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Flight Comment

IN THIS ISSUE:

- *Metal Fatigue — It's Got a Bad Name*
- *Predators on Patrol*
- *Communications During Aircraft Ground Deicing Operations*

Canada 

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Cover Page:

Pilot pre-flight walkaround at 15 Moose Jaw

Photo: Sergeant Charles Senecal, Wing Chief Warrant Officer's Assistant, 15 Wing Moose Jaw, 2004



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Division Flight Safety Officer's Views on

Flight Safety



Since my arrival at the Air Division last summer I have been struck by several comments that I've heard in various meetings, conferences and during surveys. The message has been that we have lost the depth of our experience across the Air Force. We no longer have the luxury of having five or eight experienced personnel at our units. We now have one or, if we're lucky two, experienced personnel. These experienced "old guys" not only have to do the bull work, they also tend to be the standards or training personnel, the Squadron "super tech" or the "go to" person. On top of this, I have come to realise that now I'm the experience, I (and my generation) are the old guys.

So now we are the teachers, we are the ones who have to mentor the new kids. But because there are fewer of us, the reality of today's situation is that we must do it better than our predecessors did because we don't have as much time to do it as they did. Additionally, we must ensure that we resist the temptation to pressure them to upgrade too quickly; they must not only be competent, they must also be confident

before they are asked to do the job on their own. What we must aim for is quality and not just quantity (or getting the training done quickly), because we don't have the resources to accept anything less.

This imperative then highlights that we must be better in communicating our skills and knowledge than our predecessors were. We must be receptive to the questions/needs of the junior aircrew/technicians, as they have to speak up if they are going to learn the job at the rate we are demanding of them. One of the tools we have to help us do this is the Human Performance in Military Aviation (HPMA) program. I have heard several people comment that a lot of what is on the HPMA course is "old hat" to the experienced person. What the experienced personnel must understand is that the training is meant to educate them not so much in what **they** should say, but what the inexperienced person **will be saying to them**. This is the key to HPMA in my mind, making those with less experience an integral part of the decision making process. HPMA provides a tool by which an inexperienced person can ask a

question (and know that they should ask it without fear of retribution) to increase their understanding of what is going on or, more importantly, prevent someone from making an error of technique, procedure or standards

because they are under pressure (either perceived or actual). HPMA is something new to our younger personnel and it provides them a means to enable themselves to learn things faster than we did, because they have to.

The Commander of the Air Division has made it clear to me that his main pillar during his command is safe and effective mission accomplishment. This means that not only must we be able to do our mission today; we must be able to do it again tomorrow.

I urge you all to embrace that which your experience has taught you and use the tools we have been given and take any and every opportunity to mentor our junior personnel. Our legacy is to leave behind us people who have the best chance to succeed that we can give them. Only then can we hope to assure that we've given those that will follow us the best possible chance for them to become the "old guys" ♦

*Lieutenant Colonel Pete Young,
1 Canadian Air Division Flight
Safety Officer.*

Good Show

For Excellence in Flight Safety

Warrant Officer Gordon Woods & Sergeant Douglas Hall

On departure from Zagreb, 15 September 2004, the right hand (RH) main landing gear (MLG) on *Hercules* aircraft 130343 failed to retract. Later inspection showed that the forward RH MLG had failed to retract but the aft RH MLG did. This resulted in damage to the emergency brake hydraulic lines and the landing gear itself. It took the crew over two hours while holding over Zagreb to get the landing gear secured down.

During this emergency, Flight Engineers (FEs), Warrant Officer Woods and Sergeant Hall executed multiple checklists efficiently and effectively. Their professionalism and experience was displayed when they were faced with an emergency scenario that was not directly covered in any checklist. When the forward RH MLG failed to retract, the crew selected the gear lever down, and the cockpit indications showed three down and locked. Although the gear appeared to be down and locked after the normal extension, the FEs carried out a visual inspection of the landing gear, even though it meant moving cargo around in the back. The inspection revealed the problem with the RH MLG — it wasn't down after all.

As each checklist failed to deliver the desired results, they proceeded to the next. When they reached the last checklist they ran into another obstacle. When all other checklists fail to get the gear down, the final checklist calls for the landing gear torque tubes to be removed using the quick disconnects. However, the rear torque tube was so compressed that the quick disconnects would not function. Displaying their resourcefulness and systems knowledge, they wrapped a tie-down strap around the torque shaft. One FE applied tension to the strap while the other pried at the quick disconnects.



Front left, Warrant Officer Woods; front right, Sergeant Keachie. Back left, Master Warrant Officer Poitras; back right, Sergeant Hall.

Their technique worked, enabling them to carry on with the rest of the checklist and ratchet the gear down.

WO Woods and Sgt Hall persevered, using their professional knowledge, abilities and ingenuity to get the landing gear down. Their actions undoubtedly saved the aircraft from extensive damage if not destruction and correspondingly ensured the safety of those onboard.

Warrant Officer Woods and Sergeant Hall serve with 426 Training Squadron, 8 Wing Trenton. ♦



From the Flight Surgeon

FATIGUE: WHAT YOU DON'T KNOW CAN HURT YOU!

This article is printed with the permission of Air Scoop Magazine. The article appeared in the Spring 2004 Issue of Air Scoop.

This article pertains to the military flying operations of the United States. Any questions about specific regulations, medications, etc should be directed to the appropriate Canadian Forces sources.

Everyone knows fatigue degrades alertness and performance — reaction times slow, attention spans shorten, and judgment deteriorates. Everyone knows the primary sources of fatigue — inadequate sleep (e.g. less than 7 hours a day), extended wakefulness (e.g. long duty days, sustained operations), and changing schedules. But not everyone knows that humans typically underestimate their own fatigue level and its effects on individual and team performance.

Two recent mishaps illustrate this point. The first occurred when a F-16 collided with AGE and a parked F-16 while taxiing in the combat AOR. The aircraft suffered a B-system hydraulic failure and lost nose-wheel steering. After recognizing the hydraulic failure, the pilot did not set the parking brake and instead continued taxiing, actuating the brakes several times. This action bled off pressure from the brake/jet fuel starter accumulators, eventually resulting in non-functional brakes. A maintenance troop egressed the parked F-16 immediately prior to collision and

sustained only minor injuries. The collision caused AIM-9 rocket motor fuel to ignite and damaged an AIM-120. Many factors contributed to this mishap, but specific to this discussion, the safety investigation board (SIB) found “mental fatigue caused by sleep issues, dehydration, and hunger slowed response time, decreased performance and led to distraction.”

The second mishap also involved a Viper supporting OIF — a F-16 engine flameout due to fuel starvation. System design was a primary cause in this mishap (the F-16 has a known susceptibility to trapped fuel in the external tanks), but following a second aerial refueling, the pilot made a switch error that disabled low fuel warnings. Later in the mission, the pilot failed to conduct an in-flight operational check IAW the “Dash One” that would have caught this error. When the pilot finally recognized the low fuel state, he attempted another refueling, but the engine flamed out due to fuel starvation. The pilot ejected and was recovered by CSAR forces. The SIB determined the pilot failed to recognize his trapped fuel condition due to,

among other human factors, chronic mental fatigue. In the SIB’s words “Inadequate quarters, the recent change in circadian rhythm, as well as the contingency operations tempo contributed to inadequate pilot rest.”

While these two examples are from the F-16 community, everyone knows fatigue can impact all facets of the USAFE mission. Let’s look at some basic tenets to help define that impact:

Edicts of Endurance

Rule #1: *Fatigue affects performance like alcohol.* Go without sleep for 17 hours and your performance will mirror someone with a 0.05 blood alcohol content (BAC). Stay awake for 24 hours and you can expect to perform at a level similar to a 0.10 BAC.

Rule #2: *You can go from “wide awake” to “fast asleep” in 10 seconds or less* — often without realizing you fell asleep. Sleep will win eventually, often at the worst possible moment. Most of us have “There I Was” stories (“...that’s what rumble strips are for!”).

Rule #3: *The only cure for fatigue is sleep.* Which brings us to the crux of the issue — there’s no substitute for a good night’s (or day’s) rest.

Real-world demands will continue to outpace our resources. The words that follow are an attempt to better equip you to 1) recognize when it’s time to “say when”, and 2) enhance personal strategies to mitigate the effects of fatigue.

Signs Of The Times

Since we’re lousy judges of our own fatigue levels, we must actively look for and recognize the objective indicators of fatigue in ourselves and other team members. Keep your eyes open for:

- **Impaired Judgment** — Fatigue often results in loss of sound judgment! If you begin to notice faulty judgment and stupid mistakes popping up more than once, fatigue may be a player.

- **Delayed Decisions** — Are decisions delayed and reactions slow? Fatigue greatly impacts cognitive and decision-making abilities. Unnecessary delays in this arena may reflect fatigue.

- **Loss of Short Term Memory and Recall** — Fatigue impacts short-term memory more than long-term memory. Are you forgetting mission briefed items or having difficulty recalling items?

- **Accepting Shortcuts & Taking Chances** — Accepting short cuts or deviations versus following accepted procedures can be a clear warning sign of fatigue's effects.

- **"Wandering" or disconnected thoughts** — Difficulty in staying focused is a classic warning sign.

- **Irritability or impatience** — If you're "short" with others, don't have (or want) the patience to wait on something, and/or are not willing to listen to inputs, fatigue is probably a factor.

- **Micro sleep and/or drowsiness** — No matter how disciplined you are, micro sleep can overtake you. If you consistently have trouble staying awake during monotonous

situations (See "How Tired Are You...Really?"), it's time to take appropriate action.

Define "Appropriate Action"

See rule #3: "The only cure for fatigue is sleep." Everyone knows adults need 7 to 8 hours of sleep each day. But adhering to this rule can be a challenge — at home station due to shifting mission requirements, additional duties, and personal choices (e.g. actually spending time with your family or friends); at deployed locations due to environmental conditions, contingency operations, and personal choices (e.g. adventures during Red Flag). So like many things, appropriate action depends on the situation:

Sleep Strategies 101

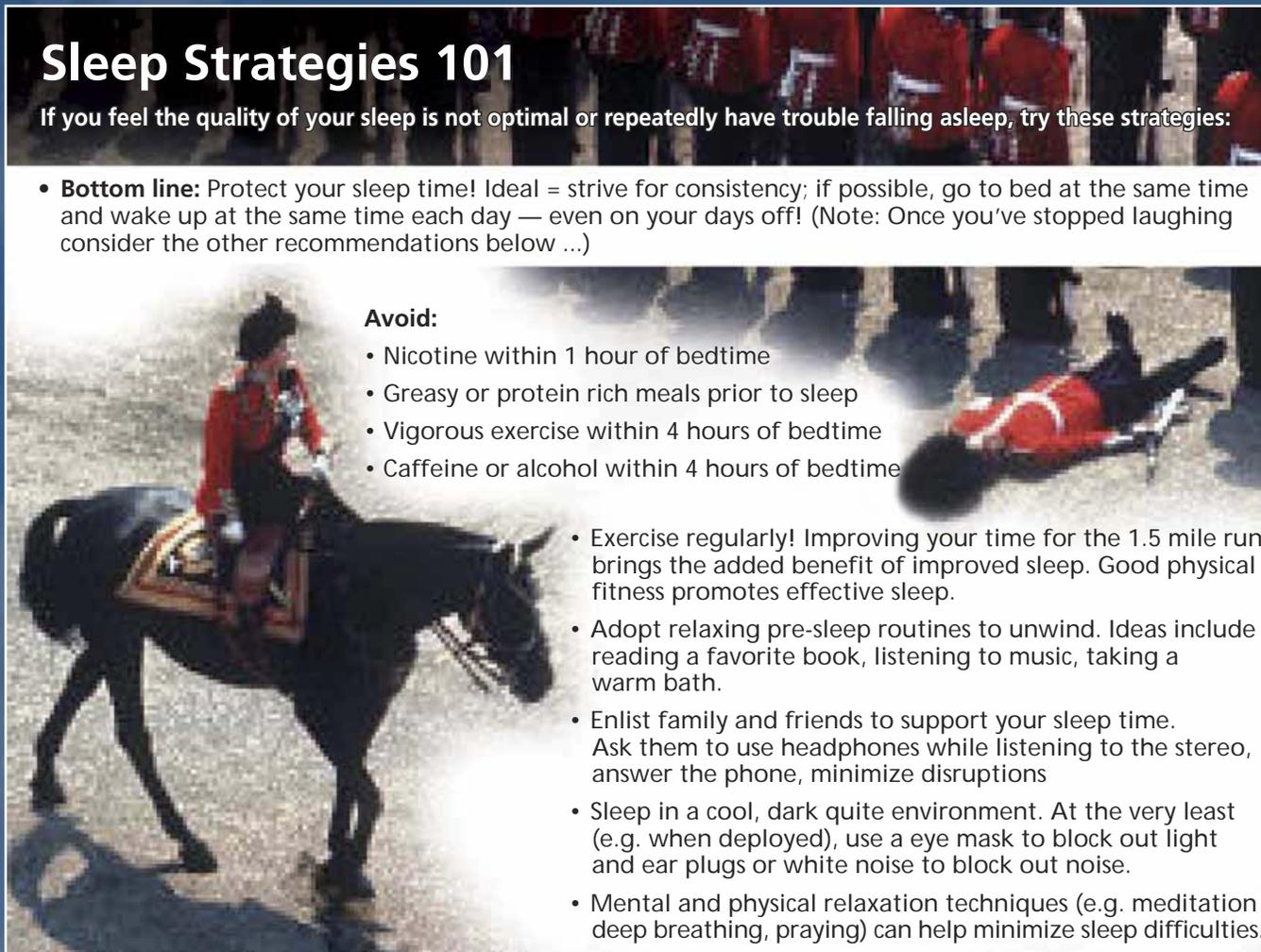
If you feel the quality of your sleep is not optimal or repeatedly have trouble falling asleep, try these strategies:

- **Bottom line:** Protect your sleep time! Ideal = strive for consistency; if possible, go to bed at the same time and wake up at the same time each day — even on your days off! (Note: Once you've stopped laughing consider the other recommendations below ...)

