



National  
Defence

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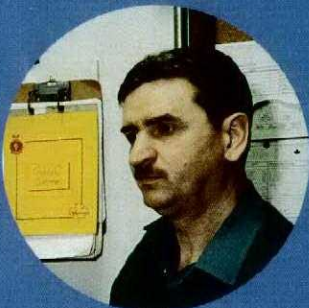
# FLIGHT

## COMMENT

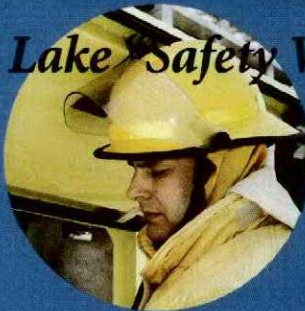


2/1997

*The 4 Wing Cold Lake "Safety Wheel in Motion"*



410 SQN-FS NCM



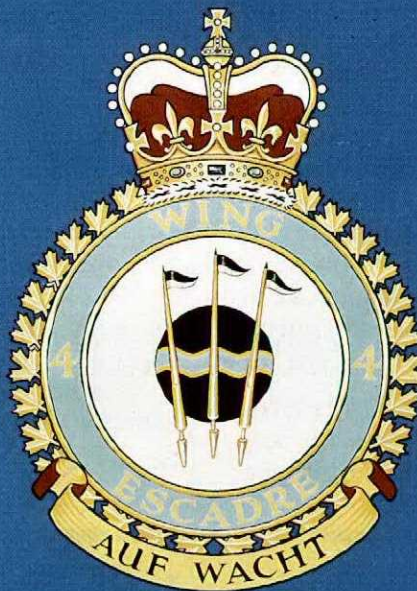
FIRE FIGHTER



417 SQN -SAR TECH



WILLIAM TELL - PILOT



WATC - CONTROLLER



416 SQN AW TECH



441 SQN - AE TECH



1 AMS - CRS TECH

Canada



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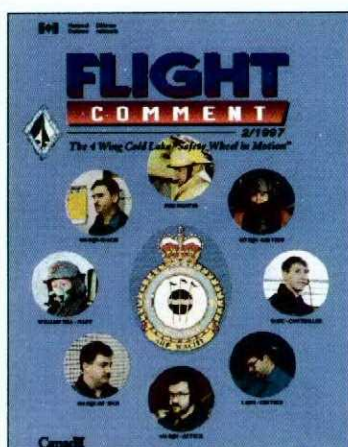
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### On the Cover:

Personnel of all trades at 4 Wing Cold Lake continually strive for excellence in Flight Safety. Personnel on the cover starting at 12 O'Clock are:

- Cpl Norman – Fire Fighter  
Sgt Eagle – 417 Squadron Search and Rescue Technician  
Capt Costello – Wing Air Traffic Control  
Cpl Gervais – 1 Air Maintenance Squadron Communication and Radar Systems Technician  
Cpl Munroe – 441 Squadron Aero Engine Technician  
MCpl Carr – 416 Squadron Air Weapons Technician  
Capt Mercer – William Tell Pilot  
WO Robert – 410 Squadron Flight Safety NCM

*Editor's Note: Congratulations to 4 Wing Imaging and their Graphic Artist, Bob Thomson for the excellent cover photos and artwork. Well done!*

## FLIGHT COMMENT

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## As I See It

The chain of accidents that marked the 1993-1994 period caused 10 TAG to adopt a series of flight safety directives very particularly stressing the need to establish effective communications, maintain a training policy in keeping with our operational requirements and exercise exemplary leadership. This philosophy has proven effective in dealing with the huge challenges met by the Group, including the arrival and integration of the CH 146 Griffon, our frequent and intensive participation in multiple operations, and the restructuring of our wings and squadrons. The implementation of this philosophy and the vigilance that has resulted from it reflect the great importance given to flight safety by all Group members. This vigilance is our ultimate protection against the harsh realities confronting us. Accordingly, we must maintain our analytical capabilities for all the steps we take and constantly assess the risks to which we are exposed.

While the level of activity for 10 TAG, and soon 1 Wing, remains high and shows no signs of declining, it is essential for us to actively pursue our prevention programs. The study on air operations supervision in the Group (Gagnon-Laliberté Study) enabled us to lay the foundations for our current preventive measures. But we must remain proactive in this approach and pursue our prevention programs. The goal is to instill a risk management culture in all Group members, so that risk assessment and, therefore, risk management become second nature to everyone.

To this end, analyzing what we do is the essential component of our approach that enables us to rationally assess the degree of effectiveness of our risk management mode. Recently during a training flight on a CH 146 Griffon, a routine engine chip incident rapidly developed into an emergency situation that, if the crew had not been alert, could have had disastrous consequences. The FS investigation established that



the causes of the incident were strictly related to human factors. In order to do justice to our prevention system and encourage openness, a group made up of representative from all 10 TAG units managed to work together and establish the lessons learned, both positive and negative, define preventive measures and describe the means necessary for implementing them. These representatives were then ideally placed to relay this prevention message to our units. This joint approach not only fosters communication within the Group but also helps to promote the vigour of the risk management culture, while providing for the analysis of a major incident.

Accidents can still happen, but I firmly believe that if we maintain a proactive approach to prevention, ensuring that the risk management culture is strongly present among us, we can push them ever further into the future. ♦

*by Brigadier-General K. R. Pennie Commander 10  
Tactical Air Group*



# First Flight

Here is a rare insight into the early years of Air Cadet gliding in Canada. The author, Mr Allen Bevan, joined the Air Cadet Program in 1941 as a student at Trinity College School in Port Hope, Ontario. In 1943 he became a member of the Air Cadet Squadron in Victoria B.C. Under the supervision of a Mr. Taylor, they built a Dagling Primary Glider (a circa 1928-1929 design from Slingsby Ltd) which they flew from a location on the northern outskirts of Victoria.

Mr Bevan has the memories of over fifteen thousand hours as Pilot in Command—just over eighteen hundred in gliders and sailplanes. After 1945, his family moved to the San Diego area in Southern California. There, he joined the Associated Glider Clubs of Southern California and flew the Schweizer TG-2, Leister Kaufman and Pratt Reed sailplanes both on the cliffs at Torrey Pines and at different desert areas. When the Korean War started he joined the U.S.A.F. serving in Korea at Kimpo (K-14).

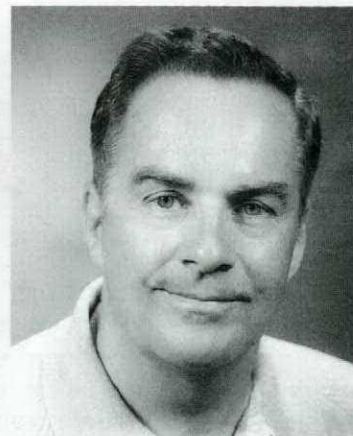
After his Engineering studies, Mr Bevan had a twenty eight year career in Aviation and Aerospace and he was an aircraft owner for most of that time. This is the story of his first flight; read on, and learn!

"...You asked for anecdotes or lessons learned over the years. If I may I would like to share with you the experience of my first and almost last glider flight!!

As I mentioned before in the early 1940s I lived at Cadboro Bay in Victoria B. C. The school I attended

was Mount Douglas. At Mount Douglas we did not have an Air Cadet affiliation so twice a week I would go to Victoria High School where we had our drill and class room instruction sessions. On week-ends and some random weeknights those of us interested congregated at a large commercial garage in Victoria where, off in the corner, they had allotted us space for the construction of a Slingsby Dagling glider. When I joined the group, the fuselage and tail feathers were well along to completion. Most of my task was wing rib building utilizing a jig or fixture that allowed us to slip into place pre cut lengths of sitka spruce that were glued in place. A birch plywood gusset would be glued and nailed over each intersection of glued spruce strips. There were a lot of the ribs to be made. However, they were all the same as the wing had the plan form of a Hershey bar—no taper that is. The skills learned on this task allowed me to help with the shaping of the fairing or pod that we built to surround the cockpit. I believe this fabric covered structure was a modification to the original Dagling plans that just had the operator sitting on a front porch stoop type of seat.

