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Flight Comment

ISSUE 2, 2012

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SÉCURITÉ DES VOLS FLIGHT SAFETY

Canada

Views on Flight Safety

By Chief Warrant Officer Jacques Boucher, Directorate of Flight Safety

"INVEST" IN FLIGHT SAFETY

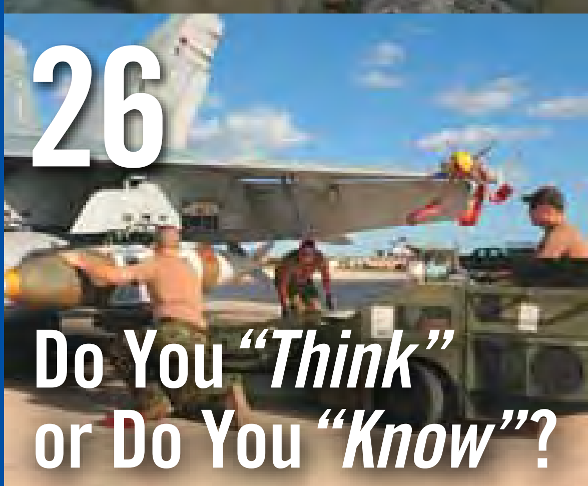
At one time or another, you have likely been briefed on the significance of investing prior to retirement. However, have you given any thought to "investing" in a new generation of air force personnel, prior to retirement? Whether intentional or not, hopefully this is occurring!

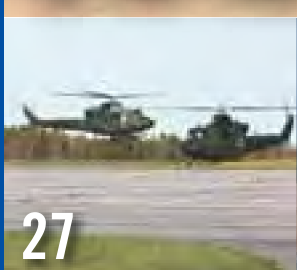
For those who have participated in this year's annual Flight Safety briefing, you are likely aware that with respect to ground occurrences, the "personnel" cause factor is the only one that has consistently increased since 2005. Although part of this trend might be explained through better reporting, which is a good thing, this does not account for many of the incidents occurring.

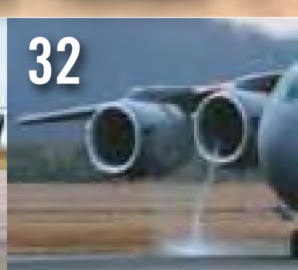
There are several factors constantly at work that challenge our Flight Safety record: personnel inexperience, new fleets in service and high operational tempos are only a few of the examples. For most members of the Royal Canadian Air Force, these factors are largely out of our control. One key factor within your control, and one that could help reverse the rising trend of the "personnel" cause factor, is ensuring effective supervision. I am not referring to micro-management here but more about the basics of good supervision. As related to the maintenance world: being there for critical juncture points during maintenance tasks, ensuring that the tasks were carried out as per the approved maintenance manual, ensuring that subordinates complete all applicable paperwork prior to releasing the aircraft for service, ensuring that close-out checks are completed at the end of inspections, ensuring that tool control is adhered to, and last but not least, ensuring that junior technicians understand the importance of properly completing their work and how it fits within the big picture of flight safety. As experience levels remain low, the need for effective supervision is not only applicable in the maintenance arena, but critical throughout the air force.

Before you leave the Canadian Forces, how much of your valuable experience are you willing to "invest" in your subordinates, today? ◆


Photo: Cpl Igor Loutsiouk







Flight Comment

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Good Show
For Excellence in Flight Safety

Corporal Dean Smith

On 21 February 2011, Corporal Smith, a Flight Engineer under training at 440 Transport Squadron Yellowknife was deployed on exercise Northern Bison in Churchill Manitoba. He was part of a CC138 ski-equipped *Twin Otter* crew which had been tasked to support and resupply members of the 38 Canadian Brigade Group who would be travelling by snowmobile over frozen tundra and ice.

440 (T) Squadron utilizes an Engines Running Operation (ERO) to maximise utilization of the aircraft and minimise turn-around time. This ensures that an aircraft does not become disabled in remote areas, while guaranteeing that safety is not jeopardized. On one such ERO resupply, Corporal Smith was directed to organise and supervise the next offloading from the *Twin Otter* to the inbound snowmobiles. Corporal Smith was situated outside and to the rear of the engines running aircraft while awaiting their arrival when he observed the first snowmobile approaching his position. It quickly became evident that the snowmobile was not stopping at the rear of the aircraft as directed, but intended to continue towards the spinning propeller.

Corporal Smith took immediate action by physically grabbing the shoulder of the driver to prevent further movement towards the front of the aircraft. The snowmobile came to a stop approximately six feet from the running propeller.

Corporal Smith's quick recognition of a dangerous situation and immediate actions most likely prevented a serious injury or possibly even loss of life. His exemplary actions serve as an inspiration to his peers and supervisors alike, and make him very deserving of this Good Show Award. ◆

Corporal Smith currently serves with 440 Transport Squadron, Yellowknife.

For Professionalism

For commendable performance in flight safety

Private Matthew Ligon

On 18 November 2010, a work crew was tasked with conducting the replacement of the Air Cycle Machine in the tail compartment of *Dash 8* aircraft CT142803. During the close out and inspection phase, Private Matthew Ligon noticed what appeared to be damage to one of the flight control cables in an adjacent area of the compartment. He brought this to the attention of his supervisor, who confirmed that there was significant damage to the cable requiring immediate replacement.

It was eventually determined that the damage occurred during a previous maintenance activity that occurred approximately one year earlier. A flight safety incident report was initiated and all squadron aircraft were inspected.

Pte Ligon was a new apprentice aviation technician recently arrived from Borden. His experience level at recognizing and repairing aircraft faults was very limited, yet he had the aptitude to identify an anomaly and the confidence to bring this to his supervisor for what he thought to be an issue of importance.

Inspection of the flight control cable was not a part of the task at hand, and Pte Ligon is commended for his exceptional diligence in looking beyond the immediate work area. Through his acute attention to detail and personal drive, he was able to eliminate the possibility of an airborne failure of the elevator flight control system, and thus, avoid a significant and hazardous flight control malfunction. He is most deserving of this For Professionalism award. ◆

Private Ligon serves with 402 Squadron, Winnipeg.

Corporal James Meikle

While performing a visual inspection of the utility hydraulic system as part of a Supplementary Inspection on a CH124 *Sea King* helicopter, then Private Meikle, from 423 (MH) Squadron, discovered a serious chaffing condition that posed a significant flight safety risk.

Cpl Meikle went above and beyond the required scope of inspection by removing a flight control access cover to gain better access to hydraulic system lines for inspection. While in this area he discovered that a rotor brake hydraulic supply line and a hoist hydraulic line had come into direct contact with a cyclic pitch control rod. He immediately informed a Level "A" technician who confirmed the existing unsafe condition and they contacted the flight safety section.

Cpl Meikle assisted flight safety personnel by researching technical orders and doing visual inspections of hydraulic line checks on other aircraft. It was subsequently determined that the line chaffing was caused by bends in the hydraulic lines that compromised the allowable clearance criteria, and that this was an isolated incident.

Cpl Meikle's action averted the possible failure of multiple CH124 utility systems such as blade fold, hoist, landing gear, main probe and sonar. His initiative to go above and beyond the inspection requirement and his exceptional professional attitude averted a potentially serious accident and is highly deserving of a For Professionalism flight safety award. ◆

Corporal Meikle currently serves with 423 Maritime Helicopter Squadron, 12 Wing Shearwater.

For Professionalism

For commendable performance in flight safety

Corporal Jonathan McArthur

On Friday 08 April 2011, Cpl McArthur, an aircraft structures (ACS) technician at 410 Tactical Fighter (Operational Training) Squadron was requested to inspect a wing pylon at 1 Air Maintenance Squadron (AMS) armament shop. He discovered that the pylon had misaligned drill holes on the bracket mounts for the encoder/decoder.

He recommended that the pylon be returned to 1 AMS for repair or have a Defect Report and Engineering Disposition (DRED) produced to repair it in the unit ACS shop. As a courtesy, Cpl McArthur called the ACS technician at the 1 AMS shop to inform them of the misaligned holes to raise awareness of the mistake made.

The following Monday, Cpl McArthur accompanied the 1 AMS ACS technician to view the misaligned holes of the pylon.

In trying to locate the u/s pylon, Cpl McArthur discovered that the pylon had been installed on aircraft 188928 and was scheduled to fly. He also found that the pylon had been worked on by unqualified and unauthorized personnel and had undergone an unauthorized repair. Recognizing the seriousness of the situation, he immediately identified the airworthiness concerns, flight implications and notified 410 Squadron Flight Safety personnel. The aircraft was subsequently removed from the flying program and placed in quarantine.

Cpl McArthur's diligence and professional actions prevented a non-airworthy aircraft from going airborne. It is very likely that the ad hoc repair would have resulted in a serious Flight Safety occurrence on a future flight. His willingness to step in and act on this potentially dangerous situation demonstrated superlative integrity. Recognizing an unsafe

situation, having the conviction to act and then following it through to a safe conclusion are all traits worthy of praise. Cpl McArthur's actions epitomize what Flight Safety is all about and he is truly deserving of this For Professionalism award. ◆

Corporal McArthur serves with 410 Tactical Fighter (Operational Training) Squadron, 4 Wing Cold Lake, Alberta.

HMCS Vancouver

On 30 September, 2011, *HMCS Vancouver* and its embarked *Sea King* helicopter were patrolling the Mediterranean Sea off the coast of Libya as part of *Op Unified Protector/Mobile*.

Approximately 45 minutes into a routine patrol flight and 25 miles from *HMCS Vancouver*, the ship's *Sea King* experienced an intermediate gearbox emergency. The ship's company immediately came to Emergency Flying Stations, changed course and increased speed in order to minimize the time for aircraft recovery.

At precisely the right moment, *HMCS Vancouver* simultaneously slowed and executed a turn to match the aircraft's flight course, providing the crew with an ideal approach for landing. The ship's company was closed up and the Captain gave permission to land. The helicopter immediately landed safely on deck and conducted an emergency shutdown without further incident.

This emergency required the aircraft to land as soon as possible, and the speed, precision and enthusiasm of the entire ship's crew enabled them to accomplish this quickly and safely.

The actions and performance of the Captain and Crew of *HMCS Vancouver* is a testament to their professionalism, teamwork and dedication. The efficiency of their reaction mitigated and minimized any further flight compromise. They are most deserving of this For Professionalism flight safety award. ◆

***HMCS Vancouver* is based in Esquimalt, British Columbia.**

Corporal Tanya Logan

In September 2011, Cpl Logan, an aircraft structures (ACS) technician at 436 (T) Squadron noticed a discrepancy in the number of exposed drain holes found under the fuselage of CC130 *Hercules* aircraft 130603. She reasoned that some drain holes had been covered when protective tape was applied to the fuselage.

A covered drain had been discovered on another aircraft earlier and approximately a gallon of trapped water was released when it was opened. Concerned that a reoccurring condition might exist, she examined an un-modified aircraft and conducted a detailed visual comparison. This exam confirmed her suspicion that several drain holes had indeed been covered. She engaged the Lockheed Martin (LM) Field Service Representative (FSR) in order to compare the drawings used in the taping process to that of the true location of the drain holes. It was discovered that the drawings were deficient and many of the drain holes were not indicated in the reference documents.

At her insistence, the FSR submitted a formal request for corrected drawings in order to prevent future errors. Upon receipt of the new drawings, she again noted that there were still several deficiencies and again brought this to their attention. When the third iteration of drawings arrived with errors, Cpl Logan assisted the (LM) engineers in producing proper drawings of the CC130J drain-hole locations. Equipped with accurate information, crews were able to identify and rectify covered drain holes on several other modified aircraft in the fleet.

Through Cpl Logan's persistence and attention to detail, she was able to identify a serious and insidious hazard in the modification process which would have unquestionably caused structural damage by internal corrosion

and weight and balance issues affecting the longevity of the CC130J fleet. If left unidentified, the likelihood that other aircraft would have been incorrectly modified was very high. Her decisive actions are commendable and a testament to her professionalism. She is definitely deserving of this For Professionalism award. ◆

Corporal Logan currently serves with 436 Transport Squadron, 8 Wing Trenton, Ontario.

Corporal Greg Myers

Cpl Myers, an Avionics Technician (AVS) at 440 (T) Squadron in Yellowknife NT, is employed in the AMCRO (aircraft maintenance control and repair office) section and due to the small squadron maintenance organization, he is often called upon to do work as a snags technician.

In Sept 2011, while working on a CC138 *Twin Otter*, Cpl Myers queried a propeller replacement team about a previously authorized maintenance deviation issued by the *Twin Otter* Aircraft Engineering Office. The maintenance deviation addressed the need to ensure that the hardware securing the propeller zero thrust assembly had a visible safety thread and was torqued properly. He was advised that this was not required, because the installed propeller's serial number was not listed on the deviation.

Although the propeller was not covered by the deviation, Cpl Myers took the initiative to verify that the contractor hardware was installed properly. Upon examination, he discovered that the safety threads were not visible. He immediately informed his supervisors who confirmed the error, prompting a thorough inspection. During this inspection of the propeller it was determined that the bolts did not meet safety specifications and required replacement

Cpl Myers' actions prevented a potential aircraft accident or incident. His actions also prompted follow-up action by the engineering authority with regard to the 3rd line contractor propeller overhaul process, thus preventing subsequent improperly assembled propellers from entering the CC138 supply system.

