, I enjoyed the smooth flight as we travelled halfway up Lake Winnipeg before angling inland.

Destination in sight, I made the appropriate radio calls. The community airport information service did not respond. The school teacher usually manned it, but he liked to fly out on weekends.

I overflew the airfield to check the windsock and runway. The sock showed a light breeze which favored landing north. The runway was 2600 feet of compacted snow over gravel. I completed the circuit and set up to land.

On speed, on centerline, power idle, I set the aircraft down near the threshold. I eased on the brakes. Instantly, the mainwheels locked, and we were sliding.

Yesterday's sun had melted the runway surface. Overnight freezing temperatures had created a skating rink, and we were on it. Worse, our runway tilted a bit downward for the first half. Just beyond the not-so-far end was a river.

On the downslope, the aircraft seemed to accelerate, which I found very disappointing. Of course, I lightened right up on the braking application. No anti-skid in this kite. Wheels rolling again, I was feeling the brake pedals for

traction. There was none. The wheels locked again with no apparent slowing effect. I tried pumping the brakes, but that didn't work either.

We had slid down onto the flat, and were still sailing along.

My boss got to the heart of the matter. "Are you going to stop?"

I had to admit: "I don't know."

It didn't look good. We were going to drive into the snowbank at the end of the runway. It would be rock hard, having been layered into place all winter by the turning of the plow. If we smashed through that barrier, the river rapids were waiting.

My high pressure check flight had suddenly become an emergency. Sliding toward disaster, I conducted a brief review of my training and still thin experience. No procedure. No maneuver. No answer!

We were nearly out of runway. Time seemed to slow down.

I hooked a thumb behind the number 1 throttle and pushed it full forward. The left engine came surging off idle.

Just as the engine responded, I stomped on full right rudder. The aircraft started sliding like a curling stone, and rotated about its' center of gravity. Quick as I could, I closed the left throttle and centered the rudder. The aircraft, still tracking the runway, was sliding sideways.

**I hooked a thumb behind the number 1 throttle and pushed it full forward. The left engine came surging off idle.**

The mainwheel tires' circumferential ribs broke through the thin ice crusting the runway, and I could feel us starting to slow a bit. Then the airplane's weight shifted, the wheels started furrowing into the snow, and we ground rapidly to a halt.

My boss climbed down off my right shoulder, and leaned forward to look past me along the left wing. The snowbank was a good ten feet away.

I was busy just breathing, and peeling my fingers off the controls.

"Where did you learn that?" he said.

"Just now," was all I could get out.

Well, I passed my check. I recall my Chief Pilot as saying that the flying I would be doing would require a lot of thinking for myself.

Another time, I was lucky enough to be a Captain on the old Dash 8. It was a winter night in Newfoundland. We were cleared for an approach, with my partner as pilot flying. I was changing the comm channel, from Terminal control over to Tower.

Just outside our final approach fix, we descended between cloud layers. In the center of my windscreen appeared two lights: green and red. They were getting further apart! Impossibly, an aircraft was flying the reverse of our approach course, climbing toward us, and already very close.

*Continued on next page.*



Our charted missed approach procedure went straight ahead, so was instantly of no use for escape.

I directed my First Officer, "Turn left now, heading 070, climb to 3000 feet". We initiated the turning go-around, and then I made a radio call back to Terminal to consult with him on what must be a very interesting radar display.

We learned that an aircraft had departed the airport just prior to our approach. That aircraft had experienced a mechanical fault shortly after liftoff, and the crew had decided to declare an emergency. They had cancelled their instrument flight clearance, and circled for an immediate visual landing.

Flying downwind in the circuit, they had flown into a snow shower which caused them to lose visibility. A bit stuck for an answer, they had started climbing to a safe altitude. A crosswind set them tracking toward our flight.

I had been communicating with terminal control, and the emergency flight was on Tower frequency. Our two procedures had ended up butting heads.

Our third example has happened to me twice. Descending below 1000 feet for a visual landing, there came into sight a Bald Eagle, on an intercept course.

I was sure that if I could see the eagle, it would have spotted my aircraft long ago. If we were set up to hit each other, I concluded that it was intentional on the part of the bird. The eagle had ages of genetic programming confirming that it had air superiority. The bird was insisting that I defer to its flight path.

These creatures had evidently not yet been close to an airplane. Obviously, a collision would obliterate the proud raptor. On the other hand, my flying machine might suffer some costly damage.

On both occasions, I lifted the aircraft above the eagle's flight path, and then pitched back down, accepting a slightly steep angle to the touchdown zone.