Avoid:

- Nicotine within 1 hour of bedtime
- Greasy or protein rich meals prior to sleep
- Vigorous exercise within 4 hours of bedtime
- Caffeine or alcohol within 4 hours of bedtime

- Exercise regularly! Improving your time for the 1.5 mile run brings the added benefit of improved sleep. Good physical fitness promotes effective sleep.
- Adopt relaxing pre-sleep routines to unwind. Ideas include reading a favorite book, listening to music, taking a warm bath.
- Enlist family and friends to support your sleep time. Ask them to use headphones while listening to the stereo, answer the phone, minimize disruptions
- Sleep in a cool, dark quite environment. At the very least (e.g. when deployed), use a eye mask to block out light and ear plugs or white noise to block out noise.
- Mental and physical relaxation techniques (e.g. meditation deep breathing, praying) can help minimize sleep difficulties.



• **Home station**

- Make sleep a priority! Strive for 7 to 8 hours of sleep each day. Schedules and responsibilities may play havoc with this ideal, but constantly work toward this goal to minimize sleep debt and degraded performance (See "Sleep Restriction vs. Performance").
- Optimize your sleep habits and environment (See "Sleep Strategies 101").
- If you fall below your "recommended daily allowance" of sleep, consider catching a combat nap. Sleeping 30 to 40 minutes provides a boost and minimizes sleep inertia after waking up. Avoid long naps (> 2 hours) within 5 hours of your projected bedtime.

• **Deployed location**

- Actively manage duty schedules and shift rotations to minimize problems with established circadian rhythms. When shifting schedules, try to move forward on the clock (e.g. progressively later show times).
- Segregate quarters according to schedules — night crews in one area, day crews in another.
- Optimize sleeping quarters — a dark, quiet, temperature-controlled room is best. Sleep masks and earplugs can improve conditions if luxury accommodations are unavailable.
- Strive for a consistent timing of sleep periods and meal times within a particular shift.
- Strategic naps may be even more important now. Some basic guidelines: Nap during natural circadian "low points" (e.g. 1400 to 1600 and

0200 to 0500); grab as much shut-eye as possible, (especially prior to night missions); and allow 15 to 20 minutes for the brain to re-engage after waking up.

- Approved "No-Go" medications (Ambien, Sonata, Restoril) are an option for certain situations. Check with your local flight doc for details. Do not use non-approved sleep aids (e.g. melatonin, over-the-counter medications) — there are potential side effects that don't mix well with flying!

don't keep it a secret. Tell other flight/crew members so they help.

- **Manage the situation:** Transfer some tasks to a more alert flight/crew member. Consider changing parameters to increase safety margin (e.g. kick a wingman out to route or tactical for some breathing room). Eliminate high workload events if the mission allows.
- **Use caffeine wisely.** This central nervous system stimulant takes 15–30 minutes to work its magic, so plan your consumption. Target times when you know you'll have problems with drowsiness. You may not know the effectiveness of caffeine is reduced when 1) you chronically abuse this agent (e.g. 24/7 coffee drinker) or 2) smoke tobacco products. Plan accordingly.
 - Note: Nattick Labs recently developed caffeinated products for the U-2 program (the infamous

What Else You Got?

You've done everything in your power to enhance your sleep prior to beginning the duty day, but you don't control your work schedule. Employ the following strategies to manage fatigue on the job:

- **Admit you have a problem.** If you recognize the effects of fatigue in yourself or others,

How Tired Are You...Really?

How much sleep debt do you have? The simplest way to find out is to evaluate your daytime sleepiness. For a rough idea, use the questionnaire below (derived from the Epworth Sleepiness Scale).

How likely are you to doze off or fall asleep in the following situations? Score yourself using the scale on the right:

Situation	Chance of Dozing
Sitting & reading	
Watching TV	
Sitting inactive in a public place (e.g. theater or meeting)	
As a passenger in a car for an hour without a break	
Lying down to rest in the afternoon (if possible)	
Sitting and talking to someone	
Sitting quietly after a lunch without alcohol	
In car, while stopped for a few minutes in traffic	
TOTAL SCORE	

0 = No chance of dozing
1 = Slight chance of dozing
2 = Moderate chance of dozing
3 = High chance of dozing

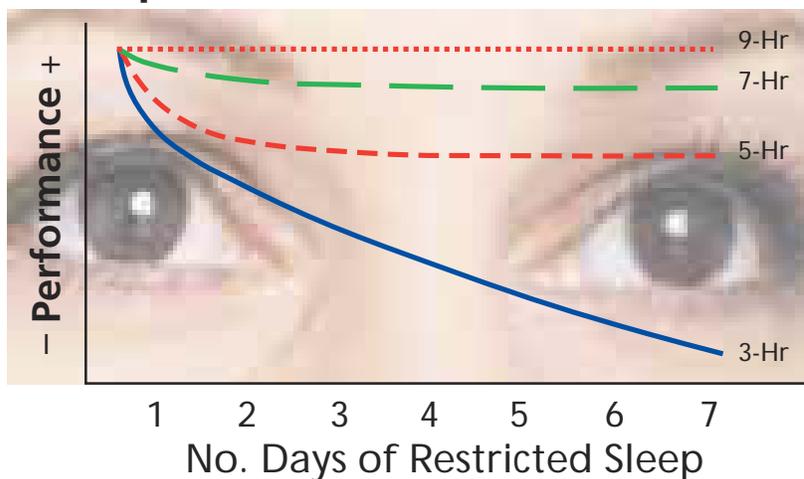
Evaluate your TOTAL SCORE:

0–5	Slight or no sleep debt
6–10	Moderate sleep debt
11–20	Heavy sleep debt
21–25	Extreme sleep debt

Many people seem to “get by” with 6 hours of sleep. Others claim to need 9 hours of sleep to perform effectively. How do you know if you’re getting enough sleep? The best indicator is sleep latency (how long it takes you to fall asleep if given the chance). Sleep experts say “hmmm ...” if you fall asleep (day or night) in 5 minutes or less. Quickly falling asleep indicates a high amount of sleep dept. A well-rested citizen should fall asleep 10–15 minutes after lying down to rest.

For individuals consistently running on 5 or 6 hours of sleep, take note: Recent studies indicate human performance drops off significantly, and then stabilizes at a lower level following mild (7-hour sleep period) and moderate (5-hour sleep period) sleep restriction. Experts caution that 5 hours of sleep per day is the absolute minimum and should not span more than 14 consecutive days ... or rule # 2 may kick in!

Sleep Restriction vs. Performance



Adapted from: "Patterns of performance degradation & restoration during sleep restriction and subsequent recovery: a sleep dose-response study" Belenky et al., J Sleep Res. Vol. 12:1 Mar 2003.

caffeinated chocolate pudding tube food). Pilots from two squadrons, 22 EFS and 81 EFS, successfully used these products during recent deployments as an additional fatigue countermeasure in single-seat aircraft. Contact the author for details.

- **Stretching and/or isometric exercise.** Researchers have spent thousands, perhaps millions, of our tax dollars to confirm that it's fairly difficult to fall asleep while walking around. Occasionally get out of your seat (if possible), take some deep breaths, stretch and move around as much as space permits. If you can't get out of your seat to move around (e.g. strapped into a F-16), try isometric exercises.
- **Engage your brain.** Start controversial discussions with others! Be the life of the party.
- **Drink lots of fluids.** Water is best. It's tough to fall asleep with a full bladder!
- **Keep cool.** A warm and comfortable environment can quickly unmask fatigue.

- **Snack on protein-rich foods.** General rule-of-thumb: Foods high in carbohydrates aid sleep; protein-rich foods enhance alertness. Ideas for "in-flight meals" include beef jerky and protein bars. Stay away from fatty and/or high-sugar foods (the classic Coke and M&M's aircrew meal).
- **"Go" pills.** An option for certain aircrew in certain situations. Use only as directed and only under the supervision of your friendly flight surgeon.
 - Note: USAF/XO recently approved use of modafinil, the next-generation of "Go" pill, by all dual-piloted bomber aircrew and F-15E WSOs. The stimulating effect of Modafinil lasts longer with less interference on subsequent sleep than dexedrine (first-generation "Go" pill). This medication will probably be available to single-seat operations in the near future (after further investigation). Stay tuned for updates and additional details.

Life In The Real World

Fatigue will remain a very real threat to effective operations. Everyone knows there's no single solution to this problem. Now you also know:

- we're poor judges of our own fatigue levels — look for the objective indicators, and
- some personal strategies to manage fatigue — adapt them to your world for optimum performance. You have to know the mission can't happen without you. ♦

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3. Fatigue Factors for Aviators...And Everybody Else, Flying Safety, Oct 2002.
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THE SPLIT

Now You See It, Now You Don't

Emergency response procedures for a failed automatic fuel control governor are common practice for crews of the twin turbine engine CH-146 *Griffon*. The procedure calls for the symptomatic engine's throttle to be reduced to idle at which point the pilots have the option of switching the failed governor into manual mode. Once that option is exercised — which is normally the case in practicing this emergency — it becomes a balancing act to manage the two engines; “hand-raulically” balancing the fuel control of the engine with the malfunction against the automatically governed second engine. The danger is that without careful manipulation of the manual throttle that engine could be caused to exceed the automatic governing range of the other engine and simultaneously cause an overspeed of both manually controlled engine and main rotor. To keep the engine and main rotor RPM within a safe and manageable range the solution is to target to keep the manually controlled engine at about five percent lower torque than the automatically governed engine.

The *Griffon's* co-axial engine torque needles need to be carefully monitored to ensure that the engines stay on condition with each power change (the manually controlled engine about 5% below the automatic; commonly referred to as

“the split”). In the blink of an eye the two torque needles can overlap or even swap positions if there isn't a throttle reduction with every reduction in power to the main rotor.



A collage of Griffon torque gauges showing “the split” — not exactly representative of flight conditions but you get the idea.

The “split” swapped on me while commencing final approach in a *Griffon* last fall — and I missed it. A victim of focused attention, I had control of the number one throttle in manual mode and in addition to visually flying the approach, was keeping a close eye on the split. As I reduced power to commence the approach I noticed the split began to widen. I had just reminded

myself that I needed to reduce throttle with every reduction in power, but unconsciously I began to increase throttle to close the gap between needles. Okay, my senses began to reel. The power reduction to commence the approach should have caused the split to decrease, not increase. I'm increasing throttle — why was the gap widening? The light went on. Unfortunately it was then that I realized I had been watching the split and not the position of needle one relative to needle two. The split, of course, continued to widen as engine one wound higher and required less torque assistance from number two engine. A costly error — in dollars, maintenance effort and personal pride.

An isolated incident perhaps and one that has been labelled a brain fart but don't get caught focussing on the wrong thing. Make sure there is a conscious connection in the brain between the manual throttle, the hand on that throttle and the specific needle that you expect to see react to your throttle changes. It is not enough to focus on the relative position of the needles — it has to be more specific. My personal fix, once I took control of the throttle in manual mode, was to reconfirm by stating to the crew which throttle I had in manual mode and specifically which needle I was watching on the gauge. ♦

Major Ed Clapp serves as Unit Safety Officer at the Aircraft Engineering Test Establishment at 4 Wing Cold Lake.

Long Day Pressures— WHEN DO YOU STOP?

It was a beautiful spring morning in Trenton when the 17 crewmembers of a *Hercules* long-range trainer were getting ready to meet in the lobby of the hotel at 0700 hours for a proposed take-off time of 0900 hours. The final destination was Nice Cote D'Azur France, via an enroute stop in St. John's for fuel. This was the second day of a 21-day trainer that had left Winnipeg the day prior and was heading eastbound to Pakistan. That particular day had the maximum proposed itinerary time planned out. However, no one really took notice...it was only day 2 of the mission and we were going to be in Nice that night with a stopover of roughly 30 hours. I was a brand new First Officer, having arrived at the squadron just four months earlier, and that day I would be part of the flying crew.

The pre-flight procedures in Trenton revealed that the weather in St. John's was going to be down to minimums at our proposed time of arrival. This indicated a potential problem for our second leg of the day — the one from St. John's to Nice. If we were going to have to overshoot in St. John's and land at our alternate in Gander, this would prolong the transoceanic leg and necessitate more fuel be uploaded in Gander. However, due to the

operational load destined for Split, Croatia that was to be put on the aircraft in Trenton, the total fuel weight that could be uploaded was now limited, not by the size of the *Hercules* fuel tanks, but by its maximum taxi and take-off weight. A second problem arose in Trenton. A last minute cargo load change would actually delay our proposed take-off time by 15 minutes and increase our empty weight a further 10000 pounds. This would further reduce the amount of fuel we could upload at the end of the first leg.

At 0915 that morning, the *Hercules* took off from Trenton enroute to St. John's with enough fuel to perform two approaches in St. John's prior to going to our alternate. Our goal was to land in St. John's and not to proceed to our alternate, but we did not want to do more than two approaches in St. John's in case we were forced to overshoot to Gander anyway. We knew we still had another long leg afterwards.

The first leg was incident free and on arriving at St. John's the weather was down to minimums just as advertised. Due to the weather, we would have to do a right seat pilot monitored approach. Therefore, I shot the two approaches in St. John's from the right seat but we

didn't break out so we had to go to Gander. Although I had about 2000 flying hours at the time, this was the first time I had to overshoot at minimums for real and proceed to the alternate. We landed in Gander, no problems, at 1300 hours (Trenton time), now 1 1/4 hours behind schedule.

The next leg to Nice, which had an initial estimated enroute time of 8 1/2 hours was now going to be an extra 1 1/2 hours. The extra time was a result of departing out of Gander instead of St. John's, and since we were heavier than initially planned, the transoceanic flight would have to be at a lower altitude and thus we would not be able to take advantage of the winds aloft. The pre-flight again revealed, that at our time of arrival in Nice, the weather had the potential of not cooperating. The forecast did not cover our actual arrival time but the overall prog was that there was a low-pressure system over the Mediterranean that could affect Nice. Due to our limited fuel upload capability, the alternate for that leg was now going to be Nante instead of Lynham, England. As a First Officer I calculated a take-off weight of 154 000 lbs, but we actually took off slightly over the maximum allowable peacetime take-off weight.