Cpl Myers' diligence, professionalism and concern for airworthiness, outside his area of expertise, make him a deserving recipient of this For Professionalism flight safety award. ◆

Corporal Meyers currently serves with 440 Transport Squadron, Yellowknife.

The Editor's Corner

To the Editor

Letter from Major Don Carver

14 Wing Air Traffic Control Officer, 14 Wing Greenwood

I read the article (RT Communications Discipline, *Flight Comment* Issue 1, 2012) and like the way you used the climb incident at the end to highlight the point. In keeping with the intent of FS to educate we used it to highlight to several new controllers/trainees the difference between rookie and advanced control technique. More experienced controllers would not only not use the "to" but would also anticipate a possible "bust" of the restriction, assess if it would be critical with respect to conflicting aircraft and either advise the aircraft climbing of the conflicting traffic (for critical situations) or prepare to level the aircraft if they pass through the altitude. Anticipation and projection of conflicts is a critical controller aptitude and the lack of it is a primary cause of our 50% failure rate.

One point, in 25 years of controlling I've never used sarcastic responses to correct a pilot's RT and the most I've said on air to address issues is "Call me when you get on the ground". However; as a former instructor your point ref non-standard RT and controllers working in their second language is spot on. Trainees working in their second language do not have time to translate standard RT never mind try and figure out expressions like "spot on".

Concern

In my relatively short time (approaching two years) in the position of Editor of *Flight Comment* magazine, I have received, heard and seen some things of concern. No, I am not referring to the occasional vilification of yours truly along with questions relating to my parentage, but more to the culture within our Flight Safety system.

Ouch

On an anonymous aviation forum, I recently saw *Flight Comment* described as being a mediocre publication (ouch!). Believe me when I say that I have heard worse. While I am not here to prove or disprove the above, I will absolutely agree that our beloved magazine can always be improved and we must continually strive to do so.

How Many?

Some of you might wonder where the articles within these "hallowed" pages come from. A few are re-prints from other magazines, and some are from previous issues of *Flight Comment*, but most are from you, members of the CF. Since I have been in this position, we have published around 75 articles: some good and some probably not as good according to some, but all intended to contribute to the Flight Safety Program. From that 75, how many unsolicited article submissions from the CF do you think I have been inundated with? 100? 200?

Anonymity

Almost all of the articles printed in the Lessons Learned section are from attendees of the Flight Safety Course. Writing an article is a course requirement, and all of these articles eventually get sent to my inbox. Then they are read and authors of the ones deemed publishable are contacted for permission to print. At this point, two things are surprising to me:

- the number of authors who request anonymity
- the number of authors who do not allow their articles to be published at all

Because sharing flight safety experiences is so important to our "blameless" flight safety culture, the second bullet in the above should be a concern to everyone. Why would someone not want to share his/her experience that others could learn from? I'll leave that for you to answer. As to wanting to remain anonymous, I am not sure that this is a concern – or is it? I would be interested to hear what *you* think about these questions.

Three

The answer to the above question on the number of unsolicited articles received and published is a grand total of 3 articles in 20 months. I mention this in the hope that some might re-consider putting "pen to paper" and passing it along. What are we looking for? Anything related to Flight Safety that others might benefit from.

In the final analysis, *Flight Comment* is your magazine and just one tool we use to promote aviation safety. To those who have contributed content in the past, we thank you; to those who have not, we look forward to your future consideration.

You can contact me directly at John.Dixon@forces.gc.ca.

Fly safe.

Captain John W. Dixon
Editor, *Flight Comment*

The Common Cold
does flying on a commercial airline increase your risk?

By Major Helen Wright, Directorate of Flight Safety, Ottawa

Sneezing, sore throat, runny nose – you know the signs of a cold. Although the common cold is usually mild, with symptoms lasting one to two weeks, it is a leading cause of doctor visits and missed days from school and work in North America. Children have about two to six colds a year, while adults average about one to three colds a year[1].

Is Flying on a commercial airline a risk factor for the Cold?

Many people complain of respiratory symptoms following air travel. Studies indicate that there may be a higher incidence of the common cold following commercial air flight. One study found 20% of passengers experienced cold-like symptoms in the week following a flight which is a much higher rate than the 2.2 colds/yr found in bus or train commuters[2]. Another study found high rates of colds in flight attendants. On the other hand, there are studies that indicate the incidence of the cold does not increase with air travel, and one looking at military aircrew found the rate of colds is similar to the North American average[3].

If the anecdotal reports are true and there is a higher risk of colds after flying, air quality does not seem to be the problem: many studies have shown that the filtered air in today's aircraft is of very high quality. 99.9% of bacteria and virus are filtered out and the air is completely exchanged at least 20 times per hour. Studies of aircraft ventilation systems indicate the spread of pathogens during flight occurs rarely[4]. Air recirculation itself is not a factor since passengers on airplanes that did and did not recirculate air had similar rates of post flight respiratory symptoms[5].

So if it is not the air quality or air recirculation, what else could be increasing the risk of a cold after flying? A recent study looked at altitude to see if physiologic stresses such as lowered barometric pressure and mild hypoxia can increase one's chance of illness. They found that exposure to cabin altitudes of about 8000 ft for 10 hrs causes temporary and very mild immune changes in the body that may contribute to an increased susceptibility to respiratory infections[2]. Interestingly, more extreme altitude exposures such as mountain climbing or space fight have also been shown to alter the immune system.

Other notable physiologic stresses of flight are dehydration due to low air humidity and fatigue associated with long days and disruption of circadian rhythm. Lack of sleep, circadian changes and dehydration all appear to influence the human immune system; however, it is not clear how the degree of the fatigue and dehydration stresses experienced in flight translate to susceptibility for illness.

Prevention

There are several ways you can keep yourself from getting a cold or passing one on to others whether you are flying or not:

- Touching environmental surfaces such as telephone, keyboard, stair railings or door handles that have cold viruses on them transfers the cold virus to your hand. The virus can survive up to 3 hours on objects. Cold viruses on your hands can enter your body through your eyes and nose. Wash

your hands frequently and keep your hands away from your face. If soap and water are not available, alcohol-based disinfecting products can help.

- Cover your nose or mouth so you sneeze or cough into your elbow rather than your hand.

(Note that it has been consistently found that risk of colds is reduced in those who engage in regular exercise while avoiding overtraining[6]).

Treatment [7]

There is no cure for the common cold. Symptoms present about two days after infection. You may get some relief from your cold symptoms by resting and taking plenty of fluids. Over-the-counter medications such as a decongestant or saline nasal spray may help relieve nasal symptoms; aspirin or acetaminophen (e.g., Tylenol™) will reduce headache or fever. Antibiotics are not used to treat a cold, however, colds can occasionally lead to bacterial infections of the middle ear or sinuses. If you suspect an ear or sinus infection you should visit your clinic for assessment as these may improve with antibiotics.

Aircrew and others with jobs that may influence flight safety should use care selecting over-the-counter cold remedies at the pharmacy. Some, such as decongestants and cough suppressants, may relieve symptoms but they do not prevent or shorten the length of the cold. Importantly, most of these medicines have some side effects, such as drowsiness, dizziness, and insomnia that are not safe for flying or other aviation-related duties. See your flight surgeon for advice.

Conclusion

It is possible that commercial airline flight increases the chances of catching the common cold, but the evidence is not conclusive. The current science suggests that altitude, fatigue and crossing time zones, as well as exposure to crowded facilities such as airports, and perhaps the very dry air in aircraft might contribute to risk of catching a cold following a flight. The quality of cabin air is very good in modern aircraft and many studies have demonstrated that there is a low chance of catching an infectious illness during the flight. ◆

Endnotes

1 *http://www.niaid.nih.gov/topics/commoncold/Pages/default.aspx*

2 Wilder-Smith A, et al (2012). Transient immune impairment after a simulated long-haul flight. Aviat Space Environ Med; 83:418-23.

3 Ungs TJ, Sangal SP. (1990). Flight crews with upper respiratory tract infections: epidemiology and failure to seek aeromedical attention. Aviat Space Environ Med;61(10):938-41.

4 Leder K, Newman D (2005). Respiratory infections during air travel. Intern Med J. 2005;35(1):50-5.

5 Zitter JN, Mazonson PD, Miller DP, Hulley SB, Balmes JR (2002). Aircraft cabin air recirculation and symptoms of the common cold. JAMA;288(4):483-6.

6 Nieman DC(2000). Is infection risk linked to exercise workload? Med Sci Sports Exerc;32(7 Suppl):S406-11.

7 Simasek M, Blandino DA (2007). Treatment of the common cold. American Family Physician;:75(4).

Photo: Cpl Pierre Habib

Maintenance Documentation

By Major Barry Devereux, Directorate of Flight Safety, Ottawa

The Directorate of Flight Safety's *Debriefing* Issue 1, January 2012, was published to highlight records related occurrences as reported in Canadian Forces Flight Safety Occurrence Reporting System. We reported that records-related occurrences account for roughly 10% of all FS reports, or roughly 300 reports every year. We also highlighted that the number and percentage of FS incidents seemed to be fairly constant, year after year. Put another way, we have been averaging nearly one FS occurrence per day due to "paperwork" errors for at least the past few years.

The point of this *Debriefing* was to solicit your feedback for where you saw problems, pitfalls and solutions. We also talked to your friendly airworthiness auditors who "visit" you periodically to refresh your AMO certification and get cosy with your various maintenance record sets (MRS). This edition of Maintenance Corner is dedicated to what you have told us.

First and foremost, the vast majority of our technicians are genuinely dedicated to doing a good job. So then why do we continue to see so many FS reports and DTAES audit observations on documentation? Maintaining an error free MRS seems to be a perennial bug-bear of maintenance. At the beginning of my career, I was assigned to work in the AMCRO section for a few weeks as part of my OJT. I distinctly recall the ongoing frustrations of a certain Sgt i/c to get the paperwork correct and I was conscripted into the effort to gain experience! When reading your feedback, I felt a certain sense of déjà vu.

It is true that we face many organizational challenges in terms of training, experience, manning levels, and ops tempo. We contend with multiple Electronic Records Keeping Systems having varying capabilities and user friendliness (or not). While these organizational factors are relevant, they are also largely outside the control of front-line maintenance.

So what can be done to improve our situation within our own scope of responsibility? Actually, quite a lot. There were many good observations and suggestions put forward (see inset), and a big thank you to those who took the time to respond. In spite of the various challenges across the fleets, the common message that came through is that the fundamentals do not change. Keeping those **fundamentals** sound depends on the front-line. The ultimate success of records keeping depends on **knowledge, supervision**, and **vigilance**.

Knowledge is the entry key to documentation. But if knowledge is the key, then how do we gain the knowledge to become competent in all aspects of record keeping? In our environment, much of our records-keeping knowledge is gained through experience and learning from others. While formal training does occur to some extent, it is the units that must ensure the detailed knowledge is gained via OJT. Many of your responses

highlighted training/knowledge as a significant challenge. How do we ensure a sufficient knowledge base, especially in smaller or new squadrons? How do we avoid the "sink or swim" scenario? How do we pass on the correct knowledge and not the mistakes?

Supervision is paramount. In our environment, there will always be a cross-section of experience and knowledge levels. Supervision provides the necessary guidance and oversight to ensure the job gets done right. Supervision is just as essential for documentation as it is for maintenance, perhaps more so. There will always be the element of human error, as well as incomplete knowledge to contend with. What mechanisms do you have in place to prevent errors and are they effective? When errors are found, are they used as positive learning opportunities to prevent future occurrences?

Of note, one of the most common Preventive Measures (PM) reported in the FS System is "Personnel Briefed on importance of following rule/order/procedure X". While an excellent immediate corrective measure to pass on knowledge, this PM often misses underlying causes. Memories fade, personnel rotate and we may have to relearn the same old lessons with new people. If this is the only PM, take the time to ask: did we dig deep enough or did we miss an opportunity to address an underlying factor?

Finally, **vigilance** underpins it all. Vigilance is an attitude that we must continually cultivate both individually and as an organization. It is our primary defence against complacency and ensures we strive for the best results. We complete hundreds, if not thousands of maintenance actions daily across the CF. Even realizing that the FS system only highlights the errors that result in a FS incident (not all errors), our track record in general still shows that we seem to be getting it right most of the time. However, in the aviation environment, even small errors can be unforgiving. In our busy workplace with its inherent pressure to achieve the mission, the opportunity for error is always present. If the paperwork is considered as secondary to the hands-on maintenance or viewed as a burden, we will not truly confront and then minimize documentation errors. Documentation is vital to the continued airworthiness of the aircraft and is every bit as important as the hands-on maintenance. We must be vigilant, pay attention to detail, and strive to get it right every time.

What will YOU do today to improve your maintenance recording knowledge and skills?

Debriefing Feedback

Learn from the experience of others. (You won't have time to make all the mistakes yourself).

- Use regular AMCRO/FS briefs to raise awareness of documentation issues.
- Use errors as teaching points. How can your technicians learn from errors if they don't realize they made one?
- Commonality and sharing of info across fleets/squadrons can be very beneficial. Common procedures and annual AMCRO conferences are excellent forums to share experiences, best practices and highlight areas for improvement.
- Use the Quality Management System to identify and fix the underlying problem and also to follow-up to ensure the fix was effective.

Priority on Paperwork

- Always open the paperwork FIRST. This is a good habit, if only to remind us of the importance of documentation, especially in the hectic pace of the front-line.

Off-Aircraft Maintenance

- Raise a CF349 to remove an item from the aircraft AND raise a CF543 for the off-aircraft work. Above all, make sure that the CF349 and CF543 are LINKED. Shops can often spot the bigger picture if they have the information.

