National Defence | Défense nationale

Flight Comment

ISSUE 1, 2023

DOSSIERS

Never Stop Flying the Aircraft!
The Dirty Dozen Redux

CHECK SIX

The Long Flight of Cudgel 5

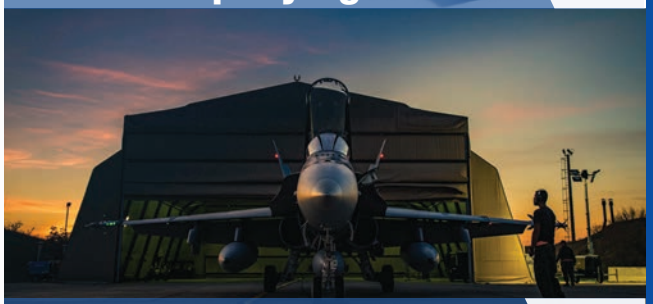
MAINTENANCE IN FOCUS

The Pressure's On

Canada

Cover – Capt Shane Amirault, a pilot onboard HMCS HALIFAX prepares a CH148 Cyclone Maritime Helicopter for take off during Operation REASSURANCE in May 2022.

Photo: Pte Connor Bennett
Graphic Artist: Cpl Kyle Morris



Flight Comment

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Views on Flight Safety

by CWO Carl Phaneuf

The Snowball Effect of Decision-making

Chief Warrant Officer (CWO) Carl Phaneuf joined the Canadian Armed Forces in 1987 as an infantryman. In 1990, he changed direction and joined the RCAF as an Airframe Technician. After several postings and exposure to multiple airframes, CWO Phaneuf is now currently posted to Ottawa as the Directorate of Flight Safety (DFS) CWO.

There are many different factors that come into play when we are looking into aircraft accidents. People often tend to look for what happened and perhaps even someone to blame. Sometimes it seems obvious, and people are prone to jump to conclusions or at the very least have biases. Why and how could they have done that? This train of thought is not conducive to a good Flight Safety reporting culture and will mostly lead you away from any enduring and efficient preventive measures.

The point of The Flight Safety Program is not to lay blame, but to find the deeper reason that lays behind the incident and offer long-lasting solutions. I am talking about daily practices of the "just culture", looking into all the conditions that led to an accident, analysing the human factors related to the cause factors and proposing real preventive measures that will avoid the likelihood of reoccurrence.

When people think Flight Safety, often everyone thinks of aircraft, aircrew or maintenance. However, there is a need to think with a larger perspective, since some of the smallest decisions made by anyone, from any background can affect Flight Safety, including latent conditions associated with personnel, supervision, and the organization. Below is an example of a seemingly simple scenario, however after examining the list of contributing factors one can see the broad spectrum of things that can affect Flight Safety. All decisions or actions related to aircraft operations, maintenance, services or logistics can affect Flight Safety positively or negatively, regardless of your rank or position!

I was once asked a question by a fellow member that seemed so simple; "why did the Commanding Officer just park his aircraft without a park crew?" However, when I stopped to really think about the possible reasons and we had a discussion surrounding that scenario, we found that it wasn't so simple. There are so many big and small decisions made during the process of parking an aircraft such as:

- Understaffing issues
- Maintenance staff being multitasked
- Maintenance vs servicing priorities
- Lack of dedicated park crews available
- Landing time changes
- Challenges when forecasting scheduling
- Internal communication issues (ATC, Ground, Squadron, Operations, Maintenance, portable radios etc.)
- Ramp driver licencing issues
- Pass control and access to gates
- Serviceability of towing vehicles/ AMSE equipment
- Fuel states
- City highways and infrastructure (i.e. Trenton aerodrome in particular)

All of these factors may have an impact on the availability of aircraft park crews, which in turn cause delays and frustration on tired aircrews who just want to finish a long day. As a result, they may elect not to wait and therefore, self-park their aircraft, increasing the Flight Safety risk. Examining the entire process, you will find out that everything is connected from the cockpit to the line-up at Timmie's.

Flight Safety is a team effort. Its success rests on the Just Culture and the ability to see the cascading series of issues that has led or may lead to a mishap and our ability to focus on preventive measures vice playing the blame game.

The Editor's Corner

by Maj Scott Young

Are you focussed with the task at hand?

As I read this sentence, I think back to my time as a Maritime Helicopter instructor on the venerable Sea King and one non-descript sunny afternoon comes to mind.

I was conducting a Clear Hood (Visual Meteorological Conditions) *"hands and feet"* student syllabus trip for a pilot returning to the community. The flight was progressing extremely well to the point where the student was not only flying the aircraft with ease, but also chiming in with anecdotal banter during non-critical phases of flight. As the flight neared its completion, the trip card called for some Auxiliary Hydraulics Off flight which included landings. The student warmed up with normal and slightly degraded systems off landings which were uneventful, and in fact the landings were near perfect – no drift, nor roll on touchdown. As we came into the hover for a series of Auxiliary Hydraulics Off landings, I remember beginning to fill out the kneeboard grade sheet, pondering the pickup of my son from daycare, and what my flight schedule would look like for the next day – my mind was everywhere but in that cockpit.

As we descended for touchdown, the aircraft drifted right, and the tailwheel bounced on first contact. The right main landing gear followed which exacerbated the rocking and pitching motion and the aircraft bucked violently. It was then that I snapped out of my train of thought, took control and lifted the aircraft back into the hover, all while trying to settle the pounding of my heart while maintaining the optics of a cool, calm instructor.