The take-off was incident free and we were on our way at 1400 hrs (Trenton time).

During the transoceanic flight, the actual winds were not giving us as much of a tail wind component as expected and thus we were not only taking longer but we were also consuming more fuel and slowly consuming our 5 % built in reserve. The airplane was also indicating an airspeed approximately 10 knots below the charted speed but we couldn't figure out why. Every hour I was getting the new actuals and eventually I got a valid forecast for Nice. The weather on arrival was again going to be down to minimums. It was about 1/2 hour after having over flown the equal time point that it was now really apparent that we were going to be below our minimum diversion fuel at destination if nothing changed. But we were now light enough to climb to the long range cruise altitude, take advantage of a better tail wind component and a in turn lower our fuel consumption. We also looked for a closer alternate to lower our minimum diversion fuel, however, we were limited to the airports that were in the Department of Defence plates since we only had the pre-planned Jeppenson approach plates photocopied. The alternate would

also have to agree with alternate weather minimums, NOTAMS, hours of operation, customs, and ramp load rating. We determined the new alternate would be Marseille. Even though it was just a spit away from destination, its forecasted weather was above alternate limits at our time of arrival. The leg, which initially was going to take 10 hours, was now going to be 11 hours. Thus at 10 1/2 hours after take-off, now 17 1/2 hours into the crew day, after having already done two approaches to minimums and two missed approaches in St. John's and all the prerequisite enroute HF monitoring and calls as well as the extra mental fatigue caused by the weather, flight profile change, extra fuel consumption, and alternate airport search, I was going to shoot yet another approach down to minimums but this time at just about minimum fuel at an unfamiliar airport with the alternate just a spit away, at night, in heavy rain.

During the approach, you could just feel that all crewmembers were tense in the cockpit. Other than mandatory calls, there was a dead silence, I felt like I had three other pairs of eyes that were glued on me. In one way it was extra pressure but I also understood that everyone in the cockpit was backing me up.

I surely had everybody's attention. The approach went on for ten minutes but it seemed an eternity. Finally I called "decision height" and I heard from the right seat "I have control" and from the navigator "minimum diversion fuel". I replied, "You have control". I looked up and saw the runway straight ahead but in limited visibility in heavy rain and dark conditions. We landed 18 hours into the crew day and got to the hotel another two hours later.

It had been a very long day with lots of lessons learned. Although the outcome was accident free, the day had produced numerous latent and active failures from violations to decision and knowledge-based errors. Lucky for the crew of that long-range trainer, these errors did not align. With hindsight, it is easy to see that the level of risk taken that day was higher than desirable. A more thorough risk assessment was warranted and as things changed the risk assessment process should have been actively used to help determine the proper courses of action. In this case the implementation of effective risk control measures were not always pre-measured and calculated and thus the outcome involved an element of luck. ♦

Captain Alex Schenk serves with 435 Squadron, 8 Wing Trenton.

When the Aircraft

I have been working on the new *Cormorant* search and rescue helicopter for approximately 2.5 years. As my background on helicopters includes the *Twin Huey*, *Sea King* and the *Labrador*, the *Cormorant* is one of the most technologically advanced helicopters that I have ever worked on. It has all the electronics of a modern aircraft, including an Active Control of Structural Response (ACSR) system that hydraulically absorbs a lot of the main rotor vibrations.

It was a fairly quiet day. The primary standby aircraft had been launched the night before to search for an overdue boater on Lake Ontario. Another aircraft was undergoing a periodic maintenance inspection. And the search backup aircraft was sitting in the hanger not being flown, as it had only a few hours left before a major inspection -i.e. only to be used if required.

The launched aircraft returned mid-afternoon after searching all night. The aircrew mentioned that there was a vibration felt during flight that was most noticeable in the hover. However, since the aircraft was still on 30-minute standby for approximately another hour, the crew, myself included, felt the vibrations were not severe enough to render the aircraft unserviceable.

Besides, the main rotor would be inspected on the daily inspection (DI) when the aircraft came off its 30-minute standby posture. The aircraft was refueled and ready for the next mission.

Before the end of the 30-minute standby, we received a call from the Rescue Coordination Centre (RCC) to launch the *Cormorant* to Hudson Bay as soon as possible. The backup aircraft was considered for this mission but as the transit time to Hudson Bay was quite long, it would have used all of its hours on this single mission. The primary aircraft was then prepared for the mission. As time was a factor, more fuel was added to alleviate the need to fuel on the way. As the aircraft had flown most of the day, the DI was due in a few hours but because the DI takes approximately 1.5 hours to complete, and due to the time constraint, it was decided that the DI would be done once they arrived at destination.

The aircraft left for Hudson Bay and I didn't expect it to return until the next day. A short while later, a call came in from RCC to let us know that the *Cormorant* was coming back early as the search was cancelled. The missing person was found and rescued by a helicopter from the Ministry of Resources.

When the aircraft returned to the Squadron a few hours later, the crew mentioned that the lateral vibrations were a lot worse than before. Once the *Cormorant* was in the hanger, I climbed on top of the aircraft to have a look at the lag dampers, as they are the common cause of this type of vibrations. The lag dampers looked serviceable, therefore I proceeded to investigate other areas that may cause these vibrations. While looking around the main rotor for anything that may have come loose, I noticed that one of the control pitch link bearings was extremely damaged. The bearing was almost out of its race. As this link is directly attached to the main rotor blade it would have only gotten worse with prolonged flight.

Like most flight safety incidents, it is always a combination of events that brings on an occurrence. First, because of the efficiency of the ACSR system, the crew didn't feel the initial vibrations until it was in a later stage of wear. Second, because of the lack of experience by both the aircrew and ground crew on this new helicopter, and not realizing the efficiency of the ACSR system, the minor vibrations were thought of as exactly that — "minor". Third, the urgency to get the aircraft in the air contributed to the delay of the

Speaks

DI, which includes the visual inspection of the main rotor pitch links. Fourth, the added fuel weight contributed to the faster deterioration of the bearing.

For two obvious reasons it was a Godsend that the person in need of rescue was found when he was. One, the individual was spared the harsh conditions of the north and possible

death from exposure to those conditions; and two, the mission was cancelled therefore returning the aircraft and its crew safely home only after a few hours of flight. If the mission had carried on, the extra hours of flying would have caused more wear of the bearing, which would have led to severe vibrations, and the possibility of much more serious consequences.

We were all very lucky that day, as ignoring the aircraft's symptoms could have been disastrous. So remember, when the aircraft speaks to you — “LISTEN” and don't ignore the signs no matter what situation you are in. ♦

Pierre Bellefleur is a Crew Chief at 424 Squadron, 8 Wing Trenton.



Photo: Corporal Dave McVeigh, 14 Air Maintenance Squadron Imaging Section, 14 Wing Greenwood, 2002

Things that make you say

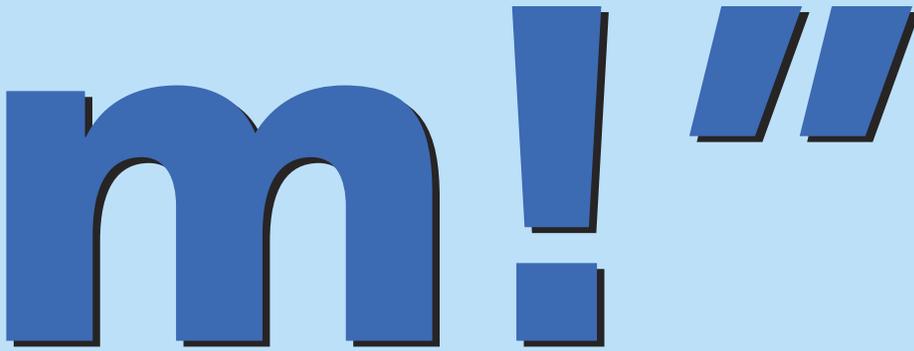
“Hmmm”

Several years ago I was a keen and newly appointed detachment commander who was finally permitted to authorize flights. I was tasked to conduct a static display at the inaugural air show of a small community in southern British

Columbia. I had planned the trip well and we arrived in time for the Friday afternoon welcome festivities. As it was this town's first, the organizers really laid on the activities, the entertainment, and the hospitality. I knew for a fact that my crew and

I had been treated like royalty for the weekend. It was definitely one of those trips that you exaggerate, embellish, or out-right lie about how bad the whole affair was, just in the hopes that you could repeat it the following year!





As we prepared to depart on Monday morning, the idea to take the event organizer for a short familiarization flight was born. I thought it was a great idea, given how well we had been treated, and decided that it warranted further investigation. I recall there being some rule about authorizers being able to grant permission for civilian passengers if the flight was in the interest of the Canadian Forces, but I wasn't certain. Unfortunately our call to Squadron Ops didn't resolve the matter either as senior squadron members weren't available for advice. As it was getting on in the day and our departure time neared, I employed my executive powers of self-authorization and decided that a quick little jaunt couldn't hurt. Just as we were about to depart, one of the crewmembers on the ground received an answer from Ops; oh well it was too late, we were strapped in and in the process of taking off. We departed, did a circuit of the valley, landed, hustled off our now beaming and gracious host, and bid him farewell until the following year. By the way, what was Ops' answer? I can't remember. **Hmmm!**

We were now ready to depart for home; however, I was keen to accomplish some concurrent training. We planned a circuitous medium-level navigation route

through the interior of BC (one that simultaneously enhanced our in-flight enjoyment), briefed, and we took off. Again we were empowered by my newly found self-authorization. Did I check in with Ops? Why should I have? I had no specific return time. And hey, if you don't like the answer, don't ask the question, right? **Hmmm!**

It was a great trip. As we flew through the canyons I amply demonstrated to the crew my knowledge of mountain flying techniques: laminar flows, boundary layers, turbulent flow zones, etc. Did I mention that, while trying to stay within the laminar flow of the canyon wall, I startled myself by flying uncomfortably close to the granite? **Hmmm!**

At any rate, after a great training flight, we checked in with the squadron as we neared home. Why did the Ops Officer want to speak to me on landing? **Hmmm!** As Murphy would have it, my aircraft had been required for an unexpected tasking and I, understandably, was on the receiving end of a bit of a chewing out for taking so long to get home. At the time, I thought it was worth it, considering the fun we had on the trip.

Now, however, after several years, I have often reflected on how my inexperience as an authorizer and my keenness to fly were a poor

match. Was it legal to take the organizer up for a flight? — It may well have been, but was I the appropriate one to do so? What about the navigation trip? — Was it appropriate to utilize a valuable asset without Ops' consent and did my self-authorization carry me for trips not within the scope of my tasking? How about that fancy mountain flying? — How well was the crew working together if I, as the flying pilot, was the only one who noticed how close we came to the canyon wall? You know, the scary thing is that I was flying cross-cockpit and nobody was monitoring my performance!

Finally, just because I was given the responsibility of self-authorization, who is to say that I was trained for it and that I properly recognized the duties and limitations associated with my signature on the CF-773? Does your unit have a program to train newly appointed authorizers with respect to their responsibilities, the scope of their powers, and the implications and consequences of authorization? Do all your squadron authorizers understand implicitly 1 Canadian Air Division Orders, wing orders and unit orders with respect to the powers of authorization? Do your authorizers ask themselves each time before they sign a crew out if that crew is current, competent, and experienced enough? Do they ensure crews know their taskings, their restrictions, and limits? What about weather, tactics, etc? The list can be pretty long.

I'm pretty sure that you can see that just because I was given a responsibility, my actions weren't consistent with carrying out my duties as expected. Were they very professional? **Hmmm!** ♦

Major Paul Dittman is an investigator at the Directorate of Flight Safety in Ottawa.

TIME = MANAGEMENT

It has been many years (1980) since I learned the importance of remaining alert. The lesson came from a then very crusty retired Captain whom had flown the *Argus* in its hay day. The rule is simple: “If you are doing NOTHING, you are doing something WRONG”.

In larger aircraft, and I suspect in smaller ones as well, we are faced with transit time to and from the mission, or perhaps the mission itself is transit. There is a tendency to view these activities as not requiring much effort and as a result we miss the opportunity to expand our knowledge and remain alert to situations in and around the aircraft. Accidents that involve under stimulation are just as likely as the ones that involve task saturation. We have become reliant on magic boxes to tell us exactly where we are and how long to go. The expectation that we will receive alarms or alerts for all the limits and malfunctions that

may occur can lead to complacency. But how many of us really check the data we are presented with; how many of us are confident we could do the math ourselves, and how many of us challenge ourselves to be as accurate as the jet plan?

I use three methods to fight the complacency and to remain alert in the cockpit:

- **First, dead reckoning.** There are a few simple formulas that assist in confirming distance, time, and drift of your aircraft. I use these for both the transit and to do the calculations for the Search and Rescue (SAR) drops that will occur at the end of the transit:
 - Time equals distance divided by ground speed in knots per hour.
 - Maximum drift is wind speed divided by aircraft speed in knots per minute.
 - Forward travel per second in meters is approximately air speed divided by 2.

- **Second, review.** The review of the aircraft operating instructions, rules and regulations, and non-standard procedures, as well as route study of the arrival airfield are productive fillers. I know that these topics are not exciting but a discussion as to why the rules exists and what could have prompted the rules will usually lead to greater understanding.
- **Third, detailed aircraft scan.** I use this time to look at the things that don't normally fall within the normal scan. Circuit breakers, Flight Management System menus and electrical loads are all important to be aware of and understand what is normal. The ability to know what is wrong is based on also knowing what isn't wrong.

So next time that you are in the aircraft be alert, be active mentally and remember, “If you are doing NOTHING, you are doing something WRONG”. ♦

Major Dave Bolton is the Wing Flight Safety Officer at 14 Wing, Greenwood.

TIME

TIME WELL SPENT



Photo: Sergeant Jeff DeMolitor, Land Force Trials and Evaluation Unit, CFB Gagetown.

AERODROME SAFETY

Did you know that in 2003 and 2004 there were 22 and 43 runway incursions, respectively? Did you also know that up until 2003, there was only an average of 16 of these occurrences per year? Luckily, so far collisions between an aircraft landing or taking-off and a vehicle have been avoided. Our luck is bound to run out sooner or later unless we stack the deck in our favour by learning and following aerodrome traffic rules and regulations.