Independent Checks

- Does the support work entry also need an independent check? In ADAM, independent checks are flagged via WUC, which do not get recorded in the support work entry. Be vigilant when making support work entries.

Time Expired Items

- Inspection Intervals. Ensure to restart the clock at the correct time. Know if the clock starts at the time of the inspection OR when the aircraft returns to service. Calendar time or Airframe Hours or both?
- For kits containing multiple time expired items (ex. ALSE, palletized kits), the kit expires when the FIRST item expires. Do you have a reliable means to track these items?

Relying on the computer

- The computer will do all the error checking and auto-generate the next inspection/removal date, right? Always double check. . .YOU are responsible to ensure correctness, not the computer.
- The computer is not always right. It depends on YOU for the correct information.

P04

The "P04" is the RCAF airworthiness maintenance policy publication for the Aircraft Maintenance Record Set (MRS). A significant rewrite of the P04 has recently been published which provides clarification and improvements affecting all RCAF aircraft MRS.

Some of the recent P04 changes include:

- Re-emphasis of fundamental principles of maintenance recording.
- More generic, making it applicable to all fleets/Electronic Record Keeping Systems (ERKS).
- Improved readability incorporating not only the how, but also the what and why.
- Clarifies SMM and SAMS accountability.
- Improved tie-in to the existing AF9000/Quality Management System.
- Requires a P04 supplement to link P04 policy with ERKS User Guide.
- ERKS training (initial and on-going) will become a 2 Cdn Air Div responsibility.
- Rework on numerous topics including: major discrepancies, support work, independent certification requirements, FOD certification, mixing of corrective/preventive and unrelated maintenance, mixing of signatures.

For details on all specific measures introduced by the new "P04",
visit the A4 Maintenance/ Air Maintenance Standards website:
http://winnipeg.mil.ca/cms/en/DComdSp/A4Maint/AMStandards/AMStds.aspx ◆

YOUR ATTITUDE > FLIGHT SAFETY > YOUR LIFE

If you *want to live,* have Something In Reserve

Flight Comment **Edition 2 1976**

By Major Don Janson

He was an old fighter pilot who settled in the neighbourhood, and he had made the Ace category a couple of times over. The other kids and I would crowd around and we could hear his stories of wild combat over the skies of Europe; and I suppose it's more than coincidence that several of us later joined his club and vaulted over the clouds in fighters of our own. And if his stories inspired our careers, they also formed a foundation for our survival. Consider, for example, the story he told about his first encounter.

"What I didn't know about flying," he began, "was an ocean of darkness on which my 230 flying hours bobbed like a cork. But I knew that I didn't know much, and literally camped within hearing distance of the few old heads around.

"Anyway, four of us took off over the sands of North Africa, and promptly ran into a couple of new ME-109s. Totally obedient to instructions, I latched my P-38 to my leader's wing and hung on grimly as a 109's tracers reached out past me and set him ablaze. Then I broke away hard and, and found myself in a tight spiral, looking across a 300-yard void at a 109 trying to tighten in and close on me. We were near the deck in no time; and with full power and all the back stick the birds would take, the two of us still stood on wingtips on opposite sides of the circle, neither able to close, and each knowing that to break the ring would bring quick death.

"I don't know how many times we went round. I do know that it became unbearably hot inside the greenhouse canopy, that I grew soaking wet with fear and perspiration, and that my right arm ached from pulling on the stick.

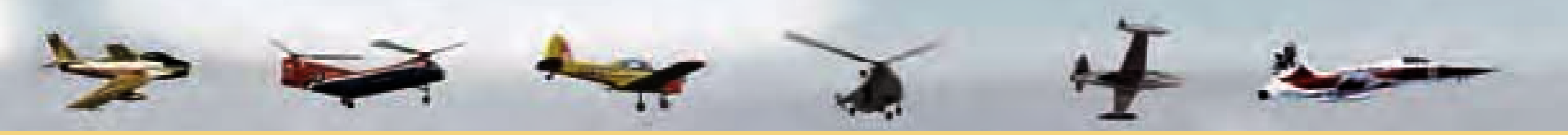
WHAT *WAS* IT?

"And all the time, my mind was searching back through classes I had attended; the lectures I had heard on aerodynamics, lift and drag; and manuals I had read. I was searching for something extra – for additional scrap of knowledge or experience which was the reason for hours of reading, for hundreds of sometimes laughed at questions, and many evenings listening to stories and exploits that were mostly just hot air. Out of that mass of words of ideas there had to be one speck of information that could help me now.

"And then it came, sounding clear and joyous above the noises of glasses and laughter in a London club.

"I'd bet'im five pounds 'e couldn't get away from me," said the red-faced Australian at the table next to mine. "But once I fastened m'self on 'is tail, 'e suddenly starts to turn in tighter. When I try to follow 'im, my bloomin' Spitfire snaps. Back on the turf I learn the devil 'as cranked a little flaps in when the speed's got down a bit."

"With my eyes glued across the circle, and still holding all the turn that I could get, I reached my left hand down beside the seat and set the flaps lever to the first notch. Nothing seemed to happen at first. But ever so slowly my props began to eat away my half of the circle. Then I could see the nose of the 109 pull in slightly, see the bird oscillate a little, then settle back to the same arc.



"It took at least three full turns to bring him through the top of my windscreen, plus another turn and a half to bring him down to the sights reticle. And during that last little time, I couldn't understand why he just held that turn while I lined him up inch by inch. But he was still turning, with the top of the canopy glinting and his face turned back towards me over his shoulder when the bullets exploded in a trail across him."

"Flying back, when my arm quit twitching and the blood quit throbbing on the side of my neck, I understood what had happened to the other guy. He had exhausted all his knowledge. He had never learned a law that became almost sacred to me – that you've gotta have something in reserve!"

MY TURN

Many times in the ensuing years I had occasion to remember that advice. And many times it snatched me away from tragedy. Take the night the turbine blew.

It was late, and very cold. I told the crew chief to check the flight surgeon's parachute, and strap him into the back seat of the T-33 while I did a fast walk-around inspection. Then I started to climb in, but thought better of it, and decided to personally check my passenger. That little bit of attention would make him feel easier during his first ride in a jet aircraft. And oddly enough, I discovered that the leg straps of his parachute harness had not been connected!

We took off and climbed through a jet black night to 36,000 feet, and had just settled for a long night's drive when an explosion shook the bird, and the sky around us brightened.

Looking back, we could both see jets of fire spraying into the windstream, and I knew that the turbine wheel had thrown some buckets out the side.

I cut the throttle and master fuel switch, and put the nose down sharply until the flame died out; then shallowed to a long, dark glide. There was plenty of time. We had 30,000 feet to lose, and I used it to calm the panic in the passenger, and to plan the altitude at which we would leave the bird.

On a winter night like that, there was no desire to punch out high and dangle freezing for a long descent. The book said 1,500 feet would be about right. Then I remembered the Fighter ace, and seemed to hear his words: *"You've always got to have something in reserve!"* So I jacked up our exit altitude by another 2,000 feet.

The passenger was thoroughly rebriefed by the time we approached the chosen altitude; our dark visors were down, and I had a flashlight trained on the instruments. As I pulled the jettison lever and felt the canopy go, I had high hopes of a perfect ejection. Through the rush of noise over the intercom I told the passenger to place his head against the headrest, put his feet into position, and squeeze the ejection trigger on the armrest. Then I waited till the blast. Five seconds passed, and he was still there!

"You have to do it. Squeeze it now!" I repeated.

His very frightened voice caught me by surprise.

"I have! Nothing happened!"

"Squeeze it again!"

Blast from the back seat. Then his voice rose towards panic.

"I've tried and tried. It won't work!"

"You're sure you are squeezing the ejection trigger under the handle on the right arm rest?"

His answer was a high-pitched, *"Yes!"*

SOMETHING MORE

My mind had gone far beyond the conversation. I couldn't punch out without him, and there was no way he could survive an attempt to climb out over the side and parachute manually. Yet, to ride the bird to the ground in total darkness was a forbidding prospect. Then I searched for something extra, and as we ate up the altitude I had thrown in for reserve, I found it.

It came from a conversation I had with a flight surgeon during a noon break at a pressurization chamber. *"Under conditions of stress," he had said, "a person who is not trained to handle a bad situation can become so tense that his muscles almost freeze up, and he can't perform simple actions."*

In the dull beam from my flashlight the altimeter unwound dangerously, but I managed to speak with calm forcefulness: *"Listen carefully! Do exactly what I tell you. Put your head against the headrest. Put your feet in position! Put your right hand around the ejection trigger. This time, don't squeeze! Instead, jerk it toward you heavily. Now!"*

There came a sudden explosion, and then the intercom was silent. My passenger was gone. Five seconds later I squeezed the trigger on my ejection seat, and was blasted clear of the aircraft. There was no time to read the altimeter just before I left the aircraft, and so I can't calculate the closeness of our escape. But I do know this: after the chute opened it was a very short descent to the farmyard where I landed – much too short to have compensated for the delay in our ejection had I not planned that extra reserve.

And I also know that the altitude would have made little difference to the passenger had I not taken the extra time and double-checked his straps before starting the engine. With two undone, he would have fallen to his death.

As it was, his parachute draped across a power line and gently stopped him just a foot above a concrete highway. He stepped to the surface, caught a ride with an attractive co-ed, and had the best steak of the house, free, at the restaurant where he waited after calling the base.

But I failed to tell him that he owed the ride, and the steak, to an old fighter ace who taught me that the unexpected can pile upon the unexpected – and that when it does, you can die unless you have something in reserve." ◆

Mountainous Terrain Clearance Profiles

The author left the airforce in the late 90's after 20 years in Air Transport Group and has spent the period since flying for various airlines in Canada, Europe and Asia.

In the fall of 1990, I was the mission commander on a Canadian *Hercules* tasked to move the headquarters of the United Nations mission to the Kashmir from Srinagar, India, to Islamabad in Pakistan. The route between the two locations overflies the Pir Panchal mountain range which rises to over 18,000'. Srinagar is situated in a valley and, at the time, had limited navigation and approach aids. The minimum IFR altitudes over the mountain range taxed the capability of the loaded aircraft.

To accomplish the assigned lift, we required VMC conditions under which we were able to shuttle climb in the valley until we had adequate terrain clearance and then cross the mountains "VFR" at about 22,000'. Our contingency plans for emergencies were relatively simple. The on-board oxygen system was more than adequate to sustain us in the event of decompression during the relatively short time we were over the high ground. Likewise, in the unlikely event of an engine fire or failure we planned to turn towards the low ground, set maximum continuous power on the remaining engines and descend at the minimum possible rate while manoeuvring visually using the mountain passes to maintain terrain clearance until we were out of the mountains.

More recently, I have crossed some of the same ground flying between the cities of Almaty Kazakhstan and New Delhi India as the Captain of an Airbus A320. This time, instead of vehicles, office equipment and personal effects, the load is as many as 150 passengers and crew and a limited amount of freight. As this flight is often scheduled at night and is flown under almost all weather conditions, the strategies for depressurization and engine failure are, by necessity, somewhat more robust than they were during the United Nations airlift 22 years prior.

In many parts of the world, aircraft are routinely flown over terrain that has minimum obstacle clearance altitudes (MOCA) exceeding 10,000'. However, in most areas, the relatively short exposure time to the high terrain diminishes the requirement for predetermined escape routes and the associated strategies to be used and the profiles to be flown in the event of an emergency necessitating an immediate descent. Central Asia is one of several exceptions to this premise due to its very extensive areas of high terrain.

Avoidance of these areas could add hundreds of extra miles to the route with the associated additional flight time and costs so the ability to overfly the high ground is highly desirable. Therefore careful pre-flight planning is required to ensure that the flight will have an acceptable outcome in the event of an engine failure or a depressurization event. For airline operations on repetitive routes, it is normally the company that will do the route planning and provide the escape routes and procedures to be utilized by their crews. For "one of" flights, non-scheduled operations or military flights, it may be left to the crew to determine the route of flight. In all cases, the critical factors and the planning process should be much the same.