To review the three questions we posed earlier, we see in our first example that the aircraft performed in a manner beyond my experience when I landed on ice. In the second case, my cleared procedure conflicted with what another flight was doing. In the third illustration, an uncontrollable natural factor was about to impact negatively on my procedure.

In all three cases, continuing with normal maneuvers or procedures in the face of unexpected circumstances would have risked

serious mishap. Note also that another common element was a critical lack of time for the process of evaluation, decision, and execution.

To be very clear, I do not recommend my specific actions. For instance, I would not try to hockey-stop any of the large jets! My invented go-around to evade traffic was based on local knowledge. That also happened in the last years before collision avoidance systems. And in the third case, many aircraft types that deviate significantly from a nominal glide path late in an approach will absolutely require a go-around.

The examples were selected to explore the idea that aviation requires us to be alert to the possibility of circumstances not covered by our usual stock of procedures and maneuvers. Often, unanticipated challenges are real hazards that require active avoidance.

Successful aviators never choose freestyle as a primary tactic. It is only when our normal disciplines are nulled by the variables encountered in aviation that we are forced to make it up as we go along.

We have recognized three general directions from which unusual threats can emerge. However, there will always be the unexpected. ✈

# DOSSIER

## Flight Safety COIN

By 2Lt Joe Al Dahby, Assistant Editor, Directorate of Flight Safety, Ottawa

The Director of Flight Safety (DFS), Colonel Steve Charpentier has implemented the production of a Flight Safety (FS) coin. The purpose of the FS coin is to recognize a notable contribution to the FS program by an individual's particular actions or noteworthy dedication and conveys DFS' appreciation to a worthy recipient that exemplifies the values of the FS Program and exemplifies the career of Group Captain "Joe" Schultz.

### Career Background

Group Captain Schultz love of flying carried over a distinguished 37-year career with the Royal Canadian Air Force (RCAF) and beyond. A well-documented WWII *Mosquito* night fighter pilot with 410 Squadron he went on to fly over 40 different aircraft including the CF188 *Hornet* twice in his later years.

As the DFS for 10 years, he was known as "Mr. Flight Safety". Our FS program is primarily the result of his hard work, self-sacrifice and dedication in furthering the cause of military aviation. In recognition of his many postwar contributions to the CAF, Colonel Schultz was named an Officer of the Order of Military Merit in 1974. Additionally, his efforts were recognised internationally by the International Flight Safety Foundation in 1977 and he was elected as honorary member of the United States Air Force (USAF) Aerospace Safety Hall of Fame. In Canada, he was awarded the Trans-Canada McKee trophy in 1978 and was inducted into the Canadian Aviation Hall of Fame in 1997 with the following citation:

"Over many years in cooperation with the military and the civilian agencies associated with aviation, his vision, dedication and pursuit of excellence resulted in significant advancement in air operations generally and flight safety accident prevention programs in particular."

As a symbol of remembrance and in recognition of all who share in the spirit of excellence that Group Captain Schultz has made a career and life's work demonstrating, the DFS has commissioned the production of a coin given selectively to any who exemplify these characteristics.

### Coin Criteria

The FS coin is used to recognize a notable contribution to the FS program by an individual's particular actions or noteworthy dedication and conveys DFS appreciation to a worthy recipient that exemplifies the values of the FS Program. As such, all recipients of any FS award as described in A-GA-135-001/AA-001 will be issued a FS coin. The coin is also awarded on a discretionary basis by the Director of Flight Safety. Individuals who are considered worthy of a FS Coin can be nominated directly to the DFS Chief Warrant Officer (CWO).

### Coin Description

The FS coin is made of pewter and shows on one side an elevated side face replica of Group Captain R.D. "Joe" Schultz (1922-2011), considered the pioneer of the CAF FS Program. The opposite side shows the DFS relief crest



Photos: Cpl Daisy Hiebert

overlaying multiple red maple leaves engraved with a relief rectangle displaying a unique serial number.

The DFS CWO will maintain a registry of all coin recipients. The registry will include recipient's name and rank, coin serial number, date of award and reason why the coin is awarded. The registry will be used as a reference to acknowledge all those that have shared in this prestigious award. The coin with serial number 001 was honourably awarded to the grand daughter of Group Captain R.D. "Joe" Schultz for an outstanding career and a beacon of excellence for all to strive for.