For a complete analysis on runway incursions see DFS website at www.airforce.forces.gc.ca/dfs/docs/home/new_e.asp

Incidents on the rise

There could be many reasons to explain the rise in this type of incident, that we call 'incursion'. For example, 20 occurrences a year may be closer to the actual number of incidents, and we are only now becoming aware of them because Air Traffic Control (ATC) personnel are reporting more of these occurrences in the Flight Safety Information System (FSIS). Or, there is an actual rise in incursion incidents by personnel that are either unaware of the rules, inexperienced, distracted while proceeding on the aerodrome or misinterpreting orders given by ATC. Either way, it is important to know that an aerodrome can be a very dangerous place to work, and to ensure we do not endanger ourselves and others (aircrew, passengers, co-workers, etc.), we have to be thoroughly aware of the hazards and the procedures regulating movement of personnel and vehicles on an aerodrome.

Hazards all around us

Most hazards and dangers on an aerodrome are fairly obvious:

- running or taxiing aircraft;
- moving vehicles such as emergency vehicles, fuel tenders, sweepers, CE (Construction Engineering) vehicles of all sorts, servicing and maintenance vehicles, etc.;
- fuelling and defuelling operations;
- towing operations;
- ice or snow on the ground and snow removal operations;
- air weapons loading, unloading and arming operations;
- etc.

However, some hazards are not as obvious. For example, active runways may not be that easy to spot. The good news is that there are tools we can use to be as safe as possible when we work on an aerodrome.

Safety tools at your disposal

Some of the important things you should know before venturing on an aerodrome are aircraft safety distances. (Please refer to *Flight Comment*, Winter 2005 issue, for an article on the subject.) The next thing you have to be aware of is the Wing/Base

order regulating traffic on the aerodrome. Furthermore, as a driver of DND vehicles, you also have to be aware of the driver's regulations found in C-02-040-010/MB-001 Rules and Regulations for Drivers of DND Vehicles — Driver's Regulations, and more specifically, Part 5, which provides rules for operating vehicles on airfields. One of the first rules given in Part 5 is that "drivers who operate vehicles on aircraft ramp areas or airfields proper, as part of their normal duties, shall be **qualified and current** on the **Ramp DDC** [Defensive Driving Course] for the required airfield." As you can see, the order does not say you should or may have a current qualification on the Ramp DDC — it says you **shall**.

Ramp DDC for everyone

The Ramp DDC was designed to provide personnel with the necessary tools to allow them to circulate safely around an aerodrome. It teaches drivers proper radio phraseology and procedures, communication basics, light signals in case of a communication breakdown, aerodrome

layout, pertinent definitions, radio and driving practical training on the aerodrome and much more.

Communication: It takes two to tango!

Effective communication between ATC and ground personnel is vital to ensure our aerodromes remain safe for everyone — military and civilian, whether on the ground or in the air. An important part of effective communication is the action of reading back, or acknowledging, every instruction issued over the radio by ATC. This simple procedure confirms the message was well received and understood. It is also a means to correct any information that may have been misunderstood or misinterpreted by personnel on the ground or in the tower. So remember this simple aerodrome safety rule: **Readback before proceeding.**

Talk the talk, walk the walk

Take a few minutes to complete the quiz at right.

I hope you did well on the quiz. If you didn't, you are probably due for a Ramp DDC refresher (or basic, if you don't have one). For your information, the questions on the quiz were based on actual occurrences reported in FSIS. When it comes to aerodrome safety, it is important to talk the talk and walk the walk: **know the rules, practice the procedures and pay attention to the instructions issued by ATC.**

STAY ALERT, STAY ALIVE! ♦

Sergeant Anne Gale
DFS 2-5-2-2

Note: Thanks to Sergeant Oetiker, 4 Wing Cold Lake, for his suggestions while I was writing this article.

Quiz: Are you game?

Here is a short quiz to test your knowledge on aerodrome safety. Don't worry, it will not affect your PER in any way, shape or form, but it may help you realize your knowledge may not be as extensive as you thought.

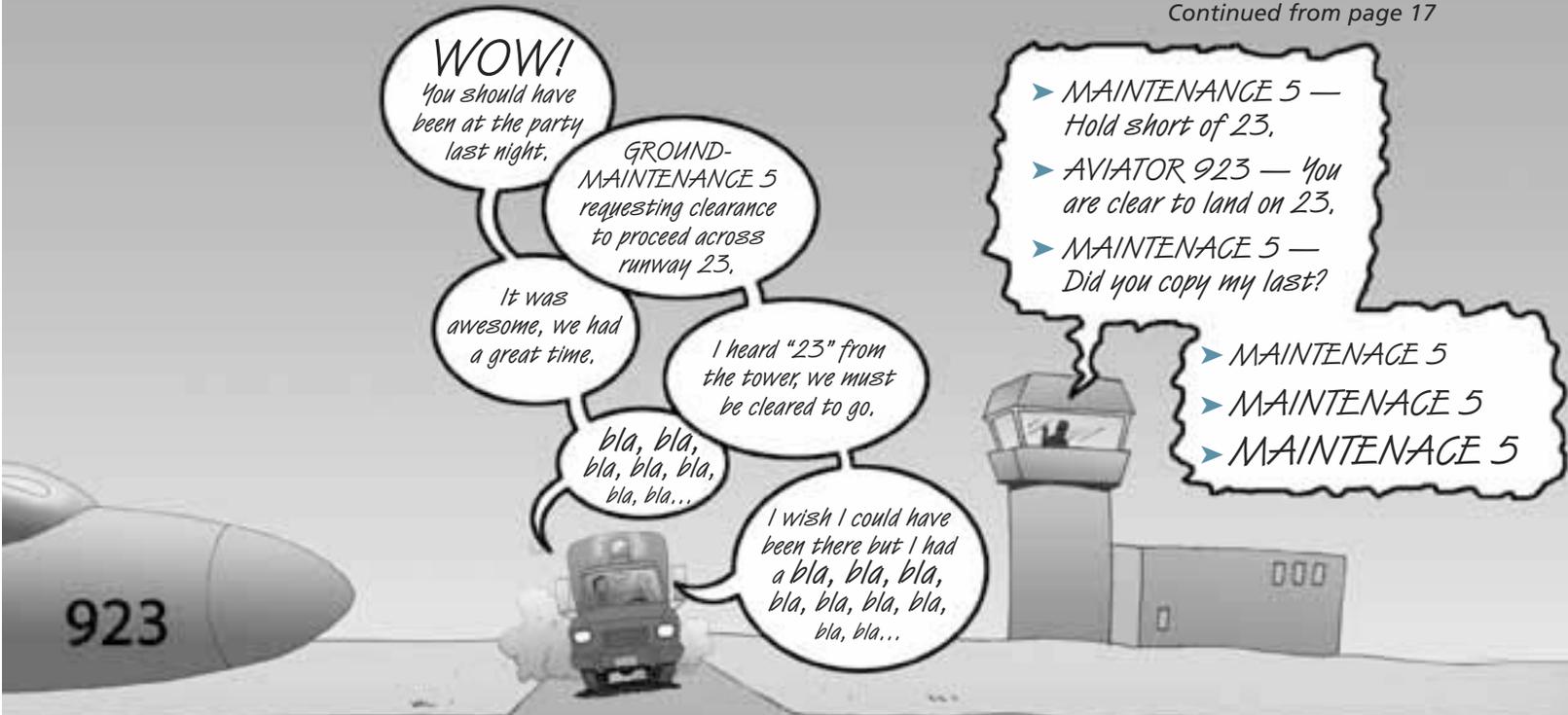
1. You are working on the arrestor cable on the runway. Suddenly, the runway lights start flashing. Do you:
 - a. return to your vehicle and contact the control tower?
 - b. return to your vehicle and clear the runway immediately?
 - c. carry on with your duties, thinking there must be something wrong with the runway lights?
2. You request clearance to ground control to cross runway X. You get a reply back from ground control, but you couldn't quite understand the message because your co-workers were speaking and laughing. Do you:
 - a. contact ground control and request a readback (after telling your co-worker to be quiet, of course!)?
 - b. start onto the runway while asking ground control what was the last transmission?
 - c. assume the tower gave you authorization to cross the runway and proceed to cross?
3. You have to deliver a part from the hangar to an aircraft maintenance crew working on the ramp. The request is urgent because the aircraft is scheduled to start in 30 minutes. You get in the line vehicle and:
 - a. drive as fast as you can, taking care to stay well away from aircraft parked on the ramp;
 - b. drive at a safe speed of about 30 km/h; or
 - c. drive at a normal walking pace (approximately 6 or 8 km/h).
4. You know you have to ask clearance from ground control to enter the aerodrome manoeuvring area. Is the manoeuvring area:
 - a. the entire aerodrome, which includes all the areas where aircraft and vehicles can circulate (ramps, taxiways, runways, access or perimeter roads, etc.);
 - b. the parts of the aerodrome used for take-off and landing of aircraft and for the movement of aircraft associated with take-off and landing (excludes ramps, access and perimeter roads); or
 - c. the parts of the aerodrome used for compass swings, weapons convoys, dangerous cargo loading and unloading and deicing operations.
5. You and your crew have to tow an aircraft from one end of the aerodrome to the other. You don't have to cross runways to get to your destination, but you'll have to follow a taxiway. It's late at night, and you know the flying is done for the day. Do you require clearance from ground control before proceeding with the towing?
 - a. yes
 - b. no

For the answers to the quiz, please turn to page 18.

MAINTAINER'S

CORNER

Continued from page 17



WOW!
You should have been at the party last night.

GROUND-MAINTENANCE 5 requesting clearance to proceed across runway 23.

It was awesome, we had a great time.

I heard "23" from the tower, we must be cleared to go.

bla, bla, bla, bla, bla, bla, bla, bla...

I wish I could have been there but I had a bla, bla, bla, bla, bla, bla, bla, bla...

- **MAINTENANCE 5** — Hold short of 23.
- **AVIATOR 923** — You are clear to land on 23.
- **MAINTENANCE 5** — Did you copy my last?

- **MAINTENANCE 5**
- **MAINTENANCE 5**
- **MAINTENANCE 5**

**You Know the Rules,
You Know the Procedures
BUT
Are You Paying Attention
to the Instructions?**

**STOP — REQUEST CLEARANCE —
READBACK INSTRUCTIONS — PROCEED (OR HOLD)**

Answers to quiz:

Q1. b Reference: ATC MANOPS, 354.13, ATC Light Signals.
Q2. a Reference: ATC MANOPS, 133.4, Clearances, Instructions and Readbacks. Also, common sense: If you are not sure of what is being said on the radio, do not proceed until you know for sure what the message was.

Q3. c Reference: C-02-040-010/MB-001, Driver's Regulations, Part 5, paragraph 14. On most ramps, personnel will have to drive the vehicle within 15 m of parked aircraft.

Q4. b Reference: ATC MANOPS, Definitions.
Q5. a Reference: ATC MANOPS, 354.4. As long as the tower is manned, you have to contact ATC to request clearance.

EPILOGUE

TYPE: A4N *Skyhawk*
LOCATION: Bagotville, Quebec
DATE: 16 June 2004

The incident aircraft was number 2 of a two plane A4N *SKYHAWK* formation which was providing Interim Contracted Air Training Services (ICATS) to the CF-18 fleet at 3 Wing. The aircraft had a civilian registration and was flown by a civilian pilot. The formation completed the tasked mission and was recovering to a left hand overhead break for landing on runway 29 at Bagotville.

The pilot in number 2 was distracted by a radio communication problem and failed to lower the gear. The aircraft landed gear up and crossed the arrestor cable slicing the external fuel tanks in half.



The aircraft continued down the centerline of the runway showering sparks underneath the ruptured tanks. No fire developed, and the aircraft came to a stop with approximately 6000' of runway remaining. The pilot shut down, egressed from the aircraft and waited for the emergency vehicles to arrive. Emergency response vehicles were on scene quickly and the site was secured. The aircraft received "D" category damage. There were no injuries.

The Flight Safety Investigation revealed that the pilot became distracted during a critical phase of flying. This distraction resulted in an interrupted pre-landing check, and subsequently the landing gear was never lowered.

The pilot in this accident was very experienced, with approximately 15,000 flying hours. This accident underscores the fact that distraction is a hazard that can affect all aircrew, regardless of experience level.

To raise the awareness of the hazards of distraction, and to provide techniques on dealing with distraction, 1 Canadian Air Division has incorporated a module on distraction on the Human Performance in Military Aviation training courses. Although this accident involved a civilian contracted aircraft flown by a civilian pilot, the lessons learned can be applied to all aircrew. ♦

EPILOGUE

TYPE: SZ2-33 Glider, C-FEAF
LOCATION: St-Jean-sur-Richelieu,
Quebec
DATE: 8 July 2003

During their first flight of the day, the Air Cadet instructor pilot (IP) and student crashed while manoeuvring to land off-field at the Eastern Region Gliding School. Both occupants suffered minor injuries while the glider suffered "A" category damage.

The IP joined the circuit mid way along downwind at 1150' AGL rather than 1000' at the upwind entry point. A base turn is normally completed by 500', however, the glider turned base at 850' and increased airspeed to 60 MPH rather than 65 MPH as required by the wind conditions. A high rate of descent was initiated in an effort to regain the normal circuit profile and complete the final turn by 300'. After becoming established on final at 350', the IP and student experienced the sensation

of hanging in their harness straps as the glider was observed to go below the normal glideslope. It was likely that this sensation and corresponding increased rate of descent was affected by some mechanical turbulence caused by a large stand of trees on the final approach path. Throughout the circuit the inexperienced IP likely focussed attention on the student rather than on accurate flying of the circuit. Once she realized that she could no longer clear the approaching tree line, the IP attempted to complete a 180° left turn in order to conduct an off-field landing in an unobstructed area. During the turn, and with a 45° angle of bank or more, the left wing contacted the ground and sent the glider cart-wheeling before it came to rest in a farmer's field.