Why had I become so distracted? Was it due to complacency or expectancy bias? How did I lose track of my focus and where it ought to have been?

As we begin afresh in 2023, we offer up the first issue of this magazine that will most assuredly cause you to reflect and consider *Your* focus.

This issue provides the reader a glimpse into the past, one that offers a multi-tiered example of complacency, expectancy bias and misguided focus. Our *Lessons Learned* section is chocked full of *"pause for thought"* moments that the reader, at any level or profession, can bolster their mental toolbox for future tasks. We delve into pressures, real and perceived, and provide a discussion that perhaps the delta between the two are not as great nor different as one would truly like to believe.

There are many factors that are at play in each of our daily lives, whether it be at home or at work. The "Dirty Dozen" redux article and posters provides the reader with the common pitfalls (Human Factors) that entrap an individual's focus and can lead to negative results. It is meant to spark dialogue and thought – and it does just exactly that.

We round out the magazine with the spotlight on our people, those who are hailed for their actions that prevented potential significant Flight Safety emergencies. These are true professionals that exhibited keen attention to detail and whose actions directly benefited the Canadian Armed Forces and its people.

On a separate note, the Flight Safety Promotional Team is hard at work procuring poignant high visibility items for Wings, Bases and Units across the country that will be shipped out early this Spring!

We hope you enjoy this magazine and that it provides you insight and provokes introspection. As always, we welcome any feedback you may have to enhance our magazine for many years to come.

Big high, blue sky, go fly!

Editors Note:

Clarification Statement – In Issue #3 2022, Flight Comment Magazine included stock images in the "*Was That Briefed?*" Lessons Learned article that included the CT114 Tutor in 431 "Snowbird" Sqn colours. The article was provided by a past Tutor pilot and was not intended to be directly or indirectly associated with any Snowbird Aerobatic Demonstration Team representative, past or present.

DFS apologizes for any confusion or misinterpretations that these images may have created.

Photo: Maj (Ret'd) Luc Lacasse

Good Show

For Excellence in Flight Safety

Mr. Brian Peddle

On 27 Oct 2022, IMP aircraft technician Mr. Brian Peddle conducted a daily inspection (DI) on a CH149 Cormorant at 9 Wg Gander. During the inspection, the center bearing of the bell crank located at yaw rod position 14 was found to have migrated slightly out of the bell crank by 3.5 mm. Typically this bell crank would not be checked during a DI due to the requirement to remove panels to observe the component. Mr. Peddle makes it a habit to check these components during a DI and noticed that it had migrated. The component was replaced, and a Flight Safety report was submitted.

In the week following this occurrence, two more Flight Safety reports were submitted by the fleet regarding migration of this bell crank, with one of the occurrences resulting in a partially stuck pedal while airborne. This triggered an immediate stop to training until a special inspection (SI) on all airframes could be conducted, and inspection of this component was added to the 75 hour Inspection (instead of the 300 hour Inspection). Two weeks after the SI was completed, only 14 flight hours after the bell crank was replaced, Mr. Peddle was performing maintenance on the tail fasteners in the general area of the component and took it upon himself to look at the bell crank. He found that it had once again migrated off the bearing. Another Flight Safety report was submitted, and a Risk Alert Notification was sent out to add the inspection of the component to the DI. Mr. Peddle went above and beyond what was required of his daily duties.

By exhibiting superior attention to detail, and excellent situational awareness, Mr. Peddle's actions directly prevented a potential serious inflight emergency and/or accident.

It is for these reasons Mr. Peddle is well deserving of the *Good Show* Award.


Photo: Capt Paul Hamlyn

Maintenance IN FOCUS

Photo: Op Caribbe DND

The Pressure's ON

by Cpl Kyle Morris (DFS Image Tech)

The opinions in this article come from my 14 years of experience employed as an aviation systems technician (AVN Tech), while working on the CH146 Griffon and the CC130 Hercules (while spending 3 of those years working as a unit Deputy Quality Manager, conducting audits and developing unit work instructions).

The following article is more than just words put on paper to me, it is a plea to anyone who is involved in the supervision of people conducting aircraft maintenance: Manage Pressure. Whether you are a Commanding Officer, a Maintenance Officer, or a Non-Commissioned member, read this and consider its meaning and perhaps consequences that follow in such high-risk work environments.

While I haven't been employed as an AVN tech for five years, there is one topic that still gets me worked up when I think about it, the concept of "Perceived Pressure." I find it such an odd term because it implies that there isn't any actual pressure, except for the pressure you have created in your own mind. While the concept of perceived pressure can be felt in any job, it's one that carries dangers of exceptional risk when applied to the aviation field. Why?

Continued on next page

Because it can take your mind off the immediate task at hand. On the technician side of the house, I don't know anyone who missed steps or left work incomplete on purpose. In fact, I found that no matter how small the mistake, individuals are always bothered by having made a mistake in the first place. What caused those errors? There are many factors that can be to blame, as described in the *Dirty Dozen* article in this issue. Fatigue, staffing shortages, equipment issues, and ineffective communication to name a few, but those can either stem from or cause the famous "perceived pressure" attitude which leads to the errors. Is it something that is really just caused internally?

There is no doubt that on days where aircraft are all serviceable and timings are met, that there is no perceived pressure and one can argue at the junior level, you are doing the same job whether it's a chaotic day or a relaxed day—fixing aircraft. However, in the following scenario things become disorganized—where does it stem from and how does it reach those junior level workers who then feel what I call actual pressure? They feel the need to be faster and split their work up in order to complete multiple tasks when they should be focused on one thing at a time.

