National Defence Défense nationale

Flight Comment

ISSUE 1, 2013

SEA KING 50th ANNIVERSARY

Canada

Views on Flight Safety

By Mr Jacques Michaud, Directorate of Flight Safety, Ottawa

Mr Michaud is a former RCAF pilot with close to 6,000 hours on the Kiowa and Griffon within the tactical helicopter community. He completed three tours with 430 Tactical Helicopter Squadron, his last one as the Commanding Officer from 1993 to 1996 and one tour as an instructor with 403 Operational Training Squadron. He retired from the Canadian Forces in 2002 and moved in his current position of Section Head for Promotion and Information within the Directorate of Flight Safety.

Well! The last time I provided my views on Flight Safety (FS) was in the spring of 2007. I then presented an argument for the Canadian Forces to embark on a Flight Operation Quality Analysis (FOQA). This idea has flown about as well as the Howard Hughes famous "Spruce Goose" HK-1 *Hercules* cargo flying boat. My editor, a relatively intense senior Captain who terrorizes much younger opponents on squash courts, convinced me that I still have something meaningful to express. Here I am reflecting on a blank page, trying to say something intelligent after the likes of Gen Charlie Bouchard, numerous Chiefs of the Air Force, Commanders of the Air Divisions, current and former Directors of Flight Safety and other significant others who have held positions of responsibility in our recently renamed Royal Canadian Air Force.

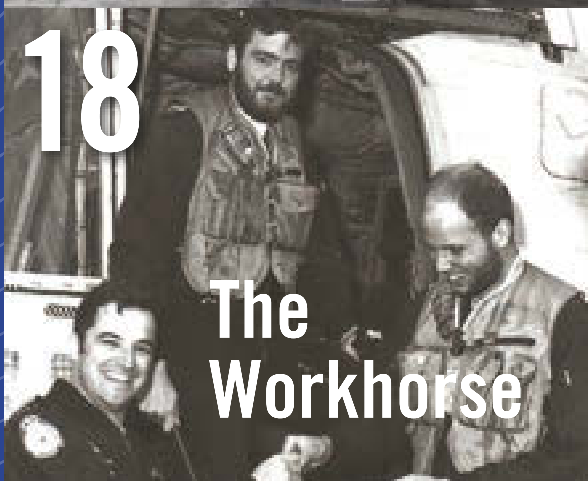
I had the honour to act as Chairman of the 9th NATO Flight Safety Panel (FSP) held in October 2012 in Prague, Czech Republic. Besides reviewing flight safety standardization issues and best practices, the 9th FSP attempted to identify the major FS concerns affecting our modern air forces. While issues like helicopter operations in degraded visual environments, operating unmanned aircraft systems in controlled airspace with conflicting traffic, congestion of airspace, reduced currency and proficiency for pilots and maintainers caused by eroding yearly flying rate were discussed, the unanimous primary concern was improper risk assessment and/or acceptance of risk at an inappropriate level in the chain of command.

I was not challenged by a command in combat operations; thus, I have little credibility in trying to give advice to future commanding officers (CO), flight commanders, operations officers and crew commanders called upon to serve in an operational theatre. Many decisions have to be made spontaneously by the crew commander without referral or discussion with external sources. However, I do understand the compelling desire for mission accomplishment, especially when the actions can lead to saving lives. Here we go with one of my "war stories".

One night in Valcartier, I had just completed a mutual NVG low level navigation training mission on the venerable *Kiowa*. I was signing in my aircraft when the night tower shift controller called the servicing desk with an urgent message. A soldier had been shot at the local range and had to be immediately evacuated to the hospital on base. His exact condition was unknown but assessed as critical. I was the squadron CO, knew the flying area extremely well, was very experienced on the *Kiowa*, weather was a non-factor and was relatively experienced with NVGs. In fact, the mission could have been completed unaided, but I elected to use the NVGs. The *Kiowa* was not a recognized platform for any CASEVAC, certainly being unsuitable for a non- walking casualty. However, I was certainly not going to let him die in an ambulance trying to navigate the sinuous and slippery roads back to Valcartier. Time was of the essence and, despite its limitations, use of the *Kiowa* could have made the difference between life and death. I guess you see the trend here: aircraft not fitted for the role, lack of preparation, no direct communication with unit supported, safety of landing zone, crew proficiency on NVGs, crew briefing, weight and balance....

(continued on page 5)

A *Sea King* helicopter landing on HMCS *Assiniboine* on 04 August 1964.



Flight Comment

TABLE OF CONTENTS

Issue 1, 2013

Regular Columns

Dossiers

Lessons Learned

DIRECTORATE OF FLIGHT SAFETY

Director of Flight Safety
Colonel Yvan Choinière

Editor
Captain John Dixon

Graphics and design
d2k Marketing Communications

Imagery Technician
Corporal Vincent Carbonneau

THE CANADIAN FORCES FLIGHT SAFETY MAGAZINE

Flight Comment is produced three times a year by the Directorate of Flight Safety. The contents do not necessarily reflect official policy and, unless otherwise stated, should not be construed as regulations, orders or directives. Contributions, comments and criticism are welcome. Contributions become the property of Flight Comment and may be edited for content, length or format.

Send submissions and subscriptions to:

National Defence Headquarters
Directorate of Flight Safety
Attn: Editor, *Flight Comment*
(DFS 3-3)
101 Colonel By Drive
Ottawa, ON, Canada, K1A 0K2

Telephone: 613-992-0198
FAX: 613-992-5187
Email: dfs.dsv@forces.gc.ca

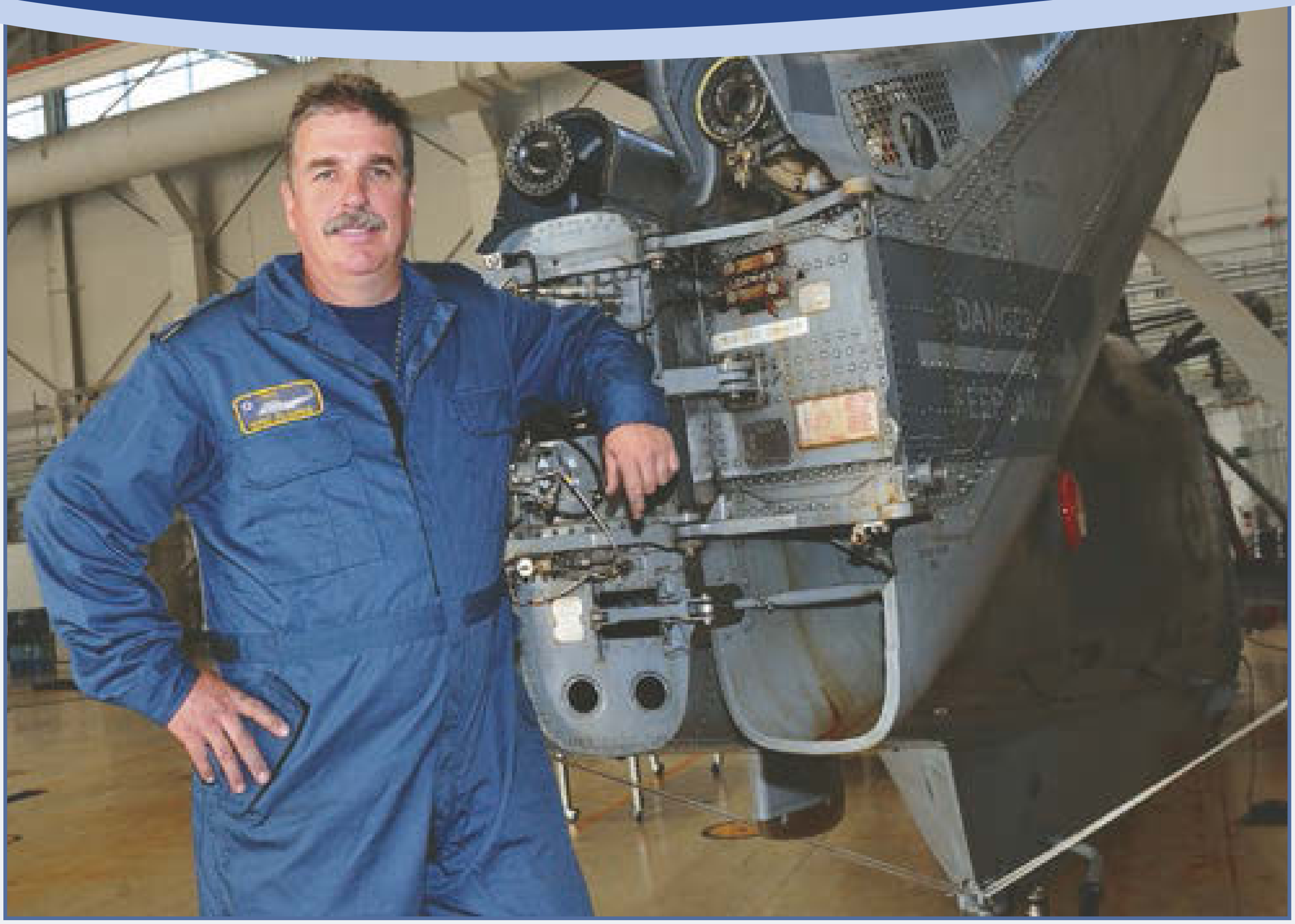
To contact DFS personnel on an **URGENT** flight safety issue, please call an investigator who is available 24 hours a day at 1-888-927-6337 (WARN-DFS).

The DFS web page at www.airforce.forces.gc.ca/dfs offers other points of contact in the DFS organization or write to dfs.dsv@forces.gc.ca.

ISSN 0015-3702
A-JS-000-006/JP-000

For *Professionalism*

For commendable performance in flight safety



Corporal Eric Plourde

Cpl Eric Plourde was tasked to conduct a Supplementary Inspection (SI) of the pylon hinge lugs and pins of a CH124 *Sea King* helicopter. In addition to the SI, Cpl Plourde did a thorough visual inspection of the area and discovered that the bottom web area of the pylon pin had been re-worked to a level that appeared to compromise the structural integrity of the component.

The follow-on investigation revealed that the lower pylon lugs had been machined using a 2.75 inch diameter counter bore cutting tool vice a 2.225 inch diameter tool. An engineering assessment of the pylon lugs concluded that the machined lug size reduced the expected lug fatigue life from 28,600 hours to 3,300 hours. An inspection of all CH124 pylons was subsequently issued. Ten pylons were found to have similar characteristics. Four of these altered pylons were installed on operational aircraft. Cpl Plourde's attention to detail resulted in the rapid identification and resolution of this issue.

Had it not been for Cpl Plourde's keen observation skills, there was a high probability of a failure of this flight critical component when airborne. Cpl Plourde demonstrates the kind of professionalism upon which a sound Flight Safety Program is built and makes him deserving of this For Professionalism award. ◆

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

Views on Flight Safety

(continued from page 2)

As fast as we could turn around the aircraft, we departed for the training area. Once airborne, we contacted range control to ensure a cease fire had been called and that we could proceed safely to the landing zone. While airborne and flying at 100 knots, I eventually donned my NVGs. Why they were not installed before start-up is beyond me but as I recall things were hectic on the radios. After we landed, my co-pilot departed the aircraft to get information on the casualty. It was definitely a stretcher case; a stray bullet had hit the soldier in the head and he was in critical condition. I was willing to take a lot of risks that night to save his life.

I considered removing the rear doors, the survival kits (regular and winter) and strap the stretcher to the aircraft with god knows what even though a medical assistant may have had to kneel beside the patient. In the end, the unit Commanding Officer decided to use the ambulance. He probably knew something about the limitations of the *Kiowa* and made what was probably the right choice.

As a result of this experience, I have a great deal of empathy for those faced with conflicting priorities in demanding operational roles - especially when lifesaving decisions have to be made. While it is impractical to impose a process where all risk assessments are referred to higher commands for endorsement, risk must be analyzed as comprehensively as possible before the operational deployment. After the mission has commenced, the crew commander must understand the limit of his/her authority. If he/she has to exceed that authority, the best course of action is to report the exceedance(s) so an honest discussion can take place on the risk accepted, the mitigation strategy adopted during the flight and, more importantly, the lessons learned to be passed to the other aircrew, not only within the unit, but with other flying units and responsible command organizations.

