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Flight Comment

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SÉCURITÉ DES VOLS FLIGHT SAFETY

Canada

Views on Flight Safety

By Colonel Dan Chicoyne, Director of Flight Safety, Ottawa

IS THE CF FLIGHT SAFETY PROGRAM FALLING BEHIND?

The CF Flight Safety Program has, in the past, been described as innovative, advanced and even the best in the world. However, a program of this complexity cannot rest on past laurels; it must continuously evolve, advance and improve.

A large part of our Flight Safety Program is based on monitoring hazards, investigating, occurrences and developing preventive measures so that similar incidents and accidents do not reoccur. While a critical part of the program, and one that CF does well, this represents a *reactive* process.

What if our program could become more *proactive*? What if we could more effectively address safety concerns *before* they became incidents or accidents? Other flight safety programs are working very hard, with some success, at developing a safety culture that continually strives to integrate safety behaviour into everything the organization does, with the goal of becoming more *proactive*. Creating this safety culture is one of the achievable goals of the still developing Safety Management System (SMS) within civil aviation.

How can the CF Flight Safety Program become more *proactive*? Although this initiative is supported and encouraged by the Chief of the Air Staff, it will require Air Force-wide buy-in that includes everything from improvements to basic safety training to changes in senior leadership style. It will require more effective and unrestricted communication of safety concerns at all levels. It will require a culture where every member of the CF automatically considers the safety aspect of each role, mission and task, regardless of occupation, trade or classification.

Establishing a more mature, *proactive* Flight Safety Program will have its challenges, however, recognizing the requirement, establishing the goal and receiving the fullest cooperation of all members of the CF is the first step in making this goal a reality. Falling behind is not an option. ◆

Cover photo: Cpl Raulley Parks

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Good Show

For Excellence in Flight Safety

Captain (retired) Bernie Reid

This Good Show award nomination was recently submitted with the intent to formally recognize the professionalism and actions taken at the time of the occurrence.

On 2 October 1981, Captain Bernie Reid was performing a "full card" maintenance test flight on CF104713 out of 4 Wing, Baden Soellingen, Germany. Following the flap check, and as the airspeed was increasing through 300 knots, a clunk was heard and the aircraft rolled violently to the right. The right leading edge flap had fallen out of position and was resting on the wing external stores pylon. An emergency was declared.

Captain Reid was able to climb and conduct an aircraft controllability check at approach speeds and based upon the successful results, he elected to do an approach to land at the Baden airfield. While on final approach and without pilot input, the dislocated leading edge flap raised off the stores pylon creating an aerodynamic moment which caused the aircraft to roll violently. Captain Reid found himself nearly inverted at approach speed over a civilian built-up area short of the runway. He was correcting for the uncommanded roll when the flap fell back onto the stores pylon, causing the aircraft to roll left and well past level flight. Although justified to eject, Captain Reid decided to remain with the aircraft and was able to regain control just in time to affect a safe landing.

Captain Reid's immediate and correct response to an aircraft emergency not covered in aircraft operating procedures, and his skill in controlling the violent rolling of the aircraft at a critical phase of flight, prevented the loss of the aircraft. His decision not to eject over a built-up area quite possibly prevented the loss of his own life and potentially of someone on the ground. His professional airmanship and exceptional flying skills displayed in response to this in-flight emergency are indeed worthy of a "Good Show" award. ◆

Captain (retired) Reid currently resides in Kitchener, Ontario.

Good Show

For Excellence in Flight Safety

Corporal Nathan Newcombe

During deployment to 4 Wing Cold Lake in support of a Close-Combat Attack (CCA) Gun Camp on 27 April 2010, Corporal Nathan Newcombe, while performing a 25 hour/30 day inspection on *Griffon* CH146464, observed that an aft coupling had been installed by error where the transmission connects to the tail rotor drive shaft. He then proceeded to verify the aft coupling connecting the drive shaft to the reduction gear box and noted that a forward coupling was mistakenly installed. Corporal Newcombe immediately informed his supervisors of his findings. Research revealed that the couplings had been installed by a contractor during a 600 hour/24 month inspection. Further investigation determined that the aircraft had flown 115.4 hours since the incorrect installation and had experienced four 25/30 inspections, one 100 hour airframe inspection, one acceptance check and numerous pre-flight inspections without the fault being identified.

Approximately one year later on 14 April 2011 while deployed to Kandahar Airfield with CHF (A), Corporal Newcombe was carrying out another 25/30 on aircraft CH146465 and again discovered an incorrectly installed part. On this occasion, he found the #2 engine internal turbine temperature (ITT) actuator installed in the wrong orientation. A quick review of the CFTO installation procedure highlighted a note that stated the electrical connector shall be installed facing down. In this particular aircraft the ITT actuator had been installed with the electrical connector pointing upwards. ADAM research indicated that this actuator was installed during the last 300 hour/12 month inspection and the aircraft had flown 158.7 hours since that time. In addition, seven 25/30 inspections, one 100 hour Airframe inspection and numerous pre-flight inspections had been carried out on this aircraft before the fault was identified.

Corporal Newcombe's keen eye for details and persistence in ensuring that potentially dangerous situations are rectified continues to play a paramount role in ensuring the prevention of accidental loss of aviation resources.

His exceptional professionalism and tenacity were major contributors in preventing the loss of limited material and personnel resources. These actions clearly demonstrate a high degree of expertise and proficiency that makes him very deserving of this Good Show Award. ◆

Corporal Newcombe is deployed with the Canadian Helicopter Force Afghanistan.

For Professionalism

For commendable performance in flight safety

Captain Mario Charron

On 28 September 2010, a newly arrived Australian crew flying a *Heron* returning to Kandahar airfield experienced an unsafe nose landing gear malfunction. The *Heron* crew, after having exhausted all the options offered by the checklist were required to remain in the air for a few more hours to burn down fuel prior to attempting a nose wheel up landing.

The Canadian *Heron* UAV Detachment provided relief to the Australian crew by sending Captain Charron to their unit. He immediately took it upon himself to provide additional guidance to the Australian crew and continued with further attempts at lowering the nose gear using different techniques the *Heron* checklist did not cover. Despite all efforts, the nose gear did not lower, and the crew was now committed for a nose wheel up landing.

Subsequently, Captain Charron provided valuable airmanship considerations relating to the approach and landing of the *Heron*, his calm, disciplined and professional demeanour in the Ground Control Station was also instrumental in maintaining effective cockpit resource management (CRM) throughout the handling of this emergency. The aircraft was landed successfully and suffered only minor damage to an antenna.

Captain Charron's experience, vast knowledge of the *Heron* system, calm attitude and exemplary CRM helped to greatly reduce the risk and minimize the damage suffered on a valuable aviation asset operated by the Australian Defence Force. ◆

Since receiving this award, Captain Charron has been promoted to Major and posted to Shearwater to the Maritime Helicopter Project, Training Detachment Team Lead.

Private David Wright

While Private Wright was carrying out an On-the-Job Training After Flight Check on aircraft CP140104 under the supervision of a Performance Of Maintenance technician, he discovered two crossed control cables in the left hand wing inboard trailing edge area. His meticulous attention to detail was instrumental in his finding the left hand aileron trim cable and emergency uplock release cable incorrectly routed and chafing against each other, thus inhibiting the smooth action of both systems. He immediately alerted his supervisor, who then informed the senior chain of command and a Flight Safety was raised.

Through a detailed inspection of both the aileron trim and emergency landing gear lowering systems, it was determined that no physical damage was evident; however, if left undetected the tension and chafing of the crossed cables would have become severe enough to cause a complete cable/flight control failure and/or to interfere with the safe lowering of the main landing gear in an emergency situation. It was concluded through a search of the ADAM (automated data for aerospace maintenance) system that the cables had been in this condition for quite some time and the aircraft had flown many times since the last recorded maintenance in this area on these systems.

Thanks to Pte Wright's outstanding attention to detail a potentially catastrophic flight safety incident was averted. For displaying the professionalism and true airmanship traits of a seasoned AVN technician well beyond his experience level, Pte Wright is highly deserving of the For Professionalism award. His exemplary actions serve as an inspiration to his peers and supervisors alike. ◆

Private Wright currently serves with 14 Aircraft Maintenance Squadron, 14 Wing Greenwood.

Corporal Richard Gomez and Private Adam Watson

On 6 August 2010, avionics technicians Cpl Gomez and Pte Watson were tasked to conduct a Special Inspection (SI) on aircraft CC130328 for wire bundle clearance behind the co-pilot's circuit breaker (CB) panel. While the SI did not reveal any problems, on their own initiative they decided to carry out a thorough inspection of all wiring behind the CB panel.

Their outstanding attention to detail during the inspection led to the discovery of an unsecured live wire with only the lug partially visible buried in an unrelated wire bundle. The wire in question, likely disconnected during the Electrical Update Program (EUP) modifications, completed 13 Dec 2008, had gone undetected for an extended time frame even though these panels are frequently opened. Upon further analysis of the aircraft wiring schematics, the technicians realised that the wire was receiving uninterrupted power from the essential DC bus.

The unsecured wire had the potential to cause system failures or the much worse scenario of electrical arcing causing a potentially disastrous in-flight fire. The technicians promptly advised their shift supervisor of the problem and subsequently rectified the snag. Their actions averted the potential of an airborne incident.

For taking the extra initiative to ensure the safety of the aircraft and crew, their extraordinary diligence, professionalism and willingness to look beyond normal maintenance requirements, Cpl Gomez and Pte Watson are deserving of this For Professionalism award. ◆

Corporal Gomez and Private Watson are serving with 413 Squadron, 14 Wing Greenwood.

Flight Sergeant McRabb and Warrant Officer Dix

On 9 December 2010, the crew flying CH147201 was carrying out hover power checks at Kandahar Airfield prior to commencing their mission. FSgt McCrabb and WO Dix from the Australian UAV detachment were walking along the ramp when FSgt McCrabb observed a leak from the *Chinook*'s right engine. Certain that this was an abnormal condition, they walked towards the helicopter in an attempt to gain the flight crew's attention. This attempt was unsuccessful, as the crew did not interpret their gestures as a cause for concern. Following the *Chinook*'s departure, FSgt McCrabb and WO Dix, still convinced that this was an abnormal condition, made their way over to a Task Force Faucon technician and explained what they had seen. This observation was relayed to operations and the aircrew was contacted, informing them of a possible leak from their number 2 engine. The aircraft had landed at a nearby FOB when Ops contacted them. The flight engineer evaluated the situation and confirmed that oil was quickly leaking from the engine. The aircraft was shutdown to prevent damage and a mobile repair party was sent to repair the aircraft.

Had the leak not been reported, the crew would likely have been required to perform a precautionary engine shutdown due to loss of engine oil pressure. The early detection of this leak not only prevented an in-flight emergency in an operational theatre but also prevented the unnecessary exposure to risk for the passengers and the crew, and prevented possible serious damage to an expensive *Chinook* power plant.

FSgt McCrabb and WO Dix's keen observation and attention to detail demonstrate their professionalism and focus towards a strong safety culture and is illustrative of their

dedication to the coalition efforts in Afghanistan. Both individuals are commended for their exemplary actions and are richly deserving of this "For Professionalism" award. ◆

At the time of the incident, Flight Sergeant McRabb and Warrant Officer Dix were serving with the RAAF *Heron* UAV Detachment, Afghanistan.

For Professionalism

For commendable performance in flight safety

Master Corporal Mike Minler

At the time of the occurrence, MCpl Minler was a 19 Air Maintenance Squadron (19AMS) Aviation Technician employed in the Aircraft Life Support Equipment (ALSE) section. On 18 November 2009, while conducting an inspection of a Life Preserver Universal Carrier (LPUC) used on the CP140, Cpl Minler noticed the anchor strap assembly's adhesive was not securing the bladder to the LPUC properly. Not content to simply repair the faulty vest, MCpl Minler elected to investigate the fault further as he suspected that there may have been a widespread problem with the adhesive. His suspicions proved well founded as he discovered several LPUCs and Life Preserver Survival Vests (LPSV) that were showing signs of the same problem.

Bringing his observations to supervisors, he convinced them that given the critical importance of this life saving equipment, an immediate local survey of all 19 Wing LPSVs and LPUCs was warranted. The survey led to the discovery that the adhesive on approximately 20 percent of all 19 Wing LPSVs and LPUCs was breaking down and compromising the effectiveness and safety of the equipment. The results suggested that this problem was probably common to an equally large proportion of LPSVs and LPUCs throughout the CF. Consequently 19AMS issued a Flight Safety Hazard report which led to a nation-wide Special Inspection. As a result, many pieces of faulty ALSE were discovered and repaired.