Let's say an aircraft is about to leave for a mission and it becomes unserviceable. There is no backup aircraft, so now things go into panic mode, and people at all levels are trying to manage the chaos.

- Servicing calls Ops to let them know the aircraft is unserviceable.
- Next, you have Ops calling down to the Servicing Desk every 30 minutes for updates on the aircraft status (especially if this aircraft is operationally required).
- Then the Crew Chief and others try to figure out ways they can get this aircraft serviceable, including extending working hours, abnormal shift hours or working on days off.
- The desk Sergeant is stressing out trying to manage all the calls from Ops, help the Crew Chief with staffing issues, as well trying to get updates on the status of the aircraft repairs, all while managing Level C duties.
- Master Corporals then go out scrambling on the flightline to fix aircraft with potentially smaller work crews than would otherwise be provided on less stressful days.
- This pressure is felt by the Corporals and Aviators, and they in turn, feel a need to pick up the pace of work.

Photo: Cpl Lynette A Dang

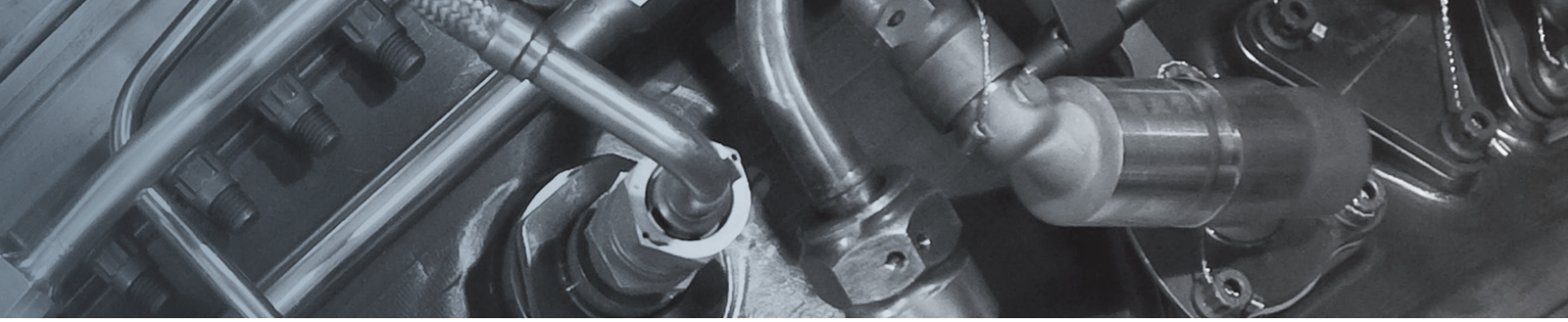


Photo: OP Impact, DND

This workflow may lead to increased risk as we know for when we start working faster it opens us up to potential errors being made. That kind of pressure doesn't really seem to be a personal perception kind of thing though, does it?

The reality is that the CAF workforce currently faces a challenge in recruitment and retention. To that end, there exists the potential of putting undue yet real pressure on the people working within the organization. We have plenty of talented people putting in 110% every day, and to some members, it may feel as though they are treading water sometimes. When I first joined in 2004, we had enough people for the workload. There would be times when the work pace felt slow, and you were jumping at the chance to do more. We are now at a time where we need to shift from pressured situations to manageable expectations in order to be more effective as an organization.

There will still be plenty of stressful days/situations ahead, so just keep in mind that as a supervisor when you show your stress you are sending a message to subordinates that things are not going well. Your subordinates may not know all the details about why things are going poorly and it's not their job to know, but they can fill in the blanks when it comes to what the consequences of the chaos might be, i.e., your shift is about to get extended, or you are forced to work the weekend or graveyard shift in order to get work done. Stress that started out from tough managerial decisions has trickled down the chain of command until it is felt by the Corporal or Aviator out on the flight line and has now potentially taken their focus away from the task at hand.

Had the pressure not been communicated down to them, either purposefully or through other means, or had intentions been communicated clearly – meaning they emphasized that there was no stress or pressure – the team may not have felt or reacted as such. For example, the Operations desk sometimes has checks they have to complete and one of them is to get regular updates on aircraft serviceability. When they make those calls to servicing, they may give the impression that there is a rush, when in fact they are just completing a standard checklist. If this is not communicated properly, the servicing desk may believe there is pressure from above to get the aircraft ready. Communication is so important in order to alleviate the "perceived pressure" phenomenon. While we like to call it perceived pressure, a lot of times on the flight line and in the hangars, what is felt by a junior member is real pressure. Now more than ever it is crucial that the people working on the aircraft are able to stay focused on the current task. Lives depend on it!

Regardless of your role, or your position within your organization, it is imperative that you remain calm even when it feels like the sky is falling. Managers need to manage the time pressures and technicians need to concentrate on fixing the aircraft. We need to do everything to maintain this separation and protect the technicians to carry out their main task, which is to fix the aircraft in accordance with policies and procedures. The CAF is comprised of highly competent, motivated members. Effective communication is key to any work process, work processes that keep our members safe both on the ground and in the air.