Flight safety encourages a strong reporting culture and an honest discussion on factors at play during an occurrence. In the age of rapid communication, it is not sufficient to keep in-house a lesson learned by asking the maintainer or pilot involved to brief in front of his peers. By universal reporting, the chain of command is made aware of the risks faced by the organization and must respond to proposed preventive measures by flight safety specialists. Would I have reported my occurrence in the Flight Safety Occurrence Management System if I had flown the injured soldier to Valcartier? With the prevailing associated risks, I can only say "I hope so". Now knowing the benefits of a strong reporting system, my answer would be a definite "yes". ◆

The Editor's Corner

Sea King's 50th Anniversary

My one and only flight in a *Sea King* was as an Officer Cadet back in 1976. At that time, the CF had already operated the aircraft type for some 13 years, and I viewed the aircraft as somewhat resembling an ancient relic. Who would have believed that the aircraft would remain operational in multiple roles for another 37+ years? Fortunately, there are many operators and maintainers who have, over the years, developed a sincere fondness and a healthy respect for the venerable aircraft. As the CF celebrates 50 years with the *Sea King* aircraft, some of those individuals with multiple tours on the aircraft have submitted compelling articles for all of us to share. First is "50 Years of the Canadian *Sea King*" by Col (Ret'd) John Orr, which gives an excellent overview of the history of the aircraft in the CF. Then Major (Ret'd) Brian Northrup provides us with "*Sea King* to *Cyclone*: Staring Into The Automation Abyss" which gives a superb analysis of flight safety aspects of increased automation during fleet renewal. Some of the concepts here would be relevant to any fleet upgrade incorporating automation upgrades. Finally, LCol (Ret'd) Larry McCurdy provides us with some first hand thoughts about the aircraft and the contributions it has made over the years.

For those few who may actually read this page, it is quite possible that this will be my final issue as *Flight Comment's* Editor. It has been challenging at times and rewarding on occasion, but what I will remember most is having the privilege of working with a supremely professional flight safety team including those in DFS, 1 Div FS and Wing/Unit FSOs/NCMs. To the flight safety team: the nature of the work you do, on a daily basis, may at times seem under appreciated, but in the final analysis is never under valued. To the regular readers of this publication: thank you for your submissions, comments, emails, and in some cases encouragement. I would hope that your contributions will continue to make *Flight Comment* a better publication – after all, flight safety is everyone's business!

Fly safe,

Captain John W. Dixon
Editor, *Flight Comment*

Access to Care – Anywhere

By Major Stephen Cooper, Directorate of Flight Safety Medical Advisor, Ottawa

In the 2012 fall Issue of *Flight Comment*, I gave an overview of how health care is provided in the Canadian Forces. Our duty is to give each patient the highest level of care wherever they serve in the world and to provide the commander with medically fit people.

Sometimes the patient has an expectation of what level of services they should receive, be it Computed Tomography (CT) scans, medications or referrals to specialists. If they are not provided with this level of care, they may be left with a perception that they are getting poor care. Some tests and medications can cause more harm than good and referrals to specialists are not always beneficial. Health care is a limited resource that is prioritized to benefit the most humans. Decisions are based on research and individual patient needs.

As CF members, we are not entitled to unlimited health care; this would take funding from other essential programs with little benefit to the patient. We are, however, entitled to additional treatments in order to return us to duty so we can continue to contribute to CF operations. In addition, we are some of the few patients who still get "house calls"; that is if our "house" picks up and moves us on a deployment.

Health Care on Deployment

As part of the planning for any deployment (land, sea, air) medical support requirements are determined. Factors such as the level of isolation, local health facilities, enemy threats, and environmental extremes will determine the number and type of health care providers that will deploy and how much equipment they will take. This can range from one QL5 medical technician with a first aid kit all the way up to a "Role 3" hospital complete with operating rooms, CT scanner, pharmacy and a dentist.

We often start seeing our patients from the time we get on the bus to deploy. Our normal ailments such as sprains, pneumonia, appendicitis, heart attacks etc. do not take a break on deployment. We start treatment wherever we are and with whatever we have and immediately consider if evacuation is required. The diagnosis may not be initially obvious. Vague symptoms in healthy patients can actually be the harbinger of a more life

Photo: Sgt Norm McLean

threatening ailment. As we move farther from civilization and into more austere parts of the world, our ability to move the patient becomes very challenging due to air resources, holding capability as well as the amount of care that must be provided for a sick person by limited health care staff.

Much of the work done by the deployed health care staff may go unnoticed since it is completed behind closed doors, after hours and/or while protecting the confidentiality of the patient. If the risk to the patient and the operation becomes too high, the senior medical person will recommend to the Commander that the patient be repatriated. This is a difficult decision to make since moving a patient imposes risks to the patient as well as the crew and also leaves the operation with one less person to do the work.

It is important to note that health care staffs are exposed to the same environmental stressors as other members of the team (jet lag, shift work, austere living quarters, heat and cold, noise, violence, malaria, sea sickness etc.) As a result, they must do everything possible to protect themselves and their patients from becoming casualties to the environment and to accidents.

Photo: MCpl Darrell Priede

Health Care at Sea

With the upcoming 50th Anniversary of the *Sea King*, and as a former TACCO (Tactical Coordinator) with 423 Maritime Helicopter Squadron on the same aircraft, I thought that I would include some thoughts on the aircraft and on health care at sea.

Some may not know that the *Sea King* was originally flown off of the HMCS *Bonaventure* aircraft carrier but was later adapted to operate on small frigates and destroyers. They went through the difficult cultural transformation from the RCN to the CF as they integrated with the Air Force aviators and maintainers. The helicopters and tactics were modernized to become the world leaders in night time anti-submarine warfare. Throughout their proud history, they were quickly adapted to many other roles such as search and rescue, fisheries patrol, humanitarian crisis, embargoes and armed conflicts too numerous to mention and too often forgotten. The *Sea King's* ability to sail with their ships from Halifax or Esquimalt on short notice, and then to support themselves for months at a time anywhere in the world, made them the first responders to world events for decades.

From a health care perspective, a physician assistant and a medical technician sail on every frigate while a physician normally sails on the supply ship. They provide care to the aircrew, maintainers and naval personnel both alongside and at sea in the most isolated and dangerous parts of the world. In addition, the embarked medical personnel fly on *Sea King* medevac flights and treat casualties, such as from humanitarian disasters on land or rescued survivors at sea.

The contribution of medical personnel can extend well beyond direct patient care. As an example, Captain (N) Brooks (MD) started as a Flight Surgeon in Shearwater in the early 1970's. He became a world expert in "cold water immersions" and survival after helicopter ditching. Over the years, his work saved several CF lives and many more around the world.

Medical personnel serve in the air, on the land, on the ocean and even below the ocean. We are adaptable and ready to deploy wherever and whenever required. You can be assured that we, in Health Services, are committed to providing the highest level of health care possible. ◆

Maintenance

IN FOCUS

When supply gives you lemons... *make sure they are the* RIGHT LEMONS!

By Sergeant Tim Maher, Unit Flight Safety NCM, 413 Transport and Rescue Squadron, 14 Wing Greenwood

Reference: http://www.everyspec.com/COMML_ITEM_DESC/A-A-51000_A-A-51999/A-A-51145_25694/

Introduction

Following the investigation into the destruction of a CC130 Navigation Light Control Panel, it was deemed important to provide maximum dissemination of the findings in order to raise awareness and prevent similar occurrences. Fortunately, the event described below happened on the ground and was rapidly contained, but had it happened in flight the result could have been catastrophic.

Event Description

Following 2nd line repair of a Navigation Light Control Panel, the panel was installed on aircraft CC130334 to complete functional testing. When the aircraft power was applied, the panel began to overheat, smoke, and burn through, damaging it beyond economical repair. Power was immediately removed, and the damage was fortunately contained to the panel. The panel was then brought back to the avionics labs under flight safety quarantine for further inspection where it was noted that the damaged area extended outside of the original repair site. (Figure 1)

Figure 1

The avionics technician removed the circuit component in the affected area and using an external power supply, re-applied power to the panel. Immediately, the panel resumed smoking and burning despite the circuit component removal. During follow-on troubleshooting, technicians began to suspect that the flux used during the previous repair was not suitable for electronic circuit repair and had caused the circuit to bridge and overheat.

Figure 2

Figure 3

A Flight Safety was raised (see FSOMS 151675) regarding the use of improper flux causing a fire in the cockpit of a CC130. The investigation that ensued was very enlightening and produced some noteworthy findings. Scoring high on the list of findings was the belief of many aircraft maintenance technicians that the supply chain ensures compliance of all products received, by verifying that they are in fact what was ordered. It is important to stress that this is NOT the case. Supply acts as the procurement authority for the purchase, but does not, nor can it, ensure compliance of the millions of items received.

In this particular case, the proper product (Figure 2) was tendered, quoted, and purchased. However, the product delivered did not meet the MIL-F-14256 specification standard associated with NATO Stock Number (NSN), 3439-01-007-5494 (Flux, Soldering), found on the order form. The distributor instead shipped a soldering flux that met the standard of Fed AA51145 (Figure 3) which corresponds to a different NSN. The reference contains the detailed specification related to the flux received and contains a quote stating "This flux is not intended for use in soldering electronic or electrical circuits." The specification also indicates that the flux residue is **conductive**. The product was labelled "SOLDERING FLUX", but only close inspection by someone with comprehensive knowledge and understanding of the product would have been able to identify the discrepancy. Nowhere on the bottle does it state that this particular flux is not intended for electronic or electrical circuits. As is often seen, the supply employee that ordered the flux was at one location, while the customer was in another. In this particular instance, the person that ordered the flux never witnessed what was received and the supply technician who received the flux simply shipped it to the originating unit with no knowledge of its requirements.

Conclusion

Supply sections across the CF deal with a myriad of products and it is unrealistic to believe they could be experts in all of them. Distributors may inadvertently substitute product without understanding the end use requirement. This ultimately leaves the end user (Technical Authority) solely responsible to ensure that each item they use meets the standard required for the applicable task. Only the end user has the detailed knowledge of what is required. Remember: this simple oversight contributed to an incident where a fire occurred in the cockpit of an aircraft. If you have always worked with the same flux that was yellow in colour and came in a brown bottle and you suddenly receive a clear flux in a transparent bottle, it is certainly worth investigating its characteristics. It is your duty to do so. ◆

50 years of the Canadian *Sea King*

By Colonel (Retired) John L. Orr

Colonel Orr joined the Royal Canadian Navy in September 1963 and graduated in 1967 from the Royal Military College of Canada. He began flying at Shearwater in 1969 and subsequently completed five operational tours on the *Sea King* helicopter culminating in command of 423 Helicopter Anti-Submarine Squadron from 1985-87. He retired from the Canadian Armed Forces in September 2000. He is currently a Research Fellow with the Centre for Foreign Policy Studies at Dalhousie University. For the past three years, Colonel Orr has been engaged in researching a history of the Canadian *Sea King* being prepared for the Golden Anniversary of that aircraft which will be celebrated in Shearwater, Nova Scotia on 31 July – 1 August 2013.

Introduction

On 1 August 1963, the first two Canadian *Sea Kings* arrived at Shearwater ushering in a new era of combat capability that was to last for the next fifty years – and beyond.

Originally acquired by the Royal Canadian Navy (RCN) in 1963 to operate in an anti-submarine role from the aircraft carrier HMCS *Bonaventure* and the destroyer-escorts of the *St. Laurent* and succeeding classes, the *Sea King* has gone on to serve in the Canadian Armed Forces (CF) and now the Royal Canadian Air Force (RCAF) in a variety of roles. In fact, for a "venerable" aircraft with reputedly limited combat relevance, the *Sea King* has been deployed extensively overseas onboard HMC Ships since OP FRICTION in 1990 and as of this date, a *Sea King* is embarked in HMCS *Toronto* in the Arabian Sea as part of OP ARTEMIS. *Sea Kings* have also participated in several significant domestic operations ranging from support to the Manitoba floods to Swissair 111 to the Winter Olympics in Vancouver – not to mention "routine" operations such as search and rescue and coastal surveillance. No mean feat!

Discussion

A unique characteristic of Canadian *Sea King* operations has been the marriage of a medium-sized helicopter with a destroyer-escort sized warship. This development was a Cold War response to Soviet conventional and nuclear-powered submarines and the threat

Photo: DND


Photo: DND

that they posed to both the sea lines of communication between North America and Europe as well as the strategic retaliatory forces of the United States. The integration of *Sea Kings* with Canadian warships improved the combat capability of the ships by greatly extending the range of their sensors and weapons. This "DDH concept" was made possible by the Helicopter Hauldown and Rapid Securing Device (Beartrap); a system conceived, designed and tested by a small team of highly dedicated Canadian professionals which vaulted Canada to the forefront of maritime helicopter aviation.

Following the demise of the aircraft carrier HMCS *Bonaventure* in 1970, *Sea Kings* operated from the destroyers of the Canadian Navy throughout the next twenty years of the Cold War in the broad reaches of the North Atlantic and set the NATO standard for the operation of ASW helicopters.

