National Defence / Défense nationale

FALL 2005

Flight Comment

IN THIS ISSUE:

- *Hydroplaning*
- *Flight Data Monitoring*
- *Dangers of Tailwinds*

Canada

Table of Contents

Cover Page:
CF-18 *Hornet* low level near 3 Wing Bagotville.
Photo: Captain Daniel Bélanger, Wing Operations, 3 Wing Bagotville, 2004.

DIRECTORATE OF FLIGHT SAFETY

Director of Flight Safety
Colonel A.D. Hunter

Editor
Captain Rob Burt

THE CANADIAN FORCES FLIGHT SAFETY MAGAZINE

Flight Comment is produced four times a year by the Directorate of Flight Safety. The contents do not necessarily reflect official policy and unless otherwise stated should not be construed as regulations, orders or directives. Contributions, comments and criticism are welcome; the promotion of flight safety is best served by disseminating ideas and on–the–job experience.

Send submissions to:

Editor, *Flight Comment*
Directorate of Flight Safety
NDHQ/Chief of the Air Staff
Labelle Building
4210 Labelle Street
Ottawa, Ontario Canada
K1A 0K2

Telephone: (613) 992–0198
FAX: (613) 992–5187
E–mail: Burt.RM@forces.gc.ca

Subscription orders should be directed to: Publishing and Depository Services, PWGSC, Ottawa, ON K1A 0S5
Telephone: 1-800-635-7943

Annual subscription rates: for Canada, $19.95, single issue, $5.50; for other countries, $19.95 US, single issue, $5.50 US. Prices do not include GST. Payment should be made to Receiver General for Canada.

To contact DFS personnel on an **URGENT** Flight Safety issue, please call an investigator who is available 24 hours a day at 1-888-WARN-DFS (927-6337). The DFS web page at www.airforce.forces.gc.ca/dfs offers other points of contact in the DFS organization or write to dfs.dsv@forces.gc.ca.

ISSN 0015–3702
A–JS–000–006/JP–000
Art Direction: ADM (PA) DMCS
CS05-0274

Directorate of Flight Safety's Chief Investigator's Views on Flight Safety

Back in the Saddle

Back in the Saddle – After a great dose of reality as the Commanding Officer (CO) of 408 Tactical Helicopter Squadron (THS) in Edmonton, from July 2002 to July 2005, I have returned to DFS. I have reassumed my previous position as DFS 2 — Chief of Investigations.

Like everyone taking over a job, I had hoped to start with a clean slate but, as in every living, breathing, active entity such as the Air Force, this was not the case. Some of the work I initiated on my first tour at DFS (1999-2002), but which I was too busy to complete, was waiting for me on my return (my predecessor was obviously equally busy). Unfortunately, while I was engaged with Tac Hel, the Air Force continued to have accidents.

So what is the current status here in the military aviation accident investigation business? **We're busy** — we currently have around 30 open investigations, covering a period from Dec 2002 to Oct 2005. We have just completed and published (available on the DFS website) one of our most intense and complicated investigations. The 2002 crash of Griffon CH146420 in Goose Bay took two lives and had an absolutely unquantifiable impact on so many people and organizations, both inside and outside the military. But, we still have a lot on our plate because we still have the following investigations in progress:

- 10 helicopter accidents;
- 10 fighter and trainer accidents (including the Snowbirds);
- 3 multi-engine accidents;
- 5 cadet glider and tow-Plane accidents; and
- 6 tactical UAV accidents

We have a plan to finish all of these within the next 12 months but unfortunately, we don't know what we don't know…**when**, not if, is the next accident going to occur, where and how big will it be? How much of our limited manpower resources will it require? The answer is, we don't know and we are committed to moving the yardstick forward but, as you can see, we have limitations too and our plans are subject to change.

On my first tour with DFS, as Chief Investigator and overseeing the prevention program, I was directly involved in multiple elements that form an integral part of the DND/CF Airworthiness Program and DND/CF Flight Safety Program. It did widen my horizons on the many challenges, limitations and obligations of a well-prepared flying supervisor, at least this is the way I felt when I left on my appointment as CO of 408 THS in Edmonton. But life at the cold face is not that easy. The challenges are huge, the experience level and the resources are scarce and there never seems to be enough hours available in a day to fully accomplish the mission.

Our work at DFS — your work in the Air Force or in supporting the operations of the Air Force — is to conduct the missions mandated by the government and people of Canada in the most efficient and safest manner possible. Both our aims is the preservation of aviation assets, through safety practices so we have the tools to complete tomorrow's missions. I felt that flight safety served me well as a CO and I still see it as one, if not the best, force multiplier for mission accomplishment.

I like to think that with my previous experience in DFS and my last tour as CO of the biggest squadron in Canada, I am better prepared to provide you and the Air Force with the right assistance in managing a safe and efficient flying operation. I am glad to be back on the DFS team and I am looking forward to sharing views and experiences with all of you.

Strive for perfection and cope well with what reality deals out.

Lieutenant Colonel Jacques Laplante, Chief Investigator at DFS.

Good Show

For Excellence in Flight Safety

Master Corporal Chuck Callaghan

Master Corporal Callaghan was tasked to de-arm one of three loaded CF-18 alert aircraft. As Man 1, Master Corporal Callaghan parked the aircraft and directed Man 2 to carry out the de-arming procedures. As Man 2 walked to the weapon's arm/safe T-handle on station 2, Master Corporal Callaghan observed him starting to cross forward of the weapon which would have taken him into the intake danger area. Master Corporal Callaghan immediately got Man 2's attention, halted him and then directed him to the rear of the weapon to de-arm. At this point, a visual chaff/flare dispenser check is to be carried out by Man 2 at a position between stations three and four, aft of the intake. However, Man 2 proceeded between the fuel tank and fuselage and came directly into the danger area, approximately 30 inches from the intake. Master Corporal Callaghan yelled and then signalled Man 2 to stop. Master Corporal Callaghan then directed Man 2 to the front of the aircraft via the approved route whereupon they exchanged duties as Man 1 and Man 2.

Master Corporal Callaghan is commended for his alertness and his prompt actions. His conduct was instrumental in twice averting an accident involving a colleague. Master Corporal Callaghan's keen situational awareness and ensuing decisive actions undoubtedly saved Man 2 from severe injury or death. ◆

Master Corporal Callaghan served with 441 Squadron, 4 Wing Cold Lake prior to his recent retirement from the Canadian Forces.

Captain Damien Brisson and Ms. Chahira Louhab

In March 2005 Ms. Chahira Louhab, an Engineer-In-Training working in the PMO Aurora Incremental Modernization Project, was assigned the task of performing the technical review of an Engineering Change Proposal (ECP) that had been submitted to resolve a problem with the Navigation and Flight Instrumentation Modernization Project (NFIMP). The system contractor submitted ECP E-2005-0008 in order to address a wiring problem that would cause the Automatic Flight Control System (AFCS) Control Panel (ACP) Fail Light to inadvertently illuminate.

Ms. Louhab evaluated the submission and determined that the proposed change would rectify this wiring problem. On her own initiative Ms. Louhab decided to investigate further into a very complicated drawing in order to learn more about the AFCS. Despite her limited experience dealing with aircraft drawings she noticed that there appeared to be an error in the drawing. Recognizing a potential design problem, she brought it directly to the attention of her supervisor Captain Damien Brisson, an AERE officer, who reviewed Ms. Louhab's initial findings. After a detailed analysis of the system drawings Capt Brisson determined that wires from the Main Electrical Load Centre to the ACP located in the Centre Pedestal were not protected against currents between 5–10 amps. This design flaw had been undetected by engineering and technical staffs at both the system and installation contractors. Capt Brisson immediately brought this deficiency to the attention of senior management both within the project and at the NFIMP system contractor where it was agreed that this potentially dangerous situation had to be resolved without delay. The CP-140 aircraft on which this system was under going flight test was immediately grounded and Capt Brisson worked with the system contractor and the installation contractor to develop an engineering solution that resolved both the original problem and the unprotected wire.

The depth of the evaluation conducted by Ms. Louhab and Captain Brisson went beyond what would normally be expected in the review of an ECP. This previously undetected problem could have resulted in a fire in the center pedestal of the cockpit and was only detected thorough the diligence exhibited by Ms. Louhab and Captain Brisson. The extra efforts shown by these two DND engineers in the review of the ECP brought to light a potentially serious problem that had it gone undetected, could have resulted in a serious flight safety incident. ◆

Captain Brisson and Ms. Louhab serve with Director General Aerospace Equipment Program Management, Ottawa.

From the

Flight Surgeon

TOPPING UP ON SLEEP: The Science of Napping

This article is printed with the permission of *Spotlight* Magazine. This article pertains to the military flying operations of the Australian Defence Force. Any questions about specific regulations, medications, etc. should be directed to the appropriate Canadian Forces sources.

Legend has it that Leonardo da Vinci slept only 15 minutes every four hours. On the other hand, Albert Einstein routinely snoozed for up to 11 hours a night and still managed to profoundlyalter our understanding of the universe.

Debra Bishop & David Levy, *Hello Midnight,* 2001

LIKE Leonardo da Vinci, Winston Churchill tended to get most of his sleep in short doses; what we would call naps. A nap is defined as any period of sleep less than four hours in duration. When carefully implemented, naps can have a beneficial impact on alertness, performance and mood.

Every person has unique and changing sleep characteristics, for example, amount of sleep needed, time taken to fall sleep, and brain wave patterns during sleep. However, unlike Leonardo and Winston, most people satisfy their daily need for sleep in the one continuous period. It is widely accepted that humans require seven to eight hours of sleep each 24 hours in order to stave off the adverse effects of fatigue. If this recommended amount of sleep is not possible in one session, then the use of naps can help to prevent or alleviate the likely symptoms of fatigue.

This article summarises key findings from the wealth of research on sleep, fatigue and napping, and provides guidance on the use of napping as a fatigue countermeasure.

Relevance to ADF aviation

A recent study of 122 ADF aircrew revealed that 62% normally gained less sleep than they believed they required for peak performance. By their own judgments, 12% had sleep deficits of two hours or more each night. Remarkably, only 4% of the sample was getting more sleep than was felt necessary to be at one's best during the next duty period.

Such findings suggest a requirement for increased and informed use of procedures to counter fatigue amongst aviation personnel. However, research with 518 ADF aviation aircrew and maintainers found that the active use of fatigue countermeasures was limited. As shown in the Table on page 5, with just one exception (caffeine), countermeasures were utilised by less than a third of personnel.

The data in the table show that the use of naps is the fourth most commonly used fatigue countermeasure. This proved to be somewhat misleading because subsequent small group discussions revealed that the napping that did occur was mainly carried out at home prior to the commencement of duty.