MCpl Minler demonstrated exceptional diligence and professionalism in going beyond his immediate task to uncover a potentially hazardous condition which may well have reduced survivability in an aircraft accident. ◆

Master Corporal Minler is currently serving with 12 Air Maintenance Squadron, 12 Wing Shearwater.

Corporal Craig Loney

On 26 May 2009 Corporal (Cpl) Craig Loney was employed at 443 Maritime Helicopter Squadron and receiving instruction on how to complete a Before Flight ("B" Check) Inspection on the CH124 *Sea King* helicopter. During his training he noticed that a fuel drain line, which ordinarily would be attached to the centrifugal purifier and fuel pump, (a part not included as a formal inspection function of the "B" Check) was disconnected. He took immediate action and informed his supervisor of this abnormality.

A Flight Safety Investigation was initiated to determine the probable cause. That investigation resulted in all of the associated engine fuel and lubrication lines being re-checked for airworthiness. A short time later, CH124441 was returned to the flying program without further incident.

Cpl Loney had only recently graduated from the Canadian Forces School of Aerospace Technology and Engineering (CFSATE) in Borden ON. In fact, this valued observation arose when he had accumulated only three weeks of practical experience as an Aviation Systems Technician.

Cpl Loney's keen eye, initiative and action, clearly demonstrates how all levels of experience can contribute to what remains a team effort and how such an observation serves as an ounce of prevention in our quest of preventing injury, loss of life and the accidental loss of aviation resources.

The presentation of this For Professionalism award from the Directorate of Flight Safety acknowledges Cpl Loney's outstanding work ethic and forthrightness in addressing an error which could have potentially resulted in a serious aircraft incident or accident. ◆

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

Master Corporal Bruno Caouette

On 6 May 2010 while participating in a hoist training operation from *Sea King* CH124443, MCpl Caouette, an AESOP at 443 Sqn Pat Bay and a diver who was also secured to the line in the water, noticed the cable was becoming taut at an angle that would result in them being dragged approximately 20 feet. They prepared themselves accordingly and were later recovered safely into the helicopter. It was later learned that the situation arose as a result of a hoist system malfunction, which was overcome by the operator's use of the "hoist override valve".

Being familiar with the frequency of these occurrences MCpl Caouette closely examined the suspect hoist and observed that the leather moisture wick appeared to cause the hoist's shroud to bulge in a manner that would result in its internal limit switch prematurely disabling the hoist's electrical raise function.

He informed the technical authority and as an additional precautionary measure, decided to examine other CH124s for comparison and discovered that the moisture wicks were installed on the exterior of the hoist fairing, vice the inside. Servicing personnel confirmed the error and corrective action, including initiation of a fleet-wide survey, 12 Wing Flight Safety Bulletin and the dissemination of clear and proper instructions for build-up procedures when installing the leather moisture wiper.

MCpl Caouette's outstanding dedication resulted in a latent hoist configuration inconsistency being corrected. His actions ensured that the level of risk associated with routine hoist evolutions remain within acceptable norms of safety and for doing so deserves to be acknowledged with this "For Professionalism" award. ◆

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

The Editor's Corner

Where's *On Target*?

As you have probably noticed, this is not the eagerly anticipated issue of *On Target*! Because of the June timing of the Air-to-Air Safety Conference (ATASC) and the possibly contributory aspects of this international meeting, a command decision was made to move up this issue of *Flight Comment*. You can expect *On Target – Technology* to be published in late September and be packed with articles ranging from multilateration to the effects of technology in the flight deck.

ICP Flight

This issue contains our first ICP Flight article in some time and I would like to extend my thanks to Captain Scott Anningson for coming through with the content on non-precision approaches. You can look forward to an ICP Flight article in every second issue and on that note, if there is a related topic you would like to see them cover, let me or Scott know.

Acknowledgements

Once again, Mr Derek Scharf has come through for us with an excellent poster. Thanks for your contribution once again. Also, look for our first in-house produced video in recent memory on the DFS web site. Our own Corporal Raulley Parks will have it up and running as this magazine hits the street and he has several other plans to add to it.

Comments?

As always, I am looking for comments, criticisms, topics, submissions and your best photos towards improving this publication. I may even be able to send you something for your trouble!

Captain John W. Dixon
Editor, *Flight Comment*

The Editor's Corner

To the Editor

Just a couple of small comments from the last issue. The poster IMSAFE has been provided by DFS over the past few years based on the FAA programs. Just for reference we have had a specific HPMA format AMISAFE which would provide a level of consistency between FS and HPMA, since we work hand-in-hand.

Secondly, the editorial comments depict ICP as a School vice a Flight. Since we changed from Central Flying School to the Advance Performance Centre last year we are composed of the ICP Flight and HPMA Flight.

Again, many thanks.

Dennis Scharf
Major
Flight Commander
Human Performance in Military Aviation (HPMA) Flight
Air Force Standards Advanced Performance Centre

Response

Major Scharf

Thank you for passing along your comments; your keen eye for detail is appreciated and certainly contributes towards a better publication. See the AMISAFE you provided on *The Back Page* of this issue.

You are also correct about the name of the ICP *Flight* versus *School*. Perhaps the title at www.icpschool.ca/index.html threw me off!

Editor

Welcome Back

Mr (Major retired) Jim Armour

Jim joined the Canadian Forces in 1977 as a pilot and completed flying tours on the *Sea King, Tutor, Silver Star* and *Aurora* aircraft. His first direct role with Flight Safety was as a backup Unit Flight Safety Officer in Moose Jaw. He subsequently completed four tours with the Directorate of Flight Safety (DFS) as an accident investigator, which included responsibilities in nearly every aircraft cell in the directorate. He became the first Senior Investigator with DFS in 1999 and was involved in more than 50 field investigations.

Jim was also the author of the first version of CF HFACS and is the CF/DND expert for the *Aeronautics Act* amendment introduced in Parliament. He was also instrumental with several initiatives to the Airworthiness Program and recently completed the first Airworthiness Investigation Manual for the CF.

In 2006, Jim was presented with the Order of Military Merit by Canada's Governor General for his work related to safety. He also received two Commanders Commendations for duties rendered in his military career and has been an instructor with an internationally accredited investigation institute since 2009. He re-joined DFS in May 2011 and is once again the Senior Investigator (for the third time) but this time as a civilian. Welcome back! ◆

From the Flight Surgeon

Melatonin Influence on Jetlag and Shiftlag

By Major Helen Wright, Aviation Medicine and Human Factors, Directorate of Flight Safety, Ottawa

Jetlag occurs after transmeridian travel when the day/night (light) cues are not in synchronization with the body's internal clock. Jetlag produces a combination of daytime sleepiness and night-time insomnia. Other jetlag symptoms include cognitive impairment, reduced alertness, loss of concentration, reduced physical performance, mood disturbance and gastrointestinal disorders[1,2,3]. Studies suggest that there may also be long-term health consequences of jet lag[2,3]. The symptoms of jet lag dissipate as one's circadian clock gradually phase shifts to the new time zone. On average the body takes approximately one day to recover for each time zone crossed after eastward travel. Recovery is slightly faster following westward travel[2].

Shiftlag is a result of rapid transition in timing of work schedules within the same time zone (for instance, changing from 0700-1530 hrs to a 1500-2330 hrs shift). Shiftlag can cause problems and symptoms similar to those caused by jetlag.

Fatigue and poor cognitive performance are clearly undesirable for air and ground crew. The most effective treatment for jet lag is shifting the circadian clock to the new time zone as fast as possible (unless one's stay in the new time zone is only 1-3 days in which case it appears to be better not to shift). Manipulation of circadian rhythms (forward/phase advance to counter jetlag from eastward travel or backward/phase delay to counter jetlag from westward travel) can significantly reduce the circadian desynchrony inherent in jetlag or shiftlag.

Manipulation of one's intrinsic circadian rhythm can be done in several ways: exposure to sunlight and/or artificial light at the right times, avoidance of light at certain key times, taking a pill form of melatonin and changing sleep/wake times[4]. Light exposure is helpful in the morning for eastward travel, and in the evening before sleep for adapting to westward travel[2].

Melatonin is a hormone produced in the body that is high when it is dark and is suppressed by bright light. It helps to regulate circadian rhythms. Artificially increasing melatonin levels using a pill form induces sleepiness and brings on sleep. Melatonin is not a sleeping pill, but melatonin does effectively shift the circadian clock and can be a useful tool for reducing jet lag[1,2].

Studies indicate the phase advance for eastward travel can be assisted using a 0.5 mg regular release melatonin 4.5 hours before sleep[2,3]. Melatonin works best when used to

Time Zone	Day	Time (24 hrs). Top scale GMT-5. Bottom scale GMT+1																								
GMT -5		12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	8	9	10	11	12
GMT -5	normal day																									
GMT -5	travel day -4							M																		
GMT -5	travel day -3						M																			
GMT -5	travel day -2					M																				
GMT -5	travel day -1				M																					
GMT -5	travel day				M								Travel													
GMT +1	destination day		M																							
GMT +1		19	20	21	22	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Figure 1. Example of advancing phase by one hour a day in advance of a trip from Trenton to Germany. On the normal day the individual sleeps from 2300 to 0700 hrs (green bar). This person begins the phase shift four days before traveling. Each night melatonin 0.5 mg is taken 4.5 hours before the target sleep time (M=melatonin 0.5 mg). The target sleep time is progressively one hour earlier each night (dark blue bars). On the travel day the individual takes 0.5 mg melatonin several hours before the flight and tries to sleep on board. The disrupted night of sleep due to travel is unavoidable, but this person takes melatonin and will sleep at an appropriate time in the destination time zone (gold bar). A similar progression can be performed at the destination if there is no opportunity before the trip.

shift circadian cycle progressively, for instance, by one hour a day. Pre-flight adaptation is optimal[3]. Figure 1 is an example of a circadian shift schedule using melatonin that might be used if travelling on TD to a meeting. The more days of phase shifting before travel, the less jet lag after arrival, and the faster the remaining jet lag will dissipate[1]. It is key that even just one or two days of pre-trip or pre-schedule change adaptation will help reduce the subsequent jet lag. Ground crew might use the two weekend days before starting a new shift time to prepare. While pre-trip or pre-schedule change shift is optimal it requires a significant effort since one becomes out of synchronization socially with family, friends and typical mealtimes.

Planning for phase shift is more complicated for aircrew who are working on the flight overseas. Often the phase shift for aircrew is done at the destination. Aircrew should consult a flight surgeon before using melatonin.

Recent work at Defence Research and Development Toronto (DRDC(T)) has determined the correct treatment times with light and melatonin for circadian phase advance and phase delay in the operational context[4]. Melatonin is only one component of an overall fatigue management program. Other elements include:

a. Scheduling using tools such as FAST™ (Fatigue Avoidance Scheduling Tool) for fatigue management;

b. Circadian synchronization by deliberately shifting bedtimes, timed exposure to light and melatonin; and,

c. Medications to induce sleep and stimulants to wake up may also be used.

This information was used to develop pecific treatment-grid protocols to optimize circadian adjustment for individuals or aircrews travelling east or west. An effort is now underway to translate the science into realistic, operationally relevant guides to assist CF operations. 1 Canadian Air Division A3 is working with DRDC(T) scientists to produce a CF guide to fatigue and fatigue countermeasures. ◆

A. In Canada, regulatory control of melatonin falls under the Natural Health Products Directorate of Health Canada. Therefore, melatonin preparations in Canada are of pharmaceutical grade and are pure, stable, and the actual dose is consistent with the stated dose[4]. (This is not true in the USA where melatonin is not regulated and as a result melatonin preparations in the USA can vary widely in purity and actual dose can be very different from the stated dose.) Melatonin is approved by Health Canada and is available over-the-counter, but it is not yet on the CF drug list or available at CF pharmacies.

B. Note: it appears the timing of melatonin is more important than the dose. Melatonin is often sold in a 3 mg tablet that will cause more sleepiness than a 0.5 mg dose. If one uses a 3 mg dose for eastward shift phase it should taken 7.5 hours before sleep rather than the 4.5 hours for the 0.5 mg tablet[1].

Endnotes

1 Eastman CI, Burgess HJ (2009). How to Travel the World Without Jetlag. Sleep Medicine Clinics 4(2): 241-255.

2 Sack RL (2010). Jet Lag. The New England Journal of Medicine 362: 440-447.

3 Arendt J (2009). Managing jet lag: Some of the problems and possible new solutions. Sleep Med Rev;13(4):249-56.

4 Paul MA, Gray GW, Lieberman HR, Love RJ, Miller JC, Arendt J (2010). Management of Circadian Desynchrony (Jetlag and Shiftlag) in CF Air Operations. DRDC Toronto TR 2010-002; Defence R&D Canada – Toronto; December 2010.