DFS has a mandate to champion a pro-active, effective, and innovative Flight Safety Program that enhances combat-effectiveness by preventing the accidental loss of aerospace resources. The introduction of this coin will help to recognize those that have made outstanding contributions and continue to promote a culture of Flight Safety. ✈

Rayne "Joe" Dennis SCHULTZ  
Group Captain  
DFC, OMM, CD  
1922-2011



# What's Between Your Legs?

By Major Brian Bews, Wing Flight Safety Officer, 15 Wing Moose Jaw

Look down, what do you see? Your crotch? OK. Too far. Look up slightly. I'll give you a hint. It's black and yellow and looks like a loop. Ah yes, the ejection handle. It's something placed there by the engineers that I will never have to use. At least, that's what I thought until one day I found myself hanging from the parachute wondering what had just happened. With over 2,100 hours of sitting on a chair designed by Martin Baker, I never really gave ejecting much thought other than the seat being there if I needed it. But why do I need an ejection seat? I'm flying a *Hornet* with 2 engines and the jet flies perfectly well on one engine so I will never need it right? But since it's there I'll maintain my currency on it, get re-qualified annually on how to use it and try to wrap my head around pulling the handle if I need to.

Let me think about this a second. I've often been warned not to do math in public but let me give this a shot. The ejection seat has 4,800lbs of thrust. My boarding weight plus the weight of the seat is around 350lbs. So that's approximately a 14:1 thrust to weight ratio. Most fighter jets have a 1:1 thrust to weight ratio. The space shuttle has a 1.5:1 thrust to weight ratio. Well then 14:1 sounds like a lot. We typically pull 7-8 G when flying so what does an almost instantaneous 22G of acceleration feel like? I have always said it feels like getting hit by a bus but I have never been hit by a bus so it's really not a good comparison.

Having said all of this, it's important not to get too wrapped up in the details. Ejection seats work and have a very high success rate. It's more

important to focus on the procedures, proper body position, strapping in correctly and trusting the seat if the time comes to take one out for a test drive. The most critical mistake you could ever make is second guessing yourself and delaying your ejection decision.

Emergency procedures are designed to save your life. They teach us habit patterns, muscle memory and decision making. They must be taken seriously. Every time you strap into an ejection seat, plan on using it. If you are not mentally and physically prepared to do so then it's time to pull the throttles past the detent, unstrap and call it a day. ✈

Photo: DND

# Error on the Side of Safety

By Captain Herb Prust, Wing Flight Safety Officer, 16 Wing Borden

Aviation is inherently a risky enterprise and military aviation is even more so. Military flight crews are often required to push their aircraft to their structural or operational limitations, or themselves to physiological limits. In addition, flight crews are typically type-A personalities that value mission accomplishment very highly. These factors can contribute to an environment that reduces the "normal" level of flight safety. Aircraft Commanders (AC) have to be aware of these pressures and tendencies, and remind themselves they are often the last line of defence to ensure the operation is conducted within an acceptable level of risk. The following scenario involving a CC130 *Hercules* illustrates this concept.

As a prelude to this specific scenario, in the *Hercules* world, there is a saying that "happiness is four engines." Should an engine failure occur, unlike two engine aircraft, there is only a 25% decrease in total power available. Should a single engine failure occur, the flight is planned as such that it can be flown safely on three engines keeping in mind factors such as fuel requirements, obstacle clearance, and weather. For a flight to continue, all considerations must now factor in the possibility that a second engine could fail. It is stressed in the upgrade process to aircraft commander that when you are flying on four engines, think about what you would do if you only had three. If you are flying on three, what are your actions should you have to fly on two?

With this in mind, our specific scenario involves a CC130 that was involved in a multi-day, around the clock supply operation in support of an overseas commitment, and it was tasked to complete a leg from RAF Lyneham in England to 8 Wing Trenton. It was one of many aircraft conducting very short turnarounds with multiple crews. The plane departed early morning with no mechanical issues and the crew was rested. Approximately one hour after leaving the coast from Ireland, a precautionary engine shutdown was conducted on number three engine due to the oil pressure falling below prescribed minimums. The final decision involving a myriad of operational and flight safety considerations fell onto the shoulders of a young AC.

This young AC faced operational pressures to get the job done; it was operationally advantageous to get the plane back to Trenton. It was also his first experience in a highly public, multinational overseas operation. He and his crew had been deployed for some time, and perhaps some "get home-itis" factored into the decision. The problem was isolated to the number three engine; this shutdown posed no increased risk of an additional engine shutdown or any other maintenance issue. Should he lose another engine, he would still have had enough fuel and would have been able to meet all obstacle clearance criteria. Weather was not a factor.