Thank you for taking the time to read this article. This topic comes from a place of gratitude for all the people I served with in my time as an AVN Tech, and also my frustration at seeing a lot of wonderfully talented people leave the organization for reasons that always seemed preventable. We may never be able to control the stress that is presented to us, but we can do our best to control how we manage it, and my hope is all supervisors will do their part in sheltering subordinates from unnecessary external stressors.

For Professionalism

For Commendable Performance in Flight Safety

Aviator Marco Macedo Teran

On 3 Nov 2022, while conducting an after flight check on a CP140 Aurora aircraft, Avr Marco Macedo Teran spotted red grease inside the aircraft's Bomb Bay which seemed incorrect at first glance. With no Air Weapons Supervisor in his immediate vicinity to confirm his suspicions, and despite being new to the team and not being particularly familiar with the Bomb Bay systems, he took it upon himself to research the proper grease on all the fittings inside of the Bomb Bay. He discovered that the grease was supposed to be golden yellow, not red in color. On his own initiative, he tracked down the grease guns used on the last aircraft wash and noticed that they had the correct grease inside of them which meant that the error occurred during the post aircraft wash lubrication.

The grease that was incorrectly applied and discovered by Avr Macedo Teran was a synthetic base fluid with an organo-clay thickener, whereas the correct grease is a golden yellow synthetic base with lithium complex thickener. These two greases are incompatible and when combined results in the greases hardening and losing their lubrication properties. If left unchecked, the potential exists in failure of the aircraft's Bomb Bay actuation system by preventing the doors from opening and closing.

Avr Macedo Teran's keen attention to detail, professionalism, and initiative removed a potential significant Flight Safety hazard. It is for these reasons that he is most deserving of the *For Professionalism* Award.

Photo: MCpl Jean-Roch Chabot

For Professionalism

For Commendable Performance in Flight Safety

Corporal Vance Bouchard and Corporal Kevin Pinard

Photo: Cpl Geneviève Beaulieu

Photo: Cpl Shawn Dlugozima

On 25 Jan 2022, during an after-flight inspection on a CP140 Aurora aircraft, Cpl Bouchard went beyond the minimum inspection requirements and visually verified the expiry dates on the installed LPUC's (Life Preserver Universal Carriers) and found that the due dates were all expired. Cpl Bouchard then compared the due dates on the stickers to the CF339B Out of Sequence Inspection Due dates which indicated the LPUC's serviceable. After discovering this discrepancy, Cpl Bouchard brought it to the attention of Cpl Pinard.

The aircraft's next flight was scheduled for an overseas deployment and the LPUC is considered critical Aircraft Life Saving Equipment (ALSE) which requires regular inspection ensuring it is operable in case of an emergency.

Cpl Bouchard took it upon his own initiative to inspect the LPUC's on another aircraft that was also scheduled to deploy on an overseas mission and found the LPUC's expiry dates again did not match.

Once this was discovered Cpl Pinard followed up to determine what caused the discrepancy between the aircraft and the electronic record set. Cpl Pinard checked with AMCRO, searched through the electronic database, and then conducted a local survey of all other aircraft at 405 LRP SQN and found the issue was caused by a Special Inspection (SI) carried out by ALSE. When the SI was completed it automatically triggered the Out of Sequence Inspection in ADAM which added time to the LPUC's expiry dates instead of the proper expiry dates.

Cpl Bouchard's and Cpl Pinard's perseverance prevented two aircraft from flying overseas with expired and potentially unsafe ALSE equipment. Cpl Bouchard and Cpl Pinard are most deserving of the *For Professionalism* Award.

Photo: Comox Air Force Museum

The Long Flight of Cudgel 5

by Col (Retired) Chris Shelley, C.D.

Chris Shelley joined the Canadian Forces in 1973. After graduation from Royal Military College he trained as a pilot, flying some 3800 hours with 424 Squadron and 408 Squadron on CH135 and CH146 aircraft. He flew on operational deployments in Central America (1990) and Bosnia (2001). He commanded 408 Squadron and 1 Wing before serving as Director of Flight Safety from 2006 to 2008. Retired since 2008, Chris retains a lively interest in aviation history and flight safety.

What is meant by, "routine training flight?" Routine, as in regular, established, repetitive, unexceptional, or low risk? Since aircrew must maintain proficiency, they fly many hours repeating core sequences to maintain basic skills and combat readiness. But routine also brings comfort, and this can leave us dangerously complacent and unprepared for challenges that might pop up amid our routine. When planning a "routine training flight," how seriously do we consider the risks? As we look at this case of a training flight from 1956 that went terribly wrong, think about the routines into which you have fallen and consider whether complacency is a risk. Something may be waiting to bite you when you least expect it!

In 1956 the RCAF's frontline defence against Soviet bombers was the CF100 all-weather interceptor. Crewed by a pilot and navigator, the CF100 was on constant alert, expected to conduct ground-controlled interceptions in any weather. This demanded high proficiency in instrument flying, and for that purpose each squadron was provided with CT133 Mark 3 jet trainers. The T-33, with its tandem cockpits, was an effective way for pilots to maintain expertise in instrument flying, saving wear and tear on the combat ready CF100s. For that reason, pilots in CF100 squadrons were encouraged to fly the T-33 as much as possible, in all weather conditions.