Photo: Cpl Marc-Andre Gaudreault

All the World's a Stage

(As Is the CF18 *Hornet*)

By Sergeant Edward Taylor, Directorate of Flight Safety, Ottawa

Sergeant Taylor's previous tours include Aerospace Engineering Test Establishment (AETE) Cold Lake and the Aerospace and Telecommunications Engineering Support Squadron (ATESS) in Trenton. His current position is DFS 2-5-2-2 responsible for Armament and Maintenance for the Directorate of Flight Safety.

The author would like to thank Warrant Officer Kevin Wezenbeek, technical authority for the M61A1 Vulcan Cannon, for his contributions to this article.

Sound familiar?

The CF18 *Hornet* plays many parts as well. It is a highly advanced technological fighting machine with a broad mission spectrum: air superiority, fighter escort, reconnaissance, aerial refuelling, close air support, air defence suppression and day/night precision strike capabilities. The CF18 platform is comprised of many parts and materials that could be referred to as S.T.A.G.E (Steel, Titanium, Aluminum, Graphite and Epoxy). The Canadian Forces began receiving the CF18 in 1982 supporting various missions such as: NORAD air sovereignty patrols, combat roles during the Gulf War in 1991, the Kosovo War in the late 1990s and as part of the Canadian contribution to the international Libyan no-fly zone in 2011.

Since inception the Air Force has lost 18 of these fine fighting machines and while there have been many years of exceptional service, there have also been a number of preventable occurrences that have directly impacted its combat capability. Take the M61A1 Vulcan Canon for example. Extremely dangerous, it is a key component of this highly advanced technical fighting machine that plays a major role in combat. The

"All the world's a stage, and all the men and women merely players; they have their exits and their entrances, and one man in his time plays many parts" – *Shakespeare*

A/A49-A1 Ammunition Handling System

cannon is part of the A/A49-A1 Ammunition Handling System. The entire system is commonly referred to as, THE GUN.

Like the human, it is constructed from thousands of minute integral parts, each part having a specific purpose to play like a precision clock. The speed in which these parts move inside the gun and the tolerances that must be maintained are amazing in that it is capable of firing 100 rounds per second. The shear weight of 578 20mm rounds contained in the gun system could knock any one part of the gun system out of alignment instantaneously.

Throughout the CF18's lifetime there have been numerous flight safety incidents reported involving this highly sophisticated piece of weaponry. Closely looking at these occurrences revealed a trend: the infamous Gun Jam.

Gun jam occurrence reporting is extremely important for all personnel who work in and around this aircraft, as well as for all levels of management. Consequently, your flight safety reporting on occurrences related to the M61A1 gun led to the conduct of Flight Safety investigations. From those, it was found that the causes for a gun jam vary but they can essentially be grouped in three categories: 20mm round case neck separation, wear and tear of components, and too much tension or slack in conveyor elements.

A study is currently on-going for the case neck separation of the 20mm rounds. As maintainers, we do not have real control over the rounds breaking, however, identifying batch and lot numbers through the Flight Safety reporting and advising the technical authority of the problem enables him to review manufacturing and material issues with the manufacturer in an effort to correct the problem.

The second cause for gun jams, internal failure of parts and/or component wear and tear of the M61A1 gun is a resultant of the aircraft reaching its "7th and final stage of life". Thorough inspection and replacement of these parts and/or components by you, the technician, is crucial towards avoiding this trend.

The last cause for gun jam, tension or slack in the Conveyor Element Assembly, is preventable. Let me tell you about a recent gun jam during the weapons phase of the fighter pilot course. It occurred during a hot strafe pass at the Cold Lake Air Weapons Range. The two initial passes were carried out successfully but, on the third pass, the 20 mm cannon failed to fire. The ground crew carried out the gun jam clearing procedures and initiated a flight safety report (CF215). The gun was determined to be damaged beyond 1st line repair and was routed to a 2nd line repair shop. The inspection revealed that it was not merely a gun jam but rather a gun wreck (a more severe problem involving many damaged parts). The cause was due to a round that came free of the conveyor element (Figure 1) and became wedged at the base of the drum. The gun stoppage created excessive pressure on the return chute causing it to shear; consequently, other parts were damaged.

The several flight safety occurrence reports on gun jams, the studies done in other countries, and the technical information available to the technical authority for the M61A1 gun point to the gun's internal parts being out of alignment i.e., too much tension or too much slack in the Ammunition Conveyor Assembly. Here is the description provided for one such occurrence: "During gun firing, slack in the ammunition conveyor elements caused a round to become loose and eventually jam in the entrance unit sprocket. This in turn created a de-synchronization between a round and the entrance unit sprocket ending in a gun jam. The conveyor elements were adjusted to within tolerance, gun was re-assembled and then tested serviceable".

The Ammunition Conveyor Assembly (ACA) transfers rounds from the storage drum to the gun and then returns spent cases and cleared unfired rounds back to the drum. Proper tension of the ACA ensures that rounds

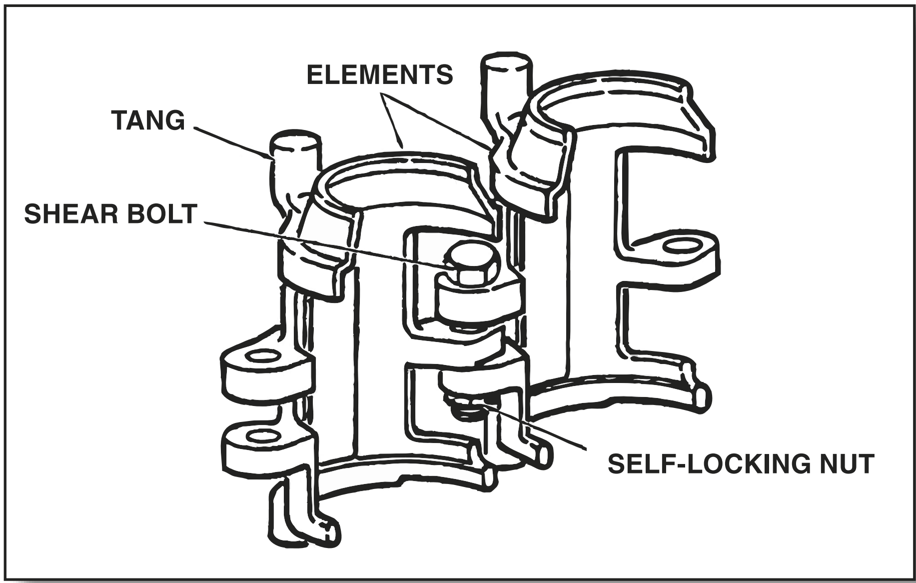


Figure 1. Ammunition Conveyor Assembly

are cleanly handed off to the various handling system components required to accomplish this transfer. Expansion and contraction of various chutes occur to compensate for the mass of the ammunition and gun recoil. **Conveyor element tension must be checked frequently and adjusted often to compensate for this change.**

Preventative measures can be taken to avoid a re-occurring trend in gun jams and wrecks. Tension in the Feed and Return chutes can be verified behind door 3 on the aircraft. First line maintenance actions, IAW C-12-188-750/MS-000, WP01800, Figure 1, are extremely important counter measures that can be performed. Proper conveyor element tension is essential to ensure proper functioning of the gun system. Its importance cannot be overstated. Failure to properly adjust conveyor element tension **will** result in a gun jam and/or gun wreck creating more work, aircraft down time and ultimately mission failure.

All the world's a stage; Feed chutes, Return chutes, Element chutes and all the other integral parts of the CF18 gun system have a specific role to play in the big picture. By ensuring torque values are correct, slack and tension are within tolerance, part specifications are met, parts are clean and well lubricated, will in the long run prevent gun jams/wrecks. Always remember to follow the CFTO's when performing maintenance. ◆

YOUR ATTITUDE > FLIGHT SAFETY > YOUR LIFE

Epilogue

TYPE: **CH146 *Griffon* (146488)**

LOCATION: **Yuma Marine Corps Air Station, Arizona**

DATE: **19 January 2008**

The incident occurred during an attempted troop insertion at an observation post located on top of a hill. As the helicopter arrived over the intended landing site the crew was surprised when the helicopter began a sudden and unanticipated rapid descent, which the pilot was unable to arrest. One second later the helicopter's right skid struck the ground and, due to the position of the left skid over the side of a steep drop off, the helicopter quickly rolled left to 48° of bank causing the Mission Specialist to fall partially out of the aircraft and one un-strapped passenger to fall towards the open left cargo door. The underside of the fuselage contacted the ledge with sufficient force that the Flight Engineer was thrown part way out of the right cargo door. A mast over-torque occurred during the overshoot. The crew carried out a precautionary landing at the base of the hill and the aircraft was shut down. There were no injuries but aircraft damage was assessed as serious.

The investigation determined the helicopter was operating within manufacturer's specifications and was serviceable prior to the occurrence. The investigation concluded that the crew started the approach without properly assessing the power requirements for the approach and landing, and had no awareness of the possible wind effects on approach. The unanticipated sink rate and insufficient application of power to arrest the descent resulted in a hard landing and roll to the left. A last minute change in plans, inadequate mission planning, ineffective intra-crew communication, overconfidence and bland, featureless terrain contributed to the ineffective reconnaissance and sub-optimal approach into an unsuitable landing site. Contributing factors also included a lack of formal mountain flying training and experience, and incomplete application of the CH146 Standard Manoeuvres Manual (SMM) procedures for mountain approaches.

Safety recommendations included a review of 1 Wing training files to ensure that Aircraft Captains (AC) employed in mountainous operations have demonstrated an appropriate proficiency level and to confirm if mountain flying skills should be a mandatory requirement for upgrade to AC status. It is recommended that the SMM provide direction on emplaning and deplaning from the hover as well as a description of the environmental conditions that would support the use of mountain flying techniques. A review of the Mission Acceptance Launch Authorization process to determine its applicability for domestic operations and a revision of the Crash Response Plan production and validation process was also put forward. ◆

Flight Safety and Combat

By Lieutenant-Colonel Larry McCurdy, Directorate of Flight Safety, Ottawa

LCol McCurdy has completed four tours on the *Sea King* and two tours on the *Jet Ranger*. As DFS 2, he is currently the Directorate's of Flight Safety Chief Investigator.

A war zone seems on the surface to be a funny place to preach flight safety. Sending men and women into combat to execute missions that are inherently dangerous appears to be at least a little counter-intuitive, from a flight safety point of view. Nevertheless, we have an opportunity to learn from our experiences to date and perhaps project knowledge into the future, as it is unlikely in the modern context that Kandahar will be the last Canadian Combat Air Wing. Recent experience has highlighted what past experience had already observed; flight safety is probably more important in combat than it is in peacetime.

Although hard facts are difficult to uncover when looking back as far as WWII, it is widely accepted that the ratio of losses due to accidents in a combat zone outstripped losses due to enemy action by a factor of six. As far as aircraft damage and personnel injury are concerned, we are our own worst enemy. In fact, this statistic was largely responsible for the acceptance and implementation of the modern CF Flight Safety program. Remember, flight safety is not about eliminating risk,

Photo: MCpl Robert Bottrill

but rather understanding and reducing risk to an acceptable level. In peacetime, risk is regulated, training missions are less urgent, and the perceived pressure to accomplish the mission is lower. In combat, the go-no-go decision may seriously impact the survivability of our troops in the field, and so the bar is set higher and the urgency of mission accomplishment is ever-present. Flight safety is an excellent tool with which to balance risk, and as a former Commander of KAF recently wrote, flight safety is an "indispensable element of operations in theatre".[1]

So how are we doing and what have we learned? We essentially have two organic groups of aircraft operating full time out of Kandahar Air Field (KAF): Helicopters and Uninhabited Air Vehicles (UAV). When we look at the Military Helicopter Fleets in KAF, the ratio of accidents to combat damage (Serious Damage or Injury) is 6:2. An improvement over anecdotal historical data, but we're still doing a better job than the enemy at taking aircraft and aircrew out of action. The occurrences attributable to enemy action involved *Chinook* helicopters, the worst of which was a shoot down, but fortunately the passengers and crew escaped the fireball virtually unscathed. We were not so lucky with the *Griffon* that, while conducting a routine logistical mission, hit a HESCO barrier on take-off from a Forward Operating Base (FOB). In that accident, two Canadians and an Allied Soldier were lost. Further, in the category of "there but for the grace of God", we came a hair's breadth from losing two *Chinooks,* each fully loaded with soldiers, in a near collision on takeoff.