When we first flew the glider, we towed it on a trailer behind a 1928 Packard roadster to the Royal Oak area (about half way to Sidney from downtown Victoria). In those days the area was open and the site chosen was a rather steeply sloping hill that had a flat area going back for a couple of hundred yards from the crest of the hill. I would guess the height of the crest above the meadow at the base of the hill was roughly 125-175 feet with about a one-in-eight gradient.



The glider was assembled at the base of the hill and then towed to the top of the hill by a stripped down Ford Model T car that was just the running gear and a bench seat tied to the frame. Meanwhile, the Packard roadster was jacked up and one rear wheel was removed to make room for the installation of a plywood drum that would receive the rope towline as it wound in—there was no level winder mechanism. Because of the layout, the winch operator could not see the glider when it came time to go. A system of flag signals was used. A wing tip runner would select one of three different colored flags based on the degree of competence of the student. One flag color would signify a beginner (me) and the signal would be relayed by a second flag man at the crest of the hill to the winch operator down in the meadow at the bottom of the hill.

The beginner was then towed at a speed just fast enough to have aileron control. This would allow the student to learn to balance the glider as it slid along through the grass. Of course, the tow was terminated well before the crest of the hill. A second, different colored flag would be used for more advanced students and would give them enough speed to lift off and fly in ground effect for a short spurt—again stopping before the crest of the hill. The third and final colored flag was used as a signal to all that here we had an accomplished aviator type who was to have

bestowed upon him a tow that would truly launch him. Usually, when passing the crest of the hill, the glider would have perhaps two hundred feet above ground—and then would continue the climb to a release height of three hundred and fifty feet or so above the base of the meadow. No soaring ever took place—it was all down hill, literally.

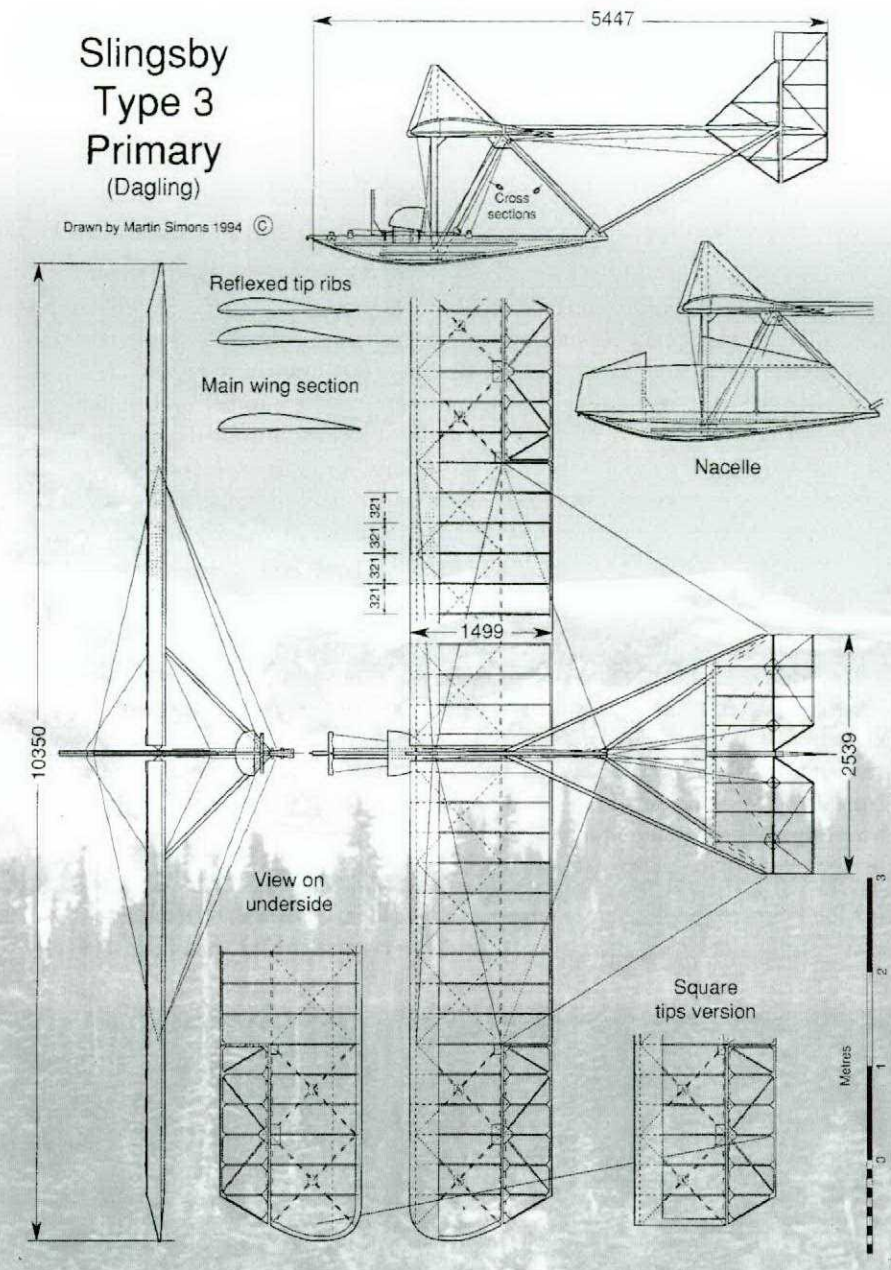
When my turn came for my initial "indoctrination tow", there was a screw-up in the flag signaling or interpretation thereof. I got the number three type tow—a most hearty send off hurled me swooping over the brow of the hill. I vividly recall the sudden sweeping panorama of the meadow below and the tiny (to me darn tiny) winch/car below. The glider was pitching and porpoising in what I know was the product of Pilot Induced Oscillations. I do not believe I released the tow; I think it released all on its own—probably because of the degree of pitch-up I was attaining. Right after the release, the glider mushed toward a series of stalls and somewhat partial recoveries—all made almost tangent to the face of the hill. Somehow the wings stayed fairly level and the stalls were not deep enough to precipitate a spin entry—all luck, NO skill!! The arrival at the base of the hill was strong enough to break almost all the landing wires that radiated to all points of the structure from a central king post mounted above the wing center section.

This adventure was my first instructional (??) session, my first solo flight and the only accident that I will admit to! Incidentally, the broken landing wires, made from about 1/8" piano wire, were replaced from a big roll of wire in the rumble seat of the Packard. The airframe was tweaked back into rig and was flying again within an hour or so!!"

(article contributed by the flight safety pages of the Royal Canadian Air Cadet World Wide Web site, at <http://www.isisnet.com/smacdougaircac/rcac.html> "Old Wazoo" is the aviation safety mascot of the RCAC internet site, and his keeper is Major Louis Allard, SO FS, Maritime Air Group HQ)

Slingsby  
Type 3  
Primary  
(Dagling)

Drawn by Martin Simons 1994 ©



Old Wazoo says:

How's that for a gliding story? I believe in today's terms, this aircraft occurrence would have some interesting "official" cause factors involving flag wavers, equipment design and supervisors. But that's not the point. The main thing to remember is that today's flight safety program is based on valuable lessons learned by our predecessors, many times the hard way.

People like Mr Bevan have taught us a lot of stuff about doing things right. Let's pay attention so that we don't repeat old mistakes, and let's also do our part to increase the collective knowledge of aviators so that those who come after us may benefit from the solutions that we find to the remaining pitfalls out there. Fly safe! ♦



## Good Show

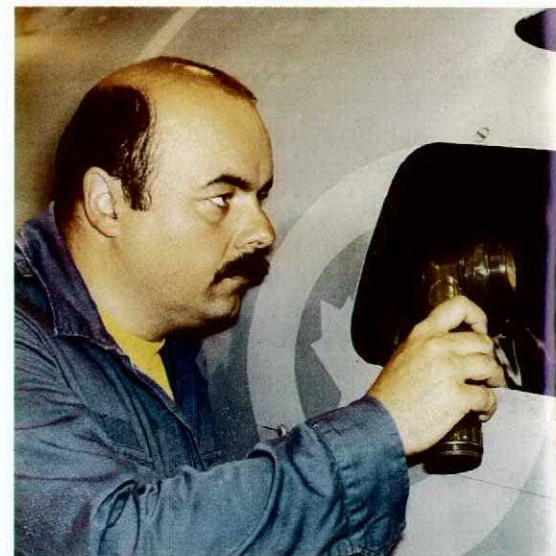
**T**ALON 22, a CH124 Sea King, had just launched from HMCS Fredericton when the crew heard loud popping sounds followed immediately by the loss of all power from their number two engine. The crew rapidly and correctly assessed that they had experienced a compressor stall on the number two engine and that a restart was not possible. Fuel was dumped and the crew was able to continue flight using power from the number one engine. A MAYDAY was declared and, while remaining at low altitude due to reduced visibility and ceilings in the vicinity of the ship, the crew explored their options. They had two choices available, one was to conduct a long overwater transit to 12 Wing Shearwater and the other to attempt a single engine landing on the ship knowing they could not hover on one engine. Due to the long transit time and marginal weather in Shearwater the crew elected to attempt a single engine landing on the ship.