Very few personnel in the Defence aviation capability appear to nap while in the base or barracks environment. (Further study is necessary to determine the use of naps during exercises, deployments and operations.)

Barriers to napping

This reluctance to nap at work may reflect a corporate culture that regards fatigue as a weakness rather than an inevitable outcome of intense and prolonged work periods. Or it may simply indicate that napping is not a 'norm'-"a way we do things around here."

A cultural resistance to napping is evident in civil aviation, where

Photo: Corporal Dan Shouinard, 14 Air Maintenance Squadron Imaging Section, 14 Wing Greenwood.

FATIGUE COUNTERMEASURE	% USE*
Using computer programs to monitor fatigue	2
Formal measurement of fatigue	3
Prescribed drugs (eg, modafinil)	3
Modifying briefing practices to account for potential fatigue	5
Ensuring adequate sleep facilities in the field	9
Exploring personal tolerance to sleep loss	10
Checking performance levels for the impact of fatigue	11
Planning and implementing a work/rest schedule to minimise fatigue	11
Avoiding sleep debt before periods of intense activity	13
Task rotation	14
Social support and crosschecking to maintain performance	15
Monitoring sleep in self and others during exercises and operations	15
Proactively checking duty schedules against crew endurance standing instructions	17
Understanding the effects of sleep loss and fatigue	21
Maintaining a high standard of physical fitness to promote recuperation from fatigue	23
Napping	27
Late starts	32
Increased frequency of breaks/rest periods	32
Caffeine (eg, coffee)	61

Percentage of respondents who have consciously used countermeasures in order to manage fatigue while on duty.** ***(Based a sample of 518 ADF aircrew and maintainers.)

some airlines allow pilots to take planned naps during long flights and other airlines do not. Interestingly, experts in the field of fatigue regard napping, when properly scheduled, as perhaps the most effective strategy for maintaining performance during sustained operations. For example, there is evidence that 40-minute naps during long-haul flights prevent 'micro-sleeps' from occurring during the latter stages of flight.

Micro-sleeps are momentary lapses into sleep, lasting for up to a few seconds, which occur in people who are considerably sleep deprived. The frequency of micro-sleeps escalates as sleep deprivation increases. One research study showed that long-haul air-crew who did not nap were likely to experience micro-sleeps about once a minute during the final half hour of flight (ie, during the critical landing phase).

It is noteworthy that the first aviation accident officially attributed by the US National Transportation Safety Board to fatigue (as the probable cause) was the crash of a contract cargo flight DC-8-61 at Guantanamo Bay, Cuba on 18 Aug 93. The crew, particularly the Captain, was significantly sleep-deprived. The uncontrolled flight into terrain probably occurred as a result of a microsleep at a critical phase of a difficult landing profile.

How long should I nap?

Until recently, a prevailing view was that naps should only be of 20 minutes duration. The rationale for this was to avoid 'sleep inertia', which is the tendency for people to be drowsy, confused and/or moody upon waking from sleep. The effects of sleep inertia can last for a few minutes to half an hour or longer, depending upon the degree of sleep deprivation and the sleep stage from which one awakens.

The 20-minute nap rule was premised on the assumption that it takes 20 minutes to reach deep or 'slow wave' sleep and that sleep inertia effects are much more pronounced when one is roused from this stage of sleep. By limiting sleep to 20 minutes, it was thought that this would avoid the onset of deep sleep, and hence prevent the more severe sleep inertia effects.

What this view overlooked, however, was that those who are sleep deprived may reach slow wave sleep more quicklythan normal after sleep is initiated, possibly within 10 minutes. In such cases, a 20-minute nap will not avoid sleep inertia.

The 20-minute nap rule has two other shortcomings. Firstly, it has overemphasised the potential impact of sleep inertia. There is marked individual and situational variation in sleep inertia effects and, in most cases, allowing people about 15 to 20 minutes between awakening and commencing duty will dissipate these effects.

Secondly, the 20-minute rule-of-thumb for napping ignored the clear dose-response relationship between sleep and performance recovery. The longer the sleep, the better the benefits. Limiting a nap to 20 minutes in order to avoid the transitory effects of sleep inertia is probably counterproductive. Longer sleep periods will foster significantly improved performance for many hours.

The new rule-of-thumb regarding nap duration is to sleep for as long as operational conditions/ demands permit.

It is important to note that the minimum recommended nap duration is 10 minutes. Naps shorter than 10 minutes do not appear to provide any measurable benefits in terms of recovery or maintenance of performance.

THE SLEEP DEPRIVATION QUIZ

- Do you fall asleep in less than five minutes after going to bed?
- Do you often feel like you could do with a nap?
- Do you become drowsy after eating a large meal?
- Do you fall asleep when watching TV or sitting in meetings and presentations?
- Do boring activities make you sleepy?
- Do you sleep and hour or two longer than usual on days when off duty?
- Do you find that you can hardly make it through the working day without caffeine in some form?

The above scale was adapted from the book *Fatigue in aviation: A guide to staying awake at the stick*. According to the authors, John and Lynn Caldwell, if you answered 'yes' to one or more of these questions, you probably are not getting enough sleep to be at your best at work each day. You are sleep deprived.

When is the best time to nap?

Naps are most effective when they are taken prior to the onset of fatigue. Therefore, if possible, naps should be taken before or early in a period of continuous activity or expected sleep loss, rather than when fatigue has become evident. A two-hour preventative or 'prophylactic' nap before a night shift or night operation can help many people to maintain adequate performance levels throughout the night.

'Recovery' naps are those used to counter unacceptable sleepiness on-the-job. Naps used to recover from fatigue need to be longer than preventative naps and, due to higher levels of sleep deprivation, sleep inertia impacts tend to be more severe. Ideally, sleep management should aim to avoid the need for recovery naps.

The timing of naps is important. Avoid scheduling naps that will have you waking during the circadian trough (around 0100–0600 hrs) or the circadian lull (1400–1600 hrs), as sleep inertia is likely to be most pronounced during these periods. The downside of this advice is that it is more difficult to initiate sleep outside these dips in the circadian cycle. The challenge is not insurmountable.

For example, one effective schedule would be for a night-shift worker to nap for one to two hours, commencing at about 1500 hrs during the circadian lull, and waking after 1600 hrs (hence outside the circadian lull period). Some experts suggest napping until as close as practicable to the start time of a night shift.

If the goal is to maintain performance, naps are usually more effective if taken late afternoon or late evening. To recover performance, daylight morning naps are often of greatest benefit, particularly after a night without sleep. Naps of at least one hour's duration are needed if the goal is to reduce the occurrence of microsleeps.

To nap or not to nap?

Napping is not an effective strategy for about one in five persons. Some people simply cannot get to sleep within a reasonable time under the conditions typically associated with napping. Furthermore, some people can be inconsistent in their ability to nap, falling asleep easily one day, but failing to 'nod off' the next. As people who suffer from insomnia know all too well, a common paradox of sleep is that the more desperate one is to fall asleep, the less likely it is to occur.

The scheduling of naps should not be used as a means of routinely extending duty periods. However, naps can be useful if the normal work period has to be extended due to operational requirements or unforeseen circumstances. The primary use of napping is to maintain alertness and performance, thereby preserving the safety of operations.

Some people dislike napping because of the immediate sleep inertia effects upon waking. Many people rate their mood and their self-perceived fatigue as worse following a nap. For some people, sleep inertia can be associated with very unpleasant feelings of nausea. However, the research evidence is quite clear: napping has definite performance benefits that persist for many hours. Most people are unaware of these performance benefits. With appropriate education, those who are reluctant to nap should be convinced of the advantages.

From middle age, night-time sleep begins to get shorter and more fragmented. Napping therefore can be especially appropriate for older workers.

Making napping effective

The rest environment provided for naps should be as conducive to sleep as possible, preferably air-conditioned, soundproofed, dark and with adequate bedding. A nap in the corner of a busy hangar or command post, or alongside an aircraft taxi route, is likely to reduce the recuperative value of sleep. Noise and surrounding activity tend to disrupt the brain wave patterns of sleep. The result is disturbed and ineffectual sleep.

When planning for scheduled naps in the workplace, one should factor in an initial period for sleep preparation and sleep onset (getting to sleep) and around 20 minutes for proper wakefulness to be achieved prior to returning to duty. This means that a rest period of about one hour is required to enable a 30-minute nap.

The formal use of napping should be one component of an integrated fatigue risk-management program, which would include information on self-care, sleep hygiene, and the signs and impact of fatigue on performance. Of course the implementation of napping in the workplace is dependent upon a supportive culture and appropriate workplace regulations.

Conclusion

The 20-minute nap rule is dead. It was based on inaccurate information and misguided assumptions. Nap for as long as operational/task management constraints allow. The longer the nap, the greater the benefits in improving mood, performance and alertness. Short naps (even 10 to 30 minutes), although not ideal, are better than nothing. However, naps shorter than 10 minutes are probably a waste of time.

Preventative naps, taken prior to the onset of drowsiness, are the most effective. The benefits of naps can be offset to some extent by lengthy periods of drowsiness known as sleep inertia. However, these post-nap 'hangover' effects can be minimised by timing the end of naps to fall outside the dips in the circadian cycle that occur for most people mid-afternoon and in the early morning hours before dawn.

Napping should be considered as a supplement to the major (anchor) sleep period, not as a substitute for good work scheduling and the provision of adequate rest periods that allow for uninterrupted sleep. People need seven to eight hours of continuous sleep to maintain the capacity to work at optimum performance levels.

When the recommended anchor-sleep duration is not possible, or if a work shift has to be significantly extended (beyond 10 hours), the precise scheduling of naps can help to recover and/or maintain mood, alertness and the mental abilities that are crucial to safe and effective performance in the workplace. ◆

Lieutenant Colonel Peter Murphy is the Senior Officer of Aviation Psychology, Autralian Defence.

If anyone has any suggestions for future topics or any feedback please contact me at Clavet.M@forces.gc.ca.

Major Martin Clavet, Flight Surgeon and Human Factors Specialist, Directorate of Flight Safety (DFS-2-6) Ottawa

Further reading

- Caldwell, J. A., & Caldwell, J. L. (2003). *Fatigue in aviation: A guide to staying awake at the stick.* Aldershot, Hampshire: Ashgate.
- Caldwell, J. L. (2002). *Napping: Power or poison? Flying Safety, October,* 16–17. Civil Aviation Authority (U.K.) (2003).
- *A review of in-flight napping strategies.* CAA Paper 2003/8. West Sussex: Safety Regulation Group, Civil Aviation Authority.
- Murphy, P. J. (2002). *Fatigue management during operations: A commander's guide.* Puckapunyal: Doctrine Wing, Land Warfare Development Centre, Department of Defence (Army).