In 1975, the responsibility for the *Sea King* and its personnel was transferred from Maritime Command to Air Command. It was during this period that LGen Bill Carr, the first Commander of Air Command, came to visit Shearwater and flew a night ASW mission with one of the junior crew commanders. His assessment rings true even today:

> *"… I'm still impressed with the "routine" demonstration I was put through over the rainy, pitch black, and rough fluorescent Atlantic at fifty feet well out to sea off the coast of Nova Scotia! During my flying career I had been exposed to many different kinds of operations, but none had impressed me more than this professionalism which [the] Sea King operation demanded and regularly demonstrated."*

More challenges were on the way in 1989 as 443 Squadron left Shearwater and deployed to the Patricia Bay airport in support of the transfer of air capable ships to the West Coast. While adding a much needed combat capability to the navy's Pacific fleet, it taxed support resources to the maximum.

Despite all these difficulties, the community rose to the challenge and, displaying a characteristic resilience, carried on. Then, with the collapse of the Berlin Wall in 1989, *Sea Kings* shifted their emphasis to new waters, new roles and new challenges.

In an incredible two-week period during August 1990, the anti-submarine equipment of six *Sea Kings* was removed and new equipment installed in support of a surface surveillance role during OP FRICTION in the Persian Gulf. The ability to compress months of effort into such a short period was a tribute to the awareness of *Sea King* staffs of recent developments in maritime helicopter aviation as well as the skill and 24/7 perseverance of technical personnel in carrying out the installation in a safe and timely manner. The proof of the excellence of their work was later evident in a phenomenal mission availability and completion rate of 98%!

OP FRICTION heralded a new era in *Sea King* operations. In 1992, *Sea Kings* were again bound "East of Suez" onboard HMCS *Preserver*; this time to Somalia and the ill-fated OP DELIVERANCE. While this operation is largely remembered for the travails of the Canadian Airborne Regiment, what is largely unknown is the truly incredible role played there by the Canadian *Sea Kings*.

OP DELIVERANCE was followed by a string of operations in which the *Sea King*, embarked in HMC Ships, was often the first Canadian combat aircraft in theatre. Many of these operations occurred with little notice and placed a high degree of reliance on the professionalism of both the aircrew and maintainers. As more than one commentator has observed, these achievements were a testament to the ability and initiative of the personnel involved as well as further evidence of the flexibility and durability of the *Sea King*.

Throughout the 80's and early 90's, considerable staff effort was expended in a variety of projects designed to replace the *Sea King* and eventually, the *Sea King* Replacement Project (SKR) became the New Shipborne Aircraft (NSA) Project. Regrettably, following the Federal General Election of 1993, the NSA Project was cancelled and the *Sea King* saga took yet another turn.

Despite the disappointments experienced by the *Sea King* community, they persevered in their mission to provide combat-ready aircraft as well as air and ground crews to HMC Ships both east and west. The new millennium saw no slacking in the pace of operations and the operational tempo for the *Sea King* continues today.

Conclusion

Reflecting on 50 years of Canadian service by the *Sea King*, a number of conclusions can be made. First and foremost, the aircraft, despite its age, continues to make a positive contribution to supporting the interests of Canada and Canadians both domestically and overseas.

Secondly, the aircrews have consistently demonstrated a high degree of innovation, flying skill and dedication; often thrust into last minute deployments to foreign environments and for missions for which they had little or no training.

Likewise, the maintenance personnel, upon whose shoulders the principal effort for the continued operation of the *Sea King* falls, have time and again demonstrated competence, ingenuity and stamina in keeping a sometimes recalcitrant aircraft flying without compromising flight safety.

Finally, the soundness of what has come to be known as the "DDH concept" has been fully vindicated. There is little doubt that the example of Canadian *Sea King* operations has had a profound and positive impact on the development of maritime helicopter capabilities throughout the world. ◆

Photo: DND

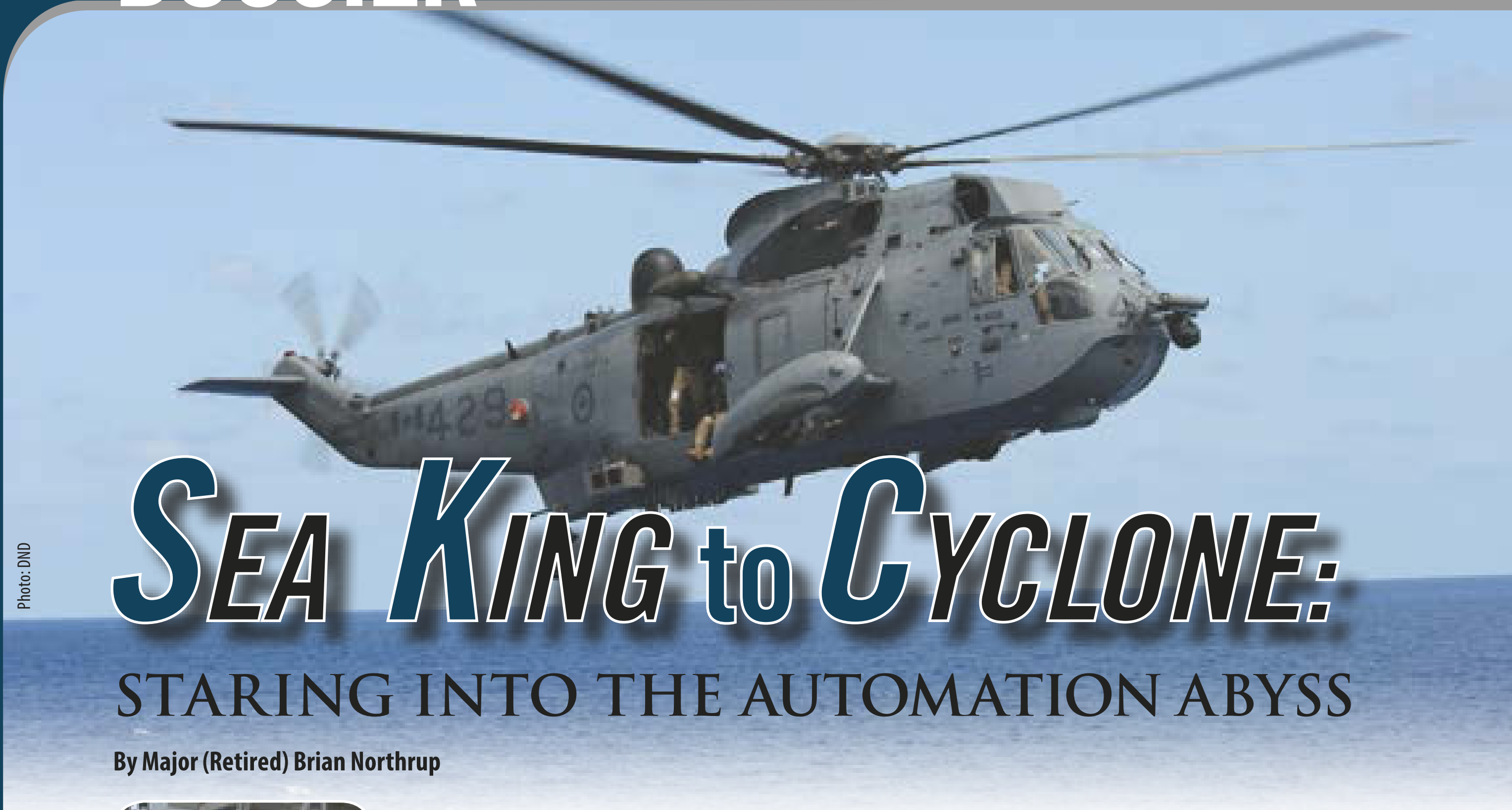
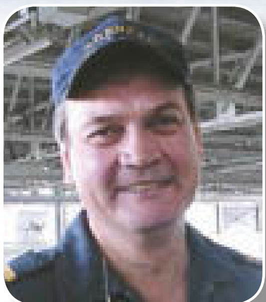


Photo: DND

SEA KING to CYCLONE:

STARING INTO THE AUTOMATION ABYSS

By Major (Retired) Brian Northrup



Major (Retired) Brian Northrup enjoyed a 35-year military aviation career, amassing a grand total of 7800 flight hours on the *Sea King*, *Chinook* and *Huey* helicopter. On retirement, he served an additional six years as an operational consultant on the Maritime Helicopter Project with an emphasis on developing automation procedures and a viable training program.

"Continuity gives us roots; change gives us branches, letting us stretch and grow and reach new heights."

– Pauline R. Kezer

For any aviation community, transition to a new aircraft offers up expected challenge and considerable angst tinged with sheer excitement. Change is never easy, as stability traditionally favors the status quo and the historic familiarity that it affords to flight operations. In the case of the Maritime Helicopter (MH) community, the anticipated arrival of the state-of-the-art *Cyclone* helicopter slated to replace the 50 year-old *Sea King* will represent a quantum leap in technology in practically all aspects of weapon system performance. It encompasses a half-century leap in technical progress that must be adapted to perform within a most unforgiving low-level maritime environment; a classic scenario quite capable of setting the stage for abject catastrophe should transitional plans not prove comprehensive, well thought out, and adroitly executed.

To address the prospective MH transitional effort, it is necessary to initially understand the role and inherent culture of the naval air community as it has evolved since inception. Transition planners need to appreciate the legacy-implicit attributes and limitations capable of providing a sound foundation for safe conversion to the new and much more sophisticated replacement aircraft and its myriad support systems. Important lessons can be derived from the earlier *Sea King* transitional journey experienced so many years ago that still have relevance to today's *Cyclone* challenge. As well, these planners need to recognize the fundamental precepts of modern flight automation complexity as they exist today. Such a collective effort may conjure up deja vu in some quarters, yet identify painful lessons learned on the *Sea King* entry into service that can still pay important dividends today.

Sea King Legacy

Fifty years of military service encompasses a tale not easily related in a few succinct paragraphs, yet some historical context must be offered to instill accuracy in speaking to transitional similarities shared between half-century transitional eras. The MH community owes its proud legacy to the small yet brash Royal Canadian Naval Air Arm, founded at the conclusion of the Second World War. Based on operating fixed-wing maritime fighter/anti-submarine aircraft on three successive aircraft carriers over a 25-year period, this small cadre of naval air warriors comprised a tightly knit group that fully recognized its immense contribution to naval operations, and yet often perceived that it was neither adequately supported nor appreciated. As such, its survival depended to a great extent on its inherent ingenuity, frugality and a tenacious attitude that consistently refused to recognize defeat under any circumstance. Perhaps the Peter Charlton-authored VX-10 Test Squadron book detailing the exploits of the naval test Squadron best captured the naval air mantra through its title: "Nobody Told Us It Couldn't Be Done." The traditional belief was that mission accomplishment epitomized the ultimate goal while operational risk and herculean effort represented the price of progress.

The mid-1960s *Sea King* introduction to service proved a dramatic undertaking for all involved, exemplified by the initial loss of six aircraft within the first seven years of operations. Two accidents in particular shone the spotlight on the necessity for identifying human performance boundaries and serve to forewarn the MH community again as it prepares to introduce the replacement aircraft to the maritime helicopter role.

CH 12402 – 30 November 1967. Having just completed an instrument overshoot procedure off a night radar approach to HMCS *BONAVENTURE*, *Sea King* 12402 was established on radar vectors at 200 feet altitude and 90 knots airspeed in transit to a designated holding area. The crew already had been airborne for 3.5 hours under Instrument Meteorological Conditions (IMC), and was scheduled to fly an additional 30 minutes prior to final recovery. Distracted by the presence of another *Sea King* operating in the same area, neither pilot recognized the subtle aircraft descent profile until water impact. Both pilots were ejected through the aircraft front windows on water impact while still strapped in their seats. The observer and naval aircrewman in the cabin area perished on impact, while both pilots miraculously survived and were later rescued by naval personnel.

This accident marked the first of the six *Sea King* accidents in which cause factors could be equally shared between engine malfunction and human performance. The original aircraft were recognized as being underpowered on delivery, with the result that *Sea King* aircrew routinely spent the major portion of the mission flight profile operating outside of safe single engine flight parameters. Should an engine fail, remaining airborne during a daytime hover was considered improbable while at night deemed impossible; not necessarily the most comforting notion when operating 40 feet above the ocean on many dark and stormy nights.

The human factor pertaining to the loss of 12402 can be directly attributable to the quantum leap in aircraft performance that allowed the *Sea King* to conduct the revolutionary night over water low level mission, an ability not previously available to the naval helicopter community. Perhaps most impressively, the aircraft was equipped with an automatic transition capability that enabled the aircraft to transition from a 150 foot cruise altitude to a 40 foot hover position for submerging and raising the sonar sensor, all flown solely on cockpit instruments without utilizing outside visual reference. For day flight only, HO4S helicopter pilots and recent cross-trained fixed wing aircrew, this impressive yet challenging operational potential came with a mix of aircrew awe and anxious apprehension.

The loss of 12420 highlighted the critical prerequisite for sound cockpit procedures and flight discipline when operating low level over the water, particularly at night. The golden rule became the necessity for at least one dedicated pilot to remain on instruments at all times during low level flight operations. Despite such automatic features as altitude hold and other supplementary automation aids, it was very easy for the aircraft to subtly lose altitude and descend unnoticed to the ocean surface, especially on a dark featureless night. This accident proved an expensive lesson in terms of aircraft and lost lives but a most crucial one in highlighting the need for standard operating procedures and one that would reap benefits for future generations.