The investigation determined that, in the event of encountering a height-critical situation, due to prior training the IP was likely predisposed to attempt a 180° turn to the accident field. Additionally, the IP demonstrated incomplete knowledge of the hazards of low-level turns as well as the actions and preparations to be taken in the event of an off-field landing. Finally, it was concluded that a poor awareness of both off-field

landing procedures and the hazards of low-level turns generally existed within the Air Cadet Gliding Program.

Completed safety actions included the establishment of an effective Standards Evaluation Team and the development of a standard Glider Instructor Refresher Course. Outstanding recommendations include increasing awareness of off-field landing procedures within the Air Cadet Gliding ground school and manual. Pilot decision-making training was also recommended for inclusion within the program. ♦



EPILOGUE

TYPE: SZ2-33 Glider, C-GDZF
LOCATION: Picton, Ontario
DATE: 24 July 2003

The instructor pilot (IP) and the student were conducting a pre-solo training flight in the Central Region Air Cadet Gliding School Program. In light rain, the student joined the circuit higher than normal. In an effort to lose height, the student entered a right wing-low forward slip on base. Once on base, the student experienced an uncommanded left wing drop and slight yaw to the left; aircraft control was regained and the slip was continued. Now on final and believing that the glider would overshoot the landing area, the IP took control at 250' above ground level (AGL) and continued with the forward slip. Now at a very low height, the glider experienced a second uncommanded left wing drop and yaw to the left. While attempting to regain control, the glider's right wing tip and main skid simultaneously struck the ground. The glider bounced back into the air before coming to rest on the wet grass. The IP received minor injuries and the glider sustained "B" category damage.

Based on Original Equipment Manufacturer (OEM) flight-testing, it was concluded that the glider likely experienced a previously unknown phenomenon in which, during a forward slip in stable meteorological conditions and in the presence of rain, an airflow separation mechanism was created. It was theorized by the OEM that this separation mechanism was initiated by a build up of water on the wing's surface that acted as an airflow separation "trip strip." Alternately, this water build up may have acted as a "turbulator" that caused many smaller wing vortices to also induce airflow separation from the wing. In either case, the result was that the left wing's



aileron likely became ineffective and caused the left wing to rapidly drop.

At some point, once the airflow re-attached to the wing's surface, the left roll motion ceased and the left aileron became effective once again. Now yawed approximately 25° to the left, the IP likely attempted to line the glider up with the landing area by using further right aileron. The glider then banked to the right, however, given its low height, insufficient clearance remained between the right wing tip and the ground. Then, in a near-level attitude, the glider's right wing and main skid simultaneously struck the ground.

In addition to the loss of control phenomenon, the investigation also focused on the validity of glider stall speed data. A review of the original OEM air-speed calculations found them to be in error by up to 15%. The OEM has since validated and published updated glider stall speed data. Recommendations for the Air Cadet Glider Program include the prohibition of glider operations in precipitation, re-inforcing the need for pilots to incorporate an instrument cross-check to confirm visually-gained information, and the introduction of decision making training. ♦

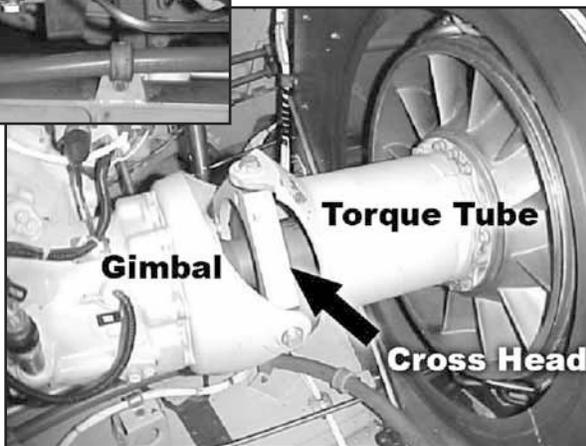
FROM THE INVESTIGATOR

TYPE: *Cormorant CH149901*
LOCATION: 19 Wing Comox,
British Columbia
DATE: 28 January 2005

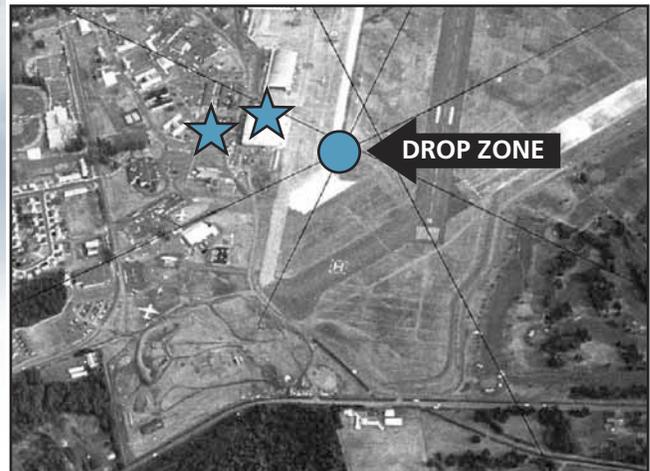
While conducting a daily inspection on CH149901, the technician noticed oil coming from the #3 engine drain line. The #3 engine oil level was checked and found to be low. Further investigation revealed that one of the engine torque tube crosshead bolts had sheared. The sheared bolt was in the 6 o'clock position connecting the crosshead assembly to the torque tube assembly.

Investigation revealed that this occurrence was similar to another incident, which happened on the same aircraft CH149901, 01 October 2004, FSIS 118564). This previous occurrence was also on the #3 engine but in this case the bolt was in the 9 o'clock position connecting the crosshead assembly to the gimbal assembly. Similar to the October 2004 incident, damage to the high-speed shaft and the # 3 engine was also observed. A detailed inspection of the sheared bolt and associated components from this event is being carried out at Quality Engineering Test Establishment (QETE). The investigation results from the October 2004 incident will be reviewed and reassessed in this recent event.

The components from this subject occurrence have been forwarded to the Original Equipment Manufacturer (OEM) for inspection. In addition, engine and transmission specialists from the OEM will deploy to the Main Operating Base to perform engine alignment checks and inspect the # 3 engine input to the main gearbox. ♦



TYPE: *Buffalo CC115457*
LOCATION: 19 Wing Comox,
British Columbia
DATE: 02 February 2005



On 02 February 2005, 442 Transport and Rescue Squadron was conducting unit training with a CC115 *Buffalo* aircraft to maintain crewmember proficiency/currency. At approximately 1238 hours (hrs) local (2038Z), a team of two Search and Rescue Technicians (SAR Techs) performed a parachute descent into the "South In-field" Drop Zone of the 19 Wing, Comox airport. Both SAR Techs encountered a low level wind shear which caused them to drift back over the built up area of the hangar line.

The first SAR Tech (TL) impacted the cement apron in front of 14 Hangar and in very close proximity to a *Cormorant* Helicopter (CH-149) that was being towed. This SAR Tech landed at an increased rate of descent and sustained serious injuries to both legs and a cerebral concussion. Members of the tow crew were quick to assist the injured jumper and call for medical help. The SAR Tech was then transported to hospital for treatment. The second SAR Tech (TM) landed downwind of 14 Hangar in the parking lot adjacent to the commissionaires building. He conducted a parachute landing fall between parked cars and was dragged approximately 4 feet before cutting away his main canopy. This SAR Tech sustained minor injuries on landing and was also transported to the hospital where he received medical treatment.

The investigation is focusing on wind assessment techniques and wind shear detection. ♦

FROM THE INVESTIGATOR

TYPE: *Schweizer 2-33A C-FARD*
LOCATION: *Trois-Rivières, Quebec*
DATE: *31 October 2004*

The crew was participating in the Fall Training Program. The objective of this flight, the student's second flight of the day, was to conduct an emergency simulation of a premature cable release procedure. This was a consolidation flight for the student to improve his skills and confidence in the glider.

The Instructor Pilot (IP) and Student Pilot (SP) took-off with the SP at the controls.

The winds at the surface were estimated at 230 degrees magnetic at 15 knots (Kts), straight down the grass runway. Light turbulence was noted during the climb to altitude. At 600 feet above ground level (AGL) the IP initiated the simulated premature cable release by pulling on the release knob. The SP then executed a right turn to downwind with the intention of carrying out a downwind landing on the grass runway. Realizing that the winds were excessive, he then decided to execute a modified circuit pattern in accordance with standard procedures.

The downwind leg was flown very close to the grass runway. The spoilers were opened at some point in the circuit and were never closed prior to landing.

The SP initiated the turn to base leg late. This combined with the strong crosswind component resulted in a lateral overshoot of the grass runway, which placed the aircraft in a difficult position to reach the intended landing area. The IP then took control and increased the bank to almost 60 degrees in an attempt to realign the glider with the grass runway. The grass runway was overshoot a second time and the glider was now positioned over small trees on the right side of the grass runway. The IP then steeply banked left at a very low height in an attempt to return to the runway.

The glider contacted the ground near the launch point, left wing first, followed immediately by the landing gear and tail of the aircraft. It skidded across the ground for approximately 30–35 meters bouncing on the right wing tip prior to stopping almost 130 degrees from the runway centreline.

The investigation is focussing on human factors and pilot technique. ♦



Q E T E

Quality Engineering Test Establishment

Metal Fatigue — It's Got a Bad Name

When, as a young engineer, I first heard of the term “metal fatigue” the words seemed quite self-explanatory. It seemed logical to assume that, over time, with exposure to loads, the metal got weak or “tired”. Following this process of reasoning the ultimate conclusion would be that eventually, a component made of metal could become so weakened that it would no longer be able to carry the loads to which it was normally exposed, and the part would break. The whole concept had a comforting biological analogy that seemed easy to understand. Unfortunately, this is not what metal fatigue is like at all.

It's too bad that the failure analyst who first coined the term didn't call it something else. For example “Progressive Cracking” would have been much more accurately descriptive. Because that's what really happens, a fatigue crack initiates, at a microscopic level, and grows bigger until it has progressed through so much of the affected structure that

one more application of load will cause a final overload fracture. Another characteristic that defines fatigue cracking is that it grows in discreet steps, each time a tension stress of sufficient magnitude is applied to the part. In engineering terms, stress is the load per unit area of the part, measured in pounds per square inch or, in the metric system, pascals (which are newtons per square meter). Normally a small stress can be applied without causing growth of a fatigue crack, however once the stress passes a certain threshold each application of the stress will make the crack grow by a small amount. The threshold stress that will grow a fatigue crack is considerably less than the ultimate strength of a metal, which is the stress that will result in overload failure if sufficient load is applied at one time. Fatigue cracking is caused by the repeated application of a stress less than the ultimate strength.

In summary, here are the basic facts about the mode of failure we call fatigue:

- It manifests itself as a crack that grows over a period of time.
- It is driven by repeated applications of a tensile stress.

Types of loads on aircraft that cause fatigue

As described above, in looking for loads that may lead to fatigue we are interested in repeated applications of tension on a component. An obvious case would be a part that is subjected to a pulling force that relaxes periodically. An example of this would be the pressurization of the fuselage. If one imagines a section of a fuselage to be a circular hoop which tends to expand like a balloon when pressurized the tensile loading is easily visualized. How about bending? As an object like a bar is bent, there will be tension on one surface of the bar and compression on the opposite surface, as shown on page 25. Fatigue crack growth will be possible on the tension side of the bar. This type of loading would be typical of a wing spar or a helicopter rotor blade.

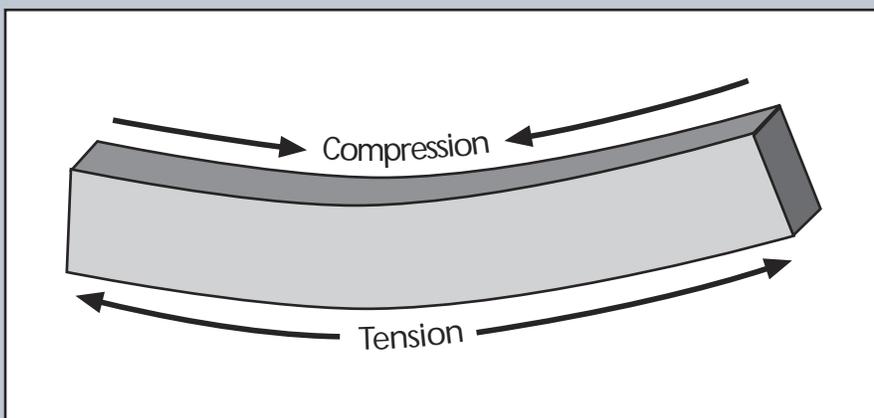


How Do We Recognize a Fatigue Failure?

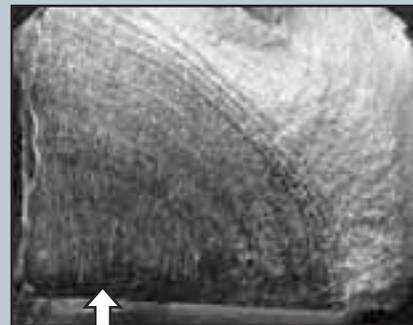
There are almost always indications on the fracture surface that can be used to identify that this was indeed a fatigue failure. Firstly, consider that the fatigue crack progresses until the normal loads cause the remaining sound material to break suddenly. This implies that there should be 2 failure zones visible on the fracture surface, the initial fatigue zone and the final overload zone. This is indeed the case, therefore any part

that displays a fracture face that has zones of differing appearance should be investigated further. Secondly, because of the progressive nature of fatigue crack growth the fatigue zone often shows a ring-like growth pattern, somewhat similar to the growth rings on a tree. These patterns are called “beach marks” since they are reminiscent of the effect of waves in the sand at the waters edge. Finally, a fatigue fracture surface tends to be much smoother and flatter than an overload failure, however this is not a very certain indication, since there are other failure modes that also result in a smooth fracture surface.

It must be cautioned that certain materials, especially castings, will be unlikely to display visible evidence on a fatigue fracture surface. Even examination with an optical microscope will not result in a positive identification of fatigue. Therefore a failure analyst may suspect a fatigue failure through visual inspection of a fracture but he or she will always rely on Scanning Electron Microscope (SEM) examination for positive confirmation. The SEM is the most readily available tool that is capable of sufficient magnification to detect the microscopic features of a fatigue failure.



Bending the bar results in tension on the lower surface and compression on the upper surface.