READY FOR TAKE-OFF

We have all said it…" TOWER…(your call-sign)…READY TAKE-OFF". But have we always truly been ready? Have all the pre-take-off checks been completed? Was an appropriate take-off brief given? Training and procedures, coupled with professionalism, will ensure checks are complete and the take-off is briefed but we still may not be ready to start rolling.

Finding myself back in training as an instructor pilot flying a single engine jet was quite sobering after years flying a fighter with the luxury of two engines. Losing your only source of thrust during take-off will obviously be a showstopper with various degrees of seriousness depending on the phase of take-off. Needless to say, emergency take-off briefs detailing your actions in the event of an engine failure are mandatory. I would always preach to the trainees to keep their briefs as simple as possible for one important reason-applying K.I.S.S. (Keep It Simple Sunshine/Stupid) ensures their crewmates, and most importantly they themselves, would have no doubts about exactly what would transpire when the fecal matter hits the fan.

Unfortunately one day I had the opportunity to put into practice what I had preached hundreds of times in the past 3 years. Just after lift off, with the gear selected up and the last bit of runway passing under the nose, I lost my only source of thrust as my Rolls- Royce had trouble trying to pass a seagull. Less than a minute later my aircraft was a crash site and the student and I were under chutes.

When the bird hit and stalled the compressor several things happened. The term significant emotional event was an understatement for me and very disruptive to my thought process. My aircraft's warning system was protesting multiple failures via Nagging Nigel and suddenly I was in a very distracting environment. The most distracting thing of all, surprisingly, was knowing we would be ejecting. I immediately told the student to prepare to abandon the aircraft but I didn't do any preparation myself. Initial actions had not cleared the stall and there was insufficient time to complete a restart, yet I still advanced the throttle to convince myself what I already knew, that the engine was indeed not generating thrust. After losing almost half the altitude I had gained with my initial zoom, I then wasted more time making a radio call to ATC before finally ejecting.

Training will give you the ability to recognise and correctly make the decision to abandon the aircraft. Actually bringing yourself to do it, as I found in my experience, is a different story. A long time ago I was told by a very experienced aviator that you need to be ready to get out of the aircraft before you even get into it. Now I know exactly what he was trying to impart. Delaying the inevitable ejection just put my student and me in jeopardy and gave us very little time for those very important post ejection drills.

"TOWER…(your call-sign)…READY TAKE-OFF"! ◆

Captain John Hutt serves with the Central Flying School, 17 Wing Winnipeg.

Photo: Mike Reyno.

How BIG is the Sky?

Occupied Airspace

It was a beautiful summer morning in St. John's as the CP-140 *Aurora* crew waited outside the hotel for their shuttle ride. The crew went directly to the aircraft to prep it for what was supposed to be the second, and final, fishery patrol of the trip. The pilots and the navigator communicator (NAVCOM) went to flight plan and to check for any conflicting traffic. The Military Operations Center (MOC) in Halifax had no traffic to pass on and there were no Department of Fisheries and Oceans (DFO) flights scheduled for the area. After consultation with the DFO officer, who would accompany us, it was decided to work the eastern edge of our patrol area first and then proceed westward.

The patrol area for the mission was east of Goose Bay and the DFO officer only expected to see 6 to 10 contacts, as opposed to the 40 to 50 contacts the crew had identified the day before off the Grand Banks. So, as a crew we had the busiest mission behind us and we could relax a little.

We proceeded towards the 200-nautical mile (nm) limit and quickly picked up 4 to 5 contacts on the radar. Finding them on the radar was the easy part — the on-scene weather had an overcast layer between 500 and 1500 feet and 3-5 statute miles (sm) visibility in fog. The crew was comfortable operating in such weather as it is often the norm over the North Atlantic. Using the radar to clear us below, we attempted a decent to visual meteorological conditions (VMC) and broke out of the cloud at 500 feet. We continued to 300 feet and proceeded to the fishing vessels that we had detected on radar. We took photos, identified the vessels in question and after informing the DFO officer that all the foreign vessels were outside Canada's 200nm limit, we turned the aircraft to the west and climbed back into clear air leveling off at 2500 feet. The only other radar contact was now some 130 nm away, approximately 70nm off the east coast of Labrador.

Approximately 20 minutes back from the target, the pilot was preparing to descend to VMC conditions with an initial descent to 500 feet. Before the decent commenced the NAVCOM heard a CC-130 *Hercules* aircraft, with

Photo: Sergeant Danielle Bernier, imaging Section Supervisor, Canadian Forces Base Valcartier.

a rescue call sign, on guard frequency. Due to our low altitude we realized the rescue aircraft was close and so, we made radio contact. The *Herc* (flown by 413 Squadron, Greenwood) informed us that they were providing top-cover support to a CH-149 *Cormorant* (from 103 Search and Rescue (SAR) Squadron, Gander) that was tasked to medivac an injured fisherman and they were about 10 minutes back.

After ascertaining the location of the vessel, it became apparent that the injured sailor was on the vessel that we were about to identify. We broke off the homing and proceeded south to clear the area. The MOC in Halifax had not updated us of a SAR in our area, nor had the Joint Rescue Coordination Center (JRCC) in Halifax told the SAR aircraft about us. Did these two different agencies know about the conflict? Considering they are next door to each other in Halifax one would hope so. Communication is not only vital to aircraft in flight, but also to the tasking agencies on the ground.

That day, the possibility existed for 3 different Canadian Forces aircraft, operated by 3 different units, under the command of 2 different agencies, to be on top of the same remotely located fishing vessel, at the exact same time, in very poor weather. If we had to plan this from scratch, it would have taken hours if not days to ensure we had it right. Yet, as events unfolded, there we were, with all three aircraft heading for the same ship and with estimates only minutes apart. Although the two SAR aircraft were working together and had separation between them, where would we have fit into the puzzle had we showed up unannounced? Luckily, the situation was avoided and once again, we were reminded that the big sky is very small. ◆

Captain Bob Mitchell serves with 405 Maritime Patrol Squadron, 14 Wing Greenwood.

THIS IS STUPID

A lot of times I've had that thought on the airplane. Funny thing is as soon as you verbalize it you get someone who agrees with you. So why have I waited so long before I let those words slip out?

We were flying an *Aurora* out of Scotland, working with a Norwegian P-3 out of Andoya, our relief aircraft was a United States Navy (USN) P-3 coming from yet another country. We were all converging on a little bit of ocean where the weather was really lousy, but that's where the target we were supposed to track was hanging out. I remembered the Scottish weather briefer summing up his presentation with "I'm just glad I won't be going with you…Har bloody Har!"

Well he was right; the sea state was huge, with 60-knot winds down low. The area was full of Cumulonimbus (CBs), small ones compared to those found back on the prairies, but they were everywhere. They only topped out at 19 000 feet with bottoms around 800 feet but all sorts of precipitation below. We were dodging around them, between them, and below them, trying to keep track of some poor slobs in a nuclear powered steel tube. The problem was the air was really moving around, up and down in all sorts of downdrafts and turbulence, and I had long ago quit having fun. With the altitude hold on, we were getting Vertical Speed Indicator (VSI) readings of over 800 feet per minute, at 500 feet Mean Sea Level (MSL) — that's uncomfortable! The Tactical Navigator (TacNav) wasn't happy with us pilots either; we just couldn't seem to get the plane where he wanted to go. He was getting a little flustered, so he came up forward and had a look around. He had felt the bumps and heard the rain and hail hitting the airplane, but until he looked out the window he wasn't entirely in the picture. I was thinking 'this is stupid' for some time now, but being a new guy flying with the Old Pros I thought maybe this was OK. I was thinking, with all that water going into the intakes, I hope those fires don't go out…

The pilot looked at the TacNav and the TacNav looked at the pilot, and they both said it. The Flight Engineer was nodding his head as well — "this is stupid!" So we knocked it off, got Radar to vector us as best he could up on top of the weather, and we told our playmates that we'd had enough and were returning to base. After a brief pause, the Norwegians said they were calling it quits as well.

As we were passing the situation and weather to our relief aircraft (which was enroute inbound) it got hit by lightning and went home too.

So the moral is — if you think something is **stupid**, chances are you're right! ◆

Major Ken Smith is an investigator at the Directorate of Flight Safety in Ottawa.

TRAIN LIKE YOU FIGHT

FIGHT LIKE YOU TRAIN

Mission Readiness

Photo: Master Corporal John Bradley, Assistant Public Affairs Officer, Canadian Forces Base Shilo.

Photo: Master Corporal John Bradley, Assistant Public Affairs Officer, Canadian Forces Base Shilo.

Train like you fight and fight like you train. This is what we all tell ourselves during peacetime exercises, but in January 2002, I found myself attempting several tasks in wartime that I had never seriously contemplated before, let alone practiced. I had deployed as part of a C-130 *Hercules* crew to the Persian Gulf as part of OP APOLLO and the circumstances of flying in Afghanistan presented us with several unique challenges. The solutions to these challenges were… unorthodox, to say the least and came close to violating the "this is stupid" maxim that we all strive to uphold in peacetime flying.

When we arrived in theatre, Afghanistan was still a high-risk environment and coalition aircraft were fired upon daily by small arms and missiles. Consequently, most of our missions were initially done at night to take advantage of the enemies' lack of night vision gear. However, there was a catch, all operations into, on and out of the airfields were to be done without lights. Now, night vision goggles (NVGs) had never been used in the C-130 community apart from the Search and Rescue (SAR) role, and certainly not in the cockpit, so imagine our surprise when our operations staff handed us a box of NVGs and wished us good luck. Those in the tactical helicopter community are probably shaking their collective heads right now.

Well, we took these things (monocular, not-certified-for-flight models that someone had borrowed from the army) and, after quick discussion with other crews that had used them recently, came up with a standard operating procedure (SOP) for our trip to Kandahar. It went like this: after executing our homemade instrument approach (a story for another time), I would provide the aircraft captain guidance down to the runway threshold using the NVGs. We decided that, for our own comfort level, we would quickly flash the landing lights just before landing so that the aircraft captain could have a peek at the short (3900 foot), bomb-cratered runway. After touchdown, the lights would be turned off and I would provide further guidance to taxi around the airport. How many holes can **you** see lining up in the accident "swiss cheese" model?