After extensive coordination with the ship and further weight reduction, the crew conducted a practice approach to the ship to ensure they had enough power to carry out a safe landing. This attempt was discontinued due to excessive deck motion and high seas. After careful timing, the next approach was conducted to coincide with a steady deck period whereupon a successful no hover landing was carried out.

Sgt Barter, Lt Wendland, Maj McFadden and Maj Cherwonick are commended for their professionalism, outstanding skill and superior crew coordination in successfully recovering their aircraft under very challenging conditions. ♦



Lieutenant Lee Wendland, Sergeant Bernie Barter,  
Major Gary Cherwonick, Major Mike McFadden  
(photo unavailable)



Corporal Daniel Dureau

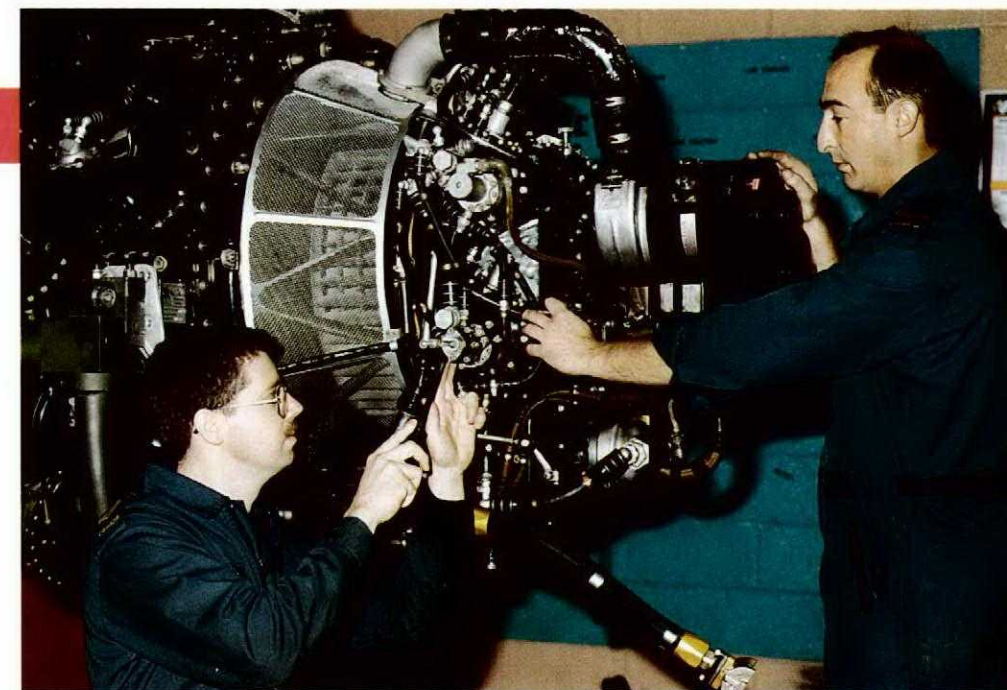
**C**pl Dureau, an Airframe Technician with 439 Combat Support Squadron at 3 Wg Bagotville, was doing a Periodic Inspection (PI) on a T33 aircraft. During the inspection he lightly shook the control rods routed inside the top portion of the airframe and found a rod moved more than normal and decided to investigate further. He discovered that the bolt holding the elevator mechanism together was almost completely out of its shaft. The nut which was supposed to hold the bolt in place was found at the bottom of the airframe and the cotter pin could not be found. If the bolt had fallen out the elevator would have been frozen in the neutral position. Following this discovery, a local Special Inspection (SI) of the T33 was ordered. A fleet-wide SI was then initiated as well as a modification to the rod attachment system in order to prevent a re-occurrence.

Cpl Dureau's professionalism and exceptional attention to detail prevented the loss of an aircraft and possible crew. ♦

Corporal Marco Rekrut,  
Corporal Tim Traill

**C**pl Rekrut, an Aero Engine Technician, and Cpl Traill, an Airframe Technician, both with 414 (CS) Squadron Comox, were performing an engine change during a periodic inspection on a T-33.

During the inspection they discovered that the High Pressure Cock Quick Disconnect assembly was worn beyond normal limits and could have failed at any time. This unserviceability was difficult to detect and only after the part was removed was the failure confirmed. Failure of this component could have led to an engine flame out. Wanting to check to see if this serious fault was isolated to this particular aircraft or not, they inspected another aircraft



undergoing maintenance and quickly discovered that it had the same problem. Cpls Rekrut and Traill immediately informed their supervisors and a squadron Special Inspection (SI) was conducted. Three other aircraft were found to have the same problem. A subsequent urgent fleet wide

SI revealed an additional six aircraft in other squadrons with the same unserviceability.

Cpl Rekrut and Cpl Traill's outstanding professionalism, perseverance and dedication prevented a serious flight safety occurrence with the possible loss of an aircraft and/or crew. ♦

## Keeping Your Sense Of Humour

**T**he following Bulletin was "acquired" from an Operations Notice Board to correct some crew's confusion over the amendment to the titles of cockpit personnel in the operations manuals.

♦♦♦ There appears to be some confusion over the new pilot role titles. This notice will hopefully clear up any misunderstandings.

The titles P1, P2, and Co-Pilot will now cease to have any meaning, within the operations manuals. They are to be replaced by Handling Pilot, Non-Handling Pilot, Handling Landing Pilot, Non-Handling Landing Pilot, Handling Non-Landing Pilot and Non-Handling Non-Landing Pilot.

The Landing Pilot is initially the Handling Pilot and will handle the take-off and landing except in role reversal when he is the Non-Handling Pilot for taxi until the Handling Non-Landing Pilot hands the handling to the Landing Pilot at eighty knots.

The Non-Landing (Non-Handling, since the Landing Pilot is handling) Pilot reads the checklist to the Handling Pilot until after the Before Descent Checklist completion, when the Handling Landing Pilot hands the handling to the Non-Handling Non-Landing Pilot who then becomes the Handling Non-Landing Pilot.

The Landing Pilot is the Non-Handling Pilot until the "decision altitude" call, when the Handling Non-Landing Pilot hands the handling to the Non-Handling Landing Pilot, unless the latter call "go-around", in which case the Handling Non-Landing Pilot continues handling and the Non-Handling Landing Pilot continues non-handling until the next call of "land" or "go-around", as appropriate. In view of the recent confusion over these rules, it was deemed necessary to restate them clearly. ♦♦♦ ♦

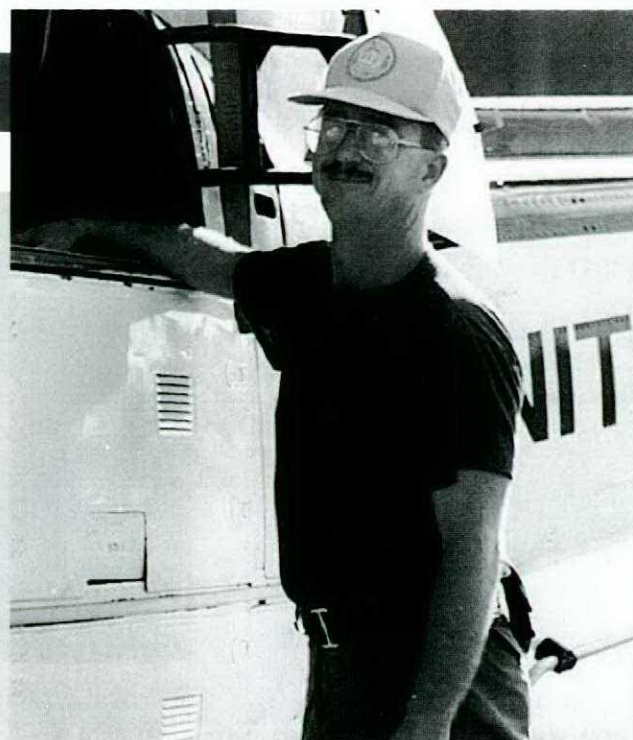


## For Professionalism

### Corporal Rick Woodward

Cpl Woodward, an Aero Engine Technician with the Canadian Contingent United Nations Mission in Haiti, and his crew were performing a Primary Inspection (PI) on a CH135 Twin Huey.