SEM Photograph of an example of a fatigue fracture on a CF-188 flap hinge. The arrow indicates the initiation site. The beach marks are clearly visible in the fatigue zone, while the lighter shaded area (upper right) shows the roughness indicative of the overload zone.

In summary the presence of one or more of the following features allow us to suspect that a fracture was caused by fatigue cracking:

- Two distinct fracture zones;
- “Beach Marks” — they look like growth rings;
- A relatively smooth, flat fracture surface.

Additional Evidence that can be Deduced from a Fatigue Fracture Examination

In a future issue of Flight Comment we will see how a detailed SEM examination of the fracture surface led to clues that allowed the investigators to find out how and why a fatigue crack started in a *Griffon* Helicopter tail rotor blade. Even more importantly, it was possible to estimate the growth rate of the crack, which can be a very important consideration in determining the life or the inspection interval of a critical part. ♦

Fred Lottes is the Group Leader for Flight Safety and Vehicle Systems at the Quality Engineering Test Establishment (QETE) in Gatineau, Québec.



Predators on Patrol!

“Too many cooks spoil the broth,” and “Too many wings, spoil the skies.” For years, airports, including 8 Wing Trenton, have been looking for safety and environmentally friendly and efficient ways of controlling wayward birds and mammals. Because Trenton is located on a migratory bird route and near the Bay of Quinte, a lot of geese and gulls are attracted to the area. While not a problem by itself, it does create a major concern when birds and planes cross paths. Recall the 1995 Alaskan bird strike disaster when an US Air force 707 AWACS crashed after take-off. For the past seven years 8 Wing Trenton has been leading the way in an amazing and surprising low tech solution. What better way to control nature’s nuisances than with nature.

FALCON ENVIRONMENTAL SERVICES INC. (FES) operates year round, from sunrise to sunset. The wildlife control team, consisting

of three officers, manages a variety of animal problems at 8 Wing: swallows to geese, ground hogs to deer. Since permits do not allow for a “blanket shooting” of wildlife, alternate means are used to ensure the sky is safe; therefore depredation (shooting) accounts for less than one percent of the total options exercised. Other control methods include falconry, pyrotechnics (noise making devices similar to flare guns), trapping, relocation, and dogs. Dave Ascott enjoys the challenge of identifying animal behaviors and patterning, and then developing new and different combinations of controls to eliminate the threat to air traffic. Dave’s strategy is to use two falcons and two dogs at the same time, which creates a “Catch 22 situation for the trespassing wildlife, because the animal cannot go to the grass where the dogs are, nor can it go to the air where the falcons are,” so it must leave the area. “The most

interesting part of the job,” states Dave, “is to watch the birds chase birds. There are some fantastic aerial displays and acrobatics involved in the pursuits. It is something to experience.” The dedicated and committed FALCON crew maintains a team effort with the Air Traffic Control (ATC) and base staff, while engaging themselves in proactive patrols on the base, looking for birds **before** they become a problem. All three wildlife control officers have extensive backgrounds in falconry, trapping, and/or hunting, but wild birds possess an intrinsic fear of falcons, which proves to be the most effective tool when managing animal threats to aviation safety.

Eldorado, one of the heroes of this story, is known by his Latin name *Falco peregrinus*, which means “wanderer”; a well-earned name it is, since his annual migration distance is the equivalent of flying from Toronto to Venezuela. This spectacular bird,



Al Adams with lanner falcon named Sierra.

Eldorado (7 year old "Vet" at 8 Wing Trenton).

Dave Ascott with gyrfalcon named Anna, at 8 Wing Trenton.

also called a raptor, boasts some amazing facts. The average height and weight of a falcon is thirty-five centimeters and eight hundred and fifty grams respectively. For a bird so small, it is a wonder it can accomplish so many incredible feats. Eldorado's eyesight is best illustrated by using a pair of ten-power binoculars. He can easily spot a pigeon from one and a half kilometers away. He needs to eat approximately one hundred grams of meat per day. His time airborne will vary between fifteen minutes to one hour. His speed of stoop (dive) can top out at an unbelievable three hundred and twenty kilometers per hour. The relationship he shares with his prey is comparable to humans and large sharks — when a large shark is spotted, swimmers get out of the ocean, fast! "Sky Shark" may be too extreme, but Eldorado is none-the-less a predator. When asked what surprised him most in his job, Jason Botting, another FES officer, speaks of

the "ferocity of a small, male lanner falcon called 'Santa's little helper'". "Although 'Santa's little helper' only weighs four hundred and ninety grams," Jason states, "he attacks and defends his field/territory against ospreys, red-tailed hawks, and even great blue herons." Jason's falcon is less than one tenth of the weight of a blue heron. "Being part of the noble history, sport, and tradition of falconry is the best part of my job," admits Jason. "it [falconry] spans ancient heritages, and so to use it in modern day contexts and applications is exciting," Jason claims.

Consequently, different sized raptors are used to scare away different birds. A lanner falcon named Sierra works well eliminating starlings. Eldorado, a peregrine falcon, chases down waterfowl such as ducks, whereas Anna, a gyrfalcon attacks geese. On a two thousand five hundred acre airfield a single falcon can clear the field in fifteen minutes, whereas it

would take up to two to three hours with a person who must wait for tower clearances and other protocols.

The FALCON ENVIRONMENTAL officers collect data on a computer system called AIRMAN, which is then used to produce wildlife trends for future use. For more information go to the FALCON website at www.falcon.bz. Further aviation information may be found at the 8 Wing Trenton website: www.8wing.ca

Remember to look carefully over the beautiful blue skies of Trenton airfield when passing by next time, and the wings of a C-130, *Airbus*, F-18, F-16, *Tornado*, *Galaxy*, or *Antonov* may not be the only ones visible; the "friendly" predator — the falcon — is also on patrol. ♦

Mark D. Willock works for Falcon Environmental Services at 8 Wing Trenton.

ICING:

COMMUNICATIONS DURING AIRCRAFT GROUND DEICING OPERATIONS

Preamble

A brief review of the article in the Winter 2004 Issue of *Flight Comment* on ground icing operations, which was focused on the use of both aircraft deicing (ADF) and anti-icing (AAF) fluids, is recommended prior to reading this article. Based upon the earlier article it may not have been immediately evident what role that communications plays in a safe and efficient aircraft ground icing operation.

Therefore, the principle purpose of this article is to highlight the role that communications, and information flow, plays in supporting safe ground icing operations. Communication between the Captain of the aircraft about to be deiced and others involved in any way with the deicing process must be robust. The communication procedures must be concise with little chance of ambiguity.

Background

The aircraft Captain will need to be particularly vigilant when operating in ground icing conditions. The Captain will need to cope with not only poor visibility and poor traction, but also with manoeuvring the aircraft in close

proximity to a wide variety of equipment and personnel in a relatively confined area. The communication between the Captain and the other members of the deicing team needs to be explicit. Ground icing operations can be very complex. There is an urgent safety requirement to use procedures that include those members of the team “outside” of the cockpit.

Walkaround

During the pre-flight walkaround, during ground icing conditions, there is a need to examine the aircraft’s critical surfaces for contamination, these surfaces include: wings, control surfaces, rotors, propellers, upper surface of the fuselage on aircraft that have rear mounted engines, horizontal stabilizers, or any other stabilizing surface of an aircraft. In addition, an inspection of pitot-static sources, emergency exits, Auxiliary Power Unit (APU) inlets, engine inlets, undercarriage and brake assemblies, and other areas specific to an aircraft, will need to be accomplished. The ground crew will need to be advised of the results of the pre-flight walkaround so that they can take the appropriate action.

The Captain will require an exchange of information, at the deicing site, regarding the deicing and anti-icing process, including: where to park, whether a one step or two step procedure will be used, the outside air temperature (OAT), the Type of fluid(s) being applied, what time the final application of fluid was started, the precipitation type and rate, the “clean aircraft” call from the deicing crew, and the “all clear” for taxi call from the deicing crew. Let’s briefly examine each of these elements in turn.

Positioning

The parking area for deicing operations is designated at many airports. However, when parking, the Captain should ensure that adequate communication and marshalling guidance are available. Deicing areas are often congested and the risk of a collision is relatively high. Vehicles have been struck and knocked over by aircraft at some of the busiest Canadian airports; these were situations that may have been averted with the use of better two-way communication. Also, the deicing crew will need to advise the Captain of circumstances requiring extra vigilance such as:



During the winter of 2000/2001 an F-28 aircraft was being deiced/anti-iced in strong, gusty wind conditions with the APU running. Despite all precautions taken by the crew applying the fluids, some fluid entered the APU inlet. The APU reacted to the ingestion of this extra “fuel” by auto accelerating to rotor burst. No one was hurt in the incident, however serious or fatal injury may have resulted. Perhaps communication between the deicing crew and the Captain would have resulted in the shutdown of the APU in order to safely complete the deicing process.

- extremely slippery conditions;
- reports of pertinent problems encountered by other aircraft;
- concerns regarding new obstacles;
- personnel movement issues; or
- other safety related concerns.

Fluid Application

A one step deicing procedure using fluid means that a single fluid is used to (a) remove the frozen contaminants from the critical surface (deice), and (b) to protect the aircraft from the precipitation (anti-ice) for a period of time. Typically, the one step procedure will usually be accomplished using a heated Type I fluid. Type III fluids, with longer Hold Over Times (HOT), may replace the Type I fluids in the near future. The Type III fluids offer a one step application potential but with longer HOTs.

A two step deicing procedure using fluids means that one fluid will be used to remove frozen contaminants from the critical surfaces of the aircraft and then a second (different) fluid will be applied to protect these surfaces, for a period of time. Typically, the two step procedure will be accomplished using a heated Type I deicing fluid to remove the frozen contaminants followed by an application of a Type II or Type IV anti-icing fluid layer.

Holdover Times (HOT)

The use of HOT tables for decision-making purposes, during active frost or precipitation conditions, requires

that the Captain have some specific information, as follows:

- the type of fluid being used and its concentration;
- the outside air temperature (OAT);
- the precipitation type;
- the precipitation rate/intensity; and
- the time that the final fluid application commenced.

The fluid must be known so that the correct HOT tables can be used. The OAT must be known so that the correct row will be selected on the HOT table and so that the fluids’ lowest operational use temperature (LOUT) limitation is respected. The snowfall type and rate must be known so that the correct column on the HOT table is chosen. With this information, the appropriate HOT time may then be chosen.

The deicing crew must advise the Captain once the final fluid application commences. This is the time when the HOT clock is started. When HOT values are being used to judge when fluid failure might occur, it is imperative that the anti-icing start time be accurately known.

Ready for Departure?

The “clean aircraft” call must be communicated to the Captain. On large aircraft in particular, it is likely that the Captain won’t be able to personally determine whether or not the aircraft’s critical surfaces are free of frozen contaminants. Typically a “trained” person will inspect the surfaces and advise the

Continued on page 30

In January of 1995, a Boeing 747 was parked in the deicing centre of the Montreal (Mirabel) Airport, in Quebec. The 747’s engines were running during the procedure. As the horizontal stabilizer was being deiced from in front, the aircraft started to taxi away. The boom and bucket deicing vehicles were struck by the horizontal stabilizer and knocked down, along with the occupants. Three persons died during this event. Confusing communications were at the core of this accident.

On March 10, 1989, an Air Ontario operated Fokker F-28 aircraft attempted a take-off at the Dryden, Ontario airport, during ground icing conditions. Twenty-four of the sixty-nine persons on board the aircraft lost their lives in the crash that followed. Passenger witnesses, including an ‘off-duty’ pilot, and an ‘on-duty’ flight attendant, observed that snow and ice were building up and adhering to the wings prior to the attempted take-off. It is possible that had the pilot and the flight attendant communicated their concerns about the snow build up on the wings that the F-28 aircraft Captain may not have attempted the take-off.

ICING:

COMMUNICATIONS DURING AIRCRAFT
GROUND DEICING OPERATIONS

Continued from page 29

Captain using agreed procedures. For example, both the Federal Aviation Administration (FAA) and Transport Canada (TC) issued recent Airworthiness Directives (A.Ds), which require a “tactile check” on the Challenger aircraft. This check is required to ensure that all frozen contaminants have been removed from the critical surfaces during the deicing process. The results of the “tactile check” will need to be relayed to the Captain. This A.D. arose because of a recent series of ground icing accidents with this model of aircraft.

The Captain must ensure that he receives the “all clear” for taxi call prior to moving his aircraft from the deicing area. The proximity of the vehicles and personnel to the aircraft implies that personnel safety is at risk. The deicing vehicles must all be well clear of the aircraft prior to the aircraft moving away from the deicing area.

Summary

Ground icing operations are complex. There are many chances to “get it wrong”. Communications and information exchange using standard phraseology must be clear and unambiguous. A sound approach to communications will go a long way to ensuring a safe and efficient ground deicing operation.

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

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

The Editor's Corner

In the last issue I had great news about having found a Deputy Editor, Sergeant Anne Gale. Anne worked diligently on this issue but unfortunately for me and for you the reader, Sergeant Gale is no longer under our employ. She accepted an offer of employment, as a civilian, with the Directorate of Technical Airworthiness. She made great contributions to the Air Force and to flight safety over her 27-year career with the CF. Being the great team player she is, Anne left us with a couple of “Maintainer” Corner” articles and the following thoughts:

I am proud of *Flight Comment*. As you know, the magazine’s main focus is the prevention of flight safety accidents and incidents. In an effort to achieve this goal, the magazine is sent to every air force squadron and to ships, schools and cadet units in the hopes that flight crews, technicians, engineers, support personnel and anyone else connected to flying operations will learn from others’ mistakes.

But, did you also know that the magazine is distributed in approximately 40 countries around the world? It is not only sent to military flight safety networks but also to civilian aviation organisations. Furthermore, the magazine is distributed to various aviation component and equipment manufacturers, universities and libraries. As you can see, there are several nations and organizations that make flight safety a priority, just like us.

The articles printed in *Flight Comment* can be valuable to the entire world of aviation, whether military or civilian. That is why articles from **you** are so important. They keep the magazine current and relevant. The mishap, near miss, or close call you may have experienced or witnessed can help someone else stay safe.