In the air, we discovered that the *Herc* cockpit is horribly bright even with all of the instrument lights turned off and therefore the only crewmembers that had any hope of using the goggles were the co-pilot (me) and the navigator who was in the observation bubble. Even better, I found that in order to use goggles successfully, I had to hold the goggles up to my eyes and lean way forward over the instrument shroud and therefore wasn't able to see any of my instruments. In the end, this is how we made it to Afghanistan and back several nights in a row until it was safe enough to fly in the day and/or use lights at night.

Other communities have well-established NVG training programs and currencies to maintain; we had to come up with our own program over a cup of coffee 3 hours before our first NVG flight in an aircraft that wasn't built for night vision devices. Funny thing is, when I returned to Trenton, nobody seemed to know what we did, nor could they see a need for NVGs in the *Herc* world. — definitely not fighting like we trained, **or** the other way around. ◆

Captain Chris Lake now serves with 2 Canadian Forces Flight Training School, 15 Wing Moose Jaw.

SICOFAA
Flight Safety Award

Canada is a member of an international aviation association called SICOFAA. This is a Spanish acronym for "The System for the Cooperation of the Air Forces of the Americas." This organisation has several sub-committees which meet on an annual basis to discuss aviation related issues (training, SAR, Flight Safety, technology, medicine, etc). Each year SICOFAA provides the member countries with a flight safety award to recognize a deserving unit within their individual air force.

2004 SICOFAA
Flight Safety Award Winner:

In recognition for their outstanding contribution to safe flight operations during Task Force Haiti and humanitarian flood relief, the officers and non-commissioned members of 430 Tactical Helicopter Squadron are deserving of the 2004 SICOFAA Flight Safety Award.

430 Tactical Helicopter Squadron was tasked to support OPERATION HALO by providing security as part of the Canadian Contingent of the Multinational Interim Force during political upheaval in Haiti in March 2004. The squadron quickly and safely responded to the short-notice tasking with a six-aircraft detachment. The mandate required 430 Tactical Helicopter Squadron to operate sixteen hours a day, seven days a week, for a four-month duration and included 1,385 hours and 545 sorties flown in support of the Canadian Joint Task Force in Haiti. The outstanding leadership provided at all levels ensured that 430 Tactical Helicopter Squadron was physically and mentally prepared. An integral component of the preparation included the development of an in-depth Flight Safety programme prepared specifically for the theatre of operations and anticipated mission profiles. During that spring, 430 Tactical Helicopter Squadron's role expanded to include an additional 73 sorties flown in support of the humanitarian response to the severe flooding that Haiti also endured. The squadron's effective flight safety culture and proactive flight safety programme ensured a successful mission accomplishment with no major Flight Safety incidents.

Lieutenant Colonel Jim Davis Task Force (TF) Commander on the actions of 430 Tactical Helicopter Squadron in Haiti:

"The accomplishments of Task Force Haiti (TFH) are noteworthy and contribute significantly to support independent recognition. TFH, a joint force that included Army and Air Force units, deployed with no notice and no opportunity to train together as a Task Force. With the exception of the 145 man rifle company, the remaining 350 personnel were force-generated from elements not at high readiness and from all across the Canadian Forces (CF) and deployed within as little as two weeks. This was one of the fastest CF missions ever mounted. TFH survived in a hot, tropical climate with few creature comforts and ate hard rations for 78 days before converting to fresh food. Interim Hardship and Risk was assessed as levels 4 and 2 respectively and after the Hardship and Risk Committee convened, Risk was increased to Level 5, the highest level. This accurately reflected the harsh climatic conditions as well as the high threat to health from those conditions and from the threat of Malaria and Dengue fever. TFH brought stability to its Area of Operation both quickly and in a manner that was emulated by the US Marines. TFH, a lean force from the outset, conducted a tactical relief-in-place with forces from Canada, conducted a relief-in-place with United Nations (UN) troops in Port-au-Prince and shifting 200 kilometres North to a new Area of Operation and transitioned from the Multinational Interim Force (MIF) mandate to the UN mandate. Simultaneously, it moved its Headquarters and the associated strategic communications equipment from one location to another, and replaced many of its personnel who had to return to Canada because of other commitments. It sustained itself throughout without the benefit of having deployed second line stocks and TFH aviation flew over 60% of all missions. Accolades were sent from Commander MIF and Commander Mission des Nations unies pour la Stabilisation en Haiti (French acronym — MINUSTAH) to the Deputy Chief of the Defence Staff (DCDS) extolling the professionalism of TFH and its accomplishments made in Haiti. These factors by themselves are sufficient to warrant independent recognition. TFH brought much credit to the CF and to Canada." ◆

GETTING DOWN & HOME

Priorities During Emergencies

"Well, this is very inconvenient." I looked at my passengers. Inconvenient? I was relieved just to be on the ground.

Ten minutes earlier: We had just taken off from Ft Lauderdale on a flight to Ottawa. Almost immediately after rotation, the cockpit was filled with a loud aural stall warning associated with a stick-shaker. This normally indicates that the aircraft is about to stall, and the next action would be a stick-pusher. I immediately checked my airspeed indicator (ASI), which indicated 160 knots — well above stall speed. I quickly verified this with the left speed ASI that also indicated 160 knots. The aural warning was very loud and distracting and increased the stress level in the cockpit, as did the stick-shaker. Communication with both the tower and the other pilot was very difficult over the noise of the stall-warning horn.

As we were climbing through 500 feet Ft Lauderdale tower directed us to climb to 3,500', turn right heading 020 degrees, and switch radio frequencies to Miami centre. I instructed the first officer in the left seat to maintain Visual flight Rules (VFR) and join a left-hand down-wind circuit. I also informed Ft Lauderdale tower of my intentions to conduct a visual circuit. Tower replied with a "negative" to my intention of a visual circuit and they repeated their instructions to climb, turn, and change frequencies. At this point I declared an emergency, and told tower of my intentions for a circuit. The co-pilot maintained control, despite the stick-shaker.

We were on downwind and I was actioning the checklist when tower informed me that we were number two, behind a B-757 which was 2 miles final. I advised tower that I needed to extend downwind to complete my checks. They responded ‘negative’, and then informed me that they had diverted aircraft for me and that I was number 2. At this point I decided to forego the ‘red page’ checklist, and conduct an emergency, overweight landing, with the stall warning horn blaring and stick-shaker activated.

The first officer carried out a flawless landing, and upon touchdown the stick-shaker stopped and the horn was silenced.

Among the lessons learned, I realized that when an emergency is declared in the States at a high-density airport you must be prepared for immediate vectors to a quick landing. This may mean prioritizing an emergency checklist against a rushed approach and landing.

Our passengers? They flew home commercial. ◆

Captain Brian Cole is an investigator at the Directorate of Flight Safety in Ottawa

Photo: Corporal Éric Jacques, Imagery Support, DFS (3-3-2), Ottawa, 2005

The Editor’s Corner

Time and Tools

Last issue I talked about “change” so this month the topics are “time” and “tools”.

First, time — you’ve probably noticed there’s not enough of it! Work time, play time, family time, personal time, meetings, appointments, courses, briefings, tests — some of us juggle and balance better than others but I’m losing the battle. Undoubtedly, many of you have noticed that since becoming editor, *Flight Comment* is at least one season out of sync (late) — spring issue in summer, summer issue in fall, etc. To date my commitment to align the issues with the appropriate seasons has failed. I’m tired of failing and so I solicit your support in readjusting the seasons. In many of the forty or so countries where the magazine is read (let’s add BC in here) seasons are not as well defined as they are here in this — no leaves, buds, green leaves, red leaves — country. With your support I will lobby government to align the seasons with the issues of *Flight Comment*. This may become part of the official reaction to the US change in daylight savings time.

Second, tools — we all need them, we all use them! From *Quotes From a Carpenter* — “with a hammer and a saw one person can build a home and another can flatten his digits and sever a limb”. How tools are used is often beyond our control but when used well everyone can appreciate the results. The aim in publishing this magazine is to provide tools for the flight safety community to achieve their missions safely. The articles contain tools, the awards contain tools, the poster is a tool, the links are tools, etc. The only place we goof off in this magazine is in this little “corner” — please forgive my frivolity and please use the tools to maximum benefit. Check out the link to the new NASA icing/deicing ground and in-flight course at http://aircrafticing.grc.nasa.gov/courses.html.

Note: Last issue I bid farewell to some incredible DFS team members but I forgot someone who served DFS, the aviation community and the Air Force with great distinction. Master Warrant Officer (MWO) Mark Sabad worked in our small but dedicated technical shop. He worked on innumerable accident investigations, he was a member of many flight safety survey teams and he was my go-to-guy on technical issues. MWO Sabad is also the contributor of *The Lighter Side*, the December *Debriefing* pamphlet, that captures some of the more humorous statements taken from flight safety reports. We miss him already.

Fly safe.

JUST ADD WATER

A Refresher on Hydroplaning

Once in a while, an occurrence of hydroplaning takes place. It could happen in rainy season as well as snowy season when slush is present. Let's take a few minutes to refresh on the topic. Understanding the cause of hydroplaning should help us combat such incidents. There are three types of hydroplaning:

1. Dynamic hydroplaning
2. Viscous hydroplaning
3. Reverted rubber hydroplaning.

Dynamic hydroplaning

This is the most common type of hydroplaning. It occurs when standing water on a runway is not displaced fast enough from the tires. Therefore, rather than making pavement contact over its total footprint area, the tire rides on a wedge of water under part of the tire surface. NASA has developed a formula that is applicable to aircraft of all size, depicting the relationship between tire pressure and the critical hydroplaning airspeed. With water level as little as 0.1 inch, the minimum hydroplaning speed can be calculated with the following formula:

> *$V_{critical}$ = 9 times the square root of tire pressure in square inches or 9 x ($\sqrt{P}$ in^2) where $V_{critical}$ is the minimum hydroplaning speed and P is tire pressure in square inches.*

Viscous hydroplaning

This type of hydroplaning can happen even when the aircraft is traveling at a speed lower than $V_{critical}$ if the runway is contaminated with a thin film of oil, grease, dust, or rubber. The run-up area is especially prone to this type of hydroplaning. Heavy rain actually washes away contamination, but light rain or heavy dew makes the perfect recipe for such type of hydroplaning.

Reverted Rubber Hydroplaning

This is the least known type of hydroplaning. Heat generated by friction between the water on the runway and the tire produces superheated steam. The high temperature causes the rubber to revert back to its uncured state, forming a seal around the footprint area of the tire and trapping the high-pressure steam.

Prevention of Hydroplaning

Proper Drainage and Grooving — they provide a pathway for the water to drain.

A Runway Free of Contaminants — this reduces the probability of viscous hydroplaning.

Properly Inflated Tires — tire pressure lower than prescribed values lowers $V_{critical}$.