There are many potential failures that can occur while an aircraft is in flight. For operations over high ground, the most critical failures are those which would require the aircraft to make an immediate descent. For route planning purposes, the failures which

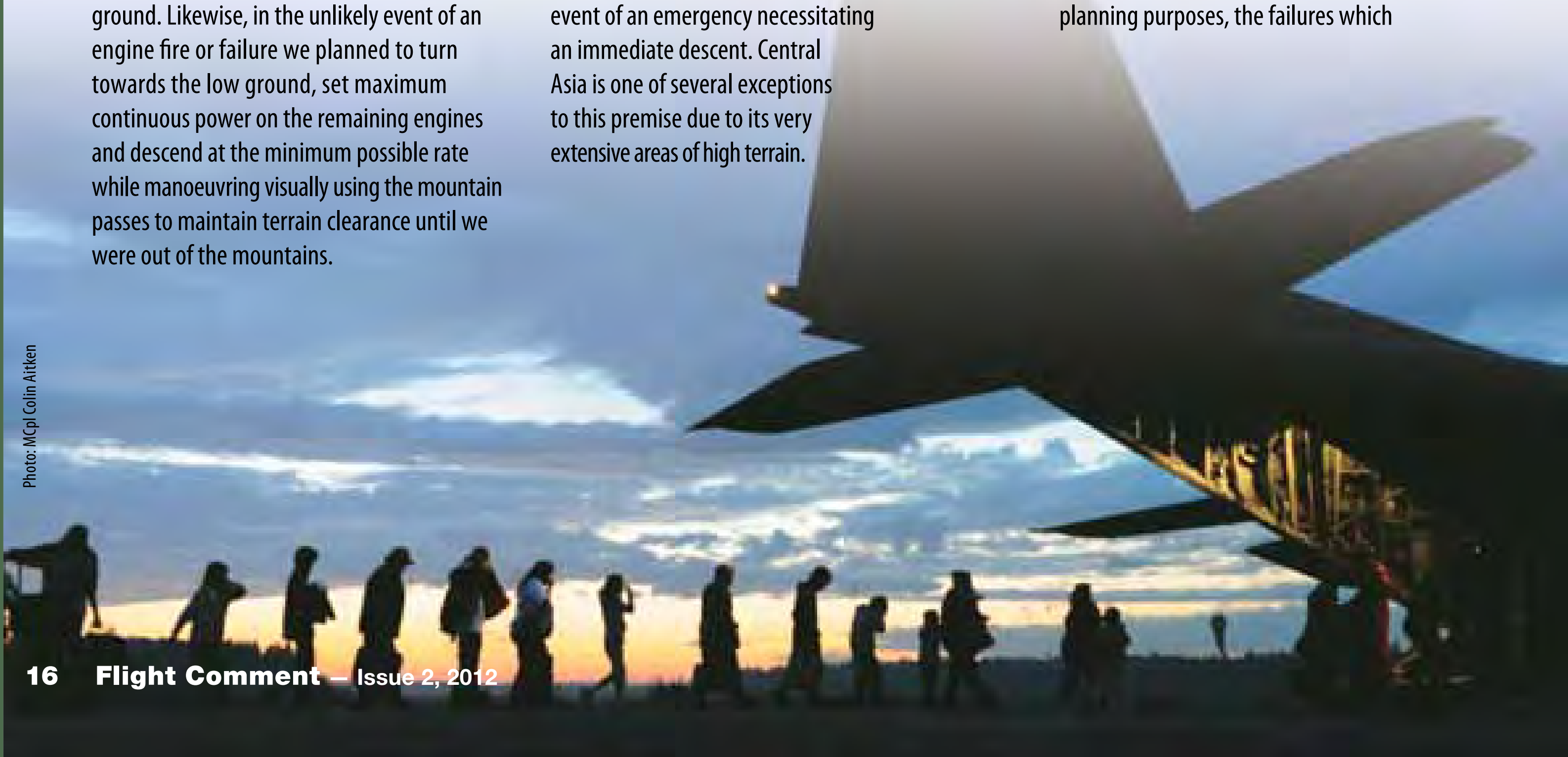


Photo: MCpl Colin Aitken

must be considered are loss of pressurization and the failure of an engine. In most cases, an engine failure will result in the aircraft being unable to maintain its planned cruising altitude. Over high ground, a drift down strategy at the aircraft's best lift over drag speed utilizing maximum continuous thrust or power on the remaining engine(s) will maximize the time available to clear the high ground before terrain clearance is compromised. In the event of a depressurization, a combination of supplemental oxygen availability and endurance plus the applicable regulating authority's legislation on its use will dictate the descent profile. It will be the more limiting of the engine failure or depressurization scenarios that ultimately determines whether or not a route under consideration can be flown safely.

In most modern turbojet equipped passenger aircraft, the limiting factor is the availability of passenger oxygen. Almost all of these aircraft utilize chemical oxygen generators which, once activated, will produce oxygen for specified period of time. Most regulatory authorities allow unrestricted operations to a cabin altitude of 10,000′ and make provisions for a cabin altitude of up to 14,000′ without supplemental oxygen for a maximum of 30 minutes. It is therefore necessary to plan escape routes on which the aircraft can safely descend to reach 14,000′ within the specified production period of the oxygen generator and further descend to be at or below 10,000′ not more than 30 minutes later.

The passenger oxygen generators installed on the A320 that I am flying will supply oxygen for a period of 12 minutes once activated. For planning purposes, the company has arbitrarily reduced this figure to 11 minutes to compensate for any required initial turn towards the escape point (which could be directly behind the aircraft) and allows for an average descent groundspeed of 5 nautical miles (nm) per minute. This means that the aircraft must be able to safely descend to 14,000′ within 55 miles from any point on the planned route. Further descent from 14,000′ to 10,000′ or below should ideally occur within 30 minutes of the depressurization but must occur within 30 minutes of exhaustion of the oxygen generators.

For my company, the ability to descend to 14,000′ within 55nm defines the limits of the planned route of flight. The flight route will normally need to be segmented to comply with this limitation with one "escape fix" identified for each route segment. At any point in time, the escape fix might be ahead of, to the left, right or behind the aircraft. Using the criteria from the preceding paragraph, escape routings to meet the required descent profile can be planned using obstacle data from en-route and topographical charts. The escape routing starts at the predetermined escape fix, which is ideally a ground based navigation aid, and terminates at a suitable diversion airfield. The escape fix may or may not be part of the planned route of flight.

The next step in the process is to determine the highest obstacle clearance requirement for the entire route. For my company, this figure is 22,000′ which is a standard worst case altitude that is valid for all of the mountain routes that we fly. In the event of a depressurization (or engine failure) this is the initial descent altitude target that will guarantee obstacle clearance. Once the escape profile has been initiated, this target altitude can be refined based on en-route, terminal and approach chart information. Note that as in all obstacle clearance situations, the initial descent altitude and all subsequent safety altitudes must be corrected for temperatures below ISA, altimeter settings below 1013mb and for winds of sufficient velocity to cause wave action over the mountains.

The final step in the process is to define the vertical profile to be followed in the event of an engine failure or loss of pressurization. As mentioned earlier, for the Airbus 320 series on the routes that I currently fly, the loss of pressurization situation is by far the most limiting. However, the engine failure scenario is still taken into consideration in the published profiles which direct an immediate turn towards the escape fix, selecting maximum continuous thrust on the operating engine and adopting an obstacle clearance drift down profile until clear of the high ground. The depressurization scenario is slightly more complex. The crew immediately dons oxygen masks, starts timing and carries out QRH immediate actions inclusive of initiating an emergency descent and turning towards the escape fix. The initial descent target altitude is 22,000′ corrected as required for wind, pressure and temperature. Once established in the descent, the aircraft is accelerated to the maximum prudent airspeed, the remainder of the QRH/ECAM items are satisfied and the initial descent altitude is refined based on charted values from the route charts. The aircraft is levelled on reaching the target altitude and maximum airspeed maintained. After 9 minutes from depressurization (sooner if charted terrain values allow), descent to 14,000′ is initiated. The escape route planner has verified that (based on the 5nm/minute average ground speed criteria) this can be done safely. If the actual ground speed is less than the 5nm/minute average, the descent point can be delayed up to 10.5 minutes which will still allow the aircraft to reach 14,000′ prior to exhaustion of the passenger oxygen generators. Descent from 14,000′ will be conducted based on charted values. However, the escape route planner has also verified that descent to 10,000′ can be safely initiated at the 29 minute point on any of our routes.

Some of the operators that routinely overfly this region have equipped their aircraft with 20 minute passenger oxygen generators. This additional eight minutes of oxygen supply and the roughly 40nm additional range that it represents allows them added flexibility in the selection of their routes. However, irrespective of the generation time, the escape planning process is the same.

Protracted flights over high terrain present additional challenges and risks beyond those encountered during normal flight operations. With careful planning, robust procedures and strict compliance with the escape profiles, the risks can be mitigated and efficient aircraft routing can be achieved. ◆

Diminishing Skills?

An examination of basic instrument flying by airline pilots reveals performance below ATP standards.

By Michael W. Gillen

This story is taken from an issue of Flight Safety Foundation's journal, AeroSafety World. *A free subscription to the digital version of that publication is available though the signup form on the Foundation's Web site home page, www.flightsafety.org.*

Michael W. Gillen is an A320 captain for a major U.S. airline and a former manager of human factors at that airline. He also is owner and president of Colorado Aviation Consultants, which provides consulting, safety seminars and worldwide aircraft ferry and test services.

With the advent of advanced, highly automated cockpits in current transport category jet aircraft, pilots no longer fly solely by reference to raw data from airplane instruments, and as a result, their basic instrument flying skills may have diminished.

In a study designed to assess their instrument flying skills, 30 airline pilots were asked to perform five basic instrument maneuvers without using automation. In addition, the pilots were questioned about their perceptions of their own instrument skill levels. Analysis of the findings revealed that, although the pilots believed that they retained a high degree of skill, all of the flight maneuvers were performed at levels below those required for U.S. airline transport pilot (ATP) certification.

Previous studies have found that opportunities for pilots to practice and maintain their skills decrease significantly over time, in part because of airline policies, advanced automation and increased long haul flying. In addition, a 1998 report from the Australian Bureau of Air Safety Investigation (now the Australian Transport Safety Bureau) found that 43 percent of pilots surveyed said that their manual flying skills had declined after they started flying advanced technology aircraft.[1]

Most pilots hand fly their aircraft at some stages of each flight. Anecdotal evidence indicates that the main reasons for this are the pilot's personal satisfaction in performing manual flying tasks, the requirement to perform manual flying exercises during simulator sessions (including recurrent training and license renewal) and the need to be able to manually fly the aircraft should the automated systems fail.

Nevertheless, it appears that both the pilots who were tested and their airlines have failed to maintain their perceived level of manual flight skills. In response, some airlines have implemented supplementary simulator programs to bolster these skills.[2]

A 1996 report by the U.S. Federal Aviation Administration (FAA) Human Factors Team – established after the April 26, 1994, crash of a China Airlines Airbus A300 in Nagoya, Japan, that killed 264 people and seriously injured seven – found that pilots often misunderstood the operation of automation equipment, as well as when it should be used.[3]

Photo: Sgt Norm McLean

For example, accident investigators found that the China Airlines first officer had been hand flying the A300, with the autothrottles engaged, on an instrument landing system (ILS) approach when he inadvertently selected the takeoff/go-around mode, causing an increase in thrust. The crew disengaged the autothrottles and manually reduced thrust but then engaged the autopilot and failed to recognize that it was trimming the horizontal stabilizer nose-up.

The Human Factors Team said that its members were concerned that incidents and accidents such as this one appeared to highlight difficulties in flight crew interactions with increasing flight deck automation.

A follow-up report by the FAA Performance-Based Operations Aviation Rulemaking Committee and the Commercial Aviation Safety Team (CAST) is expected to be released later this year.

Other studies in the 1990s found that highly automated cockpits tend to change the ways pilots perform tasks and make decisions. The studies identified problems in the use of advanced automated systems, including mode misunderstanding, failures to understand automated system behavior, confusion or lack of awareness concerning what automated systems are doing and why, and difficulty tracing the functioning or reasoning process of automated agents.[4,5]

Focus on Instrument Flight

The study that is the subject of this article gathered data from airline pilots employed by U.S. carriers during a recurrent training cycle. The average experience level of the 30 participating pilots was 7.1 years (in both aircraft and seat) with a range from two to 16 years. Seventeen of the pilots were captains and 13 were first officers; 18 flew narrowbody airplanes, and 12 flew widebody airplanes.

The study focused on two aspects of basic instrument flying. First, a qualitative survey was given to pilots to gauge their perception of their own instrument skills. The second part of the study required the use of "first look" data – data derived from a pilot flying a maneuver without a pre-briefing – from participating airlines. The first look data were obtained from a maneuver set comprising a takeoff, an ILS approach, holding, a missed approach and an engine failure at V_1.[6] These maneuvers were flown without the use of autothrottles, a flight director or a flight management computer/map and solely by reference to raw data obtained from the heading, airspeed, attitude and vertical speed instruments. The data subsequently were de-identified.

Simulator Performance

The pilots performed the five basic instrument maneuvers in an FAA-certified Level D simulator – the most advanced type of simulator, with a 180-degree wrap-around visual display and a daylight visual system. The maneuvers were rated by an FAA-certified check pilot and were graded on a scale of 1 through 5, based on the standards of both a major airline and the FAA.

The rating scale was as follows:

- 5 – Well within airline standards. Performance was exemplary.
- 4 – Within airline standards. Pilot flew to ATP standards.
- 3 – Minor deviations from airline standards that were promptly corrected. Pilot flew at the basic instrument level.
- 2 – Major deviations (e.g., full-scale localizer/glideslope deflection) for more than 10 seconds.
- 1 – Major deviations from airline standards that were not promptly corrected and/or were unsafe; or the pilot was unable to perform the maneuver/task without assistance. Crash or loss of control.

Comparisons

The type of aircraft the pilots typically flew was a factor in comparing both the survey responses and the performance of maneuvers. The pilots were divided into two categories determined by the aircraft that they were flying at the time: widebody (A340, Boeing 747, 767) or narrowbody (A320, 737, 717). This distinction was required because these two pilot groups fly a similar number of hours per month but have vastly different numbers of takeoffs and landings. During a typical 20-hour assigned flight sequence, a narrowbody pilot may conduct as many as 12 or 15 takeoffs and landings, whereas a widebody pilot typically would conduct two. Because of the higher number of cycles, narrowbody pilots might be expected to perform better on the maneuvers than widebody pilots.

'Glass' vs. Non-'Glass'

The study compared self-reported experience in "glass" airplanes – those with highly automated flight management systems and electronic flight instrument systems – and non-glass airplanes, along with the amount of time that had passed since the pilot last flew a non-glass aircraft, a majority of which are being retired. These results were further analyzed to take into account specific survey responses relating to pilot experience.