Anne, may the future be everything you wish. Thanks for your devotion and spark. All the best to you.

Fly Safe ♦

Correction: The cover photo for the winter issue — Cormorant over iceberg was attributed to Sergeant Rick Ruthven. It was actually taken by Captain Christine Bazarin with Sergeant Ruthven’s camera. Captain Bazarin works at the Directorate of Air — Public Affairs in Ottawa. Great shot Christine!

There was an error in a publication number that appeared in the “Wired!” article in the winter issue. It was written SAE ARP 5881 but should have read — SAE AS 50881.

For Professionalism

For Commendable Performance in Flight Safety

MASTER CORPORAL LARRY YOUDEN

On 4 November 2003, Master Corporal Larry Youden, an Aviation Systems Technician (AVN Tech) with 14 Air Maintenance Squadron (AMS), was deployed to Kinloss, Scotland for an exercise. While performing a "B" Check on *Aurora* CP140105, he noticed a small amount of hydraulic fluid gathered in the bottom of the hydraulic service centre. Unsure of where this fluid had come from, he carried out a detailed inspection of all components in the service centre. During his inspection, he discovered a static leak coming from a three-inch crack on the Aileron Boost Pack Actuator. He immediately informed his supervisors and declared the aircraft unserviceable. After a mobile repair party (MRP) aircraft from Greenwood delivered a new part, the actuator was replaced and the aircraft was returned to service.

Master Corporal Youden is commended for his outstanding professionalism and attention to detail in adverting a potentially serious hydraulic



failure. Had this situation gone unnoticed, it would have affected the control of the aircraft during flight, possibly at a critical phase.

Master Corporal Youden serves with 14 Air Maintenance Squadron, 14 Wing Greenwood. ♦

CORPORAL TODD GUIMOND

On the 24 November 2004, while deployed to Ghana Africa, Corporal Guimond carried out a "B" check on *Hercules* CC130315's landing gear. He decided to go beyond the limits of the listed check and inspected the lock wire of the landing gear screw jack emergency disconnects. He took the time to do this based on information given during a flight safety briefing which, outlined a flight incident on aircraft CC130343 (FSIS #118287, 15 Sep 04, Air Incident, Right Hand Main Landing Gear Failed to Retract) that had screw jack emergency disconnects lock wired incorrectly. His astute application of this information led him to question the lock wiring of the left hand aft main landing gear connection.

As Corporal Guimond continued his investigation he discovered that the quick disconnect was lock wired incorrectly in accordance with the Canadian Forces Technical Order (CFTO). When he removed the lock wire, the quick disconnect assembly rotated freely and was no longer at the proper torque specification. If this unserviceability had gone unnoticed

and the lock wire had broken in flight, the quick disconnect assembly would have separated from the screw jack, which in turn would have caused the left hand landing gear to freeze in transit.

Corporal Guimond's diligence and attention to detail resulted in the discovery and rectification of a serious unserviceability, which had the potential to develop into a serious accident. He is to be commended for his outstanding professionalism.

Corporal Guimond serves at 8 Wing Trenton. ♦



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CORPORAL PHIL DAVIS

In February 2005, Corporal Phil Davis, an apprentice aviation technician from 441 Tactical Fighter Squadron, was a last minute replacement for another technician for an air sovereignty alert (ASA) practice scramble. The scramble involved two aircraft in support of Operation Noble Eagle. Upon arriving on the flightline, Corporal Davis noted that the start crew positions were filled. Wanting to be of help, he then proceeded to the line supervisor's truck to offer assistance. The scramble start was completed; the jets were armed, and they commenced taxiing. Unbeknownst to the pilot or the start crewmembers, aircraft CF188753 was taxiing with panel 14R open. Noticing the open door, and immediately realizing the seriousness of the situation, Corporal Davis informed the line supervisor who drove up beside the aircraft and signalled it to stop. The number two engine was shut down, the door panel secured and the engine restarted.

Were it not for Corporal Davis' attentiveness the aircraft would have conducted a full afterburner

take-off and a local training flight with panel 14R open. This would most likely have led to the number two engine ingesting door panel 14R with potentially catastrophic results to a fully armed aircraft.

Through his quick thinking and attention to detail, Corporal Davis' actions potentially saved the aircraft from significant damage or total loss.

Corporal Davis serves with 441 Squadron, 4 Wing Cold Lake. ♦



MASTER CORPORAL JONATHON RUSSELL



Master Corporal Russell is a 12 Air Maintenance Squadron Aviation Systems Technician. On the evening of 04 May 2004, Master Corporal Russell was tasked to carry out an independent check on *Sea King* CH12438 for a number-5 tail rotor blade replacement. While carrying out the independent check, Master Corporal Russell noticed that the tail rotor hub bolts appeared to be excessively long. After identifying the problem, Master Corporal Russell immediately checked other aircraft

in the hangar and obtained a set of serviceable bolts from supply for comparison. As a result, it was determined that the wrong bolts had been used in the installation of the tail rotor head.

Master Corporal Russell immediately informed his supervisor of the discrepancy, and had the aircraft cordoned off and quarantined so proper flight safety procedures could take place. This included a call to the Duty Photo Technician to take appropriate pictures. Master Corporal Russell then supervised the replacement of the tail rotor hub bolts, which resulted in the return of the aircraft to operational status in minimum time.

Had he not corrected the situation, significant damage to, or even loss of, the tail rotor could have occurred. Master Corporal Russell's professionalism and initiative allowed him to identify and rectify a significant flight safety issue.

Master Corporal Russell serves with 12 Air Maintenance Squadron, 12 Wing Shearwater. ♦

CORPORAL GINA BURTON



On 11 July 2004, Corporal Burton, a journeyman aviation technician with the Task Force Bosnia Herzegovina Helicopter Detachment, was preparing to install the main rotor tachometer on a CH-146 *Griffon* which was undergoing a 600 hour inspection. It was during this time that she noticed that

a main rotor hub pivot-bearing bolt appeared out of alignment with its witness mark. Upon closer inspection, this bolt was easily turned by hand. She immediately recognized this condition as extremely unusual as this bolt is not disturbed during a 600 hrs inspection. While rectifying this snag she also checked the remaining 7 pivot bearing bolts and discovered 6 bolts were in fact loose.

With a spare main rotor hub sitting on the hanger floor, she proceeded to check this assembly as well, resulting in similar findings. It was at this point that the chain of command was informed and a local Special Inspection (SI) was issued.

The remaining Detachment aircraft, including those deployed to Banja Luka, were inspected. This local SI revealed that six of eight aircraft had loose bolts. Re-applying the correct torque and issuing a Conditional Inspection (CI) for a subsequent torque check after 10 -15 flight hours in accordance with applicable Canadian Forces Technical Orders instructions repaired all affected aircraft. If this condition had gone undetected, the bolt was free to back out and jam against the yoke, rendering the flight controls ineffective and potentially resulting in a catastrophic accident.

Corporal Burton's positive attitude and attention to detail are commendable. Her action in this matter has brought to light a potentially hazardous condition that is certain to have fleet-wide implications.

Corporal Burton serves with 408 Tactical Helicopter Squadron, CFB Edmonton. ♦

CORPORAL VAI KONG LO

In August 2003, Corporal Lo, an Aviation Systems Technician, was performing a routine 25-hour inspection on *Griffon* CH146442. The inspection consists primarily of a visual inspection of the general condition of several areas of the aircraft. While carrying out the tail rotor hub portion of the inspection, Corporal Lo went beyond the expected visual check of the lock wire condition by gently testing the torque with his fingers. He found the nut so loose that he was able to turn it by hand, with play of about 1/8 inch to the lock wire stopping point. This was possibly the last safeguard to further loosening of the nut and a potential ensuing catastrophic event.

As a result of Corporal Lo's finding, a review of current tail rotor nut torque checks and re-torque procedures and associated documentation was triggered. This further revealed that the civilian technical publications for the aircraft required a torque check every 100 hours. This was the object of a flight safety incident report number 113199. The weapon system manager at National Defence

Headquarters immediately promulgated procedures and technical publication changes in order to resolve these discrepancies.

Corporal Lo's vigilance and professionalism were the key factors in averting a potentially disastrous situation and in triggering the investigative process necessary to resolve this situation. His work has contributed measurably to the safety of the *Griffon* fleet.

Corporal Lo serves at 438 Tactical Helicopter Squadron, CFB St. Hubert. ♦



For Professionalism

For Commendable Performance in Flight Safety

CORPORAL DENIS DUBEAU

Corporal Dubeau was deployed to Camp Mirage in support of Operation APOLLO in March 2003. As part of his normal duties, Corporal Dubeau conducted daily inspections of the refueling tenders. His meticulous approach to his work led to the identification of premature splits in two of the four high-pressure hoses on the refueling tenders. He immediately rendered the refuelers non-serviceable and informed his chain of command. These splits were so well disguised that the technical assistance visit (TAV) inspection team, which had been at Camp Mirage only two weeks prior, could not detect them.

If these premature splits in the hoses had not been detected at that time, a very unfortunate result would most certainly have occurred. At worst, during a simple refueling of an aircraft with a pump pressure of approximately 1000 litres per minute, the hose could have ruptured at these split points and the fuel and vapours could have ignited. Jet A-1 fuel has a flash point of 38 °C and would have destroyed any aircraft, personnel and equipment that would have been in the immediate area.

At the very least, there would have been a very large fuel spill with significant environmental risk.

Corporal Dubeau's excellent safety awareness and thorough inspections prevented the failure of a critical equipment component. Corporal Dubeau's proactive approach to his duties averted a catastrophic situation that could potentially have caused loss of life and aircraft, along with considerable environmental contamination.

Corporal Dubeau serves at the Wing Transport Section, 8 Wing Trenton. ♦



CORPORAL BRAD PITTMAN



On 19 May 2004, Corporal Brad Pittman was tasked to change a primary hydraulic pressure transmitter NSN 6685-00-863-6350, on CH12408. Upon removal of the transmitter, he noticed that a restrictor elbow was installed in this indication system, instead of an unrestricted elbow as per Canadian Forces Technical Order (CFTO) C-12-124-ABO/MY-000.

Taking the initiative, he determined that the restrictor within the elbow would give a false hydraulic reading. This false reading could have caused the pilot to secure primary hydraulics and declare an in-flight emergency.

Corporal Pittman then took it upon himself to do a survey of all aircraft in the hangar, thereby confirming that this was an isolated incident and not a more widespread problem. As the restricted and unrestricted elbows look the same on the aircraft, they must be removed to verify the configuration.

Corporal Pittman's attention to detail and knowledge of the system demonstrated his personal commitment to flight safety and ensured the safety of the aircraft and aircrew.

Corporal Pittman serves with 12 Air Maintenance Squadron, 12 Wing Shearwater. ♦

CORPORAL BRYAN FORRESTER



While deployed as a member of a Mobile Repair Party to Torbay Newfoundland from 20-22 August 2003, Corporal Forrester, an Aviation Systems (AVN) Technician from 14 Air Maintenance Squadron, was tasked to conduct an extensive overstress inspection on *Arcturus* CP140120A. Due to his unsurpassed technical expertise, he was responsible for inspecting the entire airframe

structure. After almost two days of inspection, without hangar space, with minimal equipment and in harsh environmental conditions, he found no signs of overstress.

Showing perseverance and a keen attention to detail, he noticed that a hinge pin for the wing bleed air ducting extended out of the hinge and

was in contact with the top of the wing. The area in which he made the discovery is almost inaccessible. The panels that were open for this inspection would not, under normal circumstances, be opened for inspection until next periodic, which would be in 350 hours. Had Corporal Forrester not gone beyond the necessary inspection area, this hinge would have eventually torn and caused a bleed air leak in the leading edge ducting. If the indication system failed, or the aircrew did not notice it quickly, it could have resulted in an inflight leading-edge over-temperature resulting in an uncontrollable, catastrophic condition. The hinge pin itself, if allowed to vibrate through the leading edge, could have resulted in a very expensive leading edge change, necessitating numerous man-hours and the loss of the aircraft from the flying program for several days.

Corporal Forrester was quick to recognize the possibility for an inflight emergency and severe aircraft damage and immediately initiated a flight safety report. Corporal Forrester is commended for his professionalism and initiative in identifying this significant flight safety hazard.

Corporal Forrester serves with 413 Air Maintenance Squadron, 14 Wing Greenwood. ♦

PRIVATE STEVE FLEMING

While deployed as a member of a mobile repair party (MRP) to Torbay Newfoundland in August 2003, Private Fleming was conducting a comprehensive overstress inspection on a CP-140A, *Arcturus*. As the only propulsion technician on the team, he was responsible for the inspection of all four engine nacelles. While carrying out a visual inspection for signs of overstress to the airframe, he discovered an emergency handle cable guide bracket on the number one engine that had been improperly manufactured. This bracket is designed to guide the emergency handle cable through the engine firewall to ensure clearance and prevent chafing. The improper manufacturing of this bracket resulted in the cable rubbing on the metal guide bracket. Had Private Fleming not gone beyond the necessary inspection area, this cable would have eventually worn through.

In the event of an engine fire or any other engine emergency in-flight, this cable is the only means of

mechanically shutting off fuel flow to the engine and feathering the propeller. The failure of this cable could have resulted in a potentially catastrophic uncontrollable condition.

While working under arduous conditions, with minimal available equipment and limited aircraft experience, Private Fleming was quick to recognize the severity of this situation. He is commended for his professionalism and initiative in identifying this serious problem.

Private Fleming serves with 14 Air Maintenance Squadron, 14 Wing Greenwood. ♦



For Professionalism

For Commendable Performance in Flight Safety

CAPTAIN CRAIG ELLESTAD

Captain Ellestad was on a syllabus instrument flight for the Initial Multi-Engine course. The crew had just completed an Instrument Landing System (ILS) approach to a touch and go and was tracking the localizer and climbing on departure from Runway 31 Left in Southport.