Condition of Tires — hydroplaning is less likely to occur if tread depth of tires on aircraft is greater than the depth of the water on the runway. ◆

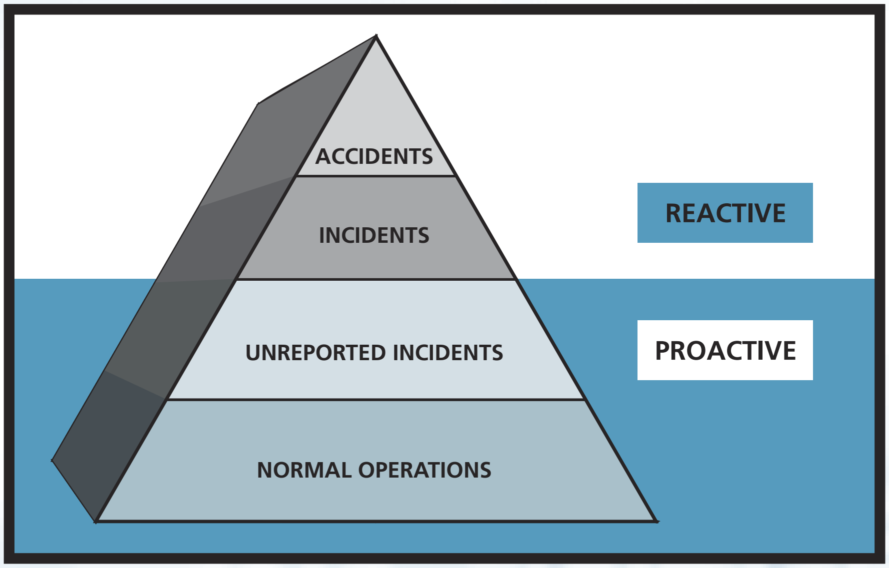
Captain Amy Tsai-Lamoureux, Accident Investigation Engineer at the Quality Engineering Test Establishment, Ottawa.

Photo: Corporal Éric Jacques, Imagery Support, DFS (3-3-2), Ottawa, 2005.

Photo: Master Corporal Rebecca Bell, 2 i/c Wing Imaging, 19 Wing Comox.

FLIGHT DATA MONITORING

Despite the best efforts of the MOD community, Human Factors (HF) continue to be the major cause of aviation accidents. The introduction of an open reporting system has improved awareness of many safety-critical events; nevertheless, the proportion of HF occurrences does not mirror the accident statistics. There may be several reasons for this anomaly; however, it is widely accepted that aircrew remain reluctant to report personal failings and minor excursions outside aircraft limits. Using the iceberg analogy, history has taught us that for every reported incident there are many unreported events lurking beneath the surface. Furthermore, there will be many safety lessons to be learned from analysing normal operating risks. Whilst we traditionally react to the visible events by modifying procedures and training, this is a *reactive* process. In the drive to improve safety and reduce accidents further, there is much to be gained from targeting the area below the waterline using a *proactive* approach to anticipate potential problems before they occur.



In an effort to identify the below surface risks, many civilian airlines have introduced Flight Data Monitoring (FDM) programmes where flight data is collected and analysed in a non-punitive environment. The benefits of these programmes have been significant and the International Civil Aviation Organisation (ICAO) has recommended their use for all Air Transport operations over 20 tonnes maximum all-up weight. Furthermore, with effect from 1 Jan 05, FDM will be made a standard in the Air Navigation Order (ANO) for all aircraft operations over 27 tonnes. The UK, in line with its policy of applying ICAO standards, will make FDM a requirement in UK law and other European regulators are also expected to comply. The military will be exempt from the majority of provisions in the ANO; however, it is policy that, where practicable, MOD regulations should be at least as effective as those of our civilian counterparts. Should we therefore consider the introduction of FDM programmes in military aviation?

FDM is defined as "The systematic, proactive and non-punitive use of digital flight data from routine operations to improve flight safety"[1]. Essential elements of the FDM process include the following:

1 *Definition of Flight Data Monitoring, CAP 739 Chapter 1 Page 1.*

- The acquisition and analysis of flight data in order to identify, establish probable causes for, and rectify trends and deviations from accepted norms of flight operations and safety.
- The capability to understand flight operations more thoroughly by tracking trends and investigating the circumstances surrounding incidents.
- The detection of HF errors before they lead to major incidents, allowing for the development of preventative measures such as increased training or changes to in-flight operating techniques.
- The monitoring of aircraft and equipment usage to provide feedback into maintenance programmes thereby enhancing airworthiness.

These elements require the collection and analysis of flight data to establish operating risks and potential trends. As with any proactive programme, the analysis process is not time-critical and modern PC cards can store flight data for up to 60 hours' flying. Data can therefore be collected periodically for long-haul flights and detached or ship-borne operations, allowing the analysis to be conducted at home base, which minimizes the requirement for ground stations and support personnel.

FDM programmes, in one form or another, have been in use for many years and British Airways has been using and developing flight data monitoring since the mid-1970s. Systems are now readily available off the shelf and several companies now offer relatively inexpensive and proven systems. In helicopter operations, the CAA instigated trials on North Sea helicopters using the Helicopter Operations Monitoring Programme (HOMP) as a low-cost FDM initiative. Military development has been slower; however, all 4 US armed services are in the process of developing similar systems to improve operational safety. FDM programmes have therefore been applied across a full range of aircraft types and the analysis process can be tailored to suit the role or operational requirements. Many of our current platforms have both the capability and the hardware to collect the required data; however, the only formally established FDM programme in the UK military is currently on the RAF's Tristar fleet, which has a legacy, tape-based recording system inherited from the civil community. Modern technology has made the recording and downloading of flight data much more efficient and the latest Flight Data Recorders (FDRs) are capable of downloading vast quantities of data in a readily usable format via optical disk or PC memory card. Equipment is already available which allows the electronic download via a transmitter link to a ground station, ensuring that data is not lost in transit. On reaching the ground station, different sets of data can be sent to the appropriate analysis cells, where monitoring of systems can be conducted by relevant specialists.

The first aim of any FDM programme must be to determine what constitutes normal practice. Deviations from service limits, Standard Operating Procedures (SOPs) and good airmanship can then be identified using preset triggers or 'exceedences'. For any aircraft type, these exceedences can be set to focus on known areas of concern. For example, in a fast jet which is prone to departure from controlled flight, angle of attack may be critical, whereas in a multi-engined or helicopter environment, over-torquing may be common in certain circumstances. By analysing why these events occur, SOPs may be modified to improve safety. Timely input from the aircrew involved in any occurrence can enhance the quality of the data, but this requires an open and honest flight safety culture within the organisation. The greatest benefit of this analysis, however, is the ability to provide constructive feedback to crews identifying areas that may require more consideration or remedial training. The key to the success of this process is how the feedback is delivered. Trusted and respected individuals must provide the feedback and protect the data from the management chain unless the severity of the event requires outside scrutiny.

The benefits of such a system are readily apparent and the experience of civil operators has been wholly positive. As a direct result of the FDM process, approach procedures to several airports have been modified, fuel consumption figures have been improved and SOPs have been changed. There are, however, 2 major areas of concern with the introduction of any potential FDM programme. The first is the perception that FDM is a *crew-monitoring* programme. The definition of FDM specifically includes the term 'non-punitive', which is an uncomfortable concept in some areas of the military. The temptation will always be there for executives to use the process as a tool to criticise a crew's performance. This would undermine the FDM process and it is therefore essential that individuals outside the chain of command carry out the monitoring and analysis of the events. Standards checkers and evaluators would probably be the best-qualified personnel; however, their status as supervisors discourages open discussion and therefore Unit Flight Safety Officers (UFSOs) would appear to be the most appropriate monitors. The experience and quality of UFSOs varies considerably across the 3 Services, however, and posting/appointing policy would therefore have to be changed to ensure that suitably qualified individuals are

Continued on page 23

WIND AT YOUR

The Hidden Dangers of

This article is reprinted with the permission of Transport Canada Aviation Safety Letter.

Tailwinds are very welcome when you are flying from A to B since they help shorten your flight time. However, close to the runway they can be anything but welcome. Even a bit of tailwind can be a hazard. Tailwind conditions can have adverse effects on aircraft performance and handling qualities in the critical flight phases of takeoff, approach and landing.

Performance regulations require that takeoff and landing distance data include correction factors for not less than 150 percent of the nominal tailwind component along the flight path. This margin is used to cover uncertainties in the actual wind condition. Aircraft flying at low speeds are relatively more sensitive to tailwind with respect to airfield performance. For instance, a 10 kt tailwind increases the dry runway landing distance of a large jumbo jet by some 10 percent, whereas for a small single engine piston aircraft the landing distance increases by some 30 percent. A small piston aircraft has an approach speed that is about half of that of a jumbo jet. A 10 kt tailwind will therefore increase the ground speed of this small aircraft relatively more than for the large jumbo jet, which explains the larger impact on the landing distance. On slippery runways, aircraft are more sensitive to variations in tailwind with respect to landing distance than on a dry runway. Tailwind-related overrun accident data show that in 70 percent of the cases, the runway was wet or contaminated. Clearly, the combination of tailwind and a slippery runway is a hazardous one, which should be avoided.

History tells us that tailwind is especially dangerous during the approach and landing. When an approach is made with tailwind, the rate of descent has to increase to maintain the glide slope relative to the ground. With a constant approach speed, the engine thrust must decrease with increasing tailwind to maintain glide slope. In

Photo: Corporal Jean-François Néron, 8 Air Maintenance Squadron, 8 Wing Trenton.

BACK Tailwind

high tailwind conditions, the engine thrust may become as low as flight idle. Flight idle thrust during the approach is undesirable for jet aircraft because engine response to throttle input is slow in this condition, which can be a problem when conducting a go-around. It can also become difficult to reduce to final approach speed and to configure the aircraft in the landing configuration without exceeding flap placard speeds.

A high tailwind on approach in itself may also result in unwanted excessive rates of descent. All these effects can result into unstabilized or rushed approaches. ◆

Gerard van Es, National Aerospace Laboratory NLR, Amsterdam, Netherlands.

FLIGHT DATA MONITORING

Continued from page 21

allocated to these critical positions. Several smaller civilian operators ‘contract out’ the monitoring process to companies with well-established support organisations, although for security reasons alone, this may not be a practical solution for the military. The second major issue is the cost of FDM. A successful programme requires a capable recording system, a ground analysis station and personnel to monitor the data. On modern platforms, this can be achieved relatively cheaply and several recent acquisitions already have the capability to record the required flight data. Legacy platforms are, however, a different matter and the cost of the onboard hardware alone may make FDM unaffordable. The major source of expenditure will be associated with the acquisition of ground analysis stations and associated software, however, this equipment is readily available and it is not manpower intensive. Finally, there will undoubtedly be software development costs as the FDM programme matures. It is accepted that safety enhancements have to compete with operational capability and the benefits of an FDM programme are hard to quantify; however, if we save one aircraft through changing procedures or improving training, the cost of a fleet-wide programme would be justified.