When we analyze the UAV fleets, every single occurrence is attributable to human or mechanical failure. This number is certainly tainted by the notoriously unreliable *Sperwer,* but despite a much lower occurrence rate with the new *Heron,* the enemy still has not damaged a single UAV in over seven years of operational service. By comparison, we have managed to damage or destroy 38 *Sperwer* and one *Heron* without the enemy lifting a finger.

Photo: Cpl Bruno Turcotte

So on to what we have learned, which appears to be precious little. Listen to what a former Wing Commander said in a *Flight Comment* article published in 2009:

> *"Some within the Wing as well as those outside of it were initially suspicious that the CF's Flight Safety program would not function effectively alongside the operational imperatives of a combat mission. Through increased understanding of the Flight Safety program and the concerted efforts of all those involved, I am confident that these concerns and doubts have been put aside..."*

Sixty-six years after the fact and under the influence of arguably the best flight safety culture in the western world, flight safety had to prove its utility to our own people. Peacetime is easy, but in combat the emotions of the day drive airmen and women to take chances that would not be considered in the training environment. It is certain that risk is necessary, commensurate with operational importance, but every mission does not merit the same risk level. War is not pretty, nor is it without sacrifices. However, our losses, to the maximum extent possible must be limited to the best efforts of our enemies.

Let's review some of the key occurrences as a litmus test for how well we have been assessing risk:

- The *Griffon* that hit the HESCO barrier was about the 1100th takeoff in theatre that required more than maximum continuous power to clear all obstacles. Maximum continuous power is a limit set by the manufacturer, much like the red line on a car's tachometer. The engines may be able to produce slightly more power, but it's not necessarily good for the long term life of the engine and there is certainly no margin for error. The first 1100 takeoffs were successful, but one takeoff was not perfect and three people died. In short, we had 1100 chances to identify the risk and avert this tragic accident. We failed.
- A *Chinook* mission almost killed a flight engineer (FE) who had wedged himself between the airframe and the open ramp, with his upper torso extending outside of the aircraft in an attempt to direct the pilot to touchdown on the side of a hill. The open ramp touched the ground and partially closed, almost cutting the FE in half. It is unclear how long this crew had been using this hybrid procedure, but risk identification through personnel injury is clearly not the most effective flight safety tool.
- The *Chinook* that was shot down managed to crash land in a farmer's field, but even in this case, flight safety could have helped to avert the loss of aviation resources. What caused the crash was small arms fire and the way to counter that threat is to fly high. In this case the planned transit was only a few miles and for the sake of speed and

Photo: Cpl Bruno Turcotte

expediency, the formation chose to stay low and therefore within range of the threat. It is an easy choice to make, particularly when hundreds of flights had escaped any damage while flying similar profiles. It is human nature to underestimate the risk when there are no immediate consequences. Just like the 1100 chances to identify the risk to the *Griffon,* we were blinded to the hazard until the odds caught up to us. For the sake of a few minutes in transit, we gave the enemy a chance for a strategic victory. Even if the probability of being hit by small arms was 1:500, bullets are cheap and *Chinooks* are expensive.

What we do is inherently dangerous and there are those out there who are making a concerted effort to do us serious harm. It is therefore incumbent upon us to use every tool in our inventory to force the enemy to risk their own lives, rather than doing their work for them. Flight safety is just one tool in that inventory. It is not there to stop airmen and women from taking risks; it's just there to remind us all to think with our heads and not our hearts. We can't save anyone if our aircraft are broken or destroyed, and neither can we disrupt the enemy's strategic and operational objectives. Flight safety is an operational imperative designed to preserve a combat capable air force by preventing the unplanned loss of operational capability. Fight smart, work safe; "make the other poor bastard die for his country."[2] ◆

Endnotes

1 http://www.airforce.forces.gc.ca/dfs-dsv/pub/nr-sp/index-eng.asp?id=9979 *Views on Flight Safety,* Colonel Christopher Coates, Commander 1 Wing Article in Flight Comment 2009 issue Jan. 21, 2010

2 George C. Scott on General George S. Patton. Patton: 1970.

CHECK SIX

The following is a reprint from *Flight Comment* Sep/Oct 1974 and focuses on the relationship of combat and flight safety. As Alphonse Karr (1808-1890) wrote, "plus ça change, plus c'est la même chose" or often translated as "the more things change, the more they stay the same".

We Only Delude Ourselves

Even in this age of enlightenment some people involved with aviation still appear reluctant to accept the fact that a dynamic flight safety program is an integral part of the operation. Quite possibly this attitude stems from a lingering conviction that flight safety is for "peace time only" – something to be ignored or played down as soon as a real operational situation develops.

While this may be overstating the case, such negative attitudes do exist and it is time we recognized that in any operation, hot or cold, it is essential to strike a balance between the risks taken and the objectives to be gained. The point at which a realistic and acceptable balance is achieved seldom remains static and certainly a change from a peace time to a combat situation will demand a drastic reconsideration of all factors. Then the need to assess risk versus gain is even more critical. Your accident prevention program must have been well thought out, firmly established, and accepted by all the players "before the fact". You may not have time to develop "after the fact" measures to prevent the accidental loss of irreplaceable resources even though those resources have suddenly become infinitely more valuable.

We are not alone in pressing for a critical examination and re-examination of everything we do in relation to accident potential. The need is recognized by most air operators and is illustrated in these recent words of Air Vice Marshal Lagesen, Deputy Commander of RAF Germany:

"The time has come where we must begin to examine all that we do in the light of the fact that the prevention of accidents is becoming paramount. We must ensure that every task is operationally viable, within our known capabilities, and involves no unnecessary risks". ◆

COL R.D. SCHULTZ
(Director of Flight Safety 1967 – 1977)

COFFEE POT TALK –
The Low Fuel Club

By Major Bill Canham, Directorate of Flight Safety, Ottawa

Major Canham has flown a variety of aircraft including the CT-114 *Tutor,* T-37 *Tweet,* C90 *King Air* and the E3A *Sentry.* As DFS 2-2, he is responsible for the Ejection Seat and Fixed Wing Training Investigation cell.

Photo: MCpl John Nicholson

No pilot intentionally sets out to become a member of the low fuel club but it happens. Anecdotal discussions around the coffee pot indicate most pilots experience this situation at some point in their career. The number of stories around would indicate it happens more often than is recorded in the Directorate of Flight Safety Occurrence Database (FSOMS). In the last five years, FSOMS shows only nine low fuel related occurrences. I believe low fuel occurrences are under reported because (characteristically) pilots don't want to discuss openly such a personal event. The consequences of insufficient fuel are slight to nil if you make it to touchdown but they rapidly rise to catastrophic if you glide your silver bird to a stop short of destination. There is no in-between. Personally, I believe it would be hard not to take away a giant personal lesson from the experience in the category of "I never want to do that again". But how will your fellow aviators avoid the same fate if you don't tell them?

How does one join the low fuel club? Pilots are typically proud, boisterous creatures. We're "big picture" planners and we love to fly our bird. We have faith in the airplane. Most CF pilots also have a "can-do attitude" concerning their mission. They are biased for success. As an example, if I give a pilot enough fuel to fly three hours but tell him he has 1.5 hours transit each way with two minutes on station in between legs to perform the mission, many would say yep, I can do that – hoping to make up two minutes of fuel en route due to so called efficiencies. We are an optimistic lot but as a group we detest cumulonimbus, short runways and if we make it to old age... the dreaded fuel shortage.

Some classic reasons to become low fuel involve the following scenarios. While flying cross-country you arrive overhead your intended destination with a fuel surplus and with what appears to be sufficient fuel to get to the next airport. So, in-flight you change your destination to one further along your route. Have you evaluated *everything* before committing to the change? Another scenario involves being not quite down to "bingo fuel" but with slightly less than enough for a complete flying sequence. After being asked by lead or another crew member, you commit to the additional sequence. The added event goes a little long or you become absorbed in the action and you unintentionally overfly your bingo, facing a fuel shortage for the rest of your mission. Another scenario concerns the unpredicted weather or ATC related delay. This can take the form of rerouting around nasty weather, weather related traffic delays at a busy destination or a missed approach at a busy airport where you have to join a long traffic sequence before being aligned on final again. Why do these scenarios spell trouble and a ticket to the low fuel club? In essence you can sum them up to insufficient contingency planning, mission creep and/or inexperience. If you're on your first or second tour with less than 1000 hours, this means you.

After an airborne pilot joins the low fuel club, they are reticent to do anything about it. Many will hope the situation does not deteriorate and stabilizes until they get back on deck. Hope is such a wonderful, positive feeling. Telling ATC you are *Minimum Fuel* or *Emergency for Low Fuel* is like publically saying I am a pilot and I can't plan. This is a tremendous blow to the pilot ego and for some it would be easier to say I have haemorrhoids or I am an alcoholic. Need proof? *Google*: NTSB Avianca B707 Cove Neck NY Crash, 25 January 1990 or see the CF188, 7 July 2008 occurrence. Pilots don't like to say these words or they say them too late for ATC to provide assistance.

Photo: Cpl Pierre Habib

For the record, the words are *MINIMUM FUEL* not "min fuel" or some other flying fraternity contraction. The FAA AIM article 5-5-15; the TC AIM, RAC article 1.8.2 and the GPH 204 article 407 pretty much say the same thing... *MINIMUM FUEL* is an advisory indicating that should the aircraft encounter any undue delay, an emergency situation is possible. Remember, to be helpful, you need to say the words well in advance of being on final. The FAA article also says on initial contact with other ATC agencies the term *MINIMUM FUEL* should be repeated after stating your call sign. I like that.

On my last airframe, we carried fuel per the charts, fuel by regulation and fuel for my wife. I mean, I always kept a few minutes of fuel reserved for the unexpected and I always flew the jet conservatively to create fuel burn efficiencies where possible. This helped to pad my reserve.

For your pilot friends, you should keep in mind that the CF Flight Safety Program is built upon a "just culture" where one is able to report occurrences without the threat of punitive actions for occurrences not involving gross negligence. This is a blatant reminder that we want you to report so everyone can learn from your mistakes because you won't live long enough to make them all yourself. ◆

Photo: Cpl Jackson Yee

Transition Level GOTCHAS

By Major Kevin Roberts, Directorate of Flight Safety, Ottawa

Major Roberts is a former Wing Instrument Check Pilot whose flying experience ranges from being a Qualified Flying Instructor in Moose Jaw to flying Airborne Warning and Control System aircraft in Geilenkirchen. He is currently the Senior Investigator at the Directorate of Flight Safety.

Approaching its destination in the Maritimes, a civilian regional jet was given a descent clearance from Flight Level 310 to 17,000 ft. Meanwhile, another civilian turboprop was in the vicinity and cruising at 16,000 enroute to a different destination. Both aircraft were issued the local altimeter setting of 29.06 inHg. As the regional jet descended through 18,000 ft, the flight crew switched the altimeter setting from the standard setting of 29.92 inHg to the local altimeter setting of 29.06 inHg, causing the nearly instantaneous "apparent" loss of about 850 ft (because every .01 inHg pressure change equates to an approximate 10 ft altitude change), placing the aircraft at an altitude of approximately 17,150 ft. Suddenly finding itself at this altitude, the autopilot was unable to level the aircraft at 17,000 ft as cleared and the aircraft descended below its cleared altitude. The turbo-prop crew received a Collision Avoidance System (TCAS) warning and carried out a descent to 15,000 ft. Separation between the two aircraft was 2.5 nautical miles horizontally and 500 ft vertically.

Before we discuss what happened here, there are some definitions that need to be understood, or at least reviewed.

Flight Level: the altitude expressed in hundreds of feet indicated on an altimeter set to 29.92 inHg or 1013.2 mb.

Transition Altitude: the altitude at or below which the vertical position of an aircraft is controlled by reference to altitudes (i.e. based on the local altimeter setting – QNH) vice flight levels.