While standing to the right of the helicopter waiting for his co-worker to hand him down the number two power section intake, he heard the engine igniters fire. After unsuccessfully trying to gain the attention of personnel in the cockpit, he ran to the pilot's seat where a technician was checking the cockpit lighting. Physically moving his co-worker's knee off the collective lever, Cpl Woodward selected the starter switch to the off position. This did not stop the start from proceeding as the engine fuel switches had been left on and the throttle open. Further, the rotor brake was off and the blades were secured only by their normal tiedown. Recognizing the seriousness of the situation, Cpl Woodward ran back to the engine compartment and shut down and secured the engine manually by depressing the idle stop solenoid and the idle stop lever.

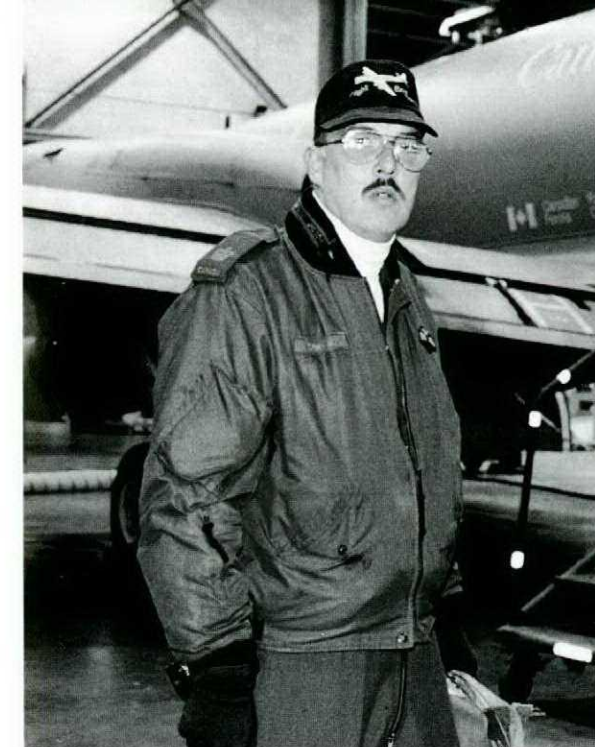


Cpl Woodward's professionalism, outstanding aircraft knowledge and quick reactions prevented severe damage to the main rotor drive train and possible serious injury to his fellow co-workers. ♦

### Warrant Officer Karl Derhak

WO Derhak, a Flight Engineer with 405 Squadron Greenwood, was carrying out a pre-flight inspection on a CP140 Aurora when he discovered a crack in the left-hand outer flap drive torque tube in an extremely difficult area to inspect.

When WO Derhak was conducting his inspection of the left-hand flap well, he noticed rust-coloured splashes inconsistent with other marks in the area. Closer inspection revealed that the pattern of the splashes appeared to have been caused by something spinning such as the flap torque tube. WO Derhak then noted that a mark on the torque tube, which would normally have passed as a grease smear, was actually a 1 1/2 inch long crack in the longitudinal axis of the tube. It appeared to have bulged from the inside, and had opened wide enough to fit the end of a screwdriver inside. He also noted that the tube drain hole approximately six inches away had been painted over preventing moisture from draining from this area. Had this crack not



been discovered a very serious split-flap condition could have developed upon failure of the torque tube placing both the aircraft and crew in jeopardy.

WO Derhak's professionalism and attention to detail prevented a possible serious flight safety occurrence. ♦

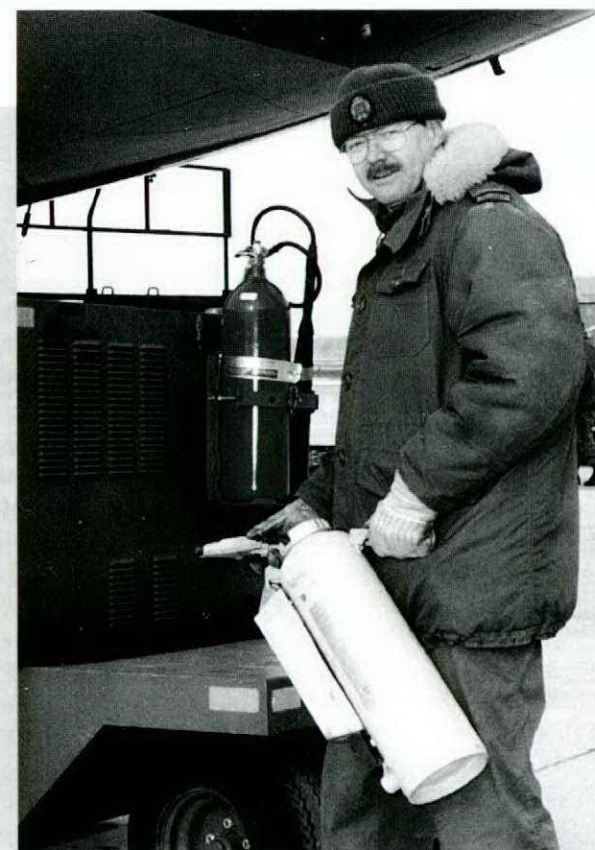


### Corporal Mike Munroe

Cpl Munroe, an Aero Engine Technician from 441 Squadron Cold Lake, was conducting a ground maintenance run-up on a CF18 in one of the hangar bays at Forward Operating Location Inuvik.

The hangars are equipped with an Automatic Foam Fire Fighting System which, without warning, started to discharge the full contents of fire-suppressant foam while the engine run-up check was underway. Cpl Munroe immediately initiated engine shutdown procedures to prevent foam ingestion and began to egress the aircraft to exit the hangar. While evacuating he realized that the foam agent could seriously damage the cockpit's instruments and avionics. Cpl Munroe got back in the cockpit and closed the canopy until the discharge was complete consequently saving the aircraft's cockpit instrumentation from damage and expensive repairs.

Cpl Munroe's professionalism, poise and quick thinking during a very stressful and hazardous situation averted serious damage to both the engines and avionics of a valuable aircraft. ♦



### Corporal George Lamoureux

Cpl Lamoureux, a Mobile Support Equipment Operator (MSEOP) with 8 Wing Trenton, was completing the refuelling of a CC150 Polaris Airbus when he noticed a fire in the ground power unit.

Using a portable fire extinguisher he quickly put out the flames which were caused by bare cable wires arcing with the metal wall of the unit. This arcing produced an eight inch hole in the unit with shooting flames out the back. Cpl Lamoureux directed personnel around him to assist in his efforts which included disconnecting the ground power unit and removing it from the area as well as repositioning the refuelling tender to minimize the threat of future fires.

Cpl Lamoureux's professionalism, alertness and quick action averted the possibility of the fire spreading to the aircraft or refuelling vehicle. ♦



# A Lesson In Risk Management And Crew Endurance

## INTRODUCTION:

*The following is a reprint of an article appearing in Flightfax January 1997. Although aimed at the Army Aviation audience its themes are universal for any Air Force. This article is especially relevant to our operations and to our present efforts in Flight Safety. We only have to think back to our recent involvement in the Gulf war, the operations of ATG and the increasing role that night vision goggles are taking in 10 TAG to realize its relevancy. Furthermore DFS has been advocating risk management over the past years as a process to help controlling risks. This article illustrates the application of this process very well.*

**S**tress, fatigue, lack of sleep, and changing schedules have always been critical issues in Army aviation. But they have become even more critical in this new Army of ours where working environments and schedules can change with little notice or time to adjust as we deploy back and forth across time zones. We may be working in the desert one week and in an urban area the next, flying days this week and nights the next, doing not only traditional military missions but also new and different ones. In addition, the sophistication of today's aviation equipment requires more alertness and concentration by all of us, aviators and maintainers alike. These factors combine to make crew endurance issues more important than ever before.