To summarise, imminent changes in civil legislation will make FDM programmes mandatory for operators of AT aircraft over 27 tonnes. Whilst the military is exempt from this legislation, there are proven benefits from the introduction of FDM in the civil sector on a variety of aircraft types. The process provides the opportunity for a non-punitive analysis of flight data leading to changes in operating procedures and training to improve safety. FDM programmes can be set up relatively cheaply for modern aircraft; however, many legacy platforms do not have the onboard recorders necessary for meaningful data analysis and retrospective procurement of the required equipment may not be cost-effective. In the current financial climate, it is difficult to justify expense on flight safety enhancements where the benefits are not readily quantifiable; however, FDM provides a proactive method of improving safety management and some IPTs are already working on developing their own programmes. If introduced on modern platforms in the military, FDM should have an important part to play in reducing our operating risks to a minimum practical level. The DASC has submitted a paper on this subject to the DASB recommending that the principles of FDM be endorsed at the highest level. If successful, a policy for MOD-wide implementation of FDM programmes could soon be a reality. ◆

Wing Commander Dave Bye was serving at the United Kingdom Defence Aviation Safety Centre. He died after a very short illness.

ICING

The use of fluid for deicing and anti-icing aircraft on the ground

Background

The operation of aircraft during ground icing conditions poses a potential threat to safety.

The principle challenge to aircraft during conditions of snowfall, freezing drizzle or other ground icing precipitation conditions is that of arriving at the take off point with a wing that is aerodynamically prepared for take off. There are a number of ways to accomplish this, one way is through the proper use of de/anti-icing fluids.

This article is intended to bring the reader "up to speed" on the principles involved in the use of de/anti-icing fluids on aircraft.

Fluid Application

Aircraft deicing fluids (ADFs) are generally understood to be fluids used for removing frozen contaminants from an aircraft's critical surfaces, and are applied hot (60–82C). Aircraft anti-icing fluids (AAFs) are generally understood to be fluids applied for the purpose of protecting an aircraft's critical surfaces during periods of active precipitation, and are not usually applied heated. A single fluid type may be used for both purposes.

A very effective deicing/anti-icing sequence would result in the use of a heated Type I fluid (ADF) to remove frozen contaminants followed by an AAF such as Type IV for maximum protection. This is called a two-step process, which has generally become the preferred procedure at major North American airports.

Aerodynamic qualities

The fluids, once applied to an aircraft, affect the aerodynamic characteristics of the aerofoil. The fluids have been designed to "shear" off the wing during takeoff to keep the aerodynamic losses to an acceptable level. The removal of fluid by "shear" takes "time". It should be understood that both the speed at rotation and the time to rotation have been identified as critical factors for ensuring that adequate removal of the fluid takes place resulting in acceptable levels of aerodynamic degradation.

Some of these fluids have been designed specifically for aircraft whose takeoff rotation speeds are in the high speed category, typically greater than 100 knots, principally jet aircraft, for example, the Challenger. Some aircraft manufacturers have evaluated the use of these fluids on their aircraft which have take off rotation speeds lower than 100 knots, for example, the DeHavilland Dash 8 aircraft. In some cases the takeoff procedure has been modified to compensate for the negative aerodynamic effect of the residual fluid on their aircraft's performance and/or handling qualities.

SAE Type III fluids are also designed specifically for aircraft whose takeoff rotation speeds are low, less than 100 knots. However, these fluids are suitable for both low and high rotation speed aircraft.

Fluid Standards

The Society of Automotive Engineers (SAE) is a body that has established specifications, and standards applicable to aircraft deicing fluids (ADFs), and aircraft anti-icing fluids (AAFs). It is this group of documents which describe how an ADF or AAF fluid needs to be successfully evaluated prior to the fluid being approved for use on an aircraft.

SAE Type I Fluid

Currently DND bases use only Type I deicing fluids. Aircraft deicing fluids (ADFs) known as SAE Type I, are designed primarily to remove frozen contaminants from an aircraft's critical surfaces prior to take off, but they also possess a very limited capability to protect an aircraft from frozen contamination build up.

Testing of Type I fluids in a controlled environment has revealed that Type I fluids cannot be relied upon to provide extended anti-icing protection during active precipitation conditions such as snow.

Type I fluid not only has a very limited protection time capability but also has the tendency to flash freeze. This tendency makes predicting or observing Type I failure very difficult. Further, Type I fluid tends to adhere to the aircraft surfaces immediately upon freezing.

SAE Types II & IV Fluids

Types II & IV fluids are thickened fluids and are designed principally as anti-icing fluids, although they can also be used as deicing fluids if heated. These fluids are designed with the longest protection times over the broadest range of precipitation rates and temperatures, and form a thick layer upon application. Most SAE Types II & IV fluids, due to their physical make-up, require specialized pumps and nozzles in their use. Failure to use the specialized pumps and nozzles, when required, can result in the destruction of the fluid characteristics that yield longer hold over times. Type IV fluid is the most advanced of the two fluids and has longer protection times. Generally, Type II fluid appears to be falling into disuse and is being replaced by the Type IV fluid as an AAF in a two-step process.

These fluids must be handled by use of the appropriate equipment: whether transporting the fluid from the manufacturer, whether moving it to on site storage tanks, whether filling deicing trucks, or whether applying it to an aircraft.

SAE Type III Fluids

SAE Type III fluid has recently been made available. The Type III fluids are thickened fluids and have been principally designed to serve as anti-icing fluids for aircraft whose takeoff rotation speed is low, less than 100 knots. However, testing has indicated that the Type III fluid, as for Type I fluids, is suitable for both the high and low rotation speed aircraft.

Type III fluids have been introduced to not only serve as a thickened fluid for low rotation speed aircraft but as a possible replacement for Type I fluids given that Type III fluids have longer protection times.

Corporal David Cribb, Imaging Technicien,
8 Air Maintenance Squadron, 8 Wing Trenton.

Photo: Corporal Gayle Wilson, Imaging Technician,
8 Air Maintenance Squadron, 8 Wing Trenton.

Operational approval for use of Fluids

There remains a requirement to evaluate the use of any fluid, which has met the SAE specification, for use on a particular model of aircraft. Typically, the aircraft OEM would be approached and asked to verify that a particular SAE Type fluid is approved for use on the operator's aircraft.

Lowest Operational Use Temperature

Fluids must always be used at or above their lowest operational use temperature (LOUT).

The LOUT for a given fluid is the **higher** of:

i. The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type, or

ii. The actual freezing point of the fluid plus its freezing point buffer of 10°C, for a Type I fluid, and 7°C for a Type II, III or IV fluid.

Example:
A Type I fluid has met the aerodynamic acceptance test down to -45°C, and has a freezing point of -43°C. The outside air temperature (OAT) is -39°C.

Q: *Can this fluid be used under these circumstances?*

A: *NO, because the freezing point buffer requirement limits the use of this fluid to -33°C, which is above the OAT.*

Generally, SAE Type I fluids have a much lower LOUT than SAE Types II, III or IV fluids. As long as the fluid's LOUT is respected, the fluids may be diluted with water for economy.

The fluid manufacturer should always be consulted to establish the LOUT of their fluids for the various operational scenarios.

Example HOTs:

Comparative HOTs for the various fluids, under specific conditions, are as follows:

FLUID TYPE (undiluted)	HOLD OVER TIME	
	Moderate Snow, -10°C	*Freezing drizzle, -10°C*
Type I	4 minutes	4 minutes
Type II	15 minutes	15 minutes
Type III	9 minutes	10 minutes
Type IV	20 minutes	20 minutes

Note: *The Fluids are continually being evaluated and the HOT values have generally been decreasing. The link for the current HOTs can be found at the following Transport Canada Website: http://www.tc.gc.ca/CivilAviation/commerce/menu.htm*

Hold Over Time

Hold Over Times (HOTs) are those times that a particular fluid, after application, is anticipated to be able to protect an aircraft's critical surfaces under specific ground icing conditions of: temperature, fluid concentration, and precipitation rate. The HOT tables are established by compiling the results of a multitude of tests conducted on specific approved SAE fluids in a controlled environment. HOT table values are not exact but rather estimates of fluid performance. HOTs vary according to fluid type.

Fluid Application

Ground Deicing Operations using fluids.

The complete removal of frozen contaminants from an aircraft's critical surfaces is necessary for safe flight. The fluid will need to be heated to between 60–82°C at the nozzle, and can generally be applied with equipment that is commonly available. If the removal of frozen contaminants is the only requirement, as would be the case when there is no active precipitation, or during most conditions of frost, then the task is completed once the critical surfaces are clean.

Potentially large quantities of ADF will need to be applied to clean an aircraft. A certain percentage of the fluid is inevitably lost due to overspray, all of which contributes to contamination of the environment. The fluid is typically applied with significant hydraulic force to assist in the removal of the frozen contaminants, which could be characterized as a "blasting" action. The use of appropriate equipment is required.

The deicing process could be accomplished using heated Type I, II, III or IV fluids, however, typically in North America, it is accomplished using an SAE Type I approved fluid.

Ground anti-icing operations using fluids.

Once the aircraft's critical surfaces have been adequately deiced, the "laying on" of a layer of anti-icing fluid is required to protect the aircraft during periods of active precipitation.

The technique used to apply anti-icing fluid differs considerably from that used in the deicing process. The fluid is distributed over the surfaces in a "wafting" manner and more precisely than for deicing. This results in less fluid waste during anti-icing than during deicing; this is the nature of the processes. The use of appropriate equipment is required. Significantly less anti-icing fluid is required than deicing fluid in a typical two-step process; as much as 7 times more Type I fluid is required than Type IV fluid.

Type I fluids.

These fluids perform the deicing function in a reasonably economic and efficient manner if applied using the correct equipment and with the right techniques. They can also be used on both high and low rotation speed aircraft. However, Type I fluids suffer from very poor HOTs.

Given the short HOT and the fact that the HOT clock starts running immediately when starting the apply the fluid, it is difficult to imagine an operational scenario during active precipitation where Type I HOTs would provide adequate operational anti-icing protection. During active precipitation conditions there is a significant probability that the aircraft will need to return for another deicing cycle due to fluid failure and aircraft re-contamination, if only Type I is used in a one-step process. The return for additional deicing is not only costly and time consuming but will cause operational launch delays.