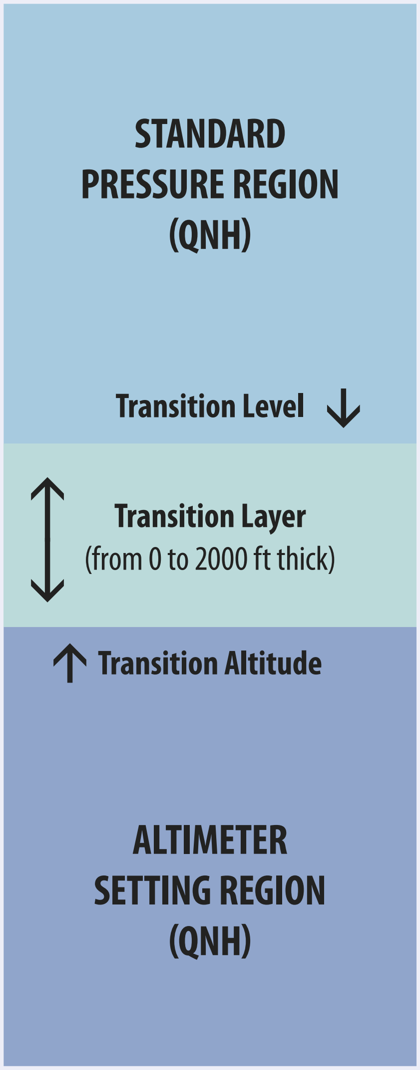
Transition Level: the lowest flight level available for use above the transition altitude.

Transition Layer: the airspace between the transition altitude and the transition level.

Altimeter Setting (QNH): is the setting applied to an altimeter so that it will indicate altitude above sea level.

Altimeter Setting Region: low level airspace of defined dimensions, as designated and defined in the *Designated Airspace Handbook*. In southern domestic airspace in Canada, that is the airspace below 18,000 ft.

Standard Pressure Region: all airspace over Canada at and above 18,000 ft ASL and all low level airspace over Canada, below 18,000 ft above sea level, lying outside the lateral limits of the Altimeter Setting Region.



Here in Canada, the Transition Altitude is fixed at 18,000 ft. Under conditions of QNH at or above 1013 mb, FL180 becomes the lowest useable Flight Level (i.e. by definition, the Transition Level). If the altimeter setting is lower than 29.92 inHg, the lowest useable Flight Level or Transition Level becomes FL190 or even FL200. This restriction ensures that a minimum of 1000 ft vertical separation is maintained between the aircraft flying at 17,000 ft, with its altimeter set to local QNH, and the aircraft flying at the lowest useable level on Standard Pressure Setting (QNE). The GPH 204 contains the following chart, depicting the lowest available Flight Level (but does not refer to them as Transition Levels):

29.92 or higher	**180**
29.91 to 28.92	**190**
28.91 to 27.92	**200**

I suspect that most military pilots in Canada, if asked what the Transition Level was in Canada, would quickly state FL180 – and only FL180. While this may be correct some of the time, it is not always FL180, as seen the table above; it will vary with the local altimeter setting.

The GPH 204 (which mirrors the civilian procedures) direction regarding altimeter barometric setting procedures is as follows:

1. All changes shall be made in the standard pressure region (i.e. above 18,000 ft).
2. The change is to take place just after entering or just prior to leaving the Standard Pressure Region. In practice, this will see the pilots changing to QNE (depending upon the altimeter subscale) as they climb through 18,000 ft.
3. When descending into the altimeter setting region the pilot shall set their altimeters to the appropriate station altimeter setting **prior to descending into the altimeter setting region.**

Can you see the problem with this wording or procedure? The pilots in the occurrence above followed this procedure and it caused them some grief, with potential for a much greater disaster. If the QNH is lower than 29.92 inHg and the pilots wait until approaching FL180 to change the altimeter subscale, an altitude bust is possible.

In contrast, the ICAO procedures state that on descent from the standard pressure region to the altimeter setting region the altimeters will remain on standard pressure **until just prior to the transition level.** Keep in mind that the Transition Level "floats", based on the QNH – the lower the QNH, the higher the Transition Level. If the altimeter setting is changed prior to the Transition Level, vice just prior to entering the altimeter setting region, the problem faced by the regional jet crew is averted. In fact, changing prior to the Transition Level is how it's done in most of the world, as our crews more versed in international flying would know (or should know). Maybe our procedures need to change to have the altimeter changed prior to the Transition Level, vice altimeter setting region.

In the meantime, be aware of the Transition Level of the day/area on your next descent, and if cleared for a level-off at 17,000 ft, watch out for this gotcha. ◆

CFIT: Do We Always Need to Be at Minimum IFR Altitudes?

By Captain Scott Annningson, Instrument Check Pilot Flight, 1 Canadian Air Division, Winnipeg, Manitoba

Captain Anningson is an instructor and Instrument Procedure Designer in the ICP Flight at the Air Force Standards Advanced Performance Centre in Winnipeg.

Background

13 years ago, the late Jim Gregory wrote in the Transport Canada ***Airspace Newsletter*** an article entitled, **"CFIT: Why Are Aircraft Flying at Minimum IFR Altitudes?"** It was reprinted this year. Though technology and policy have matured, it is still a valid question, and a valid article. Mr Gregory, a former fighter pilot and ICP, wrote his article on the heals of the then latest study by the Flight Safety Foundation showing that unstabilized non-precision approaches were the leading cause of Controlled Flight into Terrain (CFIT). Since then, training and technology has been eliminating the need for these types of approaches. We can consider this article an update to Mr. Gregory's forward thinking.

We will be making reference to these two Advisory Circulars (ACs):

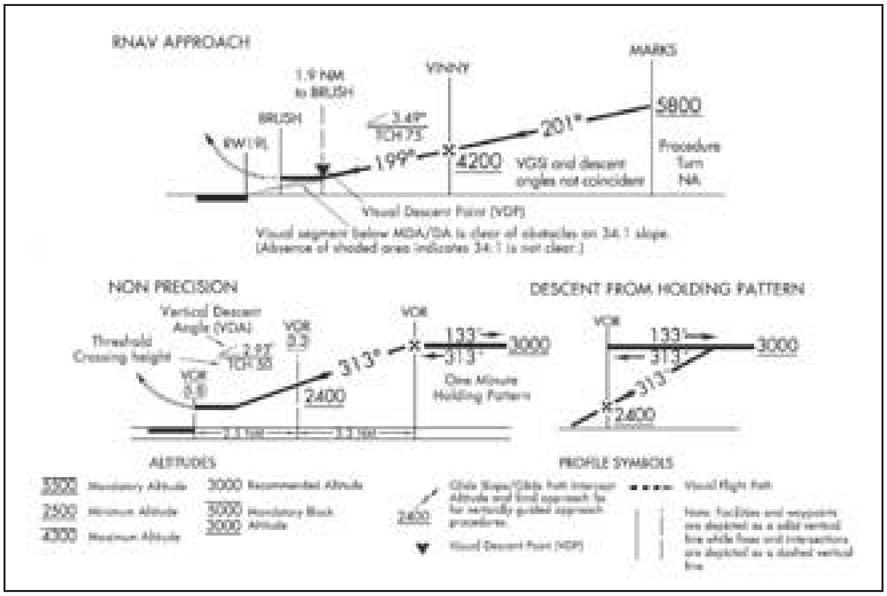
- **FAA AC 120-108 Continuous Descent Final Approach (CDFA)**
- **TC AC 0238** ***(8 Sep 2006)*** **Stabilized Constant Descent Angle Non-Precision Approach**

CFIT is still the leading cause of aviation accidents and, therefore, still a threat to be cognizant of. One could just say "Thou *shall watch thine altitude lest the earth arise and smite thee.*" So simple, yet so hard. Think of some of the crowded and confusing approach depictions that you've seen and flown; or perhaps some of your valiant struggles to arrive at and maintain minimum descent altitude (MDA) for 4 miles on a particularly challenging day; or how much instrument flying have you really been logging this year? Unstabilized approaches have been identified by governments, regulators and industry as the primary cause of CFIT. Unstabilized approaches are mainly found on Non-Precision Approaches (NPAs). Traditional NPAs have step-down fixes in the final approach and/or intermediate segments. For aircraft without a Flight Management System (FMS) or GPS avionics that provide vertical guidance, these approaches are typically flown as "dive and drive." Stepping down along an approach to the lowest published altitude in each segment requires multiple thrust, pitch, trim and attitude adjustments, especially inside the final approach fix (FAF). The goal has been to get down to MDA as soon as possible and motor in at extended level flight as low as 250 ft above the ground in instrument meteorological conditions (IMC) towards the missed approach point, hoping to become visual to land. Add fatigue, distractions, revised clearances, radio calls and traffic de-conflictions at uncontrolled aerodromes, an aircraft emergency, an "automation surprise" or being rushed or misreading a confusing approach plate, and more difficulties could arise. The demands of flying the approach and processing other required tasks, increases pilot workload and the potential for error. Errors in this critical phase of flight at low level can be catostrophic. It's not that a stepped down approach is totally unsafe, but more that a stabilized approach has been proven to be safer.

Stabilized Approaches

The International Civil Aviation Organization (ICAO) and government regulators encourage all operators and all aircraft to fly stable, constant descent angle approaches to help eliminate CFIT and runway "excursions." We have ILS approaches, GPS Overlay approaches and a growing number of RNAV/VNAV and LPV approaches, all with constant angle vertical guidance. The FAA and the Department of Defense (DoD) in the US publish flight path angles on their non-precision approaches now (Figure 1). A stabilized approach is the key to a safe approach and key to a safe landing – IFR or VFR. Isn't that what our instructors always harped on us? Get on the glide path! *Get on the 3-degree! Site picture! What's your aim point! You're too high. You're too low.* Even on nice sunny VFR circuits we stress the importance of maintaining a 3-degree final flight path, yet we still fly the step-down NDB on-the-field approach we have never previously flown in Wausau Wisconsin, in 1 mile visibility at night with no horizon or opposite end of runway in sight.

Just like when we were learning to land an airplane or helicopter, the stabilized approach concept is characterized by maintaining a stable approach speed, a stable descent rate, a stable vertical flight path, and maintaining aircraft configuration to the landing touchdown point. Ideally, the aircraft crosses the FAF configured for landing and at a power setting that will maintain the nominal 3.0° approach path right down to threshold crossing. As well, tolerances in airspeed, descent rate and displacement are prescribed for various aircraft types and operations. That's what our landing distance calculations are based on. If you motor in an extra half-mile from Visual Descent Point (VDP) in Wausau, that could eat up 3000 ft of a 5200 ft runway on a nominal 3-degree flight path to landing. If you dive steeply for the threshold instead, your landing calculations are out the window and you are technically unstabilized. Either way, a hard landing or going off the end of the runway could be a bit awkward explaining to the boss.



PDF from FAA

Figure 1 – Legend From NACO plates

Approach Designs and Vertical Path

Non-precision approaches were not originally designed like ILS or PAR approaches having a fixed angle glide path. Most of the NPA design criteria are dated, intended for slow, straight-wing prop-jobs like DC-3s and the like. Usually, a final descent gradient of no more than 400 ft/NM for fixed wing is factored in for straight-ins. However, NPAs are now being designed more like precision approaches. You will have noted the increasing availability of localizer performance with vertical guidance (LPV)/wide area augmentation system (WAAS) and RNAV/VNAV approaches. These are non-precision approach procedures designed with vertical guidance (APV). Many RNAV systems also have encoded vertical guidance in their data bases for LNAV approaches and for GPS Overlay on traditional VOR and NDB approaches. Global Positioning Landing System (GLS) approaches based on Local Area Augmentation Systems (LAAS) are coming out now. The military version is JPALS – Joint Precision Approach and Landing System. RNAV with vertical guidance in all phases of flight is becoming standard on new kit and being retrofitted to old aircraft. The message is becoming clearer – manufacturers, lawyers, insurance brokers and regulators are saying that flying NPAs with a continuous descent profile will provide a safety advantage over flying them using the "dive and drive" method. There is also an operational advantage. Rather than levelling off with the nose raised at slow speed, the aircraft constantly descends down the glide path with the nose in a lower angle of attack position where there's a better chance to see the runway environment in time for landing. Throw in enhanced vision systems and the chance of "getting in," flying an NPA approach should be even better. That should equate to more mission success, whether your motive is profit, survivability or operational effectiveness.

CDFA Defined

CDFA is a technique for flying the final approach segment of a traditional NPA – like NDB and VOR – as a continuous descent. A CDFA starts from an altitude over the FAF coincidental with a final approach angle (usually 3.0°) and proceeds to a threshold crossing height of about 50 ft, or to a point where the flare would begin for the type of aircraft being flown. There is no levelling-off on final. This technique is described by the FAA as Continuous Descent Final Approach (FAA AC 120-108) and by Transport Canada as a Stabilized Constant Descent Angle Non-Precision Approach – or SCDA (TC CBAAC 0238).