The aircraft had just completed a hot fuel evolution and departed the ship with a full fuel load when the crew experienced a significant engine failure. At night, the low level altitude and maximum weight condition afforded minimal margin for error in adapting to single engine flight, maintaining aircraft control, dumping excess fuel, and planning for aircraft recovery back onboard the small

CH 12420 – 7 November 1971. The aircraft had just departed HMCS *NIPIGON* on completion of a hot fuel/crew change to conduct a night screening mission. Immediately after takeoff, the aircraft captain declared a single engine emergency situation and attempted to return to the ship for immediate recovery. A combination of full fuel load, fuel-dumping efforts, low level IMC turn, and numerous radio transmissions overshadowed a low Rotor RPM state that culminated in an uncontrolled crash. Both pilots and the observer are assumed to have perished on water impact, while the navigator miraculously managed to egress the submerged aircraft through a side window. Arriving minutes after the crash, the Nipigon's rescue boat recovered the navigator from amongst the aircraft debris.

destroyer-class ship. Whether the aircraft could have remained airborne based on the limited power available was uncertain, yet the two pilots' attempt to accomplish so much so quickly exacerbated an already perilous situation. Rotor speed is the ultimate factor in remaining under controlled helicopter flight yet the rotor RPM needle is the smallest and less conspicuous needle on the entire *Sea King* instrument panel. It is probable the crew were unaware of the rapidly decaying rotor speed situation as they swiftly carried out their emergency procedures. As a result of this accident, a low rotor aural/visual aircraft warning system was subsequently incorporated that without question saved numerous lives and aircraft over the ensuing years. The post accident study also revealed a faulty engine failure procedure that ensured future *Sea King* emergency situations would be conducted in a more methodical and measured manner.

Eventually concern over the aggregate demands of *Sea King* performance and the low level night dipping role would lead to an official 1974 study of *Sea King* operations entitled: "Stress in HS50 Pilots" that attempted to define and assess the limiting aspects of *Sea King* operations. Pilot stress levels were best summarized in the study by the HS50 Squadron Commanding Officer who opined: "The combination of component unreliability, normal hover instability, potential sudden water entry, difficult survival, location and recovery conditions, when combined with night and adverse weather, presents too many problems for many pilots who, in another operating environment, would serve useful tours."

A second unique aspect of *Sea King* flight operations worthy of mention, beyond the demanding flight environment, relates to the exceptional degree of inter-aircraft crew cooperation within the *Sea King* crew during flight operations. Whether in pursuit of a submerged combatant, identifying surface forces, search and rescue evolutions or an instrument approach to the ship under inclement weather conditions, the four person crew was routinely highly taxed in coordinating the various sensors and armament systems to achieve mission success. It has been only through evolutionary standard operating procedures emphasizing the criticality of integrated crew performance and a proactive approach to Crew Resource Management that has allowed *Sea King* crews to manage task saturation to an acceptable level. A new challenge will soon emerge with the *Cyclone* replacement aircraft and its nascent mission system capability.

Automation: Some areas of concern

In addition to understanding the *Sea King* legacy and its cultural impact, a second critical plank in formulating a successful *Sea King* to *Cyclone* transitional bridge relates to the need for an all-embracing grasp of modern automation precepts, capabilities and limitations. Notwithstanding the challenge of allowing automation to fly the aircraft through a hands-off data input process, an even greater challenge shall be in exploiting the prospective tactical capability provided by modern automation features while yet remaining within reasonable human performance boundaries. Unfortunately, the reality of

Photo: Submitted

operating a 1960s-vintage aircraft over a prolonged period with now marginal operational capability has produced a paucity of automation-smart MH personnel. As well, the vast majority shares the added affinity of seeking to maintain the comfortable status quo in terms of familiar behavior patterns and well-engrained *Sea King* standard procedures.

The good news for the MH community is that they find themselves not alone in having to adapt to the ever advancing automation influence within contemporary flight operations. While aviation automation doesn't represent a novel concept, having steadily evolved within the commercial airline industry over several decades, its application within the more dynamic sphere of military operations has been limited to some extent. Automation tends to favor the more predictable, steady state commercial airline flight profile that functions within a static, heavily regulated and legislated aviation regime. Military operations tend to operate under more dynamic unknown conditions and nowhere more so than in the demanding low level MH operational arena.

Of all the transformational threads that the MH community must recognize and accept, it is the realization that automation fosters a distinctly different approach to fixing, flying, and fighting the replacement aircraft from the proverbial legacy aircraft. The MH community will need to discard a number of well engrained *Sea King* principles and practices, and be willing to grasp a far-reaching new way of conducting flight operations. One of the foremost and most challenging activities will be the need to identify those specific aspects of current *Sea King* operating policy and procedures that retain their validity, while jettisoning those overtaken by automation advances. As well, a conscious effort must be taken to establish relevant procedures as defined by automation attributes, rather than attempt to force the automation to reflect existing *Sea King* legacy procedures. It is a slippery slope in identifying what must go and what should stay, yet a most critical responsibility that is essential to ultimate transitional success.

Photo: Cpl Francis Gauthier

Two specific automation areas of concern where *Cyclone* transitional planners need to prevail relate to pilot flight duties and crew task saturation. While the *Cyclone* cockpit contains a multitude of automated systems including an embryonic fly-by-wire system that negates conventional helicopter stick displacement, it still can be argued that the greater risk of automation influence and potential disaster will involve combining the integral demands of the aircraft automated cockpit with the multi-faceted Integrated Mission System (IMS). Modern automation is characterized through its distinctive levels of integration and redundancy that ultimately define the final product, yet these same ingredients are capable of spawning considerable confusion and ambiguity should automation performance degrade or fail.

The *Cyclone* aircraft will routinely operate at low level altitudes less than 200 feet over the ocean and often assume automatic hovers at even lower altitudes. The ongoing aircraft flight debate centers on the premise that *Cyclone* automation is deemed fully capable of flying the aircraft through its entire flight profile… provided all systems function correctly, of course. Should they not, then pilot input will be required to remedy the situation, but just how much effort and to what extent frames the critical debate from a MH pilot perspective. The basic MH question is: "With three *Cyclone* pilots onboard [autopilot plus flying (monitoring) and non-flying pilot], can the third non-flying pilot be assigned other tactical duties on a demand or secondary duty basis? Conventional industry automation precepts stipulate both human pilots shall remain focused on monitoring flight duties during the automated flight regime, but do these stringent principles apply to a combat helicopter engaged in high-intensity combat situations? Can standard operating procedures be developed that mitigate aircraft flight risk to an acceptable level given the anticipated circumstance?

Compounding the challenge of safely flying the automated aircraft is the related complexity of the Integrated Mission System (IMS), which in turn pertains to the ability of the MH crew to effectively manage the multitude of IMS functions and capabilities that could impact the automated flight regime of the *Cyclone*. Equipped with a vast arsenal of sophisticated military capability in stark contrast to the rudimentary *Sea King*, the challenge will be for the two person tactical crew to coordinate the myriad of information provided by the various integrated sensors and complete the associated tasks without experiencing task-saturation situations during peak high activity scenarios. A comprehensive task analysis will need to define those specific saturation points, as well as identify how much workload can be modified or possibly shifted to the cockpit non-flying pilot… if it is deemed appropriate and subsequently authorized.

Keys to transitional success

The scarcity of core automation expertise within the MH community also exists in the Program Management Office and *Cyclone* industry contractors, a situation that weighs heavily on how best to slay the ubiquitous *Cyclone* automation dragon. Fortunately, at the same time that MH transitional planners were identifying this automation expertise deficiency, the Canadian Air Force also was recognizing a similar shortcoming amongst other aircraft fleets. 21st century automation was rapidly entering the military flight spectrum on an ad hoc basis with individual fleets attempting to modify their respective operating procedures with varying levels of success. A tragic 2006 Cormorant helicopter accident highlighted the potential for disaster should automation not receive just consideration throughout the critical transitional process, leading to an increased air force emphasis being placed on securing greater automation proficiency within the entire military flight milieu, an epiphany none too soon for a struggling MH community preparing to take delivery of its replacement aircraft.

On completion of a 2008 pan-air force survey, two flight automation specialty firms that had conducted the initial study were further contracted to enhance automation performance within the Canadian Air Force. PMO MHP and air force personnel, in recognition of the mutual benefit to be gained through a joint partnership with the civilian industry firms, agreed to create an MHP-ASTRA Integrated Project Team (IPT) dedicated to develop a greater automation foundation for the MH community. This IPT was comprised of key MH and air force personnel, together with civilian automation experts as provided by the contracted industry automation team. Four principal areas of effort were identified to include: aircrew cognitive task analysis, standard operating procedures, flight publications, and overall training guidance throughout the entire transitional process. The ability to progress each of these fundamental flight aspects relied heavily on *Cyclone* prime and sub-contractors supporting IPT efforts during the early formative stages of aircraft delivery. Such hope unfortunately proved optimistic, as the aircraft industry seemed to view such efforts as being more client than contractor orientated, and thus capable of promoting yet one more stumbling block related to delivery of the final product.

Although the IPT now is in hiatus due to funding restraints, its embryonic efforts managed to produce a comprehensive cognitive task analysis, a seminal Instrument Flight Procedures manual, and perhaps most importantly, a heads-up awareness to the MH community on the magnitude of automation influence and the respect it deserves within the *Cyclone* paradigm. Through considerable discussion and various working groups during its four year existence, MH personnel began to appreciate that modern automation very much represents a two-edge sword; a valuable attribute capable of enhancing modern day flight operations, yet also capable of creating considerable havoc if not implemented in the appropriate manner.

The sophisticated *Cyclone* brings with it a requirement to ensure that a comprehensive, exhaustive mission task analysis effort receives its due diligence, which in turn will ensure the development of valid and comprehensive standard operating procedures that ensure aircraft safety and optimum operational performance. These studies and subsequent standard operating procedures must exist prior to undertaking the conversion training of *Sea King* aircrew to ensure the validity of well-vetted *Cyclone* procedures, thus avoiding the dangerous ritual of amending standard operating procedures on an ongoing basis. Fortunately, the *Cyclone* training system will be able to draw on a cadre of ground based operational mission simulators in developing such seminal procedures, as well as allowing the conversion process to effectively evolve in a controlled and incremental manner. Unfortunately, the PMO, MH community, prime aircraft contractor and sub contractors collectively lack current flight automation expertise, thus will be challenged to produce a valid transitional training plan unless greater effort and resources are assigned to the conversion process.

Conclusion

Historically in fleet transitional endeavors, the aviation community relies on its older, more experienced members for leadership guidance in successfully completing the aircraft conversion process. Due to the potentially overwhelming scope of unfamiliar *Cyclone* automation influence, however, the MH transitional experience will prove the exception. Senior, more experienced *Sea King* postured members will experience the greatest transitional difficulty by having to discard engrained habits and adapting to the *Cyclone* intensive automation reality; some may not make it at all. Herein lies the MH specific automation paradox and yet only one of several legacy inconsistencies that will challenge the MH community throughout the transition journey. As with all other challenges thrown to the MH community, however, it will draw on inherent heritage attributes, nurtured naval air leadership, and an incremental training program to successfully complete the *Cyclone* conversion process and optimize its 21st century operational capability for decades to follow. ◆

The Workhorse

– 50 years of Glorious Operation

By Lieutenant-Colonel (Retired) Larry McCurdy

Mr McCurdy served in the RCAF for over 32 years, completed four tours on the *Sea King*, two tours on the Jet Ranger and two tours in the Directorate of Flight Safety.

Sad though it may be, there can be no disputing the fact that the time has come to send the venerable *Sea King* to pasture with its fabled contemporaries like the Magnificent, the Bonaventure, the Tracker and the AVRO *Arrow*. There is only so much rebuilding, re-manufacturing and analog-to-digital interfacing you can do when an aircraft has been out of production for so long. That doesn't mean that in moments of weakness, those of us who have preceded the *Sea King* into obsolescence won't get misty for the old oil-spitting pig, wishing for a return of the good old days.

Photo: Cpl Forget

Figure 1. Major Mike Pinfold, Lt Rick Witherden and me NATO 1982: Co-pilot Mutual from HMCS *Huron*.

I learned to fly *Sea Kings* from the lucky guys that brought her into service. Locally infamous aviators like Rick Smith, Gary Swiggum, Mike (Low Pass) Pinfold, Peter (Danger) Bey and Horrible Herb Harzan. I learned things like: if the *Sea King* wasn't leaking oil, then it didn't have any. These guys had beards, smoked in the cockpit and had seen every possible in-flight emergency more than once. I was 21 and these relics from the Fleet Air Arm were a storehouse of ship borne culture, helicopter knowledge and experience, back in the days when it was still called "HS". Well, as it happens, now I'm the grizzled old sea dog and it's time for me to commit a few impressions to paper before the *Sea King* passes from our collective memory.