Type III fluids.

Recent testing has indicated that this fluid serves well as a deicing fluid when heated. The fluid also has an HOT which is longer than that of the Type I fluid. However, Type III fluid does not have HOTs which can compete with either Type II or IV fluid HOTs.

Type III fluid is marginally more expensive than the Type I fluid and so from a deicing perspective would be a more costly alternative. However, if a one step process were adopted, the Type III fluid would offer some operational and safety benefits as compared to the Type I fluids when active precipitation conditions exist.

Types II & IV fluids.

These are both thickened fluids and serve principally as anti-icing fluids, in North America. Type II and Type IV fluids are similar with Type IV fluids having significantly longer HOTs. These are the most expensive fluids; Type IV fluid is about 3 times as expensive as Type I fluid on a per unit basis.

The best anti-icing protection available is from Type IV fluids. While these fluids are easily the most expensive they do offer additional operational flexibility and improved safety. At major North American airports the current practice is to use a Type I fluid to deice an aircraft followed by a Type IV fluid to anti-ice an aircraft, in a two-step process.

Many of these fluids require the use of specialized application equipment to avoid damaging the fluid, such that the HOT times cannot be realized. Apparently, there is at least one Type IV fluid that may be applied using Type I fluid equipment without compromising the fluid's HOTs. Training in the use of these fluids and the use of the specialized equipment is essential to get the HOT benefits.

The possible requirement for new equipment to apply these fluids may result in significant infrastructure cost increases; this would not be the case if the more tolerant Type IV fluid(s) were chosen. While these costs may not make the use of Type II or IV fluids attractive for military bases, there are operational and safety benefits in approving these fluids for use on DND aircraft which operate from civilian airports offering these fluids as part of their aircraft de/anti-icing service.

DRAFT article intended for use in the DFS "Flight Comment" Periodical, Fall 2005 edition, entitled: "The use of fluid for deicing and anti-icing aircraft on the ground".

Questions concerning aircraft ground icing operations in general can be directed to Mr. Ken Walper, DTA 5-6C2 at (613) 991 9530 or Walper.KL@forces.gc.ca ◆

Mr. Ken Walper works with the Directorate of Technical Airworthiness at National Defence Headquarters in Ottawa.

MAINTAINER'S CORNER

MAINTENANCE TEAM BUILDING an Integral Part of Flight Safety

Working together as a team (or not, as the case may be) is ultimately what makes an effort succeed or fail. Each of us has our own strengths and weaknesses and a good team consists of a diversified group of people with combined strengths that will together meet the objective. This issue will discuss the need for teamwork in the maintenance organization and some common obstacles to becoming an effective team.

Aircraft maintenance takes quite a bit of coordination in order to get the job done right and on time. Even at the smallest shop there is usually more than one person involved and at the larger units like an AMS, separate teams from different areas of expertise (maintenance, refinishing, avionics, etc.) must coordinate efforts to be able to deliver the aircraft with the shortest possible downtime and at the highest level of quality.

We can apply the 80/20 rule here as well in that the first 80 percent of teamwork comes pretty easy and if left alone results in a mediocre team. All you need to do is tell everyone who is on the team that they are on the team, what the objective is, and the job will likely get done, one way or another. It's the last 20 percent of teamwork that is difficult to achieve. And it's the organizations that figure out how to capture at least part of that last 20 percent that enjoy great teamwork and set the standard for time, quality, and cost for the rest of the market.

So how can you begin to make your team work better together? Well I believe that great teamwork has to be incorporated from the top down. A great leadership team will produce great teams within the organization. Conversely, it is very difficult to create great teams within the organization when organization leadership doesn't work well together. Following are five steps for improving teams at all levels.

Step 1. Build trust — be honest with yourself

First of all, each of us has our own strengths and very few of us are good at everything. To really see your strengths you have to first realize that the picture is bigger than what you might be able to see for yourself. In knowing that, it's easier to openly speak about what you are good at and most importantly what you are not so good at. This can be tough, even for the top management of a organization. We have to be honest with ourselves. Some may get into a position within a organization and feel that they were lucky to get the position and that they really aren't as good as their boss thought when they were promoted. Know this; we are much more critical of ourselves than others are and your boss very likely knows your weaknesses and promoted you because of your strengths. What happens when you begin to recognize your weaknesses with the team in mind? You start to look for others who are stronger in the areas that you are weak and can fill those voids. Opening up and becoming vulnerable with the team builds trust, and without trust great teamwork is impossible.

Step 2. Embrace conflict — engage in constructive disagreements

Every project has its plan and very seldom does the plan remain the same. Open communication about progress and changes in plans will keep everyone pulling on the same end of the rope. Collaboration about changes in the plan ensures that the most effective change will take place. Often times a team will not discuss an issue that has come up out of fear of conflict. Sometimes one particular person on the team is dominant and everyone else wants to avoid any conflict with that person. Let that person know as a team that everyone should contribute in their strength area. Avoid snide remarks and digs at each other. That sort of talk just cuts away at trust between team members.

Step 3. Set up the scoreboard — clear and defined measures

When the objective of the team is ambiguous the team will lack commitment. It is tough to be committed to something that you don't understand. The most common problem is a goal that is short and sweet. It's sort of like setting up a scoreboard. When you know where the scoreboard is you can look at it any time to see how you are doing. But without a scoreboard it is difficult to stay motivated. The team has to ask "How will we know we are succeeding?" and establish five or six measures to evaluate against and measure success. Simplicity is the key. We need to be able to look at the scoreboard and get back to work quickly and maintain the momentum. These are called critical success factors…

Step 4. Maintain accountability — high standards

Anything worth achieving, no matter the plan, will have many challenges along the road. Each team member has his or her role on the team and should know what is needed to be done to help meet the objective. When the objective is not being met either because one individual is not able to get their part done or the team as a whole is not meeting the mark, don't let the bar be lowered. Maintain a high standard and work together as a team to overcome the current challenge. This is where the open communication discussed in step two remains so important. Hold each other and the team accountable to meet the objective and work together to help a team member who needs it. Remember the goal is a team goal and the team needs to work together to attain it.

Step 5. Measure results honestly — team ego

In addition to recognizing what is not going right and maintaining accountability within the team, selfless recognition of another person's success within the team goes a long way toward maintaining momentum. Each one of us has an ego and some more than others. Recognition of each other's success reduces the other person's need for self-glorification driven by their ego. What it takes is a focus that is unnatural for many of us. We have to focus on what others are doing well and trust that others will focus on what we are doing well and be honest. And we have to focus on the team performance and gain more gratification from team success rather than our own.

I'm sure you can see why it is difficult to develop a great team. These steps aren't easy and the differences in personalities will very likely be both the strengths and the weaknesses of your team. The more diversified the personalities, the broader the team's view of the challenge will be and the better the chance for success. On the other hand, the more diversified the personalities the more challenging it is to work together as a team and tackle the issues that will inevitably come up.

From the CO to the shop floor, our air force is full of teams whether we want to admit it or not. I hope that this article has provided some ideas on how to make improvements on the teams that you work on and with. ◆

Article taken from 14 Wing Greenwood newsletter. Original author unknown.

Photo: Sergeant Gerry Antle, Wing Chief Warrant Officer's Assistant, 5 Wing Goose Bay, 2005

EPILOGUE

TYPE: ***Griffon* CH146420**
LOCATION: **Goose Bay, Newfoundland**
DATE: **18 July 2002**

The crew was conducting a Search and Rescue (SAR) mission about 100 nautical miles from Goose Bay when Rescue Coordination Centre Halifax cancelled the mission because the target had been located. The weather was marginal visual flight rules. The crew started the return leg to 5 Wing, when, in normal cruise flight at 200-300 feet above ground level, the tail rotor departed the aircraft. About 400 meters down track, the aircraft crashed into hilly, tree-covered terrain. Both pilots were killed instantly and both the SAR Technician and Flight Engineer were seriously injured. Despite his injuries, the Flight Engineer was able to render first aid to his crewmates. He used a satellite phone to report the accident to RCC Halifax. A 444 Squadron rescue helicopter arrived on scene to evacuate the survivors to medical facilities within 3 hours. The aircraft was destroyed.

The investigation revealed that while in cruise flight, the tail rotor of CH146420 failed due to a fatigue crack initiating from a small damage site on the skin of the rotor blade about 18.5 inches from the tip of one blade. That section of one blade then flew off; the resulting imbalance of this dynamic component caused the tail rotor input shaft to fail instantly and the entire tail rotor to depart the aircraft. The change to the aircraft's centre of gravity with loss of mass of the tail rotor created a nearly instantaneous and extreme out of normal flight condition which was compounded by the low altitude, terrain, and weather conditions.

Contributing factors included tail rotor inspection (frequency and criteria), and aircrew autorotation training.

A total of 39 safety recommendations resulted from this accident. These recommendations are aimed at DND, Transport Canada, the United States Federal Aviation Administration, and Bell Helicopter. ◆

FROM THE INVESTIGATOR

TYPE: ***Cormorant*** **CH149908**
LOCATION: **Bonavista Bay, Newfoundland and Labrador**
DATE: **20 September 2004**

The occurrence crew was tasked to conduct an operational rescue mission for six crewmembers of the motor vessel "Ryan's Commander" that had declared an emergency and were abandoning ship. Once at the scene, the life raft was quickly spotted and the crew proceeded immediately with the hoisting of the survivors. During the ensuing water / raft hoisting operation, the inboard hoist failed with the Search and Rescue (SAR) technician team leader (STL) in the life raft. The hoist was successfully reset and the STL was recovered with a minor injury.

The crew then switched to the outboard hoist and the second SAR technician, the SAR team member (STM), was lowered to the raft. The crew successfully extracted one victim who was hoisted back and secured inside the aircraft. The STM then proceeded back to the raft for the extraction of the other victims. Once in the water, the second hoist failed. The hoist operator proceeded to reset the hoist switch using the Crew Hoist Control Box and lost visual contact with the STM in the water. At the same time the pilot moved the aircraft forward, fearing that the tail might collide with a nearby cliff.

Concerned about the safety of the ST, the hoist operator then called for a "Cable Cut", a standard procedure in case of loss of visual contact with the STM. The inboard hoist cable was first cut inadvertently. The outboard hoist cable was cut shortly thereafter leaving the STM in the water. The STM was recovered using a wire mesh basket attached to the helicopter by a rope. He was lifted from the water and slung to the top of a nearby cliff where the helicopter rescue operation was terminated. In addition, to the minor injuries to the SAR Techs, two of the six crewmembers of "Ryan's Commander" lost their lives. The aircraft sustained "D" category damage.