Last summer at Fort Rucker, the U.S. Army Aeromedical Research Laboratory and the Army Safety Centre jointly produced the Leader's Guide to Crew Endurance to give leaders the latest information on recognizing when human performance can be expected to decline and how to control crew-endurance-related hazards.

Here's an overview of the section on work schedules and the body clock.

## The biological clock

Our biological clock regulates the availability of our mental and physical resources, which fluctuate during the 24-hour day. The best and worst times of day are determined mostly by light cues received by the body clock. Exposure to daylight after a normal night's sleep sets the body clock in a day-oriented pattern, which means that physical and mental

energy peaks between 0800 and 1200, decays slightly between 1300 and 1500, increases between 1500 and 2100, and finally declines from 2200 through 0600.

Inconsistency in daylight exposure times will result in unpredictable availability of alertness and energy. If wake-up times and daylight exposure vary continuously from day to day, the body clock receives inputs similar to frequent travel across time zones. Unstable sleep/wake schedules, whether caused by changes in work schedules or travel across time zones, may disrupt body-clock timing and ultimately induce circadian desynchronization.

**"Circadian" (Latin: circa = about; dies = day) describes biological and behavioral rhythms regulated by the body clock.**

Circadian desynchronization causes classic symptoms of jet lag and shift lag, including fatigue, malaise, sleepiness, digestive disorders, confusion, and lack of motivation. These body-clock disruptions increase mission risk levels and can compromise safety if risks are not managed. Working the five-step risk-management process offers a simple way to control the risks.

## The risk-management process

### STEP 1: IDENTIFY THE HAZARD

It's usually easy to predict shift lag or jet lag. Anytime the work schedule and sleep/wake cycle are shifted suddenly, soldiers will be at risk for circadian desynchronization. Given sufficient notice, leaders and individuals can take measures to minimize the effects of this body-clock disruption.

Circadian desynchronization can be detected by a variety of signs. However, most of these signs are also characteristic of simple fatigue, so it is important to consider the context of the situation and recent body-clock history of individuals involved. For example, the following may be present in soldiers suffering from circadian desynchronization with or without simple fatigue:

- Vacant stare.
- Glazed eyes.
- Pale skin.
- Body swaying upon standing.
- Walking into objects.
- Degraded personal hygiene.
- Loss of concentration during briefings.
- Slurred speech.

## STEP 2: ASSESS THE HAZARD

Gauging the severity of circadian desynchronization depends largely on the operational scenario. For example, a sudden change of eight time zones is obviously of more concern than a long-planned trip across three. Factors such as the severity of and soldier susceptibility to desynchronization can assist in assessing the magnitude of the hazard.

Leaders should consider the following factors when planning changes in work schedules:

- Rotations from daytime to nighttime or early morning duty hours will result in some degree of sleep loss and fatigue the first day. Controls should be implemented from the beginning of the work-schedule change.
- Night shifts ending around sunrise will pose the greatest challenge to the body clock and are associated with more severe desynchronization.
- Rotations from daytime duty hours to afternoon or evening work schedules do not require rapid adjustment of the body clock. These rotations can be considered benign compared to rotations into night or early-morning duty hours.
- Return to daytime duty hours after several days or weeks of nighttime or early morning duty hours produces significant desynchronization and should not be underestimated. At least 3 days are required to rotate from nighttime to daytime duty hours.

## Jet lag, Shift lag: What's the difference?

Although the symptoms of jet lag and shift lag are similar, their mechanisms differ. In jet lag, desynchronization is induced by the change in sunrise and sunset times that results from crossing several time zones. In shift lag, desynchronization is caused by changes in work and sleep schedules and the corresponding change in day-light exposure time.

- Eastward or westward travel across more than one time zone will result in some degree of jet lag. This may manifest as fatigue in the early night for westward travellers and reductions in total sleep duration for eastward travellers. Increasing the number of time zones crossed increases the severity of symptoms.

Individual differences make some people more susceptible to jet lag or shift lag than others. It may be useful to consider the following tendencies in shift assignments and specific missions:

- People who prefer early-morning rise time (0400-0600) and early bedtimes (2000-2100) tend to adjust easily to early-morning duty hours. In contrast, those who prefer to retire at 2200 or later and rise after 0700 tend to adjust more easily to nighttime duty hours. Preferences are often masked by work schedules, so they are not easy to detect. It may be useful to determine preferred off-day bedtimes and rise times.
- Soldiers over 40 may experience sleep disturbances and gastrointestinal disorders more frequently than younger soldiers. Controls are required for all soldiers, although younger soldiers tend to benefit more quickly than the over-40 group.

Once circadian desynchronization has developed, it is difficult to treat. To estimate the magnitude of a body-clock problem, consider the soldier's body-clock history, the severity of the signs and symptoms previously listed, and the following factors that may affect safety:

- **Impaired self-observation.** Desynchronization is usually accompanied by severe sleep loss, with an attendant fatigue-related inability to adequately judge one's own behaviour. Crewmembers may not be able to reliably determine if they are safe to fly and may not respond to subtle warning remarks made by peers.
- **Impaired communication.** Soldiers suffering from desynchronization may have difficulty communicating critical mission, flight, or safety information. Conversation may become fragmented and contain repetitive phrases and ideas. In addition, weariness tends to result in misinterpretation of verbal communications.
- **Increased irritability.** Irritability and impatience are commonly experienced in association with desynchronization. One positive aspect of increased arguing is that it shows soldiers are still talking to each other, exchanging orders and messages. Cessation of bickering may indicate mental exhaustion. This is particularly dangerous if a crew is flying between 0400 and 0700. During this period, crewmembers may experience sleepiness and degraded alertness, and cognitive function will be at its lowest. The combination of acute fatigue and desynchronization can be lethal. When possible, avoid flying between 0400 and 0700 after working all night. Fatigue can be overcome more easily between 2400 and 0300.
- **Physical exertion.** The perception of exertion changes as a function of time of day. Desynchronization can interfere with soldier's ability to judge the physical difficulty of a task.

## STEP 3: DEVELOP CONTROLS

The timing of sleep is critical to managing and preventing desynchronization. Maintaining consistent schedules that ensure well-timed sleep is essential but can be difficult in the operational setting. Once shift lag or jet lag actually develops, returning to normal can take several weeks of a consistent sleep/wake schedule. Desynchronization symptoms are likely to disappear in just a few days of normal sleep. The following controls can be helpful in preventing circadian desynchronization:

- **Napping.** In the context of body-clock adjustment, naps are recommended if soldiers rotate from day to night shift, if they cannot sleep more than 4 to 5 hours during the sleep period, and if the next night is going to be another work period.
- **Pre-adaptation.** Before deployment, a unit can attempt to pre-adapt to the new work shift or destination time zone. While potentially useful, pre-adaptation requires much coordination and cooperation from all levels of the involved unit. In a pre-adaptation scenario, deploying elements typically begin shifting their sleep/wake cycle toward the new cycle several days before transition.



- Timed light exposure. The timing of daylight exposure is critical for resynchronizing the body's biological clock. By carefully scheduling exposure to sunlight or proper artificial light. It is possible to speed adaptation to a new work schedule or time zone. However, incorrect timing of light exposure can actually worsen jet lag.

The following example illustrates the control-development step of the risk-management process:

A mission is received that will require UH-60 crews to fly nightly troop lifts to forward combat positions for approximately 2 weeks beginning that night. Mission durations vary, with some missions ending between 0100 and 0300 and others ending between 0500 and 0600. Crews will be assigned to missions randomly, so it is difficult to assure the same schedule from night to night. The tasking will require soldiers to work a full daytime duty day on the first day.