In answer to these questions, more than 56 percent of the pilots said that they had either never flown a non-glass aircraft or that the last flight had been more than 10 years earlier.

Forty-six percent said that they had spent two years or less flying non-glass aircraft, compared to 20 percent who had flown non-glass aircraft for more than 10 years.

In contrast, 73 percent said that they had been flying glass aircraft for at least 10 years. None of the surveyed pilots indicated that he or she had two years or less in glass aircraft.

Self-Assessments

In assessing their own basic instrument flying skills, 80 percent of the pilots said that they "strongly agree" with the survey statement "I usually hand fly the aircraft below 10,000 ft." A pilot retains maximum skill by routinely hand flying below this altitude in the most maneuverintensive phases of flight. The positive responses, however, did not indicate if the pilots had been using all of the aircraft's advanced capabilities or flying by "raw data" while hand flying.

Sixty percent of the pilots agreed with the statement that they feel comfortable flying by reference to raw data only.

In response to the statement "I could fly a takeoff, V1 cut, ILS and a missed approach using only raw data," 53 percent of pilots strongly agreed and 47 percent somewhat agreed. No pilots disagreed with the statement.

Although their responses indicate that the pilots believed that they could fly these maneuvers, the "somewhat agree" responses indicate that some believed that their performance might not be perfect.

Asked if they believed that their basic instrument skills had declined over time, 26 percent of pilots strongly agreed, and 53 percent said that they "somewhat agree." Only one pilot strongly disagreed with the statement; however, 16 percent said they "somewhat disagreed."

More than three-quarters of pilots said that they practice basic instrument skills often, with 33 percent strongly agreeing and 46 percent somewhat in agreement with that statement. Twenty percent of the pilots somewhat disagreed with the statement.

Simulator Performance

Analysis showed that the average grades given the pilots for their performance of the five maneuvers were significantly below the FAA's standards for acceptable ATP performance and closer to the basic instrument level (Table 1).

The lowest rating – less than 2.4 – was for the holding maneuver, which rarely, if ever, is performed by reference to raw data instrumentation. The highest – 3.2 – was for takeoffs, which typically involve reference to such instrumentation.

Further analysis of the data revealed no significant differences between the pilots of widebody and narrowbody airplanes in their performance on the individual maneuvers or on a composite measure.

Misplaced Confidence?

Technical failures in advanced glass aircraft can significantly degrade cockpit instrumentation. Poor basic instrument flying skills make these failures more difficult to detect because crosschecking raw data from the basic instruments is the key factor in quickly identifying failures.

Maneuver ratings

• Table 1

	Number of Pilots	Mean[1]
Takeoff maneuver	30	3.2000
V[1] cut maneuver	30	3.0333
Holding maneuver	30	2.3667
ILS maneuver	30	2.9667
Missed approach	30	3.0667

ILS = instrument landing system

Note

1. The mean is the average of maneuver ratings received by all 30 participants. Each maneuver was rated on a scale from 1 to 5. A grade of 4 represented the standards established by the U.S. Federal Aviation Administration for an airline transport pilot.

Source: Michael W. Gillen

In addition, when these failures occur, pilots must use basic instrument skills to safely fly the airplane. Pilots who are competent in basic instrument flying enhance their overall flying skills; because they can devote less attention and cognitive function to physically flying the airplane, they can spend more time managing their environment.

Although most pilots in the study agreed that their instrument skills have declined over time, their survey responses indicated that they felt they could still fly basic instrument maneuvers. However, their survey responses do not correlate with their actual maneuver grades, leading to the conclusion that the pilots had a false sense of confidence.

The maneuver grades generally conform to what the literature review revealed in related studies that found that skills, when not used, decline over time. This was observed throughout the study in the average maneuver grades.

The suggestion in earlier studies was that if a skill set was learned and practiced over a long period of time, it would be retained longer than if it was practiced over a shorter period of time. This was not seen in the widebody-narrowbody comparison. Although pilots of widebody aircraft had more experience flying older-generation aircraft, their maneuver grades were similar to those of narrowbody pilots, and there was no statistical difference between maneuver grades for the two groups. This is most likely because, as mentioned earlier, although both groups of pilots fly a similar number of monthly hours, narrowbody pilots fly many more cycles than widebody pilots and spend more time maneuvering the aircraft; one result is improved flying skills.

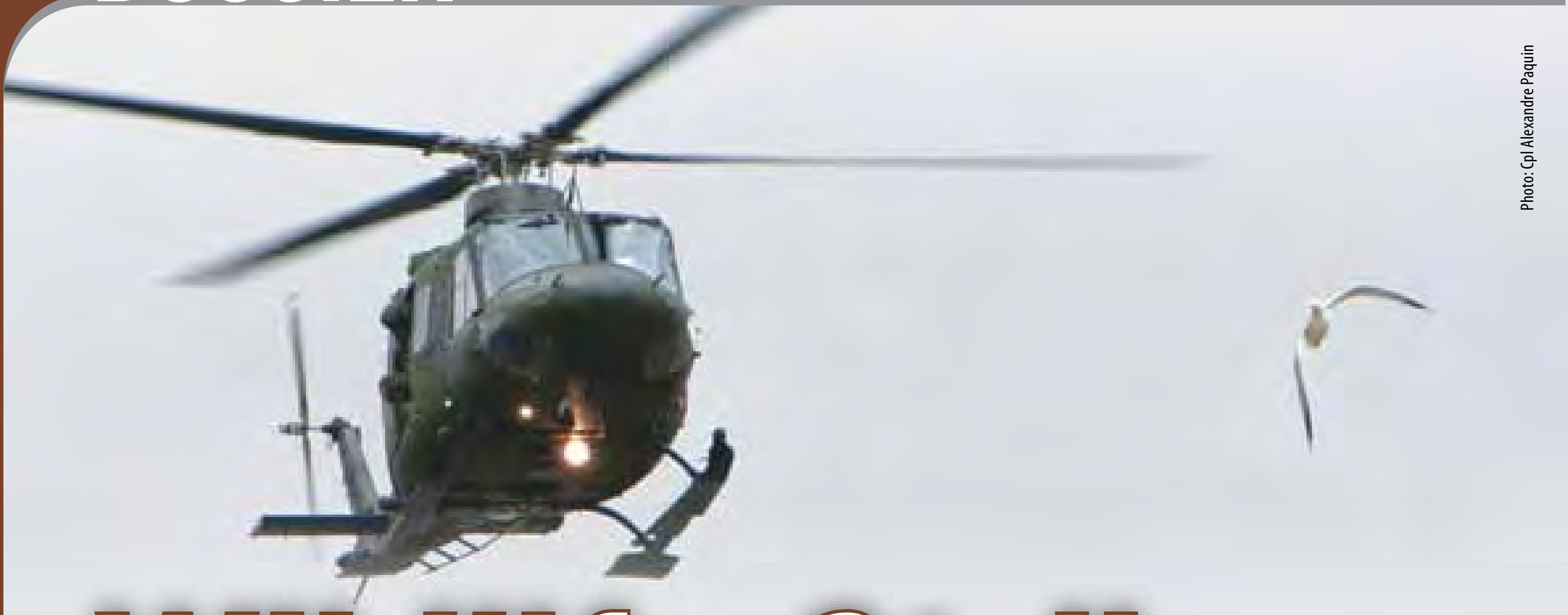
The results of the maneuvers performed as part of this study show that airline pilots' basic instrument skills may decline over time. This is associated with the decreased use of these skills in routine line flying. In addition, newer-generation aircraft generally do not lend themselves to basic instrument flying, and most companies do not train or promote this type of flying. Although rare, some failures in advanced glass aircraft can degrade aircraft instrumentation to the extent that pilots must fly the aircraft using raw data. During the past 10 years, two such failures have occurred at an airline that participated in the study. In both cases, the flight crews landed the airplanes safely.

Airline safety can be improved by ensuring that pilots are competent not only when all advanced instrumentation is functioning but also when that instrumentation fails. Pilots possessed these basic instrument skills at one time in their careers, and their skill levels can be increased through training and practice. ◆

Notes

1. Australian Bureau of Air Safety Investigation. *Advanced Aircraft Technology Safety Survey Report*. June 1998.
2. Ibid.
3. Abbott, Kathy et al. *The Interfaces Between Flightcrews and Modern Flight Deck Systems*, FAA Human Factors Team Report. June 18, 1996.
4. Billings, Charles E. *Human-Centered Aviation Automation: Principles and Guidelines*. U.S. National Aeronautics and Space Administration (NASA), Ames Research Center. 1996.
5. Sarter, Nadine R.; Woods, David D. *Cognitive Engineering in Aerospace Application: Pilot Interaction with Cockpit Automation*. NASA Ames Research Center. 1993.

6. U.S. Federal Aviation Regulations Part 1.2 defines V^1 as "the maximum speed in the takeoff at which the pilot must take the first action (e.g., apply brakes, reduce thrust, deploy speed brakes) to stop the airplane within the accelerate-stop distance. V^1 also means the minimum speed in the takeoff, following a failure of the critical engine at V^{EF}, at which the pilot can continue the takeoff and achieve the required height above the takeoff surface within the takeoff distance." (V^{EF} is "the speed at which the critical engine is assumed to fail during takeoff.")



Wildlife Strikes Part 1

By Major Jason Trudel, United States Air Force, Hurlburt Field, Florida

Major Trudel wrote this paper as part of a masters thesis. He is a former exchange officer with the Directorate of Flight Safety Ottawa, previously flew the KC-135 and currently instructs air refuelling planning at the Mobility Operations School, Hurlburt Field, Florida.

Introduction

The events of 16 January 2009 on the Hudson River brought worldwide attention to a very real danger that faces the aviation community each day. Every year, bird strikes are estimated to cause up to $1.2 billion in damage to commercial aircraft worldwide. This can range from a minor dent, to catastrophic damage (NTSB, 2010)(Dolbeer, Wright, Weller & Begier, 2009).

Environmental Aspect – Avian Habitat Pressures

Many aspects of airports make them attractive to wildlife. There is a very large amount of open space, usually with lush vegetation. Further, the safety and security aspects of the airfield limit animal traffic as well as human intrusion. This results in an environment where wildlife is free from many natural predators.

Continued development in industry, housing and transportation, place growing pressures on the availability of wildlife habitat. According to the Multi-Resolution Land Characteristics Consortium (MRLC), forested lands in the United States have declined from 29.22% in 1992 to 24.95% in 2006. At the same time, developed land has increased from 2.83% to 5.46%. With a reduction in available habitat, there is increasing pressure for wildlife to move to more suitable locations. Airfields offer a sanctuary, often untouched by development due to safety precautions surrounding flight operations (Multi-Resolution Land Characteristics Consortium, 2011).

Airspace Conflicts

The greatest risk to aviation occurs when there are high concentrations of bird activity in conjunction with high levels of air traffic. It is possible to encounter birds during any phase of a flight. The highest bird strike on record occurred off the coast of Africa at an altitude of 37,000 feet (Vulture strike). Some migratory birds have been documented as flying at altitudes of 29,000 feet. While high altitude bird migrations could pose a threat to aviation, bird strikes are far more likely to occur at lower altitudes. According to the United States Geological Survey (USGS), most small birds favor migratory altitudes between 500 and 1,000 feet. Roosting or feeding birds descending to ground level further increases congestion in lower altitudes.

Collision Avoidance

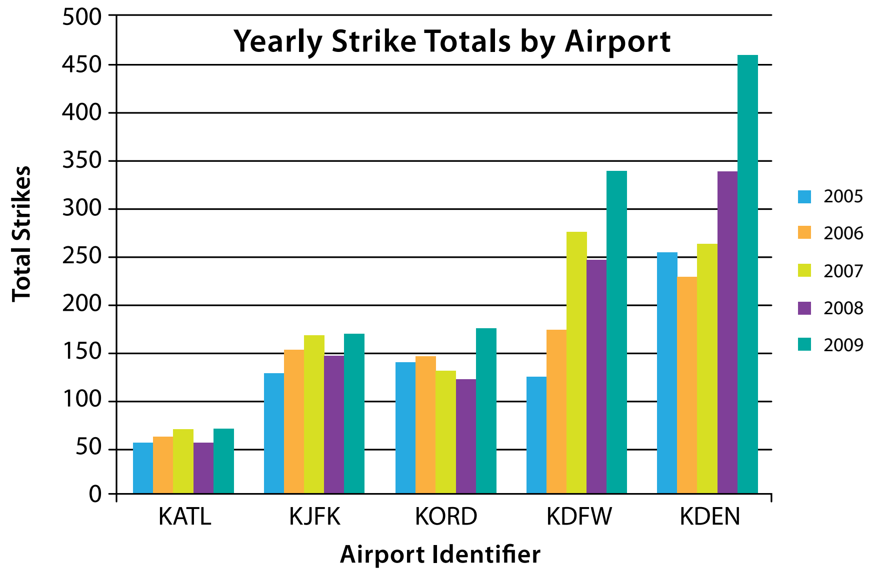
Avoiding damage from wildlife strikes is vital to aviation safety. Most aircraft operate well above 1,000 feet unless they are operating on a military training route. While bird strikes along military training routes are a significant concern, they remain outside the airfield environment, and therefore, beyond the control of the airport authority.

Since all aircraft must operate in the low altitude structure for takeoff and landing, this is the area of primary concern. The FAA defines the standard for departure procedures, and requires a climb-out performance of 200 feet per nautical mile. Since most strikes occur below 1,000 feet, this limits the area of greatest interest to 5.0 NM from the airfield, and ranges from the surface to 1,000 feet. By default, this also encompasses the same area where other wildlife would pose a threat to aviation (Dolbeer, 2006).