Today's aircraft are a wonder of modern technology and as far ahead of the *Sea King* as the iMac is ahead of the Commodore 64 (for those of you old enough to remember one of the first Personal Computers). All the same, I lament some of the advantages of a low-tech machine. First there was the difference that a skilled operator could make. I recall sub hunting with Joe Hincke, Jim Cottingham and Steve Maclean, in search of the tiny *Ula* class submarine off the mouth of the Mediterranean. Our SONAR was old and power limited, even for that time, but Steve tweaked and listened, while Jim repeatedly vectored us to where he thought that submariner would hide. At the end of two hours of continuous pinging, we received an underwater telephone transmission from our prey, which simply said "Go Away!" Technology can never replace the sixth sense of a skilled operator and an intuitive tactician.

Then there's the blessing of over-engineering. Back in the day there was no computer modelling, no flight data recorder, no complex vibration analysis, and no way to accurately predict (or record) the stresses involved in operating in the harsh maritime environment. So, everything had to be designed to "MIL-Spec" – another term for solid as a rock! That made the *Sea King* heavier than it probably had to be, but everyone knew that when required, the old beast could take a licking and keep on ticking. I wonder how many times these airframes have taken crews safely through the storm, when a lesser airframe might have failed? I wonder because often times we (we or I; pick one) didn't even think of writing up abuses – it was just expected that the *Sea King* could take it. Those days died with the advent of expedients like "COTS" (Commercial-Off-The-Shelf). Ask yourself, have we replaced "good" with "good enough" and "exceeds the requirement" with "lowest cost compliant"? Perhaps not, but in deference to the past successes of over-engineering, it is good to keep asking.

Even when events soured and the aircraft didn't survive, it often held together well enough for the crews to escape. Case in point: Gerry Conrad and the infamous Waterbird accident. They hit the water hard, flipped inverted and settled into the shallow waters of Morris Lake, but everyone escaped, and this was long before the great big brains had conceived of "survivable space". Even the sad story of Wally Sweetman and Bob Henderson who perished autorotating a burning *Sea King* from 6,000 feet to the side of a hill in New Brunswick; the post crash integrity allowed the back seaters to escape. On a personal note, Wally was the best pilot with whom I have ever had the privilege to fly and I believe even the mighty *Sea King* could not have saved that crew had it not been for him.

We should remember that despite its antique status, the *Sea King* still has a few years ahead of it and is more than capable of contributing to the mission, given the skilled aviators that are lucky enough to operate it today. So, I propose that we hoist our glasses to 50 years of glorious *Sea King* Ops, with a silent wish for many more. To the *Sea King*: designed in the 1950s, produced in the 1960s for operations well into the 21st century. ***Bravo Zulu!*** ◆

Photo: DND

FSOMS –
An Integral Part of Your Flight Safety Program

By Mr Pierre Sauvé, Directorate of Flight Safety, Ottawa

Mr Sauvé joined the CF in 1981 where he flew over 4800 hours on a variety of helicopters and served on exchange tours with both the RAF and the US Army. He has been involved in flight safety since 1983 and served as BFSO Gagetown for 3 years. In 2010, he joined DFS as the Flight Safety Occurrence Management System manager.

What is FSOMS?

The Flight Safety Occurrence Management System (FSOMS) is a flight safety data bank that enables FS staff to monitor occurrences and hazards, analyze trends and track the implementation of corrective actions. FSOMS has approximately 550 registered users, logging or viewing between 2,800 – 3,200 occurrences annually. What follows is a quick explanation of how we got here and what lies ahead.

How did we get here?

Since the birth of the RCAF, we have been keeping records on aircraft occurrences. What data was captured and what we actually did with the information has varied greatly since then.

Over the years we have used various methods to document and track occurrences such as the RCAF Aircraft Accident Record card (Figure 1 – McBEE paper punch card). This was followed by the Aircraft Accident and Incident Reporting System (ACAIRS), which was our first computer based application. Then the Flight Safety Information System (FSIS) was developed, which evolved into FSOMS, our current system for documenting and tracking occurrences.

FSOMS is a computer based tool used by FS personnel to capture relevant information concerning occurrences and hazards, document them for analysis, and then track the preventive measures (PMs) to completion. FSOMS provides a searchable database of information that is used to identify trends to assist in preventing re-occurrences. This application is used at many levels ranging from tactical to national organizations such as operational squadrons, maintenance facilities, contracted service organizations, wing HQ staff, division HQ staff and national HQ staff (DFS, DGAEPM, QETE, etc.). The type data captured is very wide ranging from aircraft identification serial numbers to accident cause factors and more.

How do we capture data?

An occurrence usually originates at unit level as an *Initial Report* entered by a FS NCM stating the basic facts (who, what, when and where). This consists of aircraft owner/operator, maximum damage, maximum injury, time of the event, location and a short description of events. Depending on the complexity of the occurrence, the "why" usually comes after an investigation has been completed. A simple occurrence can normally be sent as a *Combined Report* (initial and supplemental report sent together). More complex investigation reports can take longer (even years) to complete due to the need for outside specialist analysis. The level of investigation is dependant on damage, injury, the safety of flight compromise level (SFCL) and the level of outside interest/attention generated. The completed report (*Supplemental Report*) is usually released by the Wing FS staff, or the DFS investigator in the case of complex accident reports.

Any amount of information captured comes at a price of time and effort expended. Do we collect as much as possible or only the minimal information? FS staffs are all busy and it's a balancing act as to quantity and quality of data captured. DFS is always looking to improve the way information is captured and to standardize reports towards achieving enhanced data searches.

Search and Analysis

If we go back to the Apr/Jun 1950 edition of *Crash Comment*, *Flight Comment's* predecessor, there are some examples of accident summaries as well as a graph depicting the RCAF accident trends over the three previous years. (Figure 2)

The editorial page had an interesting comment that still applies: *"One of the most mysterious aspects of Accident Investigation Board work is the phenomenal number of graphs, like the one on the opposite page, which appeared on our desk accompanied by the proverbial chit of paper, 'Why the rise in October?' 'Why the dip in November?' 'Why the continuously high accident rate for November through April?'"*. Although we had a slightly different view on how to promote flight safety then, in 2013 we still gather data and try to analyze the information in order to prevent repetition.

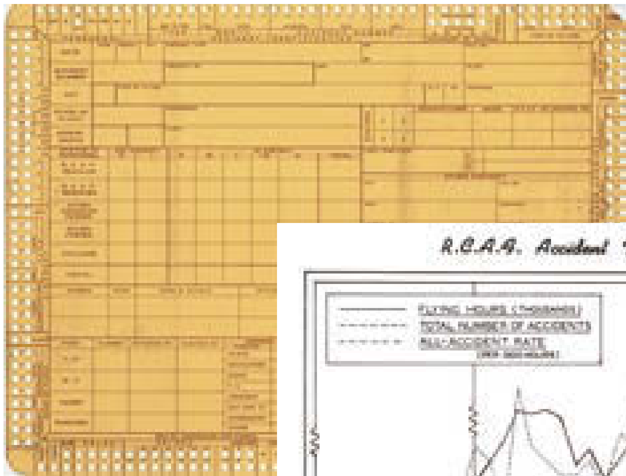


Figure 1

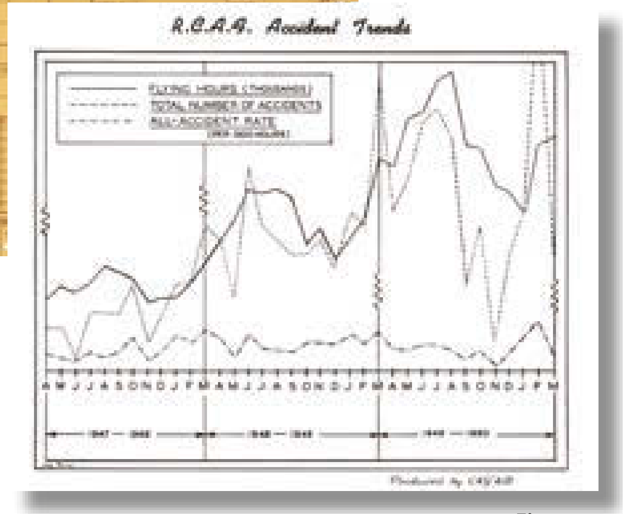


Figure 2

Today, each registered user can define their own search parameters using existing FSOMS built-in capabilities. DFS 3 also provides support for data searches that are beyond user capabilities. I will spare you the mathematical formulas and methods of filtering data, however, the main point is to find repetition concerning parts, people or procedures and raise a flag when there could be an elevated risk or the potential for a repeat occurrence.

Reports

The DFS 3 Promotion and Prevention section provides many types of reports using data extracted from FSOMS. Examples are the Wing Periodic Report, the Bi-weekly Report and the DFS Annual Report.

The Wing Periodic Report is generated each Monday and distributed to WFS personnel. It provides information for each wing down to the unit level for the current quarter, the previous quarter and the previous calendar year.

The CF FS Bi-weekly Report provides all the occurrences and hazards released during the preceding two week period. The Bi-weekly file includes two worksheets containing the basic and the detailed information. The Basic worksheet contains occurrence and hazard information for reports released as an Initial or Combined Report in the designated period. The Detailed worksheet contains occurrence and hazard information for all reports released in the designated period. The cause factors and preventive measures are included for completed reports (Supplemental or Combined). This report is sent to all FS personnel and is posted on the DFS Intranet website at http://airforce.mil.ca/fltsafety/reports/biweekly_reports_e.htm.

The DFS Annual Report provides an executive summary and detailed review of the past year divided in five parts (airworthiness program, flight safety program, statistics and trend analysis, statistical methodologies and definitions). The complete report is posted on the intranet and the executive summary is posted on the internet. (http://www.rcaf-arc.forces.gc.ca/dfs-dsv/index-eng.asp) A complete version of the DFS Annual Report is available on request.

What lies ahead?

As with all software, there is an evolutionary process before the current version becomes outdated and unsupportable. We have routinely held an annual working group for the past 6 years to upgrade FSOMS. Although we have been able to improve the quality of the database and the dropdown selections for numerous items, we have had limited success expanding internal data analysis capability. Over the last year, a combination of factors has provided us with the opportunity to develop our application in a new and more flexible programming language. A joint safety application development effort spearheaded by the Assistant Deputy Minister (Information Management)'s Director Applications Development and Support (DADS) will help us migrate to a web based application, thus paving the way to additional capability.

The new system will be called the Flight Safety Information Management System (FSIMS) and will provide us with the capability to action items tabled by the FSOMS Working Group (FSOMS WG) that were previously unfeasible. We have just completed the second of twelve 30-working day development cycles and will continue to develop this version over the next 18 months. The FS community will receive periodic updates on our progress. As user input from unit, contracted service providers and wing and division is essential to our success, we have already contacted some of our usual FSOMS WG supporters for assistance. If you are interested in being part of this development effort, please contact me at pierre.sauve2@forces.gc.ca.

Most of us know that there are no new errors; we just keep repeating the same old ones. We must use the tools that technology provides to keep our operations safe now and into the future. ◆

Photo: Cpl Malcolm Byers

Electrical Static Discharge – *Learning the HARD WAY*

By Captain Travis Lethbridge, Junior Tactical Coordinator, 423 Maritime Helicopter Squadron, 12 Wing Shearwater, Nova Scotia

On 23 February 2012, it had been over two months since my last flight and I required a wet hoist and a 60-day check prior to being requalified to conduct Search and Rescue flights.

We briefed for the flight, planning on conducting some double-lift hoists on the airfield prior to going over the water at the mouth of Halifax harbour. The weather, while still technically visual meteorological conditions (VMC), was coming down to minimums with fog and light rain; the ambient air temperature was just a few degrees above zero, as was the water!

We took off with just an hour before sunset and by the time we entered a hover for our wet hoist evolution over the water, dusk was rapidly approaching. Because it was my 60-day check, we had an experienced crewman with us in the back of the helo and a Crew Commander who was highly respected, competent and knowledgeable.

After doing a few dry hoists five minutes away from the water, we deployed our "Rescue Randy" rescue mannequin into the water and came up to a 40 foot hover. Visibility was adequate – just VMC – but somewhat degraded due to the rotor wash, fog and rain. "Perfect training scenario", I thought to myself, "not horrible conditions, but still similar to a real life rescue situation". Then it was my turn to lower our hoistee (Sgt Whitehead) after a thorough safety check. As I lowered him I simultaneously conned with minute corrections to compensate for our rotor wash pushing Rescue Randy. When his feet touched the water his whole body twitched and his limbs splayed out as the electrical static discharge (ESD) of our helo used his body as a conduit to ground itself into the water.