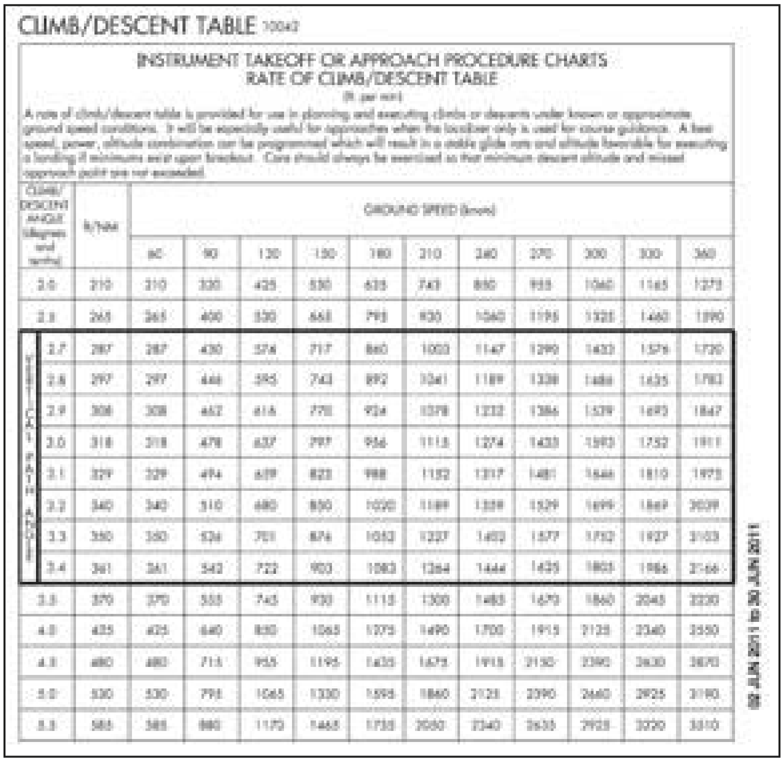
Advantages of CDFA

1. Increased safety. The concepts of stabilized approach criteria and procedural standardization are employed. You can fly an ILS, LNAV/VNAV or NDB approach pretty much the same. So it is right back to flying basics.
2. Improved situational awareness (SA) and reduced workload.
3. Less fuel burned.
4. Less noise.
5. Less chance of hitting something IMC. You are not low and slow for an extended period of time or distance at minimum altitudes.
6. Regulators are allowing operators to treat MDA as a DA or use reduced approach ban visibility limits if they use this technique.

Ways of flying a CDFA

It must first be clear that this method applies to Straight-In approaches and not circling procedures. In the US, this method only applies to non-precision approaches with a published vertical descent angle (VDA) or glide slope (GS) (See Figure 1). In Canada, we don't have that restriction. (But always check

Photo: MCpl Paul Green



CLIMB/DESCENT TABLE 10042

INSTRUMENT TAKEOFF OR APPROACH PROCEDURE CHARTS
RATE OF CLIMB/DESCENT TABLE
(ft. per min)

A rate of climb/descent table is provided for use in planning and executing climbs or descents under known or approximate ground speed conditions. It will be especially useful for approaches when the localizer only is used for course guidance. A best speed, power, altitude combination can be programmed which will result in a stable glide rate and altitude favorable for executing a landing if minimums exist upon breakout. Care should always be exercised so that minimum descent altitude and missed approach point are not exceeded.

CLIMB/DESCENT ANGLE (degrees and tenths)	ft/NM	GROUND SPEED (knots)										
		60	90	120	150	180	210	240	270	300	330	360
2.0	210	210	320	425	530	635	743	850	955	1060	1165	1275
2.5	265	265	400	530	665	795	930	1060	1195	1325	1460	1590
VERTICAL PATH ANGLE 2.7	287	287	430	574	717	860	1003	1147	1290	1433	1576	1720
2.8	297	297	446	595	743	892	1041	1189	1338	1486	1635	1783
2.9	308	308	462	616	770	924	1078	1232	1386	1539	1693	1847
3.0	318	318	478	637	797	956	1115	1274	1433	1593	1752	1911
3.1	329	329	494	659	823	988	1152	1317	1481	1646	1810	1975
3.2	340	340	510	680	850	1020	1189	1359	1529	1699	1869	2039
3.3	350	350	526	701	876	1052	1227	1402	1577	1752	1927	2103
3.4	361	361	542	722	903	1083	1264	1444	1625	1805	1986	2166
3.5	370	370	555	745	930	1115	1300	1485	1670	1860	2045	2230
4.0	425	425	640	850	1065	1275	1490	1700	1915	2125	2340	2550
4.5	480	480	715	955	1195	1435	1675	1915	2150	2390	2630	2870
5.0	530	530	795	1065	1330	1595	1860	2125	2390	2660	2925	3190
5.5	585	585	880	1170	1465	1755	2050	2340	2635	2925	3220	3510

02 JUN 2011 to 30 JUN 2011

Figure 2

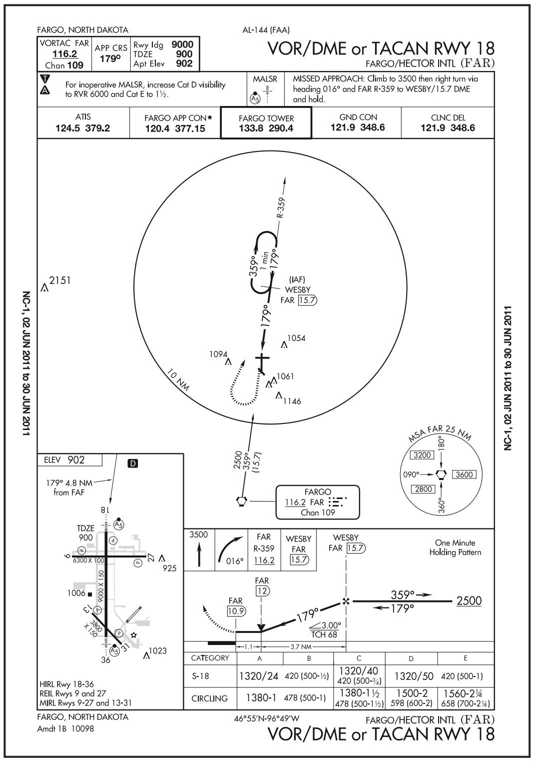


Figure 3 – Rate of Descent Table

for updates). The second thing that must be made clear is that the advisory circulars stipulate that your procedures need to be validated and approved by higher authority and that there should be training and SOPs in place to support them. There will be reading, education and practise involved. It is strongly advised to become familiar with these ACs if embarking on CDFAs.

The best way of flying CDFAs is having and using the avionics and automation to provide the lateral and vertical guidance. Both the FAA and TC advisory circulars allude to that. This should be a priority in fleet upgrades and aircraft acquisition.

However, if you're still waiting for the kit, there is an allowance for basic flying techniques in these ACs to determine vertical path.

The Published VDA or GS Method:

1. Refer to Figure 2, KFAR Fargo VOR/DME or TACAN RWY 18 and Figure 3, Rate of Descent Table. The Table can be found on the inside back cover of DoD/FAA approach plates. The GPH 200 has a similar table.
2. Find the published VDA. In this case, it is 3.0° for a threshold crossing height of 68 ft.
3. Find the descent gradient that equates to a VDA of 3.0°. It is 318 ft/nm.
4. Find a rate of descent based on groundspeed. So a nominal 150 KIAS approach speed with a nominal 10 knot headwind would be a groundspeed of 140. With some interpolation we have about 750 fpm down.

So, if you cross the FAF at 2500 ASL and go down at 700-750 fpm at 140 kts groundspeed, you should end up at VDP and then cross the threshold at 68 ft or so, all without levelling off or re-trimming or large power changes. You should be about 300 ft lower every 1 nautical mile.

The Do it Yourself Method:

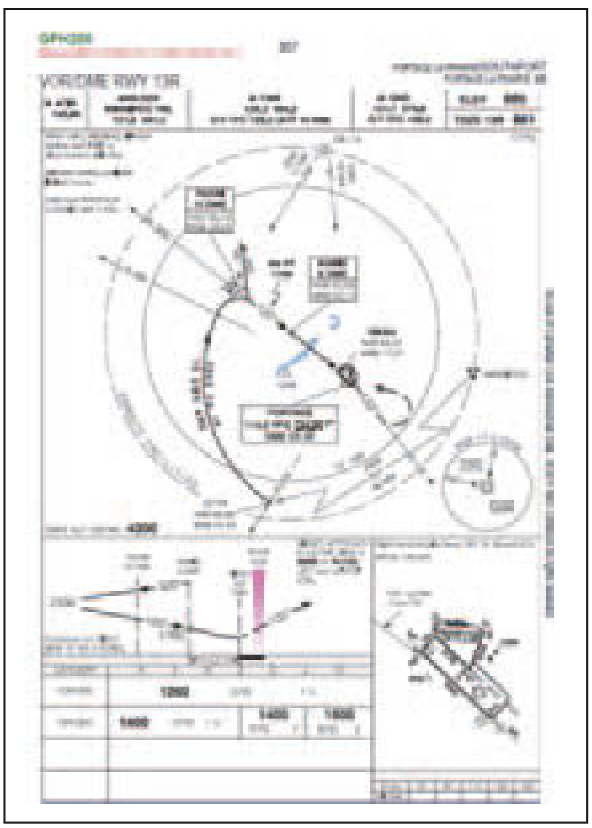
1. Refer to Figure 4, CYPG Southport VOR/DME RWY 13R. You are about 30 minutes out and plan to do a CDFA of 3.0°.
2. Figure out your threshold crossing height. 885 plus 50 ft... too hard. 900 ft. Good enough.
3. Figure out your FAF crossing altitude that will allow a 3-degree intercept. That would be 318 ft x 4.2 nm = about 1300 ft above TCH for 2200 ASL. 5 nm would be about 1600 ft above TCH for 2500 ASL. (You can keep those 4 nm/1300 ft and 5 nm/1600 ft numbers in your back pocket as a rule of thumb and for gross error checks.)
4. If you flew this approach at 120 KIAS with a nominal 10 knot headwind, that would be a groundspeed of 110 knots for about a 550 fpm descent rate. You could maintain 2500 ft ASL until 6 DME back, then start descent at 550 fpm, crossing AGBID at about 2200 ft ASL. Or you could descend to 2200 ft ASL inside of 10 DME and start down at AGBID. To gauge your progress, you should be at least 300 ft lower every 1 DME.

All this preplanning is, of course, done up at altitude in cruise. On the vast majority of our NPAs, we break out and are visual well before MDA and visibility minima. On the rare occasion when the weather is right on or slightly below the designed non-precision approach limits, the fixed wing people should be really careful. Continuing in beyond VDP and then darting for the runway is beyond the intent of the terminal instrument procedures (TERPs) approach designer. The approach will be unstabilized and could lead to a hard landing or going off the end of a runway, or both. For some aircraft types, hanging out in cloud on approach with light to moderate icing may not be such a good idea either. Descent out of cloud to the lowest minimum altitude might be the better thing to do in those instances.

Photo: MCpl Paul Green

This all leads to what one should do once you reach bottom. Some operators are permitted to use MDA as DA. For the CF (and others), in accordance with CF Flying Orders, we cannot go below MDA unless we have the visual references to conduct a safe landing. Other operators adjust their MDA upwards with an additive such as 50 ft. They will fly to MDA+50 ft and decide whether they will land or not. If they go around, the 50 ft additive protects the MDA in the dip-down as the aircraft transitions to missed approach climb. This small additive shouldn't normally be a factor in the success of the approach. Also, some operators will level off at MDA and motor in to the missed approach point in hopes of acquiring the runway. However, if you level off at MDA from a 3.0° approach path and continue in, you will be beyond the VDP and most likely unstabilized if you dart for the runway at the last second (Figure 5).