The incident aircraft, T33, callsign Cudgel 5, departed Comox at 0947 hours Pacific Standard Time (PST) on 22 March 1956 on a routine training instrument flight of 1.5 hours duration with 2.2 hours of fuel on board. The actual weather at the proposed arrival time of 1045 hours PST was estimated ceiling at 600 feet broken, 1500 feet overcast, visibility 5 miles in light rain and fog, temperature 42 degrees F, dew point 40 degrees F, winds northerly at 18 knots. Embedded CBs in clouds and quite turbulent conditions around Comox were forecasted. The crew of two pilots from a local CF100 squadron had been instructors in Moose Jaw previously and were well trained and experienced. Their brief was to stay within 100 nautical miles of Comox, practice radar tracking and return to base for landing. Cudgel 5 climbed out and called on top at FL250 at 0957 PST. The Ground Control Intercept (GCI) controller tracked Cudgel 5 from departure out of Comox on a heading of between 020 degrees and 030 degrees magnetic to 60 miles and then to a left turn back to a heading of 190 to 220 degrees. The aircraft tracked directly toward the base within 15 miles of Comox when it disappeared from radar in a heavy weather return. The GCI controller transmitted at 1020 hours PST to Cudgel 5 the latter's position as "base 12 o'clock at 15 miles" to which there was no acknowledgement. Further attempts to

communicate with or locate Cudgel 5 on radar were fruitless. Cudgel 5 would not be seen again for 41 years.

Comox launched an extensive search. Searchers considered that Cudgel 5 had suffered either a radio failure or a complete electrical failure and would have attempted to find a break in the clouds, descend below the cloud base and then make a visual approach at Comox. The mountainous terrain near Comox and the inability of Cudgel 5 to determine its position accurately with onboard navigation aids made this a risky move. The searchers' confirmation bias was reinforced by reports from two vessels in the vicinity of Raza Island, north of Comox, of a low-flying jet and a subsequent explosion at about noon. Also, an RCAF search aircraft noticed an oil slick in the same area. Based on these reports, searchers made Cortes Island the centre of the search area, and from 22 March to 6 April 45,000 square miles were covered within a radius of 50 nm of Cortes Island. Nothing was found. Samples from the oil slick were inconsistent with a T33, throwing doubt on whether it had crashed near Cortes Island after all. Further, the explosions correlated with blasting activity at a quarry on Texada Island, farther south, casting doubt on those reports. The sightings remained unconfirmed, and no trace was found of aircraft or crew.

A Board of Inquiry (BoI) sat to examine the occurrence but had little to go on. The pilots had been medically fit and were judged to be qualified and competent. The aircraft had been serviceable, and the log set showed 585 imperial gallons of fuel on board. The ground crew stated that all the appropriate ground and pre-flight checks had been carried out. The BoI noted without comment that the pilots did not have AN/URC4 survival radios, as they had been withdrawn recently, and had not drawn bandoliers of extra survival equipment. The BoI theorized that Cudgel 5 had suffered a radio or electrical failure but could find no proof. As the aircraft and crew were missing, and available evidence scant, the BoI judged the cause as "obscure," and

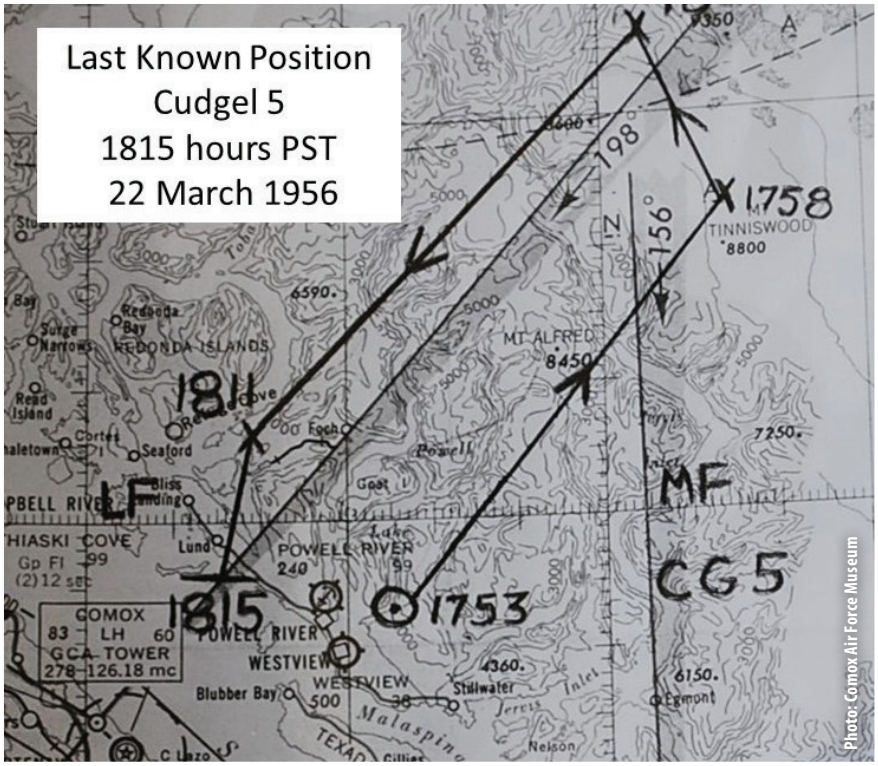

Photo: Comox Air Force Museum

made no recommendations. Six months later the pilots were declared legally dead.