He swam the few feet over to our "victim" and hooked up our harness before giving me the go ahead to recover him into the helo. After passing the conn to the front-enders I helped Sgt Whitehead into the cabin – we then secured our "victim" as per our Standard Operating Procedures. Sgt Whitehead described experiencing a significant electrical shock as he made contact with the water.

The entire crew debriefed the evolution and afterwards we switched safety tail straps so that I would be the hoistee lowered to the water. I predicted feeling a significant shock but I was not worried. I'm a fairly big guy at a lanky 100 kilograms and fit. I've experienced ESD shocks from the helo before and wasn't concerned.

I remember looking down at the water and then it felt as if "hot pokers" were grinding my spine. My next memory was realizing that water was on my face and that everything was black. The best description of what happened was something like the circuit breakers in my head being reset one by one. After suddenly realizing that I was in the water, I then assessed that I was blind; everything was black. I was touching my eyelids under my visor to affirm that my eyelids were open when I noticed that I could hear a helicopter! My vision then went from black to dark gray and opened up to normal. According to my colleagues watching me, it looked like I went limp for a couple of seconds, but my time sense was completely distorted. What seemed to be several minutes to me was only seconds according to the crew who were monitoring the situation.

I looked around, saw the Rescue Randy a few feet to my left and a helo hovering above me! "Wow", I thought to myself, "I must be doing a wet hoist"! I then swam over to the dummy and strapped him into the horse collar that we use to secure our rescued victims. I gave the sign to the hoist operator. 20 seconds later I was in the helo still trying to fully assess how the evolution went.

After we secured the evolution, I then threw up a couple of times. I was, however, still "out of it" and hadn't fully assessed that I was debilitated. Our Crew Commander asked me about how I was feeling and I responded with the "I'm absolutely fine, I'm tough" answer. It was a poor response on my part, yet a convincing one, as I was still processing what had happened. The fact was that I was still a bit "out of it" probably affected my ability to properly self-assess. The rest of the crew, who were 40 feet above me when I blacked out, had nothing to go on but my verbal reassurance that I was "good to go". I screwed up and tried to be a tough guy when I should have told my crew that something had happened.

Immediately after landing back at Shearwater, I was still a bit light-headed and went to have a shower before our debrief while the pilots wrote up a few minor snags. Instead of feeling refreshed, I threw up in the shower until there was nothing left. It was only at this point that I was able to fully realize that I had experienced a significant physiological event.

I went to the flight surgeon the next morning and found myself sent for an ECG. Following a severe reprimand from the flight medical people for not immediately seeking out medical assistance, I was told that I was a pretty lucky guy. I had a distinct burn mark on my right ear and a big fat blistered lip to boot; most likely I lost a few brain cells as well but I was fortunate that was the extent of it.

It didn't take a lot of self analysis to realize that I should have treated the whole incident differently. I let my crew down by not assessing that I had experienced a significant physiological event. Before this, it just hadn't occurred to me that the ESD from a *Sea King* could have been severe enough to cause me to lose consciousness. Even though I wasn't fully "with it" after being recovered into the helo, I knew that something was wrong with me but I covered it up in order to not look like a wimp. Bad move.

Electrical Static Discharge's potential strength was a shocking revelation for me. I fully encourage anyone to realize that even big "tough guys" can be grounded and humbled by ESD. In the end, this was both a positive and negative experience in that the Maritime Helicopter community can learn from my former ignorance of the impressive potential danger of ESD. It's the sort of lesson that should not be learned the hard way. ◆

DFS Comment:

Thank you, Captain Lethbridge, for sharing the details of this incident. There are a few options that could have minimized the danger of ESD. Use of the grounding wire could have been considered, particularly during the prevalent meteorological conditions and the ESD report from the first "hoistee." Cutting short the training mission could have been another option. Also, vomiting "a couple of times" should not be considered a normal post hoisting event; after such a physiological occurrence, it is critical to seek medical attention immediately. Finally, a Flight Safety Report should have been filed to document the problem and assist in preventing, or at least minimizing, future occurrences. Prevention of accidental losses of aviation resources (personnel and equipment) is, after all, the aim of OUR Flight Safety Program. Let's all do our part in making sure we do everything that we can (reporting!) to ensure that our buddy doesn't get hurt in the future doing the same thing that we did!

Photo: Pte David Randell

How could this *have* happened?

By Corporal Warren Marchant, 12 Air Maintenance Squadron, 12 Wing Shearwater

On a dull day perfect for ground tests, a *Sea King* helicopter from the maintenance squadron was prepared for a compass swing to confirm the accuracy of its compass after maintenance. The technicians completed a pre-flight “B” check outside with no faults found. The copilot and airborne electronic sensor operator (AESOP) began their pre-flight inspection as the pilot conferred with the crew chief and the aircraft maintenance logs. When the pilot arrived and started his pre-flight walk around, the ground crew was standing by with a towed power cart, a marshaller, two technicians and two apprentices. It is routine for the maintenance squadron to maximize participation and training during the rare servicing periods between periodic inspections. The AESOP had noticed something out of place, but assumed it would be taken care of by the start crew and thought nothing of it.

The start-up itself went normally. Directed by the marshaller standing in front of the aircraft, the two other technicians easily guided their apprentices through the start up procedure; starting number one engine, spreading the tail, spreading the main rotor blades. When the number two engine and rotor head were engaged, they removed the chocks from the main landing gear, and guided their apprentices back to the hangar.

From the cockpit point of view, it was an uneventful start-up. They requested and received taxi clearance and were about to pull away when they received an immediate radio message from the Ops section: Hold in place, the tow bar is still attached to the aircraft.

Incredibly, the twelve foot long tow bar was still attached to the helicopter's tail wheel and had been attached since the aircraft was first parked outside. With the *Sea King's* conventional landing gear, the tail wheel is completely out of sight of the crew inside the aircraft. If the helicopter had taxied, it could have easily done damage to the tail landing gear, but if the aircraft had gone for a flight it could have been a disaster. Fortunately, the rotors were shut down, the tow bar removed, and the ground run resumed without further incident.

How could this have happened?

Before the aircrew had arrived, a maintenance team had intended to verify the compass by towing the helicopter with a mule through the compass rose positions and had left the tow bar attached. When the planned tow job was cancelled in favor of a ground run, different technicians were brought in to train apprentice technicians, the mule was needed to tow the power cart, and the tow bar was simply forgotten.

Only the AESOP had noticed the tow bar was still in place, but assumed it would be taken off before the start began and did not bring it up to the ground crew. And even though the ground crew had to step over the bar to spread the tail and main rotor blades, none had noticed or questioned why it was still there. The marshaller and start team were focused on guiding the apprentice technicians through the start, and so focused that they failed to notice a major misstep.

Servicing will always be busy, loud, and the plans will constantly change. The best way forward is to follow the basics: know the procedures, keep your head up, and keep an eye on the bigger picture. ◆

Photo: Cpl Stevo J McNeil

Photo: MCpl Johanie Maheu

It Was a Dark and Stormy Night...

(And Communication Skills in Technical Fault Finding makes for a Boring Title)

By Sergeant Don Cox, Deputy Unit Flight Safety Officer, 423 Maritime Helicopter Squadron, 12 Wing Shearwater, Nova Scotia

Communication in aviation is considered one of the most important skills to be learned when it comes to safety. Aircrew are taught to utilize communication to gain a tactical advantage during operations. In an emergency it can be used to help appraise a situation and determine the proper response. It can occur between aircrew, aircraft to aircraft, aircraft to ground – you get the point. But, have you ever considered how important it is to fixing an aircraft and making it safe for flight? Now my story begins…

It was a dark and stormy night as the grizzled veteran *Sea King* pilot guided the unwieldy beast of a helicopter on to the tiny ocean tossed flight deck. His nerves of steel and years of experience gave him the gentle touch the controls demanded. OK, maybe I'm embellishing and the *Sea King* is the veteran here, but it was a dark and stormy night and this will become a key point a little further on.

The actual story begins at 423 Squadron, Shearwater. During my morning check of the Flight Safety Occurrence Management System (FSOMS) and message traffic I happened to read an initial flight safety report of an occurrence on the HMCS *Winnipeg* written by 443 Squadron flight safety, our west coast equivalent. The ship's helicopter had suffered a dual Transformer Rectifier Unit (TRU) failure during shutdown. The TRU's job is to convert the AC power, provided by the *Sea King's* dual generators, to DC power. If both fail, the helicopter loses the vast majority of its electrical equipment and has only emergency instrumentation and basic UHF radio, both powered by a very limited life aircraft battery. So having both TRU's fail is not a good thing and having it happen at sea miles from land or ship would make it even worse, possibly even life threatening.

Six months earlier, that was what precisely happened to us on the east coast during a search and rescue mission for a tourist who was swept off the rocks of Peggy's Cove.

It was a dark and stormy night, with high winds, heavy rain and the helicopter was well off shore when they experienced a total power loss when both TRU's went down. In that case, it really was the experience and skills of the aircrew that brought them home safely. In fact the aircraft captain received a "Good Show" award for his actions that night.

Photo: Cpl Rick Ayer

Now, finally to the fault finding utilizing communications part. As the aircraft recovered late at night and was quarantined, work did not start until the following morning. The aircrew gave a very good verbal description of what happened to the night crew technicians, who in turn wrote all of this down in the night handover book. When de-snagging took place the next morning, they were unable to duplicate the fault and replaced the isolation relay as the most likely cause, based on the handover information. The aircraft was ground run serviceable.

Two days later the very same aircraft flew and guess what? It was a dark and stormy night. This time the aircraft experienced a single TRU failure. The technicians involved with this snag communicated with the technicians from the earlier occurrence. Because they felt the two incidents were related, they decided to change different components. Once again, excellent communication and this time the snag did not come back.

This is where the flight safety side of things comes into play. During our conversations carried out with all of the technicians involved in the fault finding, it was determined that they were never able to confirm if any of the parts removed were unserviceable as they were all changed on speculation. It was not until months later that the parts were confirmed fault free by a third line test facility. It was because of this that our investigation speculated that the most likely cause of the TRU failures was water ingress, something that is known to happen with the *Sea King* in heavy wind and rain. Because fault finding did not occur until the following morning each time, there was no sign of water ingress, and thus, it was not considered a factor by the technicians.

So what does an occurrence with a speculative cause on the east coast have to do with one on the west coast? Easy – it was the same helicopter, now on the west coast. We quickly placed a 4473 km phone call to flight safety at 443 Squadron. By this time, we were informed that the air detachment technicians on board the ship had replaced a single TRU, ground run the aircraft serviceable and returned it to flight, only to have it suffer another dual failure in the air – and yes it was dark and stormy. The helicopter was grounded until a definitive cause could be found. With the dark and stormy confirmed we decided it was best for the 443 FS cell to contact the technicians on the ship directing them to concentrate on finding a possible water ingress problem. Finally the problem was solved; after hosing the aircraft down, water was discovered running from a disconnected water drain hose near the co-pilots feet. This water would then enter the top of the electronics bay through the rudder pedal boots and on to the terminal board next to the isolation relay (the first item replaced on speculation six months earlier).

Communication was paramount in achieving a final solution to what could have been a life threatening problem. Techs talking to techs lead to its discovery. That and the utilization of what is perhaps our greatest communication tool for making flight safe in the RCAF – the Flight Safety Program itself. ◆

Bye Bye Birdie

By MCpl Matt Vincent, 423 Maritime Helicopter Squadron, 12 Wing Shearwater, Nova Scotia

Birds and aircraft have many things in common. They fly high, seemingly floating on a pillow of air. Some may even say they are works of art. However, they don't mix well, and when they cross paths the result is never pretty. This story is not unlike any other bird strike incident, except there's a small twist and a lesson to be learned that can be applied across many aspects of operations – not only when dealing with our flying feathered friends.

We were having a great navy day aboard the HMCS *St. Johns* sailing the Caribbean Sea. The helo was off on a routine surveillance mission, and the techs and I were soaking up some sun on the flight deck awaiting the return of the aircraft. I noticed that this day, much like the few days before it, there were an abnormally large number of small sea birds flying around the deck. Some seemed to be enjoying the free ride hanging out on the on the ropes, while others pecked around the deck in search of food.

When we got the word of the helo's return, we got ourselves ready and prepared the flight deck, and as a part of that preparation, we shooed away the remaining birds. When the helo returned, they began their usual Destroyer Deck Landing's, which are practice landings and takeoffs. During one of these practice runs, upon takeoff a certain Mr Birdie decided to fly directly into the main rotor, instantly transforming himself into pink vapour. The Flying Co-ordinator immediately notified the then unaware aircrew and it was decided to land and assess the situation.