The mental gymnastics may seem challenging on do-it-yourself CDFAs, especially on a dark and stormy night with multiple runway changes. Maybe it would be better just to get some modern avionics that would do the vertical work for you. As fleets are replaced and modernized, this will eventually become the standard. ◆



PDF with MCE ASO in Ottawa

Figure 4 – Available from GPH 200

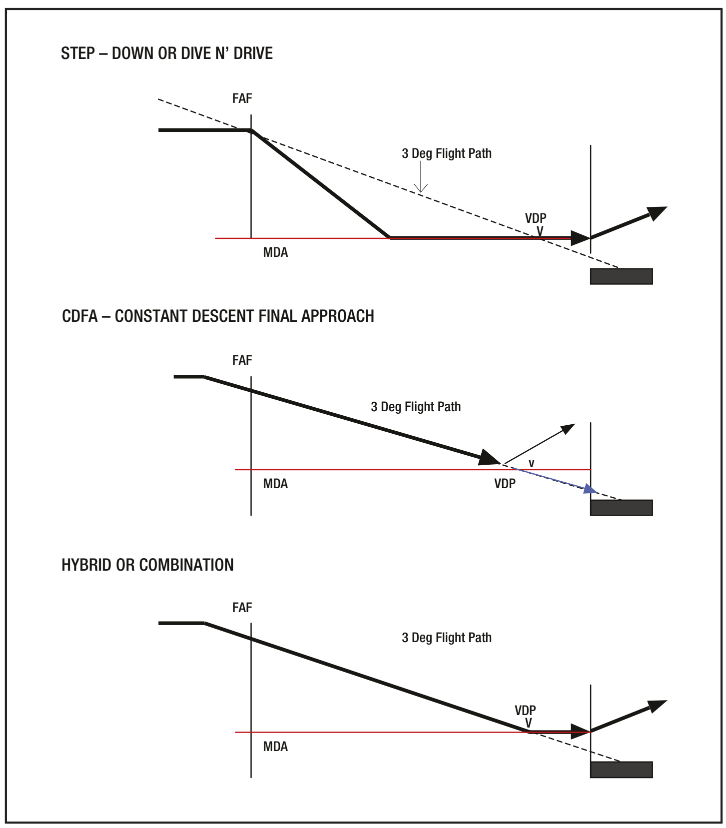


Figure 5 – Common NPA techniques

AIRSHOW ADVICE

By Major Chris "Homer" Hope, Snowbird Lead, 15 Wing Moose Jaw

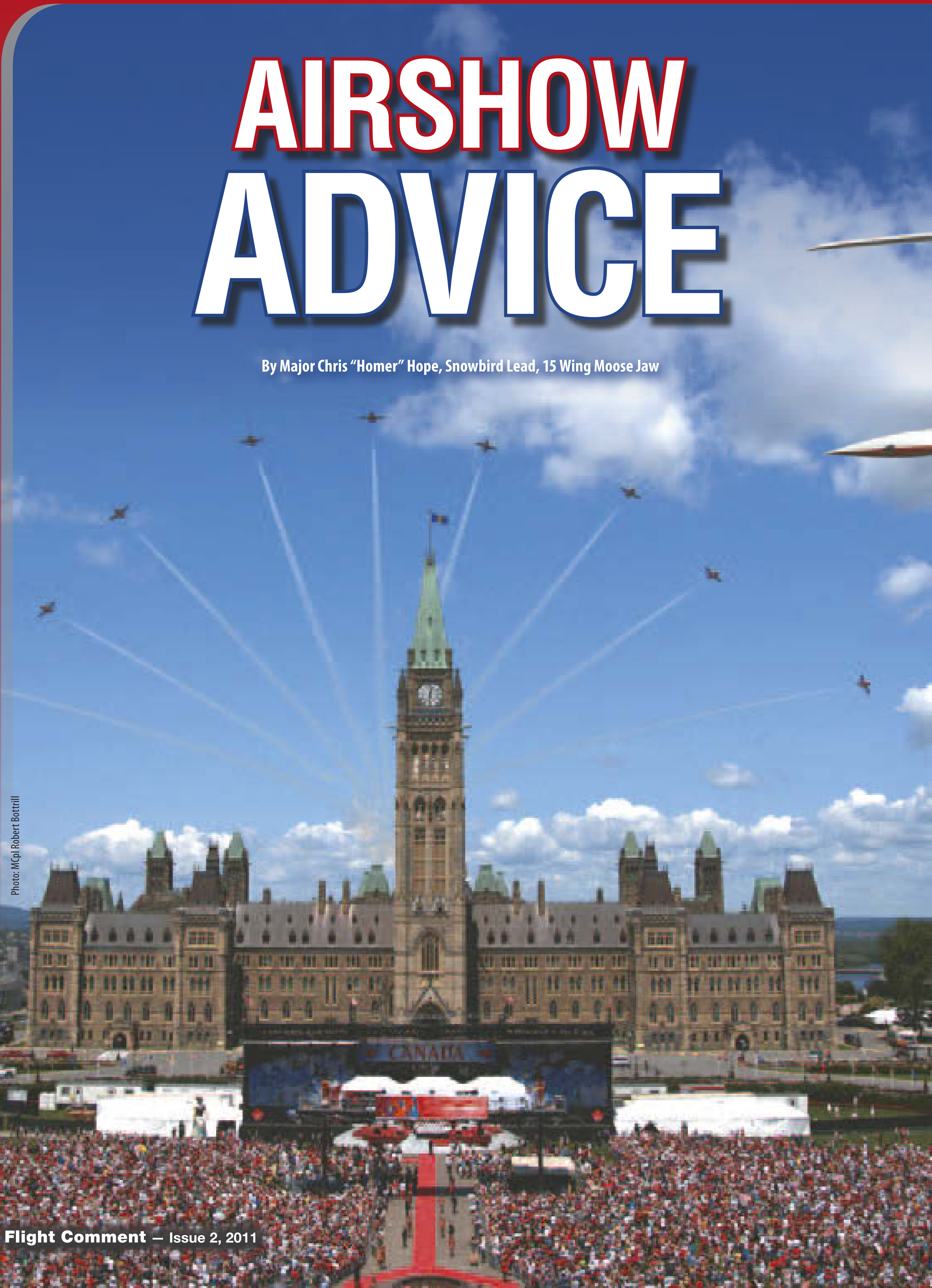


Photo: MCpl Robert Bottrill

Photo: MCpl Robert Bottrill

Now that the weather is beginning to warm up, so is the airshow season. I want to provide some wisdom that has been imparted to me by some of my previous colleagues, bosses and friends in the past. I do not feel that this is an all inclusive list, but it has kept me on the straight and narrow.

1. Arrival and departures are procedures and not opportunities to announce your arrival. Fly your normal recovery be it an overhead break, closed pattern or straight-in.
2. Fly the plan. If you have been trained to fly the demonstration, then stay to the script to the best of your ability. The vast majority of the crowd is there to be entertained and most are not educated in the capabilities of your aircraft.
3. Be cautious; you are flying in an unfamiliar area. Plan for the unexpected, be it weather, a divert etc.
4. Do not succumb to perceived pressure; the crowd will be happy to see your aircraft fly. Do not push it because the previous act was able to perform their full up show. Make your own decision based on the conditions of the day and if you are not happy land.
5. If you are going to hoot with the owls, you need to be able to soar with the eagles the next day! There are as many tricks to maintain the social aspects of the airshow party while preparing yourself for the next days performance.
6. The ground has a PK of 1. In other words, you have limits and you need to abide by them. You will not impress anyone if you push the altitudes and either scare yourself or the spectators or worse.
7. Summer weather is unpredictable, and has significant regional diversity. If you are not comfortable, then do not fly.

Airshows are a great venue to motivate, educate and promote aviation and our passion towards it. Please enjoy the summer months and the airshows that come with them.

Remember that you are out there promoting the CF and all of the folks that are deployed, so ensure that you are putting your best foot forward. ◆

WHO'S in CHARGE?

By Captain "Hazno" Faith, 425 Tactical Fighter Squadron Flight Safety Officer, 3 Wing Bagotville

At 425 ETAC the weather turned for the worse, as it often does in northern Quebec, such that our scheduled tactical missions were scrubbed for the afternoon, leaving the opportunity for some instrument flight (IF) proficiency flying. A dual CF18 was available, so a fellow pilot and myself were scheduled for an IF proficiency sortie. The mission was an IF round robin departing Bagotville to Quebec City and Baie Comeau for an approach at each destination, before returning home to Bagotville. The weather at Bagotville required us to have an alternate, so we decided on Quebec City.

I managed to convince the other pilot to let me sit in the front seat for the flight, so I could demonstrate to him my mastery of the ILS approach in Quebec City. After the approach in Quebec City, I pointed the jet at Baie Comeau for the full procedure VOR/DME. Arriving in Baie Comeau, ATC advised us that we would have to hold while traffic below finished there work. I elected to descend to VMC conditions to cancel IFR for the overhead break in Baie Comeau, after which I pointed the jet back to home base and called Montreal for a new IFR (instrument flight rules) clearance. However, instead of clearing us to Bagotville direct at FL 200 as originally planned, ATC cleared us to Bagotville via Forestville at 5000 feet. We accepted the clearance, as weather was deteriorating rapidly ahead and it was becoming increasingly more difficult to maintain flight in visual conditions. After doing the math, it became evident that overhead Bagotville at our new altitude, we would no longer be able to have the IFR fuel required to fly to Quebec City in the event of a missed approach. Weather at Bagotville was overcast at 400 feet, so there was the possibility of not being able to get in at home base.

After a short discussion in the cockpit of our options, we decided to press to Bagotville with our new plan to hold Baie Comeau as a visual diversion in the event of a missed approach at Bagotville. The rest of the flight continued without further surprises and we successfully arrived home with sufficient fuel. The flight proved to be a valuable learning experience for both myself and the other pilot as we vowed to never again let ATC drive us into an uncomfortable situation. ◆

Photo: Cpl Marc-Andre Gaudreault

SNAP OUT of It!

By Master Corporal Damian Radcliffe, 410 Tactical Fighter Operational Training Squadron, 4 Wing Cold lake

Photo: MCpl Charles Barber

As a member of a deployed Helicopter Air Detachment (HELAIRDET) aboard a naval destroyer, days at sea can become monotonous. Twelve hour flying blocks cycling from bunker gear to idle time, followed by several hours of maintenance provides fertile ground for complacency to grow. The reality is that an incident on the ocean is difficult to survive and access to proper medical facilities can be days away. Complacency can be a difficult creature to battle normally but when things get scary it is nowhere to be found.

We had worked a series of sixteen hour shifts and the aircraft had been performing wonderfully. On an "A" check, one of our senior Corporals noticed that the auxiliary panel package had a minor leak so we made the decision to change the o-rings. During the course of the job, it was observed that extra o-rings had been installed previously. After verifying the correct number required with the CFTO, we discarded all the old packings and installed all new ones. With an impending launch, we hurriedly installed the fitting and applied the specified torque to the jam nut. After a ground run, our *Sea King* was ready for the next mission.

All the checks were carried out and the aircraft started without incident, but when it lifted off the deck things changed. I was sitting with my back against a bulk head in bunker gear, thinking about how good my rack was going to feel once the helo was gone, when a panicked sailor came running over to me. He claimed that he had seen red fluid streaming down the side of the aircraft as it departed the ship. A shiver ran through my whole body when the ship piped the crew to emergency flying stations.

As the helo prepared to land on the deck, I could see the trail of hydraulic fluid down the side of the aircraft. My head was spinning with questions and fear for my teammates! Fortunately, we had a very experienced Aircraft Captain and within a few minutes he had the bird on the deck safely. As soon as the flight safety quarantine was lifted, the two of us who carried out the work, scrambled up to investigate. We discovered that the jam nut had been tightened to secure the extra packings we found. Consequently, when we threaded the fitting in, it only seated far enough to create a temporary seal and when the airframe shifted under torque, that seal broke.

Complacency played a major role in this incident, as it was just another hydraulic leak on a *Sea King,* however, the results could have been catastrophic. It was a very real reminder that flying operations are inherently dangerous and this should be a consideration in all of our tasks. Finally, remember we are entrusted with the ultimate commodity every time we pick up a wrench... a human life! ◆

Photo: MCpl Eduardo Mora Pineda

Photo: Pte Matthew McGregor

"It's the AC's Decision... OR IS IT?"

By Captain Gerald Brulotte, 408 Tactical Helicopter Squadron, Edmonton

After recently re-enrolling, retraining and then becoming once again a line pilot at an operational helicopter squadron, I have thought a lot about the role of the First Officer (FO) in a crew cockpit. Having previously been a co-pilot/FO and then upgraded to Aircraft Commander (AC), in many ways, I am starting over again as a FO. Decision making, crew coordination, CRM or HPMA; these have, for many years, all been part of the ongoing discussion and thinking about how we function in a crew environment. So none of this is new to me but after 15 years out of the cockpit, I wonder how much has changed and what my role as an FO will be.

Thinking back to my first tour on squadron, I remember one particular VFR (visual flight rules) transit; pushing the weather, going lower and slower trying to get to our destination. It was certainly not the most uncomfortable nor dangerous situation I had been in but it was the most memorable HPMA lesson I learned in the cockpit, and I learned it from the FO.

So now, as a FO once again, I decided to ask my peers what the role of the FO is, especially with reference to crew decision making. ACs, more often than FOs, clearly stated without qualification that decision making involved the whole crew. FOs, however, were more likely to add the caveat "it depends." In their view, the role of the FO *depends*! It depends on how much experience the FO or the AC has. It depends on their personalities. It depends on whether they have flown together before and whether that was a pleasant experience or not. It also depends on the mission and it depends on what decisions need to be made. So while we all know that there are well defined crew duties according to our respective SOPs (Standard Operating Procedures), decision making within a crew also depends on a lot of dynamic factors that are not always well defined nor well understood.