The Qualified Flight Instructor (QFI) was focused on tuning the navigation aids believing that no other traffic existed due to poor visibilities and indefinite ceilings. In his peripheral vision, Captain Ellestad detected an object ahead and directed the instructor's attention to it. The Qualified Flight Instructor was initially unable to see the object. Captain Ellestad's initial assessment of the object did not show any relative movement in the windshield and so, to deconflict with the traffic, he executed an immediate right turn. The aircraft detected by Captain Ellestad was in fact a *Firefly*. The contrast with the surrounding weather conditions made the white *Firefly* extremely difficult to see. Approximately six seconds after first observing

the traffic, Captain Ellestad's aircraft passed the *Firefly* in close proximity. Winnipeg Air Traffic Control (ATC) later verified that the two aircraft had narrowly missed each other, closing to within 100 feet vertically.

Through outstanding situational awareness and timely action, Captain Ellestad prevented a potential mid-air collision.

Captain Ellestad serves with 3 Canadian Forces Flight Training School, Portage, Manitoba. ♦



CORPORAL SHANE RINGER



In November 2003, Corporal Ringer was tasked to conduct a routine structural inspection of the centre fuselage as per Periodic Card Deck AF 58 and 59. While conducting the structural survey at FS198, he discovered a guide pin on the #2 engine throttle cable pulley in contact with the #1 engine

main fuel line. This area is outside the assigned inspection task. Corporal Ringer then conducted a thorough check of Canadian Forces Technical Orders and established that the pin should have been installed with the head downwards, contrary to common installation practices. Corporal Ringer identified that the position of the #1 engine fuel

line inhibited the correct installation of the guide pin and that removal of the fuel line was necessary to correct the pin installation.

Due to his insistence for accuracy, 11 of 13 aircraft were found to have incorrect guide pin installations. Of these, four had the pin resting on the #1 engine fuel line. Corporal Ringer alerted the maintenance superintendents of the applicable aircraft to the potential hazard and raised a flight safety incident report. The ensuing investigation resulted in a fleet-wide Special Inspection (SI). Had these pins been left to wear against the engine's main fuel line, a rupture could have resulted with catastrophic results.

Going beyond his assigned tasks, Corporal Ringer's professionalism and exceptional attention to detail prevented a serious in-flight occurrence. His thorough investigation resulted in the identification of a previously undetected, fleet-wide, flight safety condition.

Corporal Ringer serves with 12 Air Maintenance Squadron, 12 Wing Shearwater. ♦

CORPORAL JIM WILSON



While performing a functional check during a Period Inspection of the Dash 8 hydraulic system Power Transfer Unit (PTU), a hydraulic motor that allows the number one hydraulic system to pressurize the number two system, Corporal Wilson was unable to attain confirmation of the correct sequencing of the motor. This check

was to ensure correct functionality of the hydraulic system for landing gear retraction in the event of a number two engine failure after take-off/overshoot. In essence, the loss of number two engine oil pressure (i.e.; a number two engine failure) in conjunction with a gear up selection should activate the PTU thereby facilitating gear retraction.

Realizing the serious safety implications of this failure, Corporal Wilson immediately initiated a

verification of the system on the three other aircraft thereby confirming the remaining aircraft were safe for flight. The subsequent investigation revealed that a modification to the number two engine on the suspect aircraft had not been carried out when the engine was last changed in 2002. This precluded loss of oil pressure activation of the PTU if an engine failure occurred during the intervening two year period. The specified mod is an airframe modification intended to be employed on the number two engine wiring system. It had not been called up at the time of the engine change, since no cross-reference existed to link the airframe modification to any engine modification/work.

Corporal Wilson's diligence and immediate action identified a flawed emergency system and ensured that no aircraft were dispatched with this emergency system inoperative. Further, his alertness and thorough approach, based on a sound in-depth knowledge, resulted in a long-standing deficiency in an emergency system also being corrected and appropriate preventative measures being implemented.

Corporal Wilson serves with 402 Squadron, 17 Wing Winnipeg. ♦

MASTER CORPORAL CHUCK CALLAGHAN

Master Corporal Callaghan was tasked to de-arm 1 of 3 loaded CF-18 alert aircraft. As Man 1, Master Corporal Callaghan parked the aircraft and directed Man 2 to carry out de-arming procedures. Noting Man 2's uncertainty as to the location of the weapon's arm/safe T-handle on station 2, he closely watched his actions, and observed him starting to cross forward of the weapon. This would have taken him into the intake danger area. Master Corporal Callaghan immediately got his attention and halted him, directing 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 3 and 4 aft of the intake. However, Man 2 chose to continue forward between the fuel tank and fuselage of the aircraft, coming directly into the danger area approximately 30 inches from the intake. Master Corporal Callaghan yelled and immediately acquired Man 2's attention and then signalled him 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's keen attention to detail permitted him to quickly identify a serious safety concern and to immediately take the appropriate action.

Master Corporal Callaghan serves with 441 Squadron, 4 Wing Cold Lake. ♦



For Professionalism

For Commendable Performance in Flight Safety

MAJOR ROBERT MITCHELL



Hornet CF188904 was lead in a 2-plane formation of CF-18s that was completing a training mission from Cold Lake to Edmonton on Friday, 12 November 2004. On final for Edmonton, the pilot, Major Mitchell, noticed a slight cross-wind and compensated appropriately for the landing. Adding a small amount of power, he

cushioned the descent rate for the landing. Upon touchdown, the aircraft pulled aggressively to the left and an overshoot was carried out. The tower was notified that a landing gear failure had just occurred and the wingman was requested to overshoot. The wingman then visually diagnosed a planning link failure with the connecting rod being bent.

Anticipating an Air Traffic Control (ATC) delay at the destination the pilot had planned for 800 pounds (lbs) of extra fuel. He contacted ATC and requested

an immediate vector back to Cold Lake to engage the arrestor cable. Initial fuel calculations in the climb showed zero fuel overhead Cold Lake, but continued calculations showed the fuel remaining to be about 900 lbs at destination, later increasing to 1,200lbs in the descent. At 80 nautical miles (NM) from Cold Lake, coupled with a 30-knot tailwind, the fuel worries were subsiding except for the fact that without fuel to go around there would be only one attempt to bring the aircraft home. Major Mitchell informed his back seat passenger, a pilot awaiting training, to tighten up his seat harness and to prepare to eject if the need arose. Lining up for a normal 3-degree approach, from 3 NM back, the pilot set up for a cable engagement. Upon touchdown, the aircraft started to pull to the left and rudder without brakes was used to counteract the pull. At the same time that the cable was engaged, the aircraft started a rather hard left hand turn and came to rest about 25 feet from the grass.

The natural reaction and instinct of Major Mitchell, coupled with his quick decision to return to Cold Lake, combined with timely coordination of ATC, saved the aircraft and its occupants from a possible catastrophic event.

Major Mitchell serves with 410 Squadron, 4 Wing Cold Lake. ♦

MR. DOUG MOORE

On the evening of the 7 December 2004, Mr. Doug Moore, a contracted civilian driver, employed as a flightline driver for operations at 8 Wing Trenton, noticed a visiting CASA aircraft on the ramp oscillating due to the current gusty wind conditions.

Further investigation revealed that the aircraft's front oleo was extending to its full limits due to winds of 25 gusting to 37 Knots. It was also leaning over to the port side due to the internal transfer of fuel to the low side of the aircraft. Mr. Moore immediately recognized the potential for aircraft damage and brought the incident to the attention of the Wing Operations Duty Officer and servicing personnel. The visiting aircraft was subsequently towed to a sheltered position and tied down with chains.

Mr. Moore's quick thinking and consideration for safety averted possible aircraft damage and loss of contracted resources to 8 Wing Trenton.

Mr. Doug Moore serves at 8 Wing Transport, 8 Wing Trenton. ♦



**MASTER CORPORAL TROY CARR &
CORPORAL MIKE O'TOOLE**



Subsequent to the repair of a known leak in a main fuel cell of *Dash-8* CT142803, Corporal O'Toole was performing a final closeout inspection. He took it upon himself to inspect areas beyond that being worked on and discovered two rivets that had "popped" and were lying loose against the rear rib, behind the main fuel pump and all of the associated plumbing. Sensing an anomaly, he brought his discovery to the attention of Master Corporal Carr who did a further inspection and found 12 Cherry Max rivets installed in the fuel cell. Cherry Max rivets are not recognized for use in the CT-142 *Dash-8* fuel cell and in this case they were loose. A review of maintenance documentation revealed

no such repair having been carried out. It is therefore believed that at some previous time, a contractor affected a quick repair to the underside of the fuel tank. At this time, it is suspected that the Cherry Max rivets were inserted, pushing up the old rivet heads with the Polymerized Rubber Compound remaining intact. If these rivets had loosened further they would have become FOD. Within the fuel system, loose rivets could lodge in a fuel valve and restrict the ability to close the valve in event of an in-flight fire. Any of these loose rivets could also plug the ejector pump thus blocking the transfer of fuel from tank to tank. In such a situation the aircrew would be unable to use all the fuel onboard thus causing a wing imbalance or increased landing weight.

The loose Cherry Max rivets were subsequently removed and replaced by the specified solid-jacket rivets.

Master Corporal Carr and Corporal O'Toole's thoroughness, knowledge and professionalism resulted in the discovery of a less than obvious non-standard/unrecorded repair, which compromised the fuel cell integrity and could have led to the loss of the aircraft and all onboard.

Master Corporal Carr and Corporal O'Toole serve with 420 Squadron, 17 Wing Winnipeg. ♦

**MASTER WARRANT OFFICER STEVE KIRBY,
WARRANT OFFICER LEO JENKINS &
SERGEANT TREVOR BULL**

At the end of a routine maritime patrol, an *Aurora* crew attempted to launch a sonobuoy; a procedure that occurs on almost every mission. However, while attempting to launch a sonobuoy from the pressurized sonobuoy container (PSLT) #2, the crew heard an unusual sound. Upon inspection, the crew carried out the misfired cartridge actuated device procedure, and eventually removed the sonobuoy launch container from the PSLT. Further investigation revealed that the sonobuoy itself was jammed in the PSLT due to the malfunctioning of the lower exterior door.

As all suitable landing airfields would result in the aircraft flying over populated areas, the Maritime Patrol Crew Commander requested the two Flight Engineers, Master Warrant Officer Kirby and Warrant Officer Jenkins, assist the Lead Airborne Electronic Sensor Operator, Sergeant Bull, in attempting to remove the sonobuoy from the PSLT. This would eliminate the potential for the 16.5lb projectile to inadvertently exit the aircraft. One problem remained though - there was no procedure for such an instance.



Upon carefully assessing the situation, a cargo strap was located and slid down the PSLT, between the wall of the PSLT and the side of the sonobuoy. The sonobuoy was slowly raised the 3 feet back into the aircraft. With the sonobuoy removed from the PSLT the aircraft returned to base without further incident.

Master Warrant Officer Kirby, Warrant Officer Jenkins and Sergeant Bull exhibited a highly professional attitude in averting a serious aircraft incident. Their quick thinking, ingenuity, and resourcefulness ensured that the sonobuoy would not dislodge and fall from the aircraft.

Master Warrant Officer Kirby, Warrant Officer Jenkins and Sergeant Bull all serve at 415 Squadron, 14 Wing Greenwood. ♦

For Professionalism

For Commendable Performance in Flight Safety

PRIVATE TROY HOYT



Private Hoyt, while under supervision of Corporal Thornhill, was conducting a routine airframe "A Check" on a CH-124 *Sea King*. While inspecting the tail rotor, Private Hoyt pointed out what appeared to be a crack in one of the tail rotor blades. Private Hoyt retrieved a maintenance ladder in order to further

investigate the suspect blade. As it turned out, there was a crack, 3 to 4 inches long, through the blade. A subsequent Special Inspection and Senior Aircraft Maintenance Authority (SAMA) Alert were issued.

The initiative and attention to detail displayed by Private Hoyt prevented a situation that could easily have led to the catastrophic failure of a major dynamic component. The loss of a tail rotor blade in flight would result in a loss of controllability and would have certainly resulted in an aircraft accident.

Private Hoyt serves with 12 Air Maintenance Squadron, 12 Wing Shearwater. ♦

SERGEANT DON KEACHIE & MASTER WARRANT OFFICER GERRY POITRAS

On departure from Zagreb, 15 September 2004, the right hand (RH) main landing gear (MLG) on *Hercules* aircraft 130343 failed to retract. Later inspection showed that the forward RH MLG had failed to retract but the aft RH MLG did. This resulted in damage to the emergency brake hydraulic lines and the landing gear itself. It took the crew over two hours of holding over Zagreb to get the landing gear secured down.

During this emergency Sergeant (Sgt) Don Keachie and Master Warrant Officer (MWO) Gerry Poitras did an excellent job of performing abnormal Loadmaster (LM) duties. In order to gain access to the RH MLG area, the cargo load had to be moved. Sgt Keachie and MWO Poitras broke down the load of barrack boxes and moved them to the aft end of the aircraft. They then proceeded to secure the modified load in place. Due to a faulty dual rail system (DRS) the center pallet was secured with tie-downs. These tie-downs could have been a hazard to the Flight Engineers (FEs) as they worked on the RH MLG. Anticipating this, Sgt Keachie and MWO Poitras removed all tie-downs that might cause a hazard and ensured the pallet was secured by other means. They then went on to reconfigure the aft end of the aircraft to allow the passengers to take seats aft of the load in case of a gear-up landing.

With their loadmaster duties complete, Sgt Keachie and MWO Poitras displayed their experience and professionalism by assisting the FEs in every effort possible while not impeding their work. They acted



Front left, Warrant Officer Woods; front right, Sergeant Keachie. Back left, Master Warrant Officer Poitras; back right, Sergeant Hall.

as a communications relay when the FEs could not use the intercom during hands-on work. They provided tools, removed DRS covers and retrieved the MLG tie-down kits. When there was no specific task for them, Sgt Keachie and MWO Poitras sat on top of the load beside the RH MLG to hold books and tools whenever required for the FEs.

Sgt Keachie and MWO Poitras displayed their expertise in performing their crew duties efficiently and accurately. Further, their cooperation and coordination in assisting those responsible for fixing this threatening situation helped bring about a successful solution and a safe landing for the aircraft and crew.

Sergeant Keachie and Master Warrant Officer Poitras both serve with 426 Training Squadron, 8 Wing Trenton. ♦