Upon a quick wipe of the remaining bird residue, an inspection showed that the damage was not sufficient to warrant a blade change, but the incident got us talking. Why were there so many birds around lately? Where were they all coming from? Then someone pipes in, "Ha, it's probably because of those sailors were feeding the birds on the flight deck again." Needless to say, our Detachment Commander and Chief were not impressed. Why would anyone do such a thing knowing there's a helicopter fly off the back of the ship? The Det Commander immediately made a pipe to the whole ships company telling the crew to not feed the birds, emphasizing the dangers birds pose to safety of flight.

So, what's the point? Is the Navy just flight safety ignorant? Well no. No more than we all were if you think about it. We didn't even consider that the ships company would be so unaware of flight safety concerns. They, unlike us, who have had the privilege of having flight safety beaten in to us since we started our careers, have not had enough exposure to aircraft to fully understand.

The fact of the matter is that we frequently work with outside agencies, be it Navy, Army, civilians, and yes, other Air Force personnel who may not be immersed in the same flight safety culture we are. It is our responsibility, as techs and aircrew, to educate the people who work around us and promote flight safety ideals whenever and wherever possible. ◆

Photo: Corporal Rick Ayer

The Perils of Efficiency

By Officer Cadet Spencer Warren, Southern Ontario Gliding Centre (Central Region Gliding School), Trenton, Ontario

In the summer of 2009 I was an instructor of the Basic Glider Pilot course for the Air Cadet Gliding Program in Trenton, Ontario. As a young graduate of this program, I had worked as a civilian instructor for about two years, and this would be my second summer instructing cadets to receive their Glider Pilot Licences. During the summer training program, there were roughly 100 cadets who required about 50 flights each to complete their licences. The course took place over six weeks, and because of this short time span, there was a significant time pressure to fly whenever possible. While this pressure is rarely pushed by the management of the gliding program, it's common for individuals within the organization to have self-imposed pressure – since everybody wants to get the job done on time.

This self-imposed pressure became especially evident to me on one particular occasion during that summer. It was near the end of the course, and all of my students were in the solo practice phase of their flight training. We were operating at the airport in Picton, Ontario. The weather was good and we were all keen on doing as much flying as possible. On a good day, it is often possible to complete over 100 glider flights per day, particularly if delays on the ground are kept as short as possible. Even a few minutes ground delay for each launch can add to a significant reduction in training flights.

With this in mind, I was debriefing a student on the flight they had just completed. As I finished the debriefing, another pilot removed themselves from the flying rotation, and because of this, there was an opportunity to send another student immediately for a flight. In an effort to keep efficiency at a maximum, I shouted for my student to meet me at the glider, and we completed a very hasty pre-flight briefing. Normally, pre-flight briefings for solo practice are quite short, and are only a basic outline of the flight for the student to follow. On this particular instance, the student was to release from the tow plane at 1500 feet above ground and practise steep turns before joining a circuit and landing. However, in light of my own self-imposed pressure to get my student airborne as quickly as possible, I rushed through the briefing faster than normal. The student quickly entered the glider and departed. Prior to licensing, all solo flights are monitored visually and over the radio by the instructor, and shortly after my student's takeoff I watched as my student released from the tow plane abnormally early. I then heard the tow pilot announce that the glider had released at only 500 feet above ground. Immediately after releasing, the glider turned around and completed an abbreviated approach to an alternate runway at the airport. I was relieved to see the glider touchdown safely and to hear my student announce over the radio that he was down and safe.

So what caused the student to release from the tow plane prematurely at a very low altitude? He explained to me later that due to our rushed briefing, he had not had enough time to mentally prepare for the flight. He had been unsure about which maneuvers he was supposed to practise and his thoughts were focused on this during the climb behind the tow plane. After realizing he had become distracted, he quickly looked at his instruments and saw the "hundreds" needle on the altimeter passing through the number we had discussed for release. He was briefly confused and thought he was at release height, so he abruptly released from the tow plane. Immediately afterwards he realized he was in fact a thousand feet lower than the normal release altitude. At this point, his emergency training kicked in resulting in a well executed turn back to the airport.

As with most other flying incidents, I realized that there were several small factors that lined up to create the end result. There were policies and procedures in place which could have prevented the premature release; however, it's my opinion that it was my inattention as an instructor that ultimately could have led to a disastrous situation. In an effort to maintain operational efficiency, I neglected to adequately prepare my student for flight. I allowed a self-imposed time pressure to affect my decisions, and cut corners during the briefing in order to keep the flight line moving on time. Because of this, the lack of adequate preparation led to unnecessary stress on the student during the climb, and ultimately, a loss of situational awareness which could have resulted in an off-field landing.

Following this event, I've become increasingly aware of the danger of self-imposed pressure, and take care to avoid rushing procedures. A slight delay in completing the task is far more desirable than rushed procedures resulting in an error. Furthermore, I've come to realize that the AMISAFE checklist is critical, and that it does not only apply to instructors, but to every member of the flight crew including the student. It's imperative to ensure that students are prepared for flight both physically and mentally. In my several years of instructing the gliding course following this event, I've been diligent not only in applying this knowledge myself, but also in passing on this lesson to each of my students so they may learn from my mistake. ◆

Photo: DND

Photo: Sgt Frank Hudec

Hard Landing

By Captain Brent Sherstan, 408 Tactical Helicopter Squadron, Canadian Forces Base Edmonton

After walking away from a hard landing in a CH146 *Griffon*, and as a relatively junior Aircraft Captain (AC) flying with a very junior First Officer (FO), here are several points that I've learned that I hope others will not have to learn the hard way.

It was a beautiful VFR day and I was scheduled for a basic handling and emergencies trip (BHE) with a junior FO fresh off the *Griffon* OTU. Another aircraft was scheduled to fly at the same time so the other AC and I discussed developing a tactical scenario for our new FOs, but upon realizing how little they've flown in the past few months we decided to just concentrate on basic sequences. Little did we know how much the low flying rate at the squadron would affect us later on during the trip.

After a thorough pre-flight briefing, we began to run through all the basic sequences: circuits, emergencies, autos, and confined areas. During the flight I noticed that the FO was very cautious and prompted him throughout to work on his tactical flying and learn to expedite his sequences; this resulted in dire consequences.

As the flight drew to a close, I told the FO to take us back to the fuel pumps as it is standard practice for the crew to refuel the helicopter before signing it back in. During this last approach, I could tell that the FO was trying to heed my advice and it was noticeably quick. During the initial stages of the approach, I did not see any reason for concern and was interested to see how the FO was going to manage the final stages. Throughout the flight, the winds were light and shifted from westerly to southerly, and then to calm. Our approach was south westerly approximately 200 feet south of the fuel pumps, which are on the edge of the field. There is a chain link fence marking the boundary. I was aware that the approach would be tight but thought we still had an "out" if we turned more southerly, which would allow us to extend the manoeuvre.

As we entered the final stages of the approach, we were still coming in high and fast but I was not yet overly concerned because I assumed (incorrectly) that the FO would extend the approach until we were more in control with the "blades loaded" (stable regime of flight) before turning northerly to the fuel pumps. This was not the case. The FO initiated his turn when we were about 60 feet above the ground and that's when we felt the sink. As we started to fall, the flight engineer called "50… 40… 30… up! up! up!". From about 60 to 30 feet the FO was trying to salvage the landing by pulling in collective (adding more power), and despite this action, we continued to descend and braced for impact. Thankfully we landed in a level attitude and the skids did their job absorbing most of the energy. The *Griffon* finally came to rest on its belly with the skids completely destroyed and laying in pieces beside the machine. The crew received minor bumps and bruises but nothing significant.

Being a fairly junior AC, I've learned many things from this incident including:

1. Don't get complacent – incidents can happen at any time, even during the most basic sequences. Of all the complicated manoeuvres we did during the flight, it ended up being a basic approach to the fuel pumps that ruined our day.

2. Recognize the abilities AND limitations of yourself and your crew. Even though something is within your comfort zone, it may be outside of someone else's comfort zone or their ability to recover. Always be prepared to take control early as that may be the only way to salvage a situation going bad.

3. Pay careful attention to each member's proficiency. There is a great difference between currency and proficiency, and as such, the crew should refrain from pushing themselves until they are fully proficient.

4. Finally, always adhere to the basic rules of flight and wait until the helicopter is stable with the blades loaded before attempting to manoeuvre close to the ground. Turning downwind wasn't necessarily the final nail in the coffin, but doing so without the blades loaded was.

In being lucky enough to walk away from a potentially catastrophic incident, several valuable lessons were learned. Hopefully the rest of the community can learn from my experience instead of finding out the hard way. ◆

Photo: DFS

Epilogue

TYPE: **CF188 *Hornet* (188738)**

LOCATION: **Lethbridge, Alberta**

DATE: **23 July 2010**

During an air show practice at Lethbridge County Airport, CF188738 experienced a loss of thrust from its right engine while conducting a high angle of attack (AOA) pass at 300 feet above ground level (AGL). Unaware of the problem but feeling the aircraft sink slightly, the pilot selected maximum afterburner on both throttles in order to overshoot from the manoeuvre. The aircraft immediately started to yaw right and continued to rapidly yaw/roll right despite compensating control column and rudder pedal inputs.

With the aircraft at approximately 150 feet AGL and about 90 degrees of right bank, the pilot ejected from the aircraft. The aircraft continued in a tight descending corkscrew to the right prior to hitting the ground nose first.

The ejection system worked flawlessly, but the pilot was injured when he landed firmly under a fully inflated parachute.

The investigation revealed a number of factors that contributed to this occurrence. The engine malfunction was likely the result of a stuck ratio boost piston in the right engine main fuel control (MFC) that prevented the engine from advancing above flight idle when maximum afterburner was selected. The large thrust imbalance between the left and the right engines caused the aircraft to depart controlled flight and the aircraft was unrecoverable within the altitude available. Contributing to the occurrence was the subtle nature of the engine malfunction that was not detected by the pilot when the overshoot was attempted.

In response to this occurrence, the Royal Canadian Air Force (RCAF) expedited the implementation of a program to upgrade all CF188 MFCs. Additionally, the RCAF made changes to the conduct of the CF188 air show routine by increasing the high AOA pass altitude from 300 feet AGL to 500 feet AGL, improving the air show training program and ensuring that both engines of the CF188 air show aircraft have upgraded MFCs. ◆

Epilogue

TYPE: **CH147 *Chinook* (147202)**

LOCATION: **20 km southwest of Kandahar City, Afghanistan**

DATE: **05 August 2010**

On 05 August 2010, *Chinook* CH147202 was conducting a sustainment mission outside Kandahar Airfield. While transiting at low altitude between two forward operating bases, the aircraft was forced down due to an explosion and in-flight fire. The source of ignition was reported as being due to insurgent fire that was directed towards the aircraft. Following the sound of a detonation, flames and black smoke immediately began entering the cabin through the left side of the open rear cargo door. Despite the presence of dark smoke in the cockpit, the pilots were able to rapidly and successfully land the aircraft in an open field. After landing, all aircrew members and passengers exited the aircraft, although some sustained minor injuries from the fire or during egress.

The scope of the Flight Safety Investigation was limited to the review and analysis of aviation life support equipment, egress procedures, and other issues pertaining to occupant safety. Deficiencies in cabin safety standards for crashworthiness and egress highlighted the need for a comprehensive RCAF passenger and cabin safety policy, as well as the need for full scale cabin safety assessments in both new and legacy fleets, in order to identify and mitigate safety deficiencies.

Additionally, the investigation identified that during the deployment, a number of flying and safety orders were routinely deviated from without the appropriate risk assessments being in place. Operation in accordance with established orders and the deliberate and controlled deviation from those orders through a documented risk assessment process, especially during elevated risk operations, is an essential responsibility of Command. The importance of documenting deviations to safety orders cannot be overstressed as it enforces a rigorous approach to assessing risk, develops appropriate mitigation strategies and support, and communicates clearly whose responsibility it is to assume and mitigate that additional risk. ◆

Epilogue

TYPE: Runway Incursion

LOCATION: Goose Bay Airport (CYYR), Labrador

DATE: 29 May 2012

A civilian-operated *Beech* 1900 aircraft was landing on runway 34 at CYYR. The aircraft was in the landing flare when a vehicle entered runway 34 at the intersection of runway 26 and then stopped. The aircraft passed within an estimated 25 feet of the vehicle but continued its landing roll-out without further incident. A Flight Safety Investigation, coordinated with the Transportation Safety Board, was convened to investigate the incident.

The investigation determined that the ground controller (GC) did not use the term "negative" to issue a restriction to the vehicle operator's (VO) request to cross the runway and that the VO did not actively scan the runway for potential traffic conflicts prior to proceeding onto the active runway. Additionally, the VO's misinterpretation of the GC's clearance was exacerbated by the VO's expectancy to hear the term "proceed" or "negative." Upon hearing "proceed," the VO erroneously assumed that he was cleared to his requested destination. It was further determined that non-standard phraseology was used by CYYR Air Traffic Control (ATC) and that 1 Cdn Air Div publications did not define currency or specify a validity period for the Ramp Defensive Driving Course (DDC) qualification.