Years rolled on and Cudgel 5 faded from memory. Then, in 1974 a hiker in the rugged Callaghan Valley on the British Columbia mainland near Whistler stumbled across an aircraft canopy in the deep bush. Authorities were alerted and determined that the canopy belonged to Cudgel 5, the T33 missing since 1956. The canopy had fallen to earth approximately 20 miles beyond the eastern boundary of the 1956 search area, an area that had never been covered. A search of the local area found nothing. In 1997 the Callaghan Valley finally gave up its secret of 41 years, the wreck of Cudgel 5 being discovered in a deeply wooded area sent investigators to inspect the crash site.

The investigators saw immediately that both ejection seats were missing, meaning the pilots had abandoned the aircraft prior to impact. No trace of the seats or the pilots' remains have ever been found. The 1997 investigators carried out a thorough technical examination and determined that Cudgel 5 had run out of fuel, with ground impact stopping the clock at 1050 PST. This meant that Cudgel 5 had flamed out and crashed 55 minutes before its expected arrival time in Comox. Yet, the fuel remaining indicator showed 358 gallons of fuel on board. After comparing the 1956 BoI and the evidence in the wreck, investigators concluded that Cudgel 5 had received less fuel than recorded in the maintenance record set, leading to an unexpected engine failure. Low on fuel and unable to land at Comox, the pilots had bailed out over the mainland, never to be seen again. But how had this happened? A brief explanation of the T-33 Mark 3 fuel system can help.

The T-33 engine was fed by a series of 13 interconnected fuel tanks. Each wing had a tip tank, three inter-connected leading-edge cells, and two inter-connected inboard wing cells, all of which fed into a fuselage tank which supplied the engine. Cockpit switches controlled the supply of fuel, and the tank

Continued on next page

Photo: Comox Air Force Museum

groups could feed the fuselage tank either individually or be gang-loaded. When fuel transfer pressure fell below 3 PSI in a tank group, a red warning light illuminated on the cockpit fuel control panel alerting the pilots. The overall fuel state was tracked by a 'fuel remaining' indicator in the cockpit. Its counter had to be manually reset after refuelling to reflect the actual quantity of fuel onboard and then counted down as fuel burned. The maximum fuel load was 677 imperial gallons, with 33 gallons unusable. The system was dependable, but pilots could not know the actual quantity in a tank group since all except the fuselage tank, lacked individual quantity gauges. If a discrepancy arose between the fuel quantity set on the fuel remaining indicator and the actual contents of the tanks, the pilot would be unaware until the warning lights of the feeding groups illuminated. Fuel shortages could also arise if loose filler caps allowed fuel to vent at altitude. Routine cockpit procedures required pilots to monitor their fuel state, so that any discrepancies might be discovered in time for alternative action to be taken.

The 1997 investigation could not determine the genesis of the fuel shortage but suggested that the pilots lost situational awareness when the fuel warning lights illuminated, flying farther east than intended to where they could not reach Comox. Investigators appeared to discount the theory of the 1956 BoI that a radio failure or total electrical failure had played a role in the occurrence, and certainly the 41-year-old wreckage provided no clues in that respect. As T-33s were still being flown by the CAF in 1997, the most useful preventive measures the investigators could draw from this historic occurrence was to remind pilots to monitor their fuel systems, maintain situational awareness and to take alternative action as soon as a discrepancy became apparent.

But Cudgel 5 deserves another look. Certain aspects of the 1956 BoI combined with evidence from 1997 can give us a clearer picture of that fatal flight. Why did the search effort fail to cover the actual track of the occurrence aircraft? Was radio/navigation or electrical failure a factor? How did Cudgel 5 run out of fuel? Most importantly, what could we learn from the long flight of Cudgel 5 that could help us today?

The 1956 search effort went down a rabbit-hole based on erroneous witness reports of a low flying jet and subsequent explosion near Raza Island. It happens often during searches that witnesses confound times and dates to develop a sincere but mistaken conviction that they saw the search object prior to its disappearance. In this case the reports reinforced the searchers' mental model that Cudgel 5 had attempted a cloud-break recovery near Comox that caused them to misplace the focus of the search. Worse, there was evidence available that Cudgel 5 might have tried to reach an alternate, but this was not followed up.

In the pre-flight weather briefing, the pilots had checked alternate airports in the Aleutians, Vancouver, Spokane, and Calgary, although a specific alternate was not filed since it was a local flight. Only one alternate had VFR conditions in its forecast: Calgary. Given the favoured scenario of radio or electrical failure on board Cudgel 5, it would have made sense to search the track from Comox to Calgary. This was never done. There were also very strong westerly winds at the upper levels that favoured Calgary as an alternate. Comox radar had tracked Cudgel 5 at FL250 with a ground speed of 480 knots on a track of 020 degrees true. This gave a tailwind component of 95 knots at 25,000 feet, a crucial piece of information known to the pilots. Calgary bears 075 degrees true at 420 nautical miles from Comox. Climbing to FL330 with an indicated air speed of 260 knots would have given a true air speed of 470 knots and a groundspeed of 565 knots. At that ground-speed, Cudgel 5 could have reached Calgary for a VFR recovery in 44 minutes with the fuel the pilots thought they had on board. Further, the crash site is slightly north of the direct track from Comox to Calgary. With the estimated wind of 220 degrees T at 95 knots, or stronger, and no onboard track guidance, Cudgel 5 would have set heading in the general direction of Calgary and likely drifted north of course by the time it flamed out. This scenario explains why Cudgel 5 was found in the Callaghan Valley. Unfortunately, no radar

stations covered the Comox-Calgary track in 1956, so Cudgel 5 left no trace for searchers to follow as it flew east.