Additionally, after coast in over Newfoundland, should another problem surface, he would then have many available airports where he could land the aircraft quickly. In other words, he was on "three" and should he lose another, he would still be OK on "two". After considering all the data before him, he elected to continue to Trenton, and landed approximately eight hours later without further incident.

Was his decision prudent? Was the increased risk associated with flying across the Atlantic with one engine shutdown justified by the requirement to complete the mission? In this case, even though the aircraft commander considered and accepted the risk of losing another engine, it is generally accepted that the operational considerations did not justify the risk.

It should be stressed that it is incumbent upon aircraft commanders to remember that conducting the flight in as safe a manner as possible should be the overriding consideration, except in times of operational missions where the risk has been duly accepted by the chain of command. Turning back to England, repairing the plane and departing later would not have derailed the mission and was by far the most prudent course of action. Aircraft commanders of any fleet should always keep in mind that any deviation from the safest course of action must be the exception rather than the rule. ✈

Photo: Kevin W. Moore



## The Strength of an Idea

By Captain Dennis Mann, Unit Flight Safety Officer, 406(M) Operational Training Squadron, Shearwater

In June of 2010, a detachment of CH124 *Sea Kings* were tasked to support the G8/G20 Summit in Toronto, On. We were based out of CFB Borden but had been flying out Toronto Downsview Airport, about 10NM east of Toronto Pearson.

The operation was wrapping up and we were preparing to transit back to Borden. We were scheduled to depart early the next morning and we were waiting on the weather. The prevailing forecast was 500 feet overcast and one statute mile with mist and rain, the legal minimum for daytime flight. Sunset was approaching, but I assessed that we would be in Borden prior to civil twilight, so I decided to launch. These were not the best conditions, but they were legal, a distinction that I am much more aware of now.

As we departed Downsview, the weather proved to be less than forecast. After a few minutes, we cleared the zone to the north but the weather kept pushing us lower. With a ragged ceiling and the visibility dropping well below a half mile, we established a tight orbit at 250 to 300 ft over a set of train tracks. Knowing that there were buildings in the area taller our current altitude, and that we may inadvertently enter cloud, we contacted Toronto Center for an IRF clearance. After a short pause for sequencing, we were cleared straight North up to 3000 feet. We broke VFR out between layers, and after a short conversation with Toronto Center, we realized that Downsview and Borden were both below IRF minimum. As Borden only had a non-precision approach with an MDA of about 400 ft, we figured that our only option to get in was Special Visual Flight Rules (SVFR), if we could get back under the cloud.

We spotted a hole and descended back under the cloud layer, directly over the highway 400, heading north. But we failed to anticipate how dark it would be due to multiple layers of cloud and the delays that had pushed us into full night. Maritime helicopter crews are generally comfortable flying at or near minimums, but it is usually overwater. Having not yet been qualified on night vision goggles, we were visually unaided, being squeezed between a descending cloud layer and rising terrain. We were literally following the highway lights with no suitable options for landing. At points we were pushed as low as 150-200 feet with minimal visibility and using the weather radar to search for towers. This was compounded by the fact that the radar has a 20-degree blind arc directly ahead of the aircraft, requiring periodic heading changes to clear our path. The non-flying pilot was directing navigation off of the map, searching for altitudes, obstacles and a road that looks populated enough to get us back.

We almost went back into cloud several times and once while following a secondary road, the streetlights hit a dead end, forcing us to reverse direction on instruments and work our way back to the highway. We eventually found a road with enough lighting to lead us back to Borden.

Ultimately through great crew co-op, and a bit of luck, we landed safely in Borden, 55 minutes after take-off. This was supposed to be a 20 minute flight. I have spent a long time reflecting on the decisions made that day, I learned some very important lessons from that flight.

First, the strength of an idea is powerful thing. This could be explained academically as a sunk cost fallacy or irrational escalation of

commitment. Essentially, I became so invested in getting to Borden, that I failed to acknowledge that it was not the priority; safe completion of flight was the top priority. If this meant going IFR and requesting vectors into Toronto Pearson or City Center for an ILS or even landing in a mall parking lot (if it presented itself), then that should have been the call. These options unfortunately never even came up, as the increasing urgency of the situation demanded the crew's full attention.

Second, just because you have the minimum weather for launch, that doesn't mean that you should. It actually means that if the weather is even slightly worse, that you are not legally allowed to launch.