Here's what planners came up with to reduce the effects of shifting to the night schedule:

- Soldiers working the night shift will be required to nap between 1800 and 1930 during the first 3 days of the transition. Naps will improve alertness during the night but crews should, if possible, avoid flying the early morning hours (0300-0700) on the first day of the rotation. Leaders will need to be sure that meals are available at times that will not interfere with the napping schedule.
  - To orient the body clock to a nighttime work cycle, sleep should begin as close to 0400 as possible, even if flying is completed before that. Every effort should be made to begin sleep well before sunrise to avoid exposure to daylight. Daylight exposure should be delayed until 1200. Soldiers will wear dark sunglasses to reduce sunlight exposure when it cannot be avoided.
  - Exposure to bright light between 2000 and 0300 could improve adaptation to this schedule. Therefore, bright lights will be used in the tactical operations centre, maintenance shops, and other areas where soldiers are required to work nighttime hours. (Note: This would not be recommended for flight crews or drivers because of night-vision impairment.)
  - Soldiers working the night shift will eat breakfast upon awakening. This means breakfast must be served in the early afternoon.
  - Soldiers working the night shift will be required to wear sleep masks during their sleep period to avoid inadvertent exposure to daylight.
- All briefings, maintenance, and training will be scheduled to take place outside the designated sleep period.
- The sleep period will be protected from noise by using power generators to mask sound. Commercially available sound-masking devices may also be used. Earplugs provide an alternative, and combining their use with sound-masking may be most effective.

## STEPS 4-5: IMPLEMENT CONTROLS & SUPERVISE

The commander and planners have now identified controls to mitigate the risk. The implementation measure best used in this example would be to insert the control measures into the operations order. Supervision in the form of spot checks would ensure that the controls are followed.

### Problems Unique To Nighttime Aviators

Because of the necessity to protect their night vision, aviation crewmembers are not usually able to get the amount of light exposure that would help adjust their body clocks to a night-duty schedule. In addition, the quality and duration of their sleep are frequently degraded by lack of properly darkened sleeping quarters and lack of control over environmental noise.

There are, however, several effective countermeasures that nighttime aviation crewmembers can employ. A general night operations crew-rest plan might include the following:

- Avoid working after 0400 to prevent the harmful effects of fatigue on performance and the pronounced tendency to fall asleep from 0400 to 0700.
- Avoid exposure to daylight in the morning after flying a night mission. Exposure to sunlight before bedtime can severely retard adaptation to night shift and result in reduced sleep time and quality.
- Schedule sleep to begin between 0400 and sunrise, and delay exposure to sunlight until noon. Engage in outdoor activities as much as possible in the afternoon. Reduce unavoidable early-morning exposure to sunlight by wearing dark sunglasses.
- When possible, sleep in complete darkness and avoid even momentary exposure to sunlight during the sleep period. Sleep quarters should isolate night-shift personnel from the activity of day-shifters, reduce environmental noise, and reduce sunlight in all living areas, including restrooms, during sleep periods.

### SUMMARY

Soldiers – even aviators – are only human. Therefore, Army leaders must clearly understand how human-endurance limitations can degrade human performance, which, in turn, can jeopardize both the safety of their soldiers and unit readiness. It's also critical that leaders understand how they can use the five-step risk management process to control the risks. ♦

# Thunderstorms

Thunderstorms are one of nature's most frequently occurring severe-weather hazards. Turbulence, hail, rain, snow, lightening, sustained updrafts and downdrafts, and icing conditions could all be present in thunderstorms.

The safest course is always away from the known thunderstorm area. It is better to go a few miles out of your way or land and wait it out than take the shortest and most direct route if that course is through the storm area. No procedures exist that can guarantee safe flight through a thunderstorm, including those found in the operator's manual for any given type of aircraft.

### *The following are some of the do's and don'ts of thunderstorm avoidance:*

**DON'T** land or take off in the face of an approaching thunderstorm. A sudden gust front of low-level turbulence could cause loss of control.

**DON'T** attempt to fly under a thunderstorm even if you can see through to the other side. Turbulence and wind shear under the storm could be disastrous.

**DON'T** fly without airborne radar into a cloud mass containing scattered embedded thunderstorms. Scattered thunderstorms not embedded usually can be visually circumnavigated.

**DON'T** trust the visual appearance to be a reliable indicator of the turbulence inside a thunderstorm.

**Do** avoid by at least 20 miles any thunderstorm identified as severe or giving an intense radar echo. This is especially true under the anvil of a large cumulonimbus.

**Do** clear the top of a known or suspected severe thunderstorm by at least 1,000 feet altitude for each 10 knots of windspeed at the cloud top. This should exceed the altitude capability of most aircraft.

**Do** circumnavigate the entire area if the area has 6/10 thunderstorm coverage.

**Do** remember that vivid and frequent lightning indicates the probability of a severe thunderstorm.

**Do** regard as extremely hazardous any thunderstorm with tops 35,000 feet or higher whether the top is visually sighted or determined by radar.

### *If you cannot avoid penetrating a thunderstorm, the following are some do's BEFORE entering the storm:*

**Do** tighten your safety belt, put on your shoulder harness if you have one, and secure all loose objects.

**Do** plan and hold your course to take you through the storm in minimum time.

**Do** establish a penetration altitude below the freezing level or above the level of minus 15\_C to avoid the most critical icing.

**Do** verify that pitot heat is on and turn on carburettor heat or jet engine anti-ice. Icing can be rapid at any altitude and cause almost instantaneous power failure and/or loss of airspeed indication.

**Do** establish power settings for turbulence penetration airspeed recommended in your aircraft manual.

**Do** turn up cockpit lights to highest intensity to lessen temporary blindness from lightning.

**Do** disengage altitude hold mode and speed hold mode if using automatic pilot. The automatic altitude and speed controls will increase maneuvers of the aircraft, thus increasing structural stress.

**Do** tilt the antenna up and down occasionally if using airborne radar. This will permit you to detect other thunderstorm activity at altitudes other than the one being flown.

### *The following are some do's and don'ts during the thunderstorm penetration:*

**Do** keep your eyes on your instruments. Looking outside the cockpit can increase the danger of temporary blindness from lightning.

**DON'T** change power settings; maintain settings for the recommended turbulence penetration airspeed.

**Do** maintain constant altitude; let the aircraft "ride the waves."

Maneuvers in trying to maintain constant altitude increase stress on the aircraft.

**DON'T** turn back once you're in the thunderstorm. A straight course through the storm most likely will get you out of the hazards most quickly. In addition, turning maneuvers increase stress on the aircraft. ♦



## From the Investigator

### Aircraft Occurrence Summary DFS 96/12

TYPE: Air Cadet Glider C-GCLW

DATE: 7 Sept 96

#### Circumstances

The accident occurred during routine gliding operations in support of the Air Cadet Gliding and Familiarization Program. After a normal winch launch the driver of the retrieval vehicle connected the tow cable to the hitch and began his return to the launch point. While driving over some uneven terrain the cable became disconnected and the driver stopped to reconnect it. After reattaching the cable and confirming that there was no signal from the winch operator, the driver continued with the retrieval. Shortly afterwards the cable once again became disconnected and the driver noticed the winch operator was signalling for him to return.

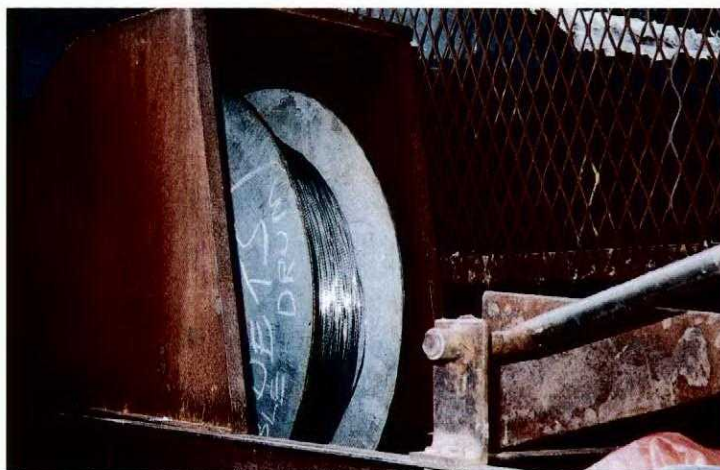
At the same time as the driver was having his problems with the cable disconnections the winch operator was attempting to correct a tangle in the cable at the winch. As the driver drove off to continue with the retrieval the winch operator's thumb was caught between the drum and the cable and it was severed. The winch operator was transported to hospital where the thumb was reattached. As the winch operator sustained serious injuries, this event is classified as an "E Cat" ground accident.