Wildlife Strike Trends

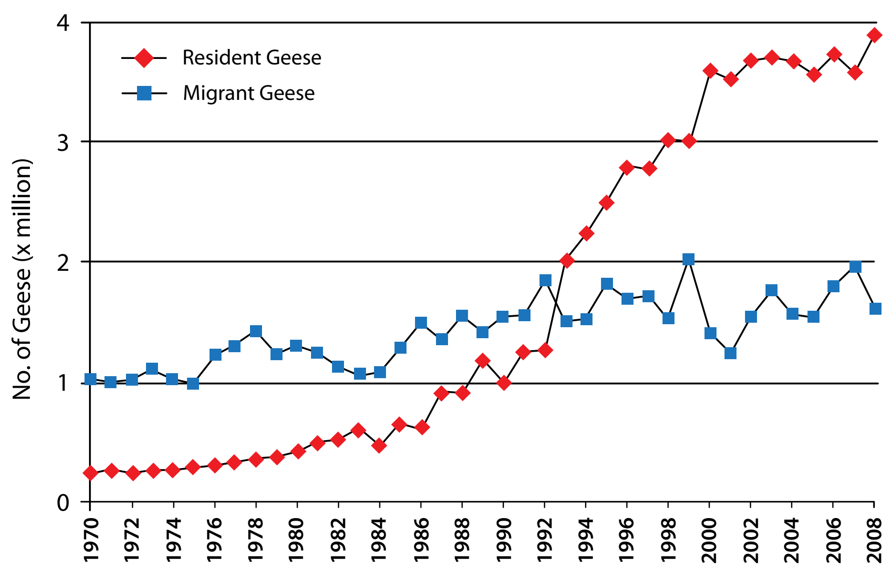
Based on the current environment and trend information, wildlife management and mitigation measures are going to be increasingly important to the aviation community. In order to determine the hazard, a detailed evaluation of airport operating areas is essential. Bird strikes are reported by both aircrew and ground crew, and collectively gathered into several databases for analysis. As an example, the following chart depicts the 5 highest strike rate airports in the United States based on the FAA strike database (Federal Aviation Administration, 2010).

Figure 1. Yearly Strike Reports for Highest Strike Rate Airports



Although this chart shows a large number of strikes, it only shows part of the picture. The number of strikes at an airfield also needs to be compared to total movements, and the risk posed by those strikes.

Figure 2. US Canada Goose Population



While the population of the Canada Goose was growing rapidly from 1984 until 2000, national level mitigation practices have been reducing the growth rate of this species. In particular, hunting permits and programs issued by the US Fish and Wildlife Services, as well as habitat management have led to a stabilization of this problem population. Although somewhat stable, the migratory population is still close to four million, and a single bird is able to do massive damage to an aircraft. This bird continues to be top priority for local management across North American airfields. (Dolbeer & Begier, 2011).

Hazardous Species – Assessing Risk

The risk posed by bird strikes is based on two factors: how likely is a strike and how likely is that strike to cause damage to an aircraft? As an example, the risk of hitting a flock of Sparrows is not nearly the same as hitting a flock of Canadian Geese.

Although a species may be repeatedly reported as being involved with aircraft strikes, this may not necessarily indicate a significant risk. The US Air Force tracks the strikes reported, as well as the associated damage resulting from each strike. The following tables depict the USAF reports since 1987, detailing the species that did the most damage as well as those most frequently struck (US Air Force Safety Center, 2011).

Of the total 95,383 strikes reported, the Horned Lark accounted for 3.69% of all strikes. Those strikes only accounted for 0.82% of the total dollar value of damages. Conversely, the American White Pelican and Canada Goose accounted for a mere 0.17% of the reported strikes, but were responsible for over $350 Million in damage, or 42.7% of the total losses incurred by the US Air Force. Based on this data, it is much more likely for an aircraft to hit a small bird, but even rare collisions with large birds prove to be extremely costly (US Air Force Safety Center).

Unsafe Acts – Loss of Aircraft from Wildlife Strike

In the worst case, bird strikes can lead to loss of the aircraft and the death of all personnel on board. On 22 September 1995, a Boeing E-3B AWACS aircraft ingested Canadian Geese into the #1 and #2 engines shortly after takeoff. This caused the failure of both engines on the left wing, and directly contributed to the crash of the aircraft and loss of all personnel. The accident report for this example found that

Table 1. Top 10 Wildlife Species by Cost

Rank	Common Name	Count	Cost
1	American White Pelican	21	$257,650,916.00
2	Canada Goose	139	$92,829,720.00
3	Black Vulture	458	$56,811,479.00
4	Turkey Vulture	860	$53,539,935.00
5	Spot-billed Duck	15	$24,920,198.00
6	Red-tailed Hawk	866	$15,738,015.00
7	Barn Swallow/Swallow	2175	$11,599,704.00
8	Mallard	346	$10,582,110.00
9	Dark-eyed Junco	156	$10,251,842.00
10	American Mourning Dove	2862	$9,970,304.00

Table 2. Top 10 Wildlife Species by Strikes

Rank	Common Name	Count	Cost
1	Horned Lark	3523	$6,770,650.00
2	Perching Birds	3148	$3,848,047.00
3	American Mourning Dove	2862	$9,970,304.00
4	Barn Swallow/Swallow	2175	$11,599,704.00
5	Eastern Meadowlark	1379	$2,163,875.00
6	Killdeer	1292	$4,465,838.00
7	No Feather Remains Found	1137	$3,064,373.00
8	American Robin	1112	$2,154,448.00
9	Chimney Swift	1109	$899,951.00
10	American Kestrel	1081	$2,744,742.00

the airfield did not have an effective wildlife mitigation program in place for deterring hazardous bird species (Laeton, 1996).

Bird Detection and Mitigation

Strike reports and accident data are valuable tools in assessing the hazard of wildlife strikes. While useful in determining the magnitude of the risk to aviation, comprehensive wildlife strike management programs require evaluation of a multitude of additional factors. Most bird activity occurs without impacting aircraft. As this bird activity defines the underlying potential for a collision, it must be carefully studied. To properly mitigate risk, the entire airport ecosystem must be evaluated as well as its place in the local and regional ecology. Migratory species and their movements need to be continually monitored on a seasonal basis. Local nesting bird populations need to be tracked and counted to determine their activity levels and flight patterns. Food sources, nesting locations, and shelter areas that are attractive to birds need to be evaluated for possible modification or removal (MacKinnon, Snowden, Russel, Dudley, Davis, Kelly, Huzieer & Richardson, 2010).

Technology – Radar as an Aid to Detection

Recent developments in radar technology are greatly improving the data collection process for wildlife activity. In particular, avian radar systems offer a persistent detection capability with 24 hour coverage. Radar coverage is limited by the line of sight that the radar beam can scan, as well as the scanning volume requiring coverage. A narrow beam radar offers greater precision, but sacrifices scanning volume. Conversely, a radar beam that can cover a large area has greatly reduced resolution. The main companies in the United States and Canada offering avian radar systems are Accipiter and Merlin. Both of these companies use mechanically actuated scanning systems. The radar antenna has to be physically moved to complete its scan. This, by default, involves moving parts requiring maintenance and subject to possible failure. The BSTAR radar, developed by SRC, uses multiple elements for an electronically steerable array. While this system has no moving parts, it requires more complex software to operate. All of these radar systems provide energy returns from birds, or possibly wildlife, that can be analyzed. Radar returns provide information on mass, position, and rate of movement. Depending on distance from the airfield, these systems may not be able to readily differentiate between one large bird and several small birds. In most cases, it is simply not possible to determine the species of a bird from a radar return. For this reason, additional evaluation tools remain a necessity (Beason, 2011).

Environmental Aspects – Ongoing Assessment

Currently, the only way to accurately determine the species of birds flying near an airfield is with visual identification, either from a distance, or by evaluation of physical subjects. This includes evaluation of bird strike remains as well as living bird populations in the airfield vicinity. By determining the species of birds present at an airfield, as well as their numbers and activity pattern, the reasons for their presence can be determined. This is also applicable for other species of wildlife that may be present on airport grounds.

Due to the complex environmental aspects involving species attraction to an airfield, professionally trained biologists are often best suited to evaluating the airport ecology. This will aid in accurate assessment of wildlife attractants, as well as developing a plan to mitigate risk.

Hazard Species

In a study conducted by the US Department of Agriculture (USDA), Barn Swallows accounted for approximately 1,500 strikes, and Canada Geese accounted for approximately 1,300 strikes. The Barn Swallows accounted for less than 1% of adverse effects on aircraft, while the Canada Geese were listed as causal in 60% of adverse effect events on aircraft. The risk posed by this species makes it much more of a concern, and a much higher priority for mitigation activities (Johnson & Clifton, 2011).

At Salt Lake City, Utah, there were 37 wildlife strikes reported between 2006 and 2010 that had adverse effect on aircraft. Of these, 16 were from ducks and geese, seven were hawks and owls, two were gulls, six were form other species, and 6 were unknown. The mitigation priority for this airfield placed the Canada Goose as number one. Mitigation of the hawk and owl risk was secondary, with gulls third, and all other species at priority level 4 (Dolbeer & Begier, 2011).

As an ongoing problem species, the national population of the Canada Goose is depicted in the chart below (NTSB, 2010). ◆

("Wildlife Strikes – Part 2" will be provided in Flight Comment Issue 3, 2012).

Photo: Cpl Mathieu St-Amour

DO YOU "THINK" or DO YOU "KNOW"?

By Sergeant Lisa Joyal, 435 Transport and Rescue Squadron, Winnipeg

Photo: Cpl Pierre Habib

It was a balmy -45 degrees in Cold Lake and I was on night shift. Night shifts are the time when all the heavy or long drawn out snags are carried out; this night was no exception.

My MCpl and I were assigned to do a wingshoot on the left wing, which is the process of sealing the integral fuel tank. The wing is divided into 3 different levels with each level having a channel that requires a specific fuel sealant that comes in tubes. The equipment required to complete the task is a pneumatic (60 psi) powered gun where the tubes fit into a threaded cylinder.

At the beginning of shift, we gathered up all the equipment and went to work. Several hours later, the tube ran out of sealant so it needed to be replaced. I got a new tube, unthreaded the cylinder, changed the tube and thought I threaded the cylinder back into place – the key word in this statement was "thought." At this point my MCpl pulled the trigger which made the cylinder shoot out the back of the gun like a bullet. The projectile contacted the middle of his chest, lifting him off the ground and sending him back at least 10 feet.

My first thought was "oh my god, I've killed him". Off to the hospital we go since we were pretty sure that he had a couple of broken ribs because of the pain he was experiencing. After seeing the doctor, it was confirmed that there were no serious injuries except for a wicked bruise the size of a watermelon on his chest.

The moral of the story is that "THINK" should never be part of our vocabulary when working with or around aircraft. If you think you did something, go back and recheck your work. The only word that should be acceptable is "KNOW". ◆

Photo: Capt Jean-Guy Pitre

Near Miss

By Captain Bruce Aitken, 403 Helicopter Operational Training Squadron, Gagetown

It was a marginal VFR day and I was scheduled for a TAC (tactical) formation training mission with a First Officer (FO) who had recently completed the *Griffon* OTU. We decided to "practise parade form" (where the wingman maintains a fixed distance and bearing from the lead with 2 rotors spacing minimum) during the first leg of the flight, as it was not going to be flown at tactical altitudes. Upon departure, we determined that the weather between the base and the Tactical Low Flying Area (TLFA) was not within limits and so decided to return to base and conduct TAC form manoeuvres on field, as it was designated a TLFA allowing us lower weather limits.

We were the number two aircraft and I had allowed the FO to fly in order to practise his newly learned "parade formation" skills. He was doing well and I was impressed by his smooth aircraft handling and station keeping. After some further practise over the base we landed and lead informed us that we were going to switch to TAC form and practise some TAC confined areas within the confines of the base. I acknowledged and we departed again with the FO at the controls.

At this point I had been impressed with the new FO and gave him a little slack when he was initially a little tight on lead for trail loose (form spacing of 5 to 10 rotors) following the transition from parade form. Unfortunately, at this point lead identified a confined area and elected to do a hard 180 degree turn to the right to align the formation for landing into wind. We were on the right side of lead and tighter than we should have been at this point. Both the FO and I were surprised by this sudden turn and instead of moving left to avoid lead by crossing behind his tail, the FO elected to try to turn inside of lead's turn. This did not work out well. I took control about half way through the turn with almost zero airspeed, max allowable angle of bank and 30 feet above the ground. As our aircraft began to sink, we had our belly towards lead and we were no longer visual. I pulled max torque and initiated a right pedal turn away from lead in an attempt to regain air speed. At this point the aircraft sunk into a clearing just in time for me to look through the cockpit roof window and see the lead aircraft's cargo hook and skids go over us much too close for comfort. After lead passed, we recovered to a 2 foot hover in a small clearing in the trees. We then landed in another field and discussed what had just happened with lead and decided to cancel the remainder of the trip and return to base.