The investigation is focusing on the design and operation of the hoists, as well hoisting and cable-cut procedures. ◆

FROM THE INVESTIGATOR

TYPE: ***Hornet* CF188745**
LOCATION: **Bagotville Area**
DATE: **16 August 2005**

The accident aircraft was the number two aircraft of a two-plane Basic Fighter Manoeuvres (BFM) mission. The mission took place in the Saguenay Training area approximately 60 nm to the north-east of 3 Wing Bagotville. The accident aircraft was conducting its first engagement, a 6000 ft defensive set-up. Following the initial defensive break turn, the accident aircraft executed a more aggressive defensive manoeuvre, and shortly thereafter departed controlled flight and entered a flat spin at about 13000ft MSL. The pilot was unable to regain control of the aircraft and subsequently ejected from the aircraft as it descended through approximately 7,500ft. The pilot suffered minor injuries and was extracted from the site by a CH-146 helicopter approximately 40 minutes after the ejection and transported to medical facilities in Bagotville.

On 19 Aug DFS released a Flight Safety Flash relating to this accident. This message stated that lateral asymmetry was suspected as a contributing factor in the departure from controlled flight as well as the sustained nature of the spin. It stated that CF-18 pilots are reminded to pay particular attention to aircraft configurations and fuel imbalance scenarios that may create significant lateral asymmetries and appropriate manoeuvring limits closely adhered to. Also of importance is the awareness of aircraft stores asymmetries, which must be added to the effect of fuel imbalances. It stated further that the CF-18 is extremely susceptible to departure or auto-rotative spins in the direction of the light wing with approximately 10 000 ft-lbs or more lateral asymmetry above 30 AOA. ◆

FROM THE INVESTIGATOR

TYPE: ***Griffon* CH146457**
LOCATION: **Edmonton, Alberta**
DATE: **25 August 2005**

The co-pilot carried out the engine start and post-start sequences from the right seat with the flight engineer while the pilot entered Computer Display Unit (CDU) data. Engine number one was started first with no incident noted. Engine number two was started normally. Only a slightly low N1 engine RPM was noted (59 % vs 61 % plus or minus 1%). The required Engine Fuel Control check was carried out in accordance with standard procedure. Throttle was advanced slowly and immediately a rumbling/grumbling noise was heard and number two engine Inter Turbine Temperature (ITT) was observed rising rapidly. Number two engine was immediately shut down using hot start procedure to assist in cool down and the aircraft shut down was completed without further incident.

The aircraft Health Usage Monitoring System (HUMS) indicated that a maximum ITT value of 1063.66 degrees Celsius was reached on the number two engine ITT for a duration of four seconds during the Engine Fuel Control check procedure. This value requires that a Power section Over temperature Inspection or Light Overhaul be carried out.

The co-pilot reported throttle stiffness as she increased throttle following changeover from automatic fuel control to manual fuel control.

A visual inspection of the airframe and affected power plant revealed that no obvious indications of defect or over temperature were immediately noted. The occurrence is currently assigned as a C category pending final assessment of engine damage.

The investigation is focussing on throttle rigging, engine and engine components condition. ◆

For Professionalism

For Commendable Performance in Flight Safety

SERGEANT DENIS PLOURDE

On the 17th of November 2004, while performing a routine pre-flight inspection for a second flight of the day on a CH-146 *Griffon* helicopter, Sergeant Plourde was inspecting the rotor head. While checking an area not required by the inspection, he brushed his hand across a bolt that moved. Upon further inspection, all eight of the collective sleeve hub drive plate bolts were found to be loose. This would not have been noticed using visual inspection as the nuts are located below the plate and are not visible from the top of the helicopter. Had this problem not been corrected the possibility of loosing pitch link control and loss of the aircraft and crew were probable.

Sergeant Plourde is recognized as a member who routinely goes above and beyond. This find is the exclamation mark on his professional, thorough, and safety conscious work. With his attention to detail, this member has prevented a possible catastrophic accident.

Thank you Sergeant Plourde for your outstanding dedication to your job. ◆

Sergeant Plourde serves with 444 Combat Support Squadron, 5 Wing Goose Bay.

MASTER CORPORAL JASON AL-MOLKY

In October of 2004 while deployed on Exercise Open Road, Master Corporal Al-Molky, a Flight Engineer with 427 Squadron was preparing a Griffon Helicopter for flight. After verifying the Aircraft Record Set, Master Corporal Al-Molky identified the requirement to complete a Tail Rotor Inspection upon completion of that day's missions.

Master Corporal Al-Molky elected to carry out the Tail Rotor Inspection in advance, thereby avoiding the necessity of doing so in the dark while deployed in the field. Upon preparing the blade, Master Corporal Al-Molky noticed an area that required additional cleaning in order to carry out a thorough inspection. While doing so, Master Corporal Al-Molky detected an unusual sound, thus requiring further examination, which revealed signs of delamination. Master Corporal Al-Molky then sought out an Aircraft Structures Technician to verify the unserviceability. Further inspection revealed the tail rotor to be unserviceable, therefore removing the aircraft from that night's missions.

Master Corporal Al-Molky's professionalism, attention to detail and immediate actions prevented the possibility of a serious incident from occurring. Without the timely initiative of Master Corporal Al-Molky's inspection, the tail rotor delamination may have gone undetected therefore rendering the tail rotor susceptible to failure, jeopardizing both crews and aircraft. ◆

Master Corporal Al-Molky serves with 403 Helicopter Operational Training Squadron, Canadian Forces Base Gagetown.

CORPORAL PAUL GENDRE

During the repair of any fuel cell, entering and working in the dark confines of a fuel cell is a difficult job at best. Not only do you have to overcome the confined spaces, but also the entry in itself is dangerous work. The technicians must train for most eventualities, which includes unconscious extraction.

On Tuesday 10th of May 2005, during the fuel cell repair of CP140101, Corporal Paul Gendre was in fuel tank #2 to repair the Up Lock for the left main landing gear. While positioning himself, he was also conducting a cursory inspection of the entire tank. In a dark and remote part of the fuel tank, he noticed 16 Hi Lock fasteners were missing their locking collars and the sealant had been removed from the surrounding area. He proceeded to report the defect and proper actions were taken to fix the problem.

Working under very hazardous conditions, Corporal Gendre discovered, investigated and reported a serious maintenance deficiency on a CP-140 fuel tank. Due to his keen insight, diligence and technical prowess, Corporal Gendre averted what may have been a serious impact on the airworthiness of this aircraft. The professional conduct displayed by Corporal Gendre is of the highest order and is to be commended for his Airmanship. ◆

Corporal Gendre serves with 14 Air Maintenance Squadron, 14 Wing Greenwood.

MASTER CORPORAL TERENCE SHANKS

On the 26 October 2004, while performing an annual inspection on a CH 146 Griffon, Master Corporal Shanks was tasked to remove, inspect and install a new Hub & Sleeve assembly on the main rotor drive system. During the pre-installation inspection of an overhauled assembly, he noticed that something about it did not appear to be correct. He initiated a more detailed inspection of the assembly, confirmed his findings with available technical publications and determined that both swash-plate links were adjusted beyond allowable tolerances.

Master Corporal Shanks informed his immediate supervisor, who confirmed his findings. He then proceeded to remove the swash-plate links in order to rectify the fault. During the replacement of the swash-plate links he discovered that the corrosion preventative compound applied to the mounting bolts was not the proper type. Master Corporal Shanks then initiated a complete inspection of the remaining bolts on the Hub & Sleeve assembly for compliance to published installation procedures. The inspection revealed that all of the bolts on the Hub & Sleeve were treated with the incorrect type of corrosion preventative compound.

Master Corporal Shanks demonstrated outstanding professionalism and technical skill in discovering a potentially serious condition with an overhauled component. As a Flight Engineer he is not routinely exposed to such complex maintenance tasks. As such, his findings further exemplify the extremely high level of technical skills demonstrated in approaching and correcting this condition. His superb attention to detail and dedication is to be commended. His expertise ensured that a thorough inspection was carried out on the swash plate assembly to ensure compliance with technical orders. If this condition had gone unnoticed, it surely would have resulted in the premature wear of bearings on this critical flight control and possibly a serious flight safety incident.

Master Corporal Terence Shanks' professionalism, dedication and superb technical skill are indicative of a top-notch performer. His keen technical aptitudes have likely prevented a potential flight safety incident. ◆

Master Corporal Shanks serves with 444 Combat Support Squadron, 5 Wing Goose Bay.

For Professionalism

For Commendable Performance in Flight Safety

CORPORAL SERGE ALARIE

Corporal Alarie is an avionics technician employed in second-line maintenance (troubleshooting) for 430 Tactical Helicopter Squadron (Tac Hel Sqn).

During a standard maintenance inspection that included the inspection of the main gear shaft on aircraft 146435, Corporal Alarie discovered that the bolts connecting the transmission torque shaft connector to the engine reduction gearbox (RGB) connector, did not correspond to the bolts specified in the Canadian Forces Technical Order (CFTO). To accurately determine the nature of the problem, Corporal Alarie stopped all work and immediately notified his supervisor of the situation. After an extensive search, it was determined that the bolts that were on the connector at the time were bolts that are normally used for the drive shaft boot. These bolts are of a lower lateral force resistance level than the prescribed standard. In response to this incident, a review of the CFTOs was carried out and several changes will be made to better reflect the importance of installing the proper bolts. Corporal Alarie's discovery lead to a serious flight safety report and, without his initiative and innate professionalism, the installed bolts could have broken resulting in the disastrous consequences that such an event could have. ◆

Corporal Alarie serves with 430 Tactical Helicopter Squadron, Canadian Forces Base Valcartier.

CORPORAL DON RODGER

Corporal Rodger, an AVS Technician, was tasked to carry out an all trades "A Check" inspection on the Squadron standby *Buffalo* aircraft 115462.

During the course of his inspection, Corporal Rodger discovered a black line on the elbow of the R/H engine start valve. The location of this elbow makes it very difficult to inspect and is not part of the inspection instructions. On further investigation, it was discovered that the elbow had a large crack that continued around three quarters of the circumference of the elbow. Corporal Rodger's inquisitive nature led him to carry out an in-depth investigation of the R/H engine. During the course of this investigation he also discovered the shield for the Hot Air Valve was broken and wedged between two oil lines that could have worn through causing a significant oil leak.

Corporal Rodger's keen eye and attention to detail while inspecting components not called for in the "A check" averted a potential engine start malfunction during a SAR launch. In addition, if he had no put in the extra investigative effort the broken shield would have gone undetected, perhaps resulting in an in-flight fire. ◆

Corporal Rodger serves with 442 Training and Rescue Squadron, 19 Wing Comox.