There were several other factors that should have held more weight in my decision. The difference in terrain and standard operating environment, the risks associated with unfamiliar operations and the possible alternates, to name a few. Since that flight, I have observed many pilots who have demonstrated superior judgment by cancelling a mission for weather that was above minimums due to appropriate consideration of other factors.

In hindsight, I realize that I was fixated with reaching Borden, and that I had interpreted every setback as a problem to be solved. I had become overly committed to an idea, and had inadvertently placed my crew in a riskier situation than intended. I am now much more aware of the risk of the strength of an idea and that and if we are making decisions based on degraded situational awareness, then our decision making process is fundamentally flawed. 4





# What's That Smell?

By Captain Jim Behn,  
1st Air Force USAF Detachment 1 Canadian Air Division, 17 Wing Winnipeg

As a new aviator in the United States Air Force, one of the first topics I remember discussing was airmanship. Most of the students had little to no previous experience as crew members and were, very impressionable. We've all heard stories (unfortunately most told third-hand) about an incident that could've been avoided. We rarely hear of safety incidents that were avoided. Here's an example of a potential flight safety incident, which through sound Crew Resource Risk Management (CRM) practices, was mitigated.

Prior to one of my first sorties without an instructor, our Mission Crew Commander (MCC) reminded us, as they always do - "If something looks different, smells different or feels different, inform me", and he'd decide on the appropriate action. This concept had been engrained into our heads, but as new aviators we had little experience in its practice. We have all heard stories of

someone who encountered some smell or became worried about a weird noise only to be told it was normal or even shrugged aside. We didn't have thousands of hours. What could we know?

So as a young aviator, even though you're told to bring it up, you may be inclined to follow the actions of those around you, perhaps looking at the more experienced airman next to you to see if they're worried. Luckily for me, my instructors' sound mentorship had ensured I was comfortable with bringing any issue up for discussion.

Halfway through this particular sortie I encountered one of the most feared smells in aviation: the smell of something burning. I queried the airman next to me. He didn't smell anything. I wondered for a second if it was just me or if I should tell the MCC. I didn't want to look like a newbie but I had been trained better. I told the MCC what I smelled. He said he didn't smell anything but

opted to send a tech to investigate. Soon the smell spread and sure enough, we discovered an electrical fire brewing beneath my console. The tech immediately informed the MCC who ran the proper checklist. Later, I was relieved that I brought it up and the issue was resolved quickly and without incident. Once practiced and employed many concepts become second nature. CRM however, needs to be practiced and employed often and objectively. When I became an instructor, I often thought about what could've been. I consistently made it a point to remind all my students not to hesitate when it came to safety. Safety has no rank and complacency has no place in aviation.

So to us old-hats, remember: Sometimes it takes a fresh new mind to notice something that looks different, smells different or feels different. To the next generation of aviators: Trust your Spidey-senses, break the chain and BE that guy! ⚡



Photo: WO Serge Peters

# Laser Guided Training

By Master Corporal Alain McGraw, 410 Tactical Fighter Operational Training Squadron, 4 Wing Cold Lake

While deployed near Salina Kansas, on the Forward Air Controller (FAC) course, we were being instructed on using a Ground Laser Target Designator (GLTD) to guide a Laser Guided Training Round (LGTR). During the practice, A LGTR went off target and landed approximately 50 feet(ft) from the position where the FAC were.

Obviously, as soon as it happened the course staff were trying to figure out what went wrong. It could have been a bad LGTR or the Pulse Repetition Frequency (PRF) settings could have been wrong, resulting in absolutely no tracking of the laser designator on the ground (they need to be the same in order to work properly).

After further investigation they concluded that the equipment that the FAC course used to Laser the target was too close to the ground and the laser beam refracted off of the vegetation 50ft in front of them. The result was the training round dropping on the area that was inadvertently targeted. This could have been a really bad situation if we would have been dropping live ammunition, example GBU-12.

The preventative measures to ensure this occurrence didn't happen again included ensuring that the GLTD is pointing directly at the target without any obstructions and additional safety briefs before the field portion of the course. ⚡

Refer to Epilogue CF188925 on the Directorate of Flight Safety website for more information regarding this incident.

Photo: Cpl Pierre Habib





## Crew Rest Limits

By Captain Jeffrey McIsaac, 424 Transport and Rescue Squadron, 8 Wing Trenton

Crew rest regulations are there for a reason. We were on day three of our northern patrol on the mighty CP140 *Aurora*. Day one of the trip took us from 14 Wing Greenwood to Iqaluit conducting a fisheries patrol enroute. Day two had us fly a sovereignty patrol of the Davis Strait, Baffin Bay, and Nares Strait to include a recce of Hans Island for Op Nunavut, then back to Iqaluit.