I learned several things from this incident. First, I determined that the FO's strong initial performance had impressed me into becoming more relaxed than I normally would have been on formation spacing. This is sometimes referred to as the "halo effect". The second lesson was the importance of taking control early when you see something going bad. Had I taken control or instructed the FO to move to the outside when we initially tried to turn inside lead, this incident could have been avoided. The third lesson learned was that as formation lead, if an aggressive manoeuvre is required, give the remainder of the formation a heads up on the radio. I am also more diligent about taking the time to brief new FOs and students on the importance of "taking the tail" (a turn toward lead aircraft's tail during formation manoeuvres in order to maintain correct spacing) during TAC formation in order to avoid lead. ◆

No Problemo

By Captain John Dixon, Directorate of Flight Safety, Ottawa

In one of my previous jobs flying a 737-800, we were scheduled to fly a double stop to Veradero (Cuba), Roatan (Honduras), and then back to Toronto.

The first leg was uneventful as the weather was good and the co-pilots and I had been there many times before. I mention co-pilots because crew days planned over 14 hours (#1) require three pilots; two occupying the front seats and one in the center "agony" seat.

Talking with the other pilots about the second leg to Roatan, neither of the First Officers nor yours truly had ever flown into this airport (#2). We looked up what information we had on the area and found that only an offset non-precision approach was available (#3) to only one end of the single runway (#4), and, the runway was only 7000 feet long (#5) (I know – you folks with rotors and props are thinking, "what's the problem with 7000 feet?" The answer is, with possible tailwinds and runway contamination – enough to ruin your day!). Also, there is little underrun or overrun with water at both ends of the runway (#6). The reason there was no instrument approach to the other end of the runway was that *high terrain* only allowed for visual approaches (#7).

The good news was that the weather was forecast to be well above instrument minimums with light winds calling for a ceiling of 1500 above ground level (AGL) feet compared with approach minimums at 700 feet (AGL). Based on this, we didn't bring much in the way of extra fuel. As an aside, our alternate of Cancun was CAVOK (ceiling and visibility okay, which is a quick way of saying no weather affecting arrival is expected). We were good for the instrument approach and if the winds became a problem with direction and intensity, we still had well over the 1000 feet AGL required for the visual circuit to the other end – no problemo!

What I hadn't thoroughly considered was the question of how inaccurate the weather reporting could be in this part of the world. (#8)

As we passed over the navigation aid outbound for the approach, Air Traffic Control (ATC) reported the ceiling at 1200 feet and the wind gusting to 15 knots… favouring the visual end of the runway. He also reported heavy rain with a weather cell moving through the area. Hey, that wasn't in the forecast! As the maximum tailwind allowed for our aircraft type was 15 knots we were still ok for the landing from the instrument approach, and if the winds increased, we could do the visual circuit to the other end.

On final approach passing through 1000 feet, we were still in solid cloud (there goes the visual circuit option) (#9) and the winds were slightly abeam and now gusting to 20 knots (#10). I quickly briefed the crew that the option for a visual was passed and in the event of a go-around for winds or ceiling, we were off to Cancun. Exactly at minimums (really!), I was able to call visual and ask for a final wind check which was just within limits. After a firm landing utilizing spoilers, full reverse and braking level 3 (moderate) it was enlightening to me how much runway was actually used (about 5000 feet) to bring our max landing weight aircraft to a stop.

The *Lesson Learned* for me was how quickly and easily 10 holes aligned rather neatly to create what could easily have become an incident or even an accident. Fatigue, aerodrome unfamiliarity and misleading forecasts can quickly alter the safety of a flight and highlight the importance of always keeping alternatives. ◆

Supply and Demand – of ATTENTION!

By Captain Steve Jurkowski, Unit Flight Safety Officer, Gimli Gliding Centre

There is a tendency, in any given repetitive activity, for one's attention and focus to drift. It becomes increasingly difficult to maintain your attention on many tasks/situations happening concurrently. I notice this tendency occurring on the gliding field on a regular basis. This is not an analysis of a single event, but an abstract of typical situations experienced in the conduct of gliding operations.

At the start of the day, the crew is well-rested, fed and refreshed. Attention is at maximum and motivation is high to get an efficient gliding operation going. The launch point is set up, and soon the Launch Control Officer (LCO) is engaged in launching and recovering gliders. The LCO is responsible for a bubble that surrounds the operating radius of the gliders and all the personnel within it.

After performing the same task for some period of time, attention to detail naturally diminishes. Pilot briefings are curtailed as the situation is similar from one flight to the next. Ground crews are not as energetic in getting to their duty stations. Environmental conditions, whether it is the sun beating down, or the chill of the wind, take their toll on the personnel. Typically, flying conditions increase in difficulty as turbulence increases, weather changes, traffic increases, and fuel remaining decreases. These factors demand more and more from personnel who have less and less 'work' left in them over time.

How to combat complacency? Recognize the signs of tiredness and rotate duty positions, allowing personnel to take breaks and sit down to have something to eat and drink. Air Crew positions have established maximums for continuous cockpit time; other work stations can and should be viewed the same way. Communicate your desire for a change of pace, or your need for a break.

As a supervisor, build duty changes into the schedule. Be pro-active in keeping your staff sharp. Do not wait until you have a tired group of people to do something about it.

A little extra time spent to rotate personnel through various tasks and levels of activity is much better than the potential drastic consequences of pushing operational demands past the available supply of attention to support it! ◆

Share the POWER

By Mr Collin Fraser

Mr Fraser has flown for over 35 years in many aircraft types, at all levels of civil aviation, across Canada and abroad. He is currently flying jets for a major airline.

Information is power. We all know that one. Let's examine it from an angle that applies to aviation. Throughout my career, it has been a habit to brief my fellow aviators on the condition of the flying machine I was exiting and on any relevant operational circumstances. My colleagues would often greet me with "Hi, how's it going." I would launch directly into a list of mechanical quirks in the airplane and any factors I thought might bear on the next flight.

Here is what happened on the one notable occasion that I failed in my habit. I was assigned to an operation remote from the maintenance base. There were several light transport aircraft rotating among an equal number of intrepid flyers. We flew single pilot, fanning out on various routes. At the end of our long days, when all the aircraft had returned to the outstation, we would commute home in one airplane for a short sleep. Early next morning, we rode back to the deployment and started the rotation over again. As we were discouraged by our superiors from logging faults until the aircraft were occasionally ferried to home base, we were dependent upon each other to share details of intermittent radios, stiff fuel caps, etc.

One afternoon, I finished loading at my last stop before returning to the hub. I had bulked out to the point where I was lying on top of the cargo, squeezed against the cabin ceiling. It was an awkward reach down to close and latch the aft clamshell door. I then crawled forward and dropped into the flight deck. It was forty degrees inside the aircraft, and I had soaked my flying suit. My headset was sliding around on my dripping face. To say the least, I was miserable. I fired up the engines and took off, glad of the air cooling as I climbed. Just after levelling at cruise altitude and reaching top speed, the cabin door warning went off. There was no cancel button. *Do* something, *do* something, it insisted. Alright, never mind that noise. Think this through. I'm by myself, no autopilot. I am sure that I closed that door correctly. The warning buzzer, though, states otherwise.

So, what happens if the door opens in flight? At 200 knots, unpressurized, the airplane will probably be OK. However, if the hatch pops, part of the load might fall out. That would certainly require that I give the boss a darn good listening to. Now there's a problem.

There was a suitable airport just ahead. I cancelled IFR and spiralled down to a landing on a scorching desert strip. I squirmed over the load again and dangled to inspect the door and latch. It all looked good. I carefully felt the opening action. The door sensing micro-switch looked grimy and possibly bent. I positively reclosed and locked the hatch. It had been fine the whole time!

Doubly melted now, I rushed off again, a half hour late. There was no further nuisance warning. Finally at destination, I heaved the load into a waiting van, and collected my gear. I ran across the tarmac to the aircraft waiting, with the other pilots aboard, to take us home for the night. The Captain started the onside engine and gave me a blast of prop-wash.

Really annoyed now, I settled cross-legged on the plywood deck. I was hot, tired and frustrated. I could see by the faces of my mates that they had a long hard day behind them, too. I opened my mouth to relate my experience. Just then, the fellow beside me (let's call him Joe) said "We don't know whether to give you the silent treatment, or just beat you up." Completely beyond my limit, I was instantly furious. I clamped my jaw and stared a hole in the bulkhead until we landed and the others had exited. Tomorrow was a day off for me. I really needed it.

Refreshed, I breezed back into work. My cheerful greetings were met by sombre and disapproving looks. "Joe's plane went down this morning. He's missing from the wreck."

What bizarre story was this? The airplane, the one I had been in two days prior, had cratered from a steep descent. There was no evidence of an occupant. Despite a month of searching, Joe was never found. My speculation was that, outbound to the last stop in the morning, the remaining load would have been very small. As the aircraft reached cruising speed, the airflow started pulling on the door, and that maladjusted micro-switch had triggered a relentless warning. Perhaps Joe felt goaded into action. Alone, and with no autopilot, he might have dialed in a measure of nose-down trim. Maybe he unbuckled, and took three quick steps back to the door, intending to give the handle a good push toward locked.

Whatever happened next led to the pilot being outside of his airplane. It is one of the genuine regrets of my life that I believe I missed a chance to break the chain of events that led to a tragic accident. I wish that, in spite of all the negative factors weighing on me, I had kept to my discipline and told Joe of my incident with that airplane door and warning horn.

The point of my tale is that, in our business of aviation, information often has power over life and death. It can mean survival to you or someone else. We pilots are, among other prominent characteristics, a competitive bunch. Also, some organizations cultivate dynamic sparring within their own ranks. Maybe you think that what you know, and the other guy doesn't, can give you a necessary advantage. It might seem foolish and weak to just give away your resources. I urge you to reconsider that viewpoint.

Whatever our present flying assignment, be it fighter, transport, surveillance or rescue, we all have one thing in common; we are professional aviators. As such, we are obliged to share our hard-won knowledge, no matter how we feel at the time. It's not about individual gain. Habitually and generously passing along what we know that might be of use to someone else advances the profession as a whole, and can save lives.

If you share the power of information, in the long run, you won't regret it. ◆

The WRONG MIX

By Major John F. Peetsma,
Wing Flight Safety Officer,
12 Wing Shearwater

The C-17 engine and gravel don't mix well. You would think anybody would see that. Here I was, on exchange with the USAF as a maintenance officer on C-17 *Globemasters*, finding myself debating the risks of having C-17s taxi over large piles of gravel.

Here is the story. It was decided to repave the 10,000 foot runway at the strategic airlift wing where I was stationed. Desire to do this during a period of extremely high operational tempo, driven by the two ongoing conflicts, was low so if it was going to be done it had to happen quickly that summer. Consequently, the wing had to quickly disperse the support and materiel required to recover and turn close to 40 C-17s. One of our options was to make use of the nearby army base runway which had a "small" ramp that could easily accommodate six C-17s. Unfortunately, the army base was also undergoing some summer construction activities near its runway and taxiways.

During the first recce of the army airfield, I made mention that the construction materials (i.e. gravel) should be relocated farther away from transit lanes for the aircraft. To me this was obvious as I had ample opportunity during my tour to admire the impressive ground-to-engine vortices created when the aircraft applied power over saturated ground. I imagined that a well placed pile of gravel with an engine with any reasonable power setting/condition passing over it could also create something less admirable.

A few days later, again visiting the army airfield, I noted that nothing was relocated. In fact there was more construction material piled close to the runway and taxiways that posed a hazard to any taxiing C-17.

Well, it was my responsibility to act and to raise this hazard to those who could ensure that it would be addressed – so I did. I mentioned it at my unit safety meeting, I mentioned at the Wing Operation's meetings, and finally I documented and discussed it with the Wing Flight Safety Officer. The WFSO acknowledged the potential hazard, but in his experience and opinion, this hazard and risk could be managed and he wasn't concerned. He and other senior operational and maintenance staff assured me that a NOTAM would be issued and all C-17 aircrew would be briefed on the FOD hazard and advised to reduce power when taxiing near the piles of gravel. Everybody seemed in agreement with this, so I let it go. Should I have?

A few weeks later I had my answer as I was now responsible for an engine change and getting that critical aircraft back in the operational loop. The engine change was no big deal as the more than capable USAF technicians would have that sorted out in quick time. Though it was regrettable that a multi-million dollar engine was probably written off, what bothered me the most was the suggestion by some senior staff at the wing that I wasn't forceful enough in making my concerns known, and that I didn't take the required action to address the hazard and prevent the occurrence.

Now, several years later as I assume the 12 Wing WFSO duties, I reflect back on that accident and ask myself: What could I have done differently? What should the WFSO have done differently? What would have been the outcome if I had been more forceful in my concerns? Had I dismissed others who had brought concerns to me? Will I dismiss others as a new WFSO?

The Flight Safety Program relies heavily on people coming forward, voicing their concerns and identifying hazards in the interest of the program and safe and effective operations. Equally, the system relies on those *in a position to do something* to actually *do something* about concerns brought forward. When neither side steps up, accidents happen, so my advice to you (and to me, I guess, as a new WFSO) is to not only step up and be heard, but equally as important, to listen. ◆

Photo: Sgt Matthew McGregor

Snowmobile *vs* Twin Otter

Photo: Capt Cheryl Major

By Captain Mat Giroux, 440 Transport Squadron, Yellowknife

As a first tour pilot, my experience is limited when it comes to working with other elements of the CF. I am a recently upgraded CC138 *Twin Otter* ski-equipped Aircraft Commander, and the mission in question was a reconnaissance flight.

We were tasked to recce a lake to determine it's suitability as a landing zone for a potential VIP flight later in the exercise. Normally, our main concerns are the landing conditions, weather and the odd curious animal that decides to join us. This time, we had a couple of hundred army soldiers spread out in the general area as part of the exercise.