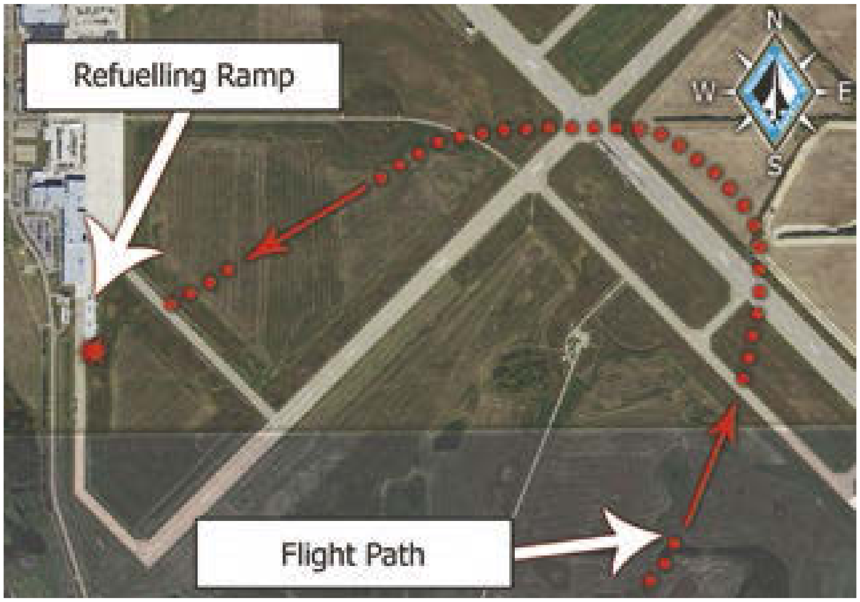
Approximate distance between the vehicle and *Beech* 1900 wing tip (marked by the person).

Safety recommendations included the publication of a Flight Safety Debriefing article summarizing CF runway incursion trends within the past ten years. 1 Cdn Air Div reviewed the Civil Aviation Daily Occurrence Reporting System filing policy, clarified the timelines for the Ramp DDC validity period, and made the revamped Ramp DDC program accessible through their website. It is further recommended that 1 Cdn Air Div formally publish the Ramp DDC currency and validity requirements and review the content of the Ramp DDC program and ATC National Professional Knowledge exam. Recommendations specific to CYYR included ensuring ATC terminology and phraseology is conducted according to the ATC Manual of Operations, relocating the GC speaker in the control tower, and imposing the successful completion of a written and practical airfield driving test for the local Ramp DDC qualification. ◆

Epilogue

TYPE: **CH146 *Griffon* (146437)**
LOCATION: **Edmonton, Alberta**
DATE: **05 July 2012**

On completion of a Basic Handling and Emergency training flight, *Griffon* CH146437 was attempting to conduct a descending, decelerating transition to the hover to a spot south of the fuel pumps with a right hand turn to a northerly heading. During this final turn, the aircraft began to sink rapidly; the First Officer (FO) raised the collective to a position which he believed to correspond with maximum mast torque (QM) but the aircraft continued to descend. Just after the FO levelled the aircraft, *Griffon* CH146437 landed hard and sustained "C" category damage. The Flight Engineer suffered minor injuries.



The investigation focused on power management, aircrew flying rates, aircrew fault analysis, aircrew factors, crew pairing and mentorship.

The investigation concluded that the crew entered into a settling with power situation from which they did not recover. An incorrect wind advisory by the Advisory Controller, an inadequate wind appreciation by the crew and the attempt of a descending, decelerating transition to the hover with an inadequate assessment of closure rates were factors in this accident. A significant contributing factor included poor power management; the blades were not loaded during the final approach, both pilots inaccurately assessed the collective position and they did not increase it to its maximum travel. Lastly, the aircraft captain (AC) did not recognize the point at which he needed to provide assistance to the FO. Collective travel, corresponding QM and rotor RPM were available to slow the rate of descent and potentially prevent the accident.

The investigation team also found that the low yearly flying rate amongst 1 Wing pilots could hamper skill development, delay progress in the pilot upgrade program, and degrade experience levels. Several ACs within 1 Wing have not received any formal fault analysis and debrief training and may be ill-prepared to mentor and assist junior FOs. The AC's expectancy and complacency during the approach and the FO's lack of consistent crew pairing during the early stage of his rotary wing flying career were also safety concerns. ◆

Epilogue

TYPE: **CH146 *Griffon* (146453)**

LOCATION: **Approximately 6.5 NM north-west of Yellowknife airport (CYZF), Northwest Territories**

DATE: **13 February 2012**

While supporting Exercise *ARCTIC RAM*, *Griffon* CH146453 was conducting a night familiarization in the approved Low Flying Area. On the return to CYZF, while practicing low level flying, the aircraft overflew a lake and cut three high-tension power lines with the wire strike protection system at 54 feet above ground level (AGL) approximately 6.5 nautical miles north-west of CYZF disrupting electrical power to the city of Yellowknife. In the ensuing post-impact confusion, the crew then allowed the helicopter to descend to approximately 6 to 21 ft AGL before they conducted a climbing 180-degree turn, inadvertently overflying the same power line again. The helicopter returned to CYZF from the north, overflew the airfield, hovertaxied to the ramp and shut down. The aircraft sustained "B" category damage.

Without the use of a checklist during a poor mission brief, the investigation found that the crew was not adequately prepared for this flight. No map or route reconnaissance of the area was completed, however, they still conducted unplanned low level flying in an unfamiliar area without reference to a map. After having completed their training, on the return to CYZF the crew chose to fly north of their intended route to conduct this low level flying training. Their perception of this mission as a low risk/low threat flight, their expectations regarding the distant location and large size of the transmission line, and their low state of arousal led to a reduced vigilance that contributed to a breakdown of visual scan.

Due to this breakdown, combined with the lack of familiarity with the northerly flight path and a distracting discussion on simulated emergency considerations, the crew experienced geographical disorientation that precluded them from manoeuvring in time to see and avoid the transmission line.

Post-accident, the exercise low level flying altitude was raised to 500' AGL, errors with maps were corrected and the Commander 1 Wing provided direction on proper pre-flight planning, reconnaissance procedures, wire strike avoidance training, flight authorization procedures and supervision of inexperienced crews.

Safety recommendations include reviewing directions to Flight Authorizing Officers and to crews in the event of aircraft damage sustained in flight. Defence Research Development Canada was asked to review aircrew post-deployment/post-high operational tempo risk factors and human performance training tools to develop risk mitigation and coping strategies for RCAF implementation. Other recommendations include the implementation of a mission acceptance and authorization process for all CF fleets, inspection procedures of crew life support equipment, guidance to Flight Surgeons when dealing with civilian hospitals and post-occurrence testing of night vision goggles. ◆

Epilogue

TYPE: CH146 *Griffon* (146434)
LOCATION: Forward Operating Base Afghanistan
DATE: 06 July 2009

Griffon 434 was tasked to transfer two passengers to and from a Forward Operating Base (FOB). As power was increased for the takeoff a very large dustball developed. Immediately after takeoff, the aircraft drifted forward and to the right, struck a barrier, rotated left, rolled onto its right side and caught fire. One pilot was unharmed, one sustained minor injuries and one passenger suffered serious injuries. The remaining three personnel tragically perished in the crash. The aircraft was destroyed.

Dustball during morning landing.

Crash site after evacuation of survivors morning landing.

In consideration of the anticipated dustball and high density altitude conditions, the crew combined the maximum performance and instrument takeoff (ITO) procedures. Unintentional forward and right drift was induced at takeoff by the helicopter's inherent hover instability and the lack of adequate pilot instrumentation. During the takeoff and while cross-checking flight instruments, the Flying Pilot lost visual references, reduced power, which slowed the helicopter's climb momentum, and inadvertently made a right cyclic input that exacerbated the helicopter's right drift. Additional right drift was introduced with the zero pitch and roll attitude technique of the ITO. In addition, the intense dustball created a degraded visual environment (DVE) that removed the crew's visual references, impairing their ability to see and avoid the barrier.

The investigation identified that the aircraft weight exceeded limits, the crew did not complete pre-flight performance calculations, and they attempted the takeoff without knowing the helicopter's available power. Errors and omissions in critical operational and technical reference material precluded the crew from accurately conducting essential pre-flight calculations had they attempted to do so. Furthermore, evidence existed of a systemic lack of understanding within the CH146 community of how to correctly utilize performance data. Pilot training for operations in DVE was also found to be inadequate.

The investigation identified that the *Griffon* was deployed to Afghanistan without proper mitigation strategies for certain missions. There was a breakdown in communication between command and tactical levels about the commander's intent to mitigate limited aircraft performance in Afghanistan's environment. Finally, limited amount of personnel in key headquarter positions contributed to inadequate planning support during the deployment preparation and planning phases.

Post-accident, safety actions included risk management activities, improvements to technical airworthiness processes, amendments to aircraft publications, changes to flight procedures, and the creation of performance planning software. Flying orders were modified to require all *Griffon* passengers be seated in approved seats with lap belts secured for takeoffs and landings. The annual pilot examination was modified to address performance planning deficiencies. Defence Research and Development Canada and the Directorate of Air Requirements initiated projects to enhance crew efficiency in a DVE. Additional preventive measures include further revisions to the aircraft publications, performance calculation training, training in DVE for all CF helicopter pilots, and operational currency requirements. Improvements to software planning tools, upgrades to *Griffon* systems for operations in DVE, the modification of Crash Fire Rescue standards for deployed operations, reviewing performance deficiencies associated with adapting civilian aircraft models for CF use, and the creation of capability planning teams for major deployments are also recommended. ◆

Epilogue

TYPE: ***Heron* 255**

LOCATION: **CFB Suffield, Alberta**

DATE: **16 July 2010**

Heron 255 was leased from Israel Aerospace Industries (IAI) to MacDonald, Dettwiler and Associates Ltd (MDA). It was being operated by MDA and involved an IAI instructor providing training to the Royal Australian Air Force when the accident occurred. Given the crash location, DFS was tasked to lead the investigation, which was coordinated with the Transportation Safety Board of Canada.

The mission consisted of three circuits, the first two using the Remote Auto-Landing Position Sensor (RAPS) to conduct approaches to the overshoot and the last one to conduct a Differential Global Positioning System (DGPS) approach and landing. Throughout the mission both the Unmanned Aircraft (UA) and the Advanced Ground Control Station (AGCS) experienced multiple intermittent navigation failures. In addition, the vehicle's outboard flaps failed and remained in the down position on the overshoot after the second RAPS approach.

While on short final during the DGPS approach, the student Air Vehicle Operator (AVO) noticed that the UA was flying too low. While attempting to recover, the student AVO made a button selection error that required the AVO instructor to take control of the UA. The UA was in the process of retracting its landing gear and executing the overshoot when it hit an electrical pole and was destroyed in the crash. The accident caused a power outage to the town of Ralston, AB, and CFB Suffield. There were no injuries.

The investigation determined that multiple navigation system failures ultimately affected the UA's programmed altitude control. Exacerbating these component failures were the crew's poor altitude monitoring technique, inadequate system knowledge, and problem solving abilities. Their decision to overlook the checklist and ineffective employment of the vehicle's Low Altitude Warning signal also contributed to this accident.

Safety recommendations included operational directives published by MDA involving the use of the Low Altitude Warning signal and actions in the event of multiple navigation system failures. Software was updated to improve the navigation system computer interface with the DGPS system and to adjust altitude information in the event of a DGPS failure. MDA now requires that UA automated approaches are monitored by AVOs in the same manner that pilots of manned aircraft monitor their automated approaches. ◆

THE BACK PAGE

Sea King 50th Anniversary: 1963 - 2013

"Best regards from the waterfront to all who have flown, fixed, controlled, supplied, carried in your DDHs and AORs or in other ways have had anything to do with the venerable *Sea King* helicopter over the last 50 years.

On the afternoon of August 1st 1963, two *Sea Kings* landed on at the then HMCS *Shearwater Naval Air Station*. The lead helicopter was flown by the Squadron CO at the time, Lieutenant-Commander Ted Fallen, and was copiloted by none other than our then Lieutenant Colin Curleigh, who tells a very funny story about "who" was actually flying the machine. That one will be for the retelling at the planned reunion in 2013.

There is much more information about the events planned on the website (www.seaking50.ca), so we encourage you all to take a look.

On behalf of the committee which is arranging the *Sea King* Golden Jubilee, begin planning to come home to Shearwater to help us celebrate the old girl's 50 years of service to the nation. Watch our website as it continues to develop for news of events which are planned for this weekend, and please set aside the date of 1 August 2013 for a visit home to see the *Sea King* and Shearwater as it sits today."

Yours aye,

John M. Cody
Co-Chair

Alan Blair
Co-Chair

Tim Dunne
Publicity Chairman