#### Investigation

The investigation revealed that if the cable abruptly loses tension during the retrieve (ie becomes disconnected from the vehicle) the drum will continue to rotate due to its momentum and more cable will be released. This inevitably results in a tangle of some degree to the cable. The winch operator normally monitors the paying out of the cable and applies slight power opposite to the rotation of the drum. As well the operator will apply the drum brake to minimize the amount of cable released should the tension on the cable be reduced. In this accident, when the cable became disconnected from the vehicle, the winch operator was not in his seat and he proceeded to the front of the winch to untangle the cable. When tension was reapplied to the cable as the vehicle started up again the winch operator's thumb was trapped between the cable and the drum.

#### DFS Comments

Good communications and strict adherence to Standard Operating Procedures are essential in all aspects of aircraft operations. While experience can teach us when a routine operation might turn into a hazardous event, Orders, SOP's and Regulations can aid less experienced members of our team to act safely in otherwise routine situations. ♦



Drum and Cable of winch on "stake" truck.



"Guillotine" on winch.

Hitch of retrieval vehicle.



### Aircraft Occurrence Summary DFS 96/06

Type: Schweizer SGS2-33A Glider C-GIIB

Date: 29 Jul 96

Location: Picton Airport, (20 miles South of Trenton) Ontario

#### Circumstances

The glider was being used in the Air Cadet Glider Training Program at the Picton Airport in accordance with the Air Cadet Training Manual. The pilot had completed one dual lesson-plan and was flying his third solo trip of the day. He was established in a left-hand traffic pattern for the grass Runway 10. As the aircraft passed abeam the launch point he was 100 feet higher than required and commenced to use side-slip and spoilers to lose the excess altitude. The student discontinued the side-slip, but as he turned onto the base-leg at 600 feet he noticed that the descent rate was high at approximately 500 feet per minute. The pilot now concentrated on flying through the sink rate that he thought was caused by the ridge (the final approach to Runway 10 is over a valley) by pushing the nose of the glider down. He realized that he was low now, but assumed that it was due to the ridge-induced sink rate that his instructor had warned him about. While on final approach the Landing Control Officer made two calls to the student advising him to close the spoilers. A third and final spoiler advisory call was made to close the spoilers as the glider descended below the tree line. The glider struck a 30-foot pine tree approximately 2200 feet from the threshold of Runway 10 and slid down to the ground. The uninjured student climbed out and walked 100 feet to a road to wait for assistance.

#### Investigation

Investigation revealed that the student had failed to close his spoilers after he discontinued the side-slip manoeuvre. He became channelized with the high-sink rate which he believed was being caused by the ridge, and did not check his spoilers. He did close the spoilers just prior to the impact. Due to his lack of experience, and the fact that he had not been briefed on suitable off-airport landing areas in the event of an emergency, the student continued straight ahead and stalled the glider into the trees. Since the aircraft was stalled, it hit the tree at a very low airspeed with minimal impact forces and the student was not injured. Initially, it was estimated that the aircraft had sustained B Category damage. Upon closer inspection the category of damage was reassessed as D Category.



#### DFS Comments

Making timely decisions while still learning to fly is not an inherent skill. Lessons are taught and examples are shown by the instructors so that the required experience can be gained through practice. However, the training system must ensure that every precaution is taken to minimize the risk involved while students acquire this experience. Young student pilots must be given all possible assistance, guidance and instruction in order for them to operate in the safest possible flying environment. ♦



## From the Investigator

### Aircraft Occurrence Summary

DFS 96/09

Type: CH12424B

Date: 9 October 1996

Location: At sea, on-board HMCS HURON, 65NM off northern coast of California

### Circumstances

After approximately one hour of SAR training, Sea King CH12424B returned to HMCS REGINA to pick-up two passengers and ferry them to HMCS HURON. The approach to HURON was normal and carried out in daylight VFR conditions. The weather conditions were Sea State One with light winds and a temperature of 15 degrees C. As the aircraft was in the high hover over the centre-rear of the flight deck for a Free-Deck landing, it suddenly descended and landed with the aft portion of the fuselage extending over the "lip" of the flight deck. The crew carried out an emergency shutdown, and all five crew members and both passengers evacuated the aircraft with no injuries.

The aircraft came to rest with both main wheels on the flight deck. However, the aft portion of the fuselage, just forward of the tail wheel, was embedded approximately four inches onto the ten inch steel lip around the deck. Furthermore, the final impact drove the tail probe housing assembly up into the cabin area by about five inches. The resultant structural damage is classified as "C" category.

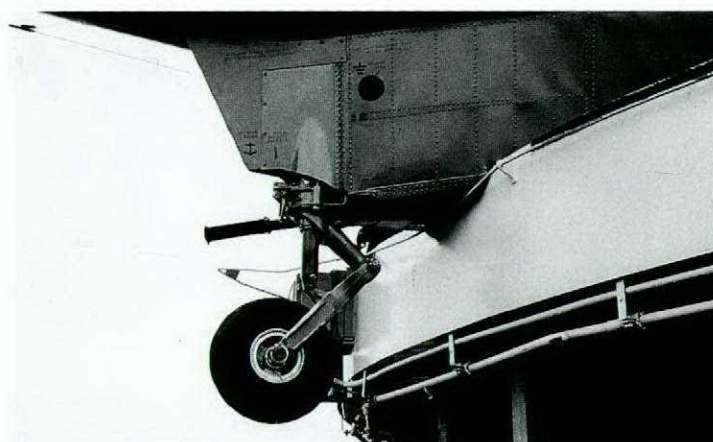
### Investigation

The investigation determined that CH12424B was serviceable and operating normally just prior to the occurrence. As the aircraft was positioned for landing, both pilots felt the aircraft sink, heard the Low Rotor Warning and noted a torque split. The aircraft captain interpreted these as symptoms of an engine failure and reacted quickly and correctly by lowering the collective, initiating a controlled rate of descent and cushioning the landing prior to touchdown. Aware that the aircraft was too far aft, he also pushed the cyclic forward. This moved the aircraft approximately 10 to 12 feet ahead as it descended onto the flight deck.

Both engines were removed and tested serviceable at a third line facility. Suspecting a possible intermittent failure with a Fuel Control Unit, both units were subsequently shipped to another facility where they were



Forward view of aircraft resting on lip of flight deck



A left side view of aircraft resting on the lip

fully inspected and again tested serviceable. In all, the investigation identified 27 possible technical, operational and environmental factors described. All were eventually ruled out with the possible exception of a momentary "slippage" of the Main Gear Box. The US Navy has experienced such a phenomenon before and termed it a Free Wheel Unit "spit-out". Had it occurred in this case, it would have resulted in an engine overspeed. The governing system would then have reacted by retarding the affected engine to idle. Spit-out is dependent on a number of variables, not all of which are evident in this case. Nevertheless, this factor has not been conclusively ruled out, and further testing and analysis continue.

### DFS Comments

We were very lucky that this accident resulted in relatively minor "C" category damage and no injuries. Had the power loss occurred only a few seconds earlier, the aircraft could have either crash landed on the quarter-deck of the ship or even tipped over and entered the water uncontrolled. The consequences could have been catastrophic, and the absence of video coverage and a water depth in excess of 6,000 feet would have seriously hampered the investigation. Fortunately, that was not the case.