Before landing on the lake, we conducted a ski drag. The drag is a procedure where after initial touchdown, we maintain around 50 knots with the main skis on the ice and the nose ski airborne. We then complete a takeoff and assess the snow conditions before committing to a full stop landing.

With the drag complete and the ice deemed suitable, we commenced our final approach. When on final for our full flap ski landing, we noticed a snowmobile with two soldiers driving along the edge of the lake. As long as they stayed away from our landing zone there wouldn't be a conflict. It wasn't until short final that the snowmobile drove into the middle of the lake – right into our landing path. With a sufficient landing distance beyond the snowmobile, we elected to adjust our aim point versus completing a go-around. As we were passing over the soldiers we noticed that one of them was shooting at the aircraft (fortunately with blanks!).

As the aircraft came to a stop, the soldiers drove up to the left wing tip and started walking in front of the running aircraft. The flying pilot signalled them to stop and the Flight Engineer disembarked to talk to the soldiers. They were informed about our safety concerns with respect to their actions around the aircraft and were instructed to move back and not to interfere with our departure.

Were they completely in the wrong? Not necessarily. The soldiers were on exercise and their task was *to deny access to the lake*. Their actions were in accordance with the exercise plan and they did not receive information that our *Twin Otter* was not part of their plan. Also, the soldiers had planned to place obstructions on the lake, but couldn't due to a risk of cold casualties amongst the workers. Had these obstacles been installed as planned, and not detected by the aircrew, this incident may have ended up being an accident.

This incident stresses the fact that what may seem like common sense to aircrew, may not be so for those who are not used to working around aircraft. Pre-Op planning has to ensure the message is passed all the way down to the lowest levels regarding safety around aircraft versus exercise gamesmanship. ◆

From the Investigator

TYPE: CC130 *Hercules* (130342)
LOCATION: Key West, Florida
DATE: 21 February 2012

The accident occurred during a touch and go at Naval Air Station Key West. During the takeoff just prior to the aircraft becoming airborne, the Loadmaster, who was seated in the rear of the cargo compartment, heard an electrical buzzing sound and observed an orange jet-like flame shoot across the cargo ramp from left to right at floor level. He then unbuckled his harness and was reaching for the fire extinguisher when an expansive orange fireball erupted, causing him to protect his head with his jacket. Once the fireball receded, he proceeded forward and alerted the crew to the fire while calling for the takeoff to be aborted.

Concurrently, the aircraft had just become airborne and reached 10 feet above the runway. With sufficient runway remaining, the flying pilot landed straight ahead and aggressively stopped the aircraft while the non-flying pilot notified ATC. Once the engines were shut down, all nine crewmembers quickly egressed and moved upwind of the aircraft. Crash, fire, and rescue services responded and expeditiously extinguished the fire. The aircraft was extensively damaged and one crewmember received a minor injury during egress.

The flight data and Cockpit Voice Recorders were recovered along with many parts related to the auxiliary hydraulic system, located in the aircraft's rear. The investigation team identified that a stainless steel braided flexible hydraulic line associated with the auxiliary hydraulic system pump was breached where it routed next to an electrical power cable. The ongoing investigation is focussed on the maintenance history of the auxiliary hydraulic system. ◆

From the Investigator

TYPE: CH146 *Griffon* (146453)

LOCATION: Approximately 6.5 NM northwest of Yellowknife airport (YZF)

DATE: 13 February 2012

While supporting Ex ARCTIC RAM, *Griffon* CH146453 was conducting a night area of operations familiarization in the approved Temporary Tactical Low Flying Area. All three aircrew were qualified, current and authorized for the mission. They were all wearing night vision goggles.

The crew departed YZF, proceeded into the approved exercise area and conducted their planned landings and take offs at two Forward Operating Bases. On the return to YZF, while conducting low level flying training, the aircraft contacted three high power transmission lines approximately 6.5 NM north west of YZF. The three wires were guided through the wire strike protection system and were severed, which removed electrical power to the city of Yellowknife.

Post-impact, windshield plexiglas and other debris entered the cockpit and entangled the Aircraft Captain's helmet. Shortly thereafter, the First Officer initiated a 180-degree turn to return to YZF and then overflew the same high-tension power line. The aircraft then approached YZF from the north, overflew several taxiways, ramps, and the main runway before turning onto the Golf taxiway and hover-taxing to the ramp for landing and shut down.

The aircraft sustained "B" category damage. Severe damage was found to the left pilot windshield, top window and adjacent fuselage structure. Electrical burn marks were found on the left tail pylon and the left and right fuselage, which indicate electrical discharge exit points. The aircraft was returned to third line contractor for further damage assessment.

The investigation is focussing on aircrew supervision, pre-flight preparations and briefings, aircrew human factors, in-flight decision making, low level flying in the wires environment and the wire strike protection system. ◆

Epilogue

TYPE: CF188 *Hornet* (188925)

LOCATION: Salina, Kansas, USA

DATE: 17 November 2009

The incident occurred at night on the Smoky Hill Air National Guard Range (SHANGR), near Salina Kansas. Canadian military personnel conducting a Forward Air Controller (FAC) course were using a Ground Laser Target Designator (GLTD) to guide a laser guided training round (LGTR) from aircraft CF188925 to a range target located approximately 790 metres (m) to their south.

Using standard procedures and following pilot/FAC mutual confirmation of the correct target using infra-red markers, the pilot was cleared for his attack run; however, instead of guiding on the intended target, the LGTR impacted approximately 50 feet southwest of the ground personnel and the laser designator. There were no injuries and further training using the GLTD was terminated.

The investigation determined that the Observation Post (OP) was established within the LGTR seeker Field of View (FOV) when lasing was commenced and the FAC team had positioned the GLTD so that the laser beam passed through tall grass immediately in front of the GLTD. This created a second laser spot that was disregarded by the LGTR seeker while the target area laser spot was still visible. At some point during the LGTR fly-out, the seeker lost sight of the target area laser spot and switched to the laser spot in the grass and guided to that location.

Contributing to the occurrence was insufficient guidance and information available to allow the FAC team to ensure they were positioned outside of the LGTR's FOV.

Recommended preventive measures include developing a tool that will aid the FAC to determine the appropriate location for the OP and updating the relevant user publications to include the lessons learned from this investigation. ◆

Epilogue

TYPE: **CH146 *Griffon* (146488)**
LOCATION: **Yuma Marine Corps Air Station, Arizona**
DATE: **19 January 2008**

CH146476 was scheduled as part of a night two-ship Close Combat Attack training mission that included the insertion / extraction of a Joint Tactical Air Controller. The aircraft was serviceable and the crew was qualified and current for the mission. During the extraction, while the crew attempted its second approach using night vision goggles (NVG) to a spot 100 feet south of an observation post and fence, a dustball formed at 30 to 40 feet above ground level (AGL). By 20 feet the flying pilot began to lose all references. The non flying pilot, who was the aircraft captain (AC), then lost his forward visual references and instead made use of lateral ground references but did not take control. After entering the dustball the FE and AC made several "drifting right" calls, though no consideration to transfer aircraft control was made, no statement of lost references was given, and no decision to overshoot was taken. On short final the helicopter yawed and drifted approximately 120 feet before it came to rest within 20 feet of the fence. Damage to the left skid and fuselage, lower Wire Strike Protection System and landing light was observed.

The investigation focused on supervision, decision making, dust landings and operations in the Degraded Visual Environment (DVE). Under external pressure and time constraints, the crew was authorized to fly the mission, which included dust landings, in low illumination conditions. The AC, under similar external pressures, elected to accept the mission. Once airborne and after having conducted multiple challenging approaches that resulted in overshoots due to DVE, the crew still elected to conduct an approach into the same area. The flying pilot did not fly the prescribed procedure and had difficulty judging height and closure rates. Post occurrence, unexploded ordinance (UXO) was found in the vicinity of the selected landing site.

Safety recommendations included amendments to CH146 NVG operations to unprepared surfaces in low illumination and in DVE. Amendments were also recommended to day/night currency requirements for brownout landings and takeoffs, approach glideslope parameters for dust landing procedures, and verbal crew calls when losing references. Other recommendations included domestic implementation of a Mission Authorization and Launch Authority process, the modification of the CH146 flight data recorder to record GPS and radar altimeter information, the pursuit of technical solutions to reduce the risk of CF helicopters operating in DVE, and a review of investigator training to include consideration of UXO when managing an accident site. ◆

Epilogue

TYPE: **Bellanca 8GCBC *Scout* (C-GSSD)**

LOCATION: **Gimli, Manitoba**

DATE: **25 July 2011**

The tow pilot was flying the Bellanca *Scout* supporting the Air Cadet Gliding Program (ACGP). After landing from a glider tow the pilot realized that he was quickly approaching his pre-selected stopping point abeam the glider launch point. He applied the brakes abruptly and aggressively which slowed the aircraft and forced the tail to rise. He then released the brakes and ensured that the control stick was in the full aft position. Moments later he felt a bump, possibly from uneven terrain, and re-applied the brakes, bringing the aircraft to a stop; however, the tail resumed its upward movement and the aircraft slowly nosed over and came to rest in an inverted position. The pilot egressed the aircraft with minor injuries and was taken to the local medical facility.

In the absence of any technical malfunction with the *Scout*, the investigation focussed on ground handling, pilot technique, self-induced constraints, and staff arrival procedures and a review of the training documents. The investigation found that over time, the pilot developed a tendency to relax back pressure on the control stick and apply the brakes in a more aggressive manner than what was required for the *Scout*. These inappropriate techniques were possibly developed during the pilot's flying experience on the heavier Pawnee tail dragger aircraft. Despite a Currency and Annual Proficiency Check flight and an Area Check flight, the pilot's inappropriate techniques were not identified and, therefore, were not corrected.

The investigation concluded that in order to stop the aircraft prior to a pre-selected and self-imposed point and to avoid a perceived potential traffic conflict, the pilot applied the brakes abruptly and aggressively while not maintaining full back pressure on the control stick, causing the tail of the aircraft to rise and initiating the accident sequence. Prior to the tail wheel settling back on the ground, the pilot inappropriately re-applied the brakes abruptly and aggressively, causing the aircraft to nose over.

Preventative measures taken consisted of additional ground school training and confirmation flights for the tow pilot prior to returning to flying duties. A National Pilot Information File was published requiring all tow pilots of the ACGP to review the Flight Safety Investigation Report for the L-19 Nose Over in Comox on 19 June 2010 as well as the Enhanced Supplementary Report for this accident. Recommended preventive measures included amendments to the local flying orders concerning airfield layout and a review of decision-making training provided to Air Cadet pilots. ◆

THE BACK PAGE

2012 RCAF Flight Safety Conference

LCol Paul Dittmann, DFS 2, briefs on the outstanding items from the previous seminar.

Col Yvan Choinière, DFS, answers a question from a participant.

Photos: Cpl Alexandre Paquin

LGen André Deschamps, Chief of the Royal Canadian Air Force, closes the proceedings of the seminar by fielding numerous questions from the 50+ FSOs in attendance.

The Directorate of Flight Safety hosted the RCAF Flight Safety Conference 21 – 24 February 2012 at the Lord Elgin Hotel in Ottawa. This conference represents the one opportunity each year for Wing and Unit flight safety officers and NCMs to meet with their counterparts from 1 Cdn Air Div and DFS to discuss all facets of flight safety.

The conference was opened by the Chief of the Air Force, Lieutenant-General André Deschamps. He described the current FS Program as an excellent one, respected world-wide, with the resultant pay-off of low accident rates. The demographics are changing in the air force and soon 45% of our people will have nine years of service or less. LGen Deschamps suggested that WFSOs/UFSOs are advisors to senior management and emphasized their importance as an early warning and are critical for assessing risk. He then cautioned everyone that as operational tempo drops, accident rates during routine missions can climb and that everyone must remain vigilant.

Some of the highlights of the conference included:
Major Helen Wright, DFS's Flight Surgeon, spoke on the difficulties of defining "pilot error". In trying to find a definition, a "Systems Approach" or combination of conditions that are not of themselves unusual or abnormal, is examined. This approach professes that human error/deviation is not random but is systematically linked to task, tools, operational environment and context. Also, it suggests that there are many error types and that failures are an outcome of normal behaviour. Major Wright then briefly discussed CF-HFACS and said that the current fundamental structure will not change, however, there could be minor alterations to some definitions in order to improve clarity and minimize overlap.

Mr Daryl Collins, a Senior Investigator with the Transportation Safety Board, provided a candid review of the *Cougar* Sikorsky S-92 accident 12 March 2009 along with valuable lessons learned relating to the investigation process and some of the difficulties incurred.

Mr David Hurst from the Directorate of Technical Airworthiness and Engineering Support, spoke on the airworthiness risk management (ARM) process and colour coded Airworthiness/Survivability Risk Index. Lots of questions and a good discussion followed.

From Public Affairs, Major Lynne Chaloux provided some very informative points to assist in situations where the civilian press is involved.

Major John Meurling, from the Directorate of Air Programs, spoke on the status of Aviation Life Support Equipment (ALSE) within the RCAF. A very lively discussion followed.

Dr Bob Cheung, from Defence Research and Development Canada (DRDC), spoke on a number of topics related to FS and research and development. One included the impact and consequences of degraded visual environment (DVE), such as experienced with rotary wing brownout. Several technologies are being developed and DRDC is tasked with providing a recommended solution.

There were many other very interesting, productive and lessons learned presentations throughout the week. It was mentioned that almost one third of FS staffs are new to the discipline and therefore the sharing of FS information at all levels proved most invaluable.