But what if the Comox-Calgary track had been searched? Assuming they survived the ejection, the pilots were still behind the 8 ball: they had no survival radio and were short of survival supplies. The 1956 BoI noted that the AN/URC 4 survival radio had been withdrawn recently but made no other comment. The AN/URC 4 radio was used well into the late 1960s and could generate a tone that could be tracked at 100 nautical miles, with short-range voice capability. Without it, downed pilots had to rely on visual means of contacting a search aircraft, leaving them with slight chance of attracting the notice of a random overflight. The RCAF certainly recognized the need, and survival radios were brought back into service once the issues with the AN/URC 4 were resolved. The pilots also chose not to take extra supplies in survival bandoliers and relied on their seat pack contents only. When flying CF100s on far-ranging intercepts these extra supplies would help to sustain a crew that had to bail out hundreds of miles from the nearest base. But Cudgel 5 had been on a local training flight, so the crew likely perceived extra supplies as unnecessary. Despite a local flight near Comox being more challenging than a local flight near Moose Jaw from a survival point of view, the risk of flying without a survival radio or extra rations did not result in any mitigation by the authorities in Comox.

What of the 1956 theory of a radio or electrical failure onboard Cudgel 5? The 1997 investigation did not pursue this line of enquiry and assumed Cudgel 5 could have communicated with Comox radar but failed to do so for unknown reasons. Why did a radio/electric failure seem plausible in 1956 but not in 1997? In the 1950s the RCAF was operating hundreds of T-33s, flying tens of thousands of hours every year. This flying rate generated many flight safety occurrences, which led to regular reviews and articles in Flight Comment about T-33 issues. Among these were many accounts of problems with radios, navigation aids and electrical systems in flight. Further, the onboard radio and navigation equipment of the day was also subject to environmental interference, particularly CB activity, which caused radio compasses to read incorrectly, and NDB and radio receivers to operate erratically. CB activity was both in the forecast and seen on the radar during the flight of Cudgel 5, and Comox radar lost contact "in a heavy weather return," likely a CB.

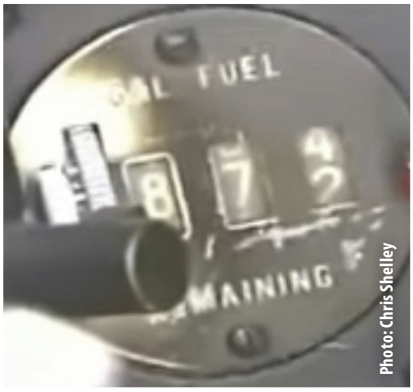

Photo: Chris Shelley

Additionally, the AN/CPS 5 radar at Comox was an early type that had challenges with range and bad weather in the mountainous terrain of the west coast, so it is not surprising it lost contact with Cudgel 5. The 1956 BoI also neglected to question why the pilots chose to carry out an instrument training sortie in challenging weather conditions with CBs present. Respect for the "Anvil of the Gods" was still developing in 1956. An "All-Weather Fighter Squadron" was exactly that, with all levels inclined to accept the risks that came from flying in "all-weather," even CBs.