The investigation has been, and continues to be, an exhaustive one. While we may not yet know for sure what caused the accident, we do know what did **not** cause it and that can be just as important. In the process, a number of anomalies have been identified and are being addressed. The end result will be a further improvement in the safety of the Sea King fleet. ♦

### Aircraft Occurrence Summary

DFS 96/08

TYPE: CF188764

DATE: 19 Oct 96

Location: Andrews AFB, Maryland, USA

### Circumstances

The mishap aircraft was participating in a 4v4 DACT mission with USA ANG F16s. Upon return to the base the pilot set up for a VFR straight in approach to Rwy 01R. He was #2 in one mile trail behind the lead aircraft. Just after touchdown the left wing rose and the aircraft tracked to the right of the centre line. The aircraft departed the right side of the runway, ran through the infield with increasing left crab and struck a distance-to-go marker with the right hand external fuel tank. After crossing a taxiway, the aircraft spun to the right when the right wing dug in and broke off at the hinge. The radome separated and the left main landing gear collapsed as the aircraft came to a stop at the right edge of the runway facing approximately 150 degrees to the right of runway heading. After two unsuccessful attempts to jettison the canopy, the pilot raised it electrically and egressed. He suffered minor injuries during the accident sequence. The aircraft sustained "B" category damage.

### Investigation

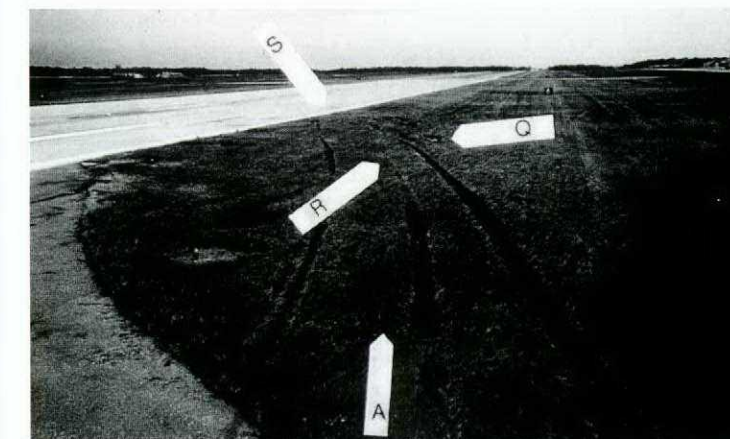
The weather at the time of the accident was VFR with strong winds (90 degrees left at 17 knots). After extensive research and inspection it was determined that the aircraft was serviceable prior to landing. The investigation then focused on the pilot's actions during the crosswind landing and his handling of the departure from the runway centre line. According to testimony, immediately prior to touchdown the pilot used rudder to remove half of the crab but did not cushion his landing. Immediately after touchdown the left wing and nose rose to the point that he lost sight of the runway ahead. During this time the right aileron scraped the runway. He attempted to correct using nose wheel steering and only used left aileron input when he felt that runway departure was inevitable.

The pilot decided not to eject due to his assessment that conditions on the infield were ideal. As the aircraft ploughed across the ground it developed left crab of up to 40 degrees. The ground conditions beyond the taxiway were considerably wetter and this led to the right wind digging in and the aircraft almost flipping as it spun to the right. ♦

The canopy jettison system was examined to determine why it did not function. The propagation of the charge stopped at the Flexible Confined Detonation Cord (FCDC) which transfers the charge from the canopy rail to the canopy. Non-destructive testing of the FCDC determined that it was cracked. Nineteen other CF18s undergoing maintenance at Mirabel were inspected and all FCDCs were serviceable. Nevertheless an SI to inspect the fleet for this problem is forthcoming.

### DFS Comments

Application of the correct and appropriate crosswind landing technique as described in the AOI is necessary to prevent loss of directional control while landing the CF18. Guidelines for landing the aircraft in crosswinds must be consistent in all official publications and pilots must have confidence in the procedure as published.



Final resting point of aircraft after removal



Damaged aircraft



# Microburst/

Cloud base (as r  
Base des nuages (aussi

Virga or rain  
Virga ou pluie

Dry air



artist:: Ronald G. Lowry

## of No. 111 "Thunderbird" Squadron (Auxiliary) Jul-12 Oct 1942.

This squadron was credited with the only victory to a RCAF unit based in North America. Squadron Leader Boomer DFC destroyed a Nakajima A6M2-N Rufe floatplane of the Japanese Imperial Naval Air Force over the Aleutian Islands.

The Kittyhawk Mk. I was powered by an Allison V-1710-39 engine of 1,150 h.p. It was armed with four 0.5 inch machine guns, had a gross weight of 8,670 lbs. and had a maximum speed of 260 mph. ♦

research by Capt Jay Medves, 4 Wing Cold Lake



# Microcellule

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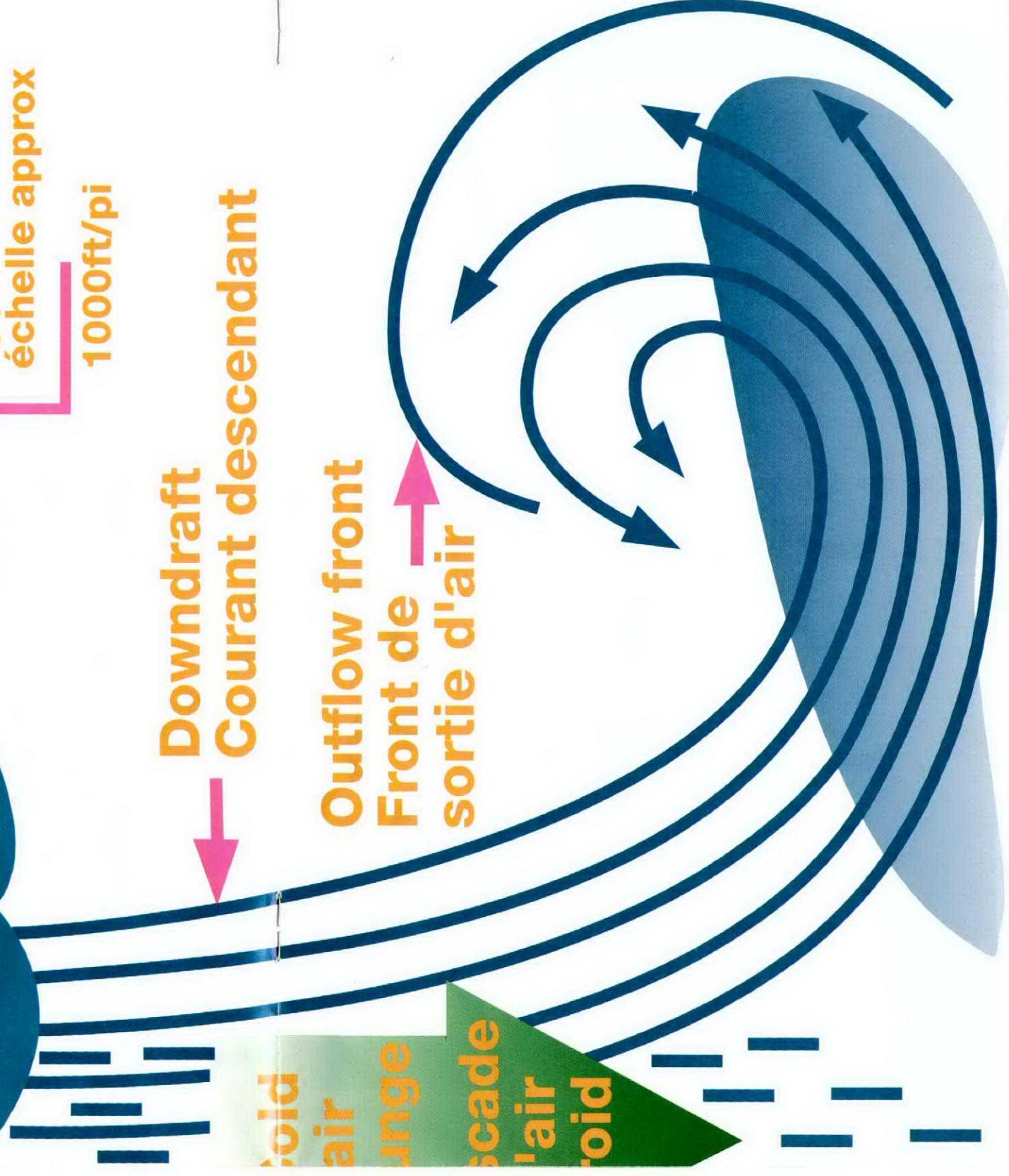
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Downdraft  
Courant descendant

Outflow front  
Front de  
sortie d'air

Cold  
air  
range  
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l'air  
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Direction artistique par USFC (O) Services créatifs

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