Day one was a 11.5 hour crew day with 8.5 hours of flying. Day two was a 12.5 hour crew day with 10.2 hours of flying.

Day three began early in Iqaluit with the flight deck crew dealing with a less than ideal flight planning facility. The computer was slow and the printer was old. We were tasked for another 11 hour crew day with 8 hours of flying for a fisheries patrol ending in St John's (CYYT) where we would take a well deserved

36 hour crew rest before continuing with two more patrols out of CYYT. We had tasking timings to make so we put together the information we needed and departed.

The mission went well, then we transited to St John's. Prior to descent, the non-flying pilot reviewed the flight planning info for any significant Notice to Airmen (NOTAMS). Upon review, he noted that some of the NOTAMS were almost unreadable due to the poor print

job. Subsequently, he missed the NOTAM stating the Direction Measuring equipment (DME) was unserviceable (U/S) on the field. It was dusk with good weather and haze when we commenced descent into CYYT planing a visual approach. CYYT was a spot we visited regularly, but none of us had ever approached from the north west, so with the haze at dusk, we were having difficulty visually acquiring the airport so we remained on vectors. As we didn't know the DME was U/S, we were relying on what appeared to be a good DME readout to adjust our descent profile.

About the time we visually picked up the city of St John's we noticed the DME reading drop, then disappear. We asked the controller for the location of the airport relative to us and he helped us acquire it.

We were a lot closer than anticipated, so we did what we could to adjust our descent. We dropped the gear and extended flaps to maneuver and turned to give time for descent and to reduce speed, but we just didn't have

was already in transit. The gear retraction speed limits is 190 KIAS. We completed a circuit, landed, quarantined the A/C for inspection and filed a flight safety report. No damage found.

Would a better rested crew have avoided the overspeed? We had flown three days at the crew rest limits and it ended with exceeding an airframe limit. Watch your itineraries, pay attention to your crew rest status, and try to be extra vigilant when working on the limits. ⚡

**Watch your itineraries, pay attention to your crew rest status, and try to be extra vigilant when working on the limits.**

the space. I assessed and called the overshoot, then gear up. No one in the flight deck noticed we were still at 200 KIAS until after the gear





# From the Investigator

TYPE: CH146485 *Griffon*  
LOCATION: Mahone Bay, NS  
DATE: 29 September 2014

Three CH146 *Griffon* helicopters from 427 Special Operations Aviation Squadron were conducting a training mission staged out of 12 Wing Shearwater, NS. The plan was to simulate a night troop insertion aboard the Canadian Coast Guard Ship Sir William Alexander while the ship was anchored in Mahone Bay, NS. All crewmembers were wearing Night Vision Goggles (NVG). The occurrence aircraft was the lead aircraft.

For the insertion, the lead helicopter approached the forward deck of the ship below the upper deck at approximately ninety degrees on the starboard side. As the aircraft entered the hover over this area which was just right of the ship's bridge, the main rotor blades made contact with a tall antenna located on the forward section of the bridge.

The aircraft began to experience considerable vibrations so the crew initiated a departure from the ship and proceeded directly towards a nearby shoreline where they conducted an emergency landing within the confines of a residential back yard.

The aircraft sustained very serious damage to the outer two meters of all four main rotor blades and some damage to both tail rotor blades.

There was no evidence of a mechanical failure so the investigation is focusing on human factors and organizational factors that may have been contributory to this accident. ⚠



# From the Investigator

TYPE: SZ 2-33A  
LOCATION: Picton Airport, Ontario  
DATE: 13 Aug 2014

The incident occurred during the summer Air Cadet Gliding program.

This mission was the Cadet Pilot's (CP's) first flight of the day, and 6th solo flight of the Cadet Glider course. As per the Air Cadet Gliding Program Manual the tow rope was inspected prior to launch by the glider hook-up person as well as the CP. The glider was pulled aloft by a tow plane from runway 28 at 1039 (L). The flight called for a tow to 1500 feet above ground level (AGL), but climbing through approximately 230 feet AGL, the tow rope broke at the glider tow ring.

The CP immediately turned back towards the runway to conduct a downwind landing on runway 10. The glider landed hard, which caused the glider to bounce into the air. Another two bounces occurred before the glider came to rest prior to the end of the runway.

The CP incurred only minor injuries whereas damage to the glider was very serious. ⚠







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