My fellow FOs recognized that their role depended on their level of experience and "even though it has been beaten into us to speak up", to be an active part of the crew. With respect to decision making, in situations where they still have "a lot to learn" they felt they have only a "small role" or even "little or next to no input." It comes down to, "you can voice your opinion but in decisions about weather, tactics or procedures it's the AC's decision."

Personality was another key factor. Some FOs are simply not confident in their knowledge, abilities or judgment and are reluctant to speak up. Others, after a negative experience with an AC, are reluctant to voice their opinion. Many FOs recalled a time when they "spoke up" but the AC simply said "noted!" and pressed on or took this as an opportunity to point out what the FO didn't know.

Pressure to perform was another factor that, I am sure, all aircrew have felt at some point. New crew members want to make a good first impression and show that they are competent, capable, or simply good at their job. Those that are gaining new skills or upgrading feel the pressure to perform. All this can contribute to a reluctance to speak up. Furthermore, our aircrew culture, while an essential aspect of esprit de corps and camaraderie, often increases this pressure. The "remember when..." or "this isn't as bad as..." statement often makes less experienced aircrew question whether their most recent "I should have done something different" experience, was actually that bad. The enjoyment we sometimes gain from publicly recounting another's mistake in the aircraft, while usually light hearted and a part of our common experience, can also add to this pressure. So to what extent do all these factors contribute to feelings of having to prove oneself?

Overall, I think things have changed (for the better) but when the holes start lining up in the Swiss Cheese and a decision needs to be made, there are still several factors that make FOs reluctant to speak up and ACs reluctant to listen and that hasn't changed very much.

Remember my VFR transit in which we pressed on in deteriorating weather conditions? Many of us have had that experience. Lower and lower, slower and slower; the turn around point becomes more flexible; let's go a little farther and see what the weather does. The FO expressed his discomfort with pressing the weather. "Noted!" and we pressed on. I thought and stated "I've seen worse." We probably would have arrived safely at our destination without mishap. Probably! But when the FO again stated his discomfort with the weather, I realized that I was *pushing the weather* and we should turn back while we still had that option. In the end, I made the turn around decision but it was the FO that made the decision that the weather was below limits and that we should not push any further and said so. What I learned from that experience was that it may not be the AC that initiates the decision making process and it may not be the AC that has the most important and decisive input. We returned safely home that day because the FO made a decision and spoke up.

What is the role of the FO and other crew members? All of us can, and there will be times when we must, initiate the decision making process. Regardless of our experience level, personality, or pressure to perform, being part of a crew will require us to highlight important information that will require us to speak up! Equally important, is for everyone to contribute to the environment where effective communication can occur. ◆

Photo: Cpl Julie Bélisle

DISTRACTED? Recheck your Steps!

By Sergeant Pat Rice, 14 Air Maintenance Squadron Flight Safety, 14 Wing Greenwood

Photo: Cpl Pierre Habib

It was a typical weekend routine in AMO servicing; not much on the fly due to some inclement weather in the area which provided us with an opportunity to tie up loose ends on the maintenance side of the house.

As one of the more experienced technicians on the crew, I was tasked to replace the auxiliary power unit (APU) fire extinguisher bottle which would soon be time expired. This was a task I had completed on numerous occasions before. Armed with all the applicable technical references, along with a junior technician, we set out to complete the task. The replacement of the fire bottle and functional check was completed without a hitch, except for aircraft power being disrupted on a couple of occasions due to power bumps in the hangar as a result of high winds in the area.

It was while completing the final steps of the functional checklist that power was knocked off the aircraft once again. The technician assisting me had just left the aircraft to pack up the old bottle and to start the paperwork, forcing me to leave the aircraft and reset the power. Upon returning to the cockpit, I continued through the checklist where I had left off – or so I thought! It was at this point I reset the circuit breakers for the APU system and heard a "pop" and "whoosh" sound emanate on the hangar floor. My head sank into my hands as it was at that exact moment that I knew I had missed the step for returning the APU control switch to the off position. The result was the discharging of the APU fire bottle that we had just replaced.

Well, what can I say? I consider myself a very competent technician who always follows technical orders to a "T" and had never been involved in an incident like this before. This is one of those life lessons learned the hard way. Now when something distracts me from a task or disrupts my train of thought, I recheck my steps to verify my last know point in the procedure. If I had employed this strategy it would have saved time, critical resources and ultimately a great deal of embarrassment. ◆

Photo: MCpl Dan Mallette

Curling in the ARCTIC

By Major Matthew Jarrett, USAF exchange, 429 Transport Squadron, 8 Wing Trenton

We all know every good aviation story begins with, “So there I was…”. Here is mine. It was the final leg of the day on my first winter visit to the Canadian Arctic. We all knew weather could change rapidly in the north, but were about to learn just how rapid that can be. Our CC177 *Globemaster III* was fully configured and cleared to land at Thule AB, Greenland. Just hours prior we had successfully completed a snow Semi Prepared Runway Operations (SPRO) landing at CFS Alert and were well into our crew day that had begun 0200 local time back in Trenton. We were well aware of poor runway conditions, however, a double and triple check of the numbers assured us that we were within limits for a safe landing. What I did not know was that a blizzard was descending upon the base, and within a matter of minutes winds would be gusting well over 60 knots, taking our aircraft, and us, on a journey we will not soon forget.

At the time, I was six months into my tour as a USAF exchange officer with the Canadian Forces, and while I had over 2000 hours flying the mighty C17, I was only beginning to learn the dangers that can occur while operating in the Arctic. Our mission was tasked to depart Trenton, download cargo and fuel to CFS Alert, and then overnight in Thule, Greenland. The following day we were to carry out the mission in reverse (Thule – Alert – Trenton). While I had a fair amount of experience operating in and out of gravel runways, this would be my first mission landing on a completely snow covered runway. Therefore, most of my time mission planning was spent focused on the dangers and performance limitations of flying into and out of Alert. I had been to Thule a couple times before and everything had gone smoothly, so I did not anticipate any major issues there, other than the chance of high winds.

Our arrival into Alert went off without a hitch, although it sure is dark up there in the winter! Upon taxiing into our spot, we began prepping for the short trip to Thule. We took off from Alert without incident and arrival procedures into Thule were normal. It was re-assuring to be under radar control once again. Thule approach kept us updated with the latest runway condition reading and we triple checked our landing data to ensure everything was within limits. The approach itself went fine and a wind check on short final gave us a 9 knot crosswind component – well within charted limits. The landing and subsequent rollout were nothing out of the ordinary. It was when I slowed the aircraft to a safe taxi speed, while still on the runway, that I realized just

how slippery the runway condition was. I radioed tower advising them we were proceeding slowly and cautiously and were in no rush to get to the hangar.

It took about five minutes for us to slowly taxi down the length of the runway and as we prepared to exit onto the taxiway, the winds had gone from a brisk 9 knot crosswind to gusting well over 60 knots! We suddenly found ourselves in a rather precarious situation as the winds proceeded to spin our aircraft around 180 degrees and slide the 400,000 pound aircraft out of control toward the edge of the taxiway. This was one of the more surreal moments in my 10 years of mobility flying and a position I certainly hope to never find myself in again. None of the crew panicked, and we all reverted to our training. Remaining calm, we analyzed the situation and decided on an appropriate course of action.

The aircraft had come to rest on the unplowed section of the taxiway and was stuck in about 6 inches of packed snow. Fearing further damage to the aircraft had we left it in this position to weather the storm, I asked to be towed out and down the runway to the hangar that awaited us. Thinking the worst was over, the bizarre night when from bad to worse once towing operations commenced. It took two tugs to pull us out and as they began to steer us down the runway, we once again found ourselves spinning out of control. The CC177 has an enormous rudder and tail section, which acted as a large weather vane and we were essentially a very large curling stone as we spun out of control down the runway. When we finally came to rest, the aircraft lay perpendicular about a third of the way down the over 10,000 foot length runway. At this point we had enough and there was no way I was going to move the aircraft any further. Amazingly, there was no damage to the aircraft up until this point and I began to worry that any further attempts to move the aircraft to the ramp area was simply pushing our luck. We packed sandbags around the aircraft wheels and left the two tugs connected to the nose wheel. I hoped they would serve as an anchor and prevent any further movement in the very strong and gusty winds. Our crew was subsequently evacuated from the aircraft by a couple of large tracked vehicles belonging to the Thule Fire Department. Once we reached the safety of our accommodations for the night, we were locked down for the next 6 hours while the storm passed on. Remarkably, after that entire ordeal, there had been no damage to the aircraft or the airfield and we ended up flying the rest of our tasked itinerary the following day!

Upon my return to Trenton, some post flight studying lead me to an excerpt from Transport Canada, which I think is quite appropriate to my experience in the Great White North:

> *"Finally, the responsibility for the decision to take off or land, based on information supplied from various parties and knowledge of the aircraft, ultimately rests with the pilots. Obviously, these decisions can be critical and pilot requirements for effective and consistent evaluation of runway conditions, along with a reliable means for relating those conditions to the aircraft's capabilities, cannot be overstressed. Inconsistent or untimely reporting of runway conditions, such as the presence of slush on the active runway, can be a contributing factor to aircraft ground handling incidents. In spite of advances in technology and operational procedures, safe winter operations remain a challenge for all stakeholders in the aviation industry, especially for all concerned who must coordinate their efforts under rapidly changing weather conditions"*[1].

Lesson learned – be prepared, brush up on your decision-making process, and take appropriate action to attain the highest degree of aviation safety that can be achieved this and every winter season. Fortunae Nihil! ◆

Good luck and fly safe out there!

Endnote

1 Aviation Safety Letter, http://www.tc.gc.ca/eng/civilaviation/publications/tp185-1-03-451-2943.htm

Photo: Pvt Pameal Turney

How the STANDBY ATTITUDE INDICATOR Saved my Life

By Major Dano Girard, Fighters/Trainers Flight Safety Officer, 1 Canadian Air Division, Winnipeg

Photo: Cpl Marc-André Gaudreault

Let me explain: my incident of Spatial Disorientation (SD) took place 23 October 1991 when I was flying the CF18 in Germany with 439 Squadron. I remember that previous to my selection as a fighter pilot, SD was a big subject of conversation in the fighter world following a series of SD implicated mishaps. But I also remember thinking, this can't happen to me.

Well here I was, flying as number 2 in a 4 ship formation when we were told to rejoin in close formation by lead, due to approaching cloud at our altitude. Unfortunately, the call came too late for me and the rest of the formation, as lead immediately disappeared into cloud!

No biggy – just carry out the lost wingman procedure. First step, turn away from the last known lead position using 15° of bank, revert to instrument flying and advise lead. That's all it took; when I transitioned from visual conditions to instrument conditions, my Heads Up Display (HUD), which is the primary flight instrument for the *Hornet,* did not make sense. I was trying to fight it but my body sensations were winning.

I am not sure how long it took from being in perfect control of my Jet to total confusion and helplessness but it sure felt like a long time. During those few seconds, many thoughts raced through my mind. I thought of my wife (of course) and how this situation could happen to me.

I also remembered something one of my flight instructors told me: "the HUD is a new thing for you and it can get disorientating at times. Remember, if everything fails, you still have a standby attitude indicator just by your right knee". This is how I found out that I was nearly inverted. So I quickly rolled the plane into level flight, took a breather for a few seconds to clean my shorts, and successfully rejoined the formation before returning to base. ◆

Spatial Disorientation can happen to you!

Your Personal Checklist

If you want to know whether or not you are prepared, you can use this simple checklist. It's pretty easy to remember, all you have to ask yourself is "AM I SAFE"?

- **A** — **Attitude** – do I have the right attitude to do the job?
- **M** — **Medicated** – am I currently on some type of medication that could impair my judgement or my ability to do the job?
- **I** — **Illness** – am I suffering from any type of illness that could affect my work?
- **S** — **Stressed** – am I suffering from an acute or chronic stress? If yes, what can I do about it?
- **A** — **Alcohol** – have I been out drinking and could it affect the task at hand?
- **F** — **Fatigue** – am I well rested? Have I had enough sleep for me to be alert enough to complete this task?
- **E** — **Eating** – have I had a good meal recently that will be able to tide me over until my next opportunity to eat?

As you can see, this is a short, simple "Personal Checklist" that was designed for self assessment but can also be used on others too!

Typically, other people are the first to notice something wrong with us. Remember threat and error management? This is your opportunity to avoid or trap an error before something happens.

Just ask yourself, "AM I SAFE"? What about the other personnel working with me? ◆