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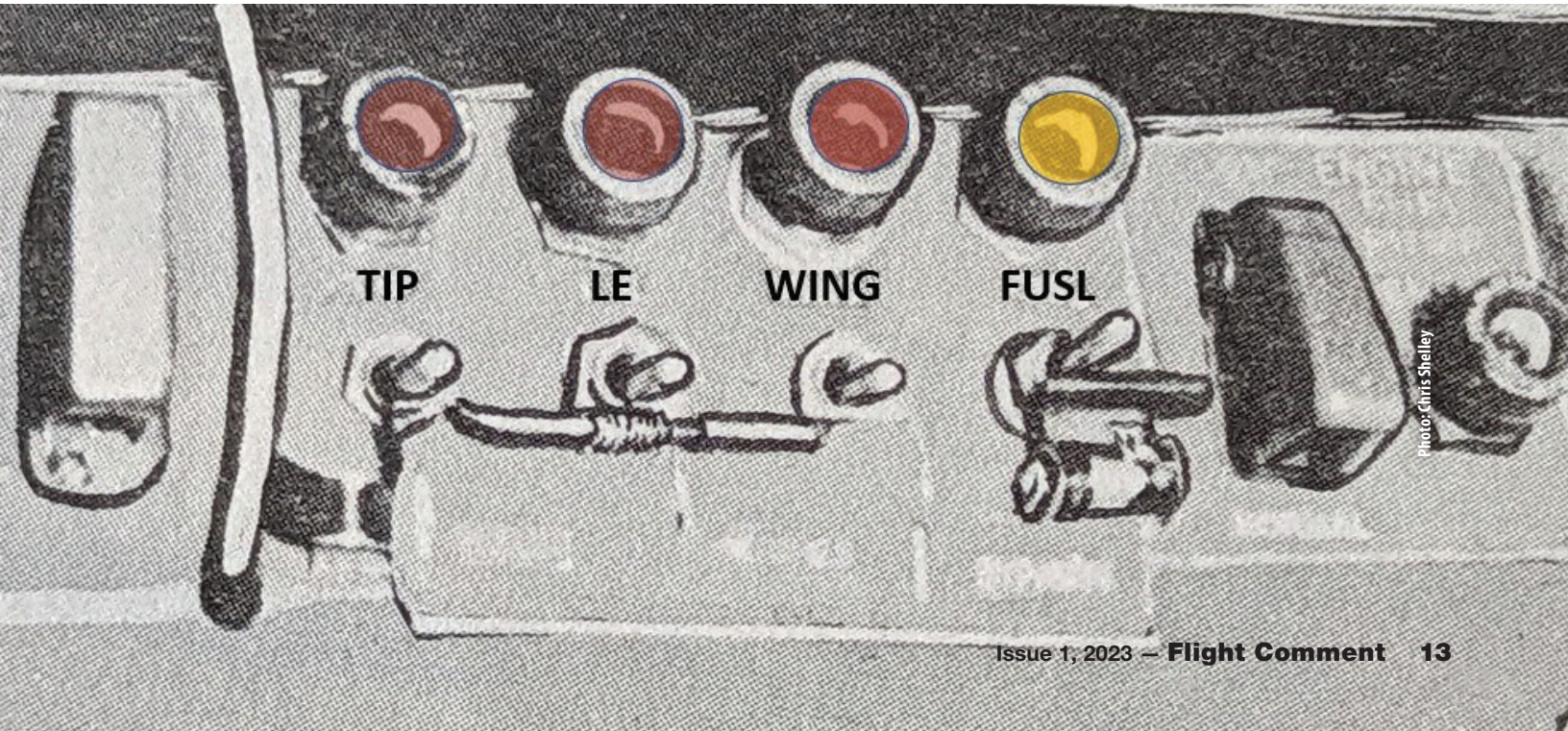
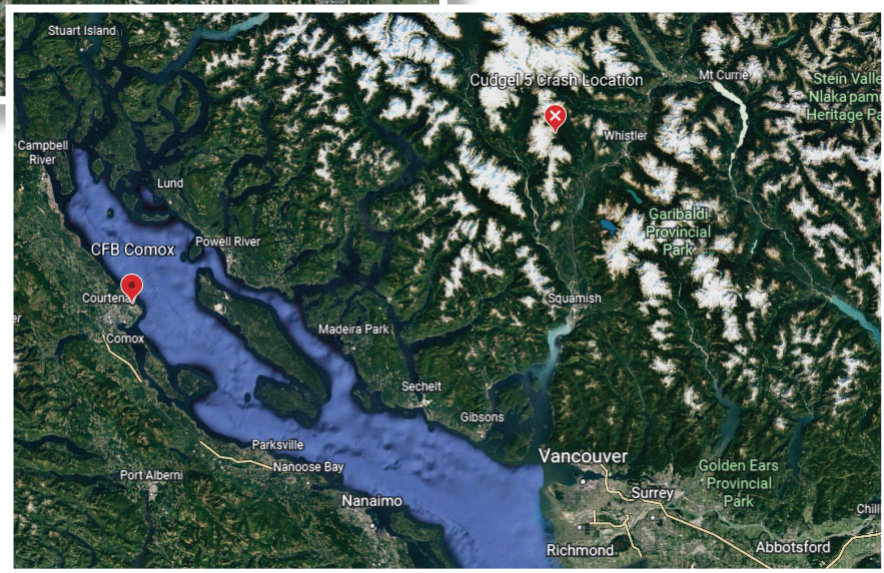


Photo: Chris Shelley



Flight Comment articles from the 1950s also reveal many occurrences where T-33s received incorrect fuel loads or where fuel vented in flight, leading to hasty action to save the aircraft. Pilots relied on the fuel state in the maintenance records set being accurate, and that ground crew had reset the fuel remaining indicator properly. Since wingtip and wing fuel tanks lacked fuel quantity gauges, pilots would need to remove the filler caps and dip the tanks to verify the actual fuel state before flight. This was not normal practice. Pilots relied on the ground crews to refuel the aircraft properly. While this worked 99 percent of the time, inattention or time pressure did produce the occasional error. For example, when multiple T-33s had to be refueled, it was common for one technician to reset all the fuel remaining indicators to the desired load prior to refueling to save time. This introduced the risk of error should the refueling sequence be disrupted or some problem arose with the bowser. In the case of Cudgel 5, the log set showed a total load of 585 gallons, with 493 gallons being added during refueling, whereas investigators determined that only 267 gallons had been added. This left Cudgel 5 unexpectedly and disastrously short of fuel in mid-flight, to where the only option was to reach for the handles and eject.

Cudgel 5's story is one of a crew who were well prepared and briefed to fly a routine but challenging training flight in line with the standards of the day, but who fell prey to a series of unexpected difficulties. Each might not have proved fatal, perhaps, but when combined they led to a 41-year gap between take-off and the discovery of the wreckage. The crew did all the checks and planning required in 1956 yet could not know that human error had left their T-33 with less than its advertised fuel load. They tested their reputation as "all-weather" pilots by flying in cloud with CBs in the forecast despite the known problems this might cause with onboard radios, navigation aids, electronics, and radar coverage. When faced with serious onboard difficulties, they made a logical choice to divert to a VFR alternate, Calgary, but were unable to communicate this vital change to the ground. The searchers' mental model of a local cloud break procedure was reinforced by confirmation bias when erroneous sighting reports led the search far from its object.

Forced to eject when the engine flamed out, this crew was a long way from anywhere with scant ability to summon help. They remain missing. What started as routine became exceptional and ended as a disaster and a mystery that endures.

So, take heed: the next time someone describes an activity as routine, think about Cudgel 5 and Check Six!

For Professionalism

For Commendable Performance in Flight Safety

Mr. Derek Coffey

Photo: Capt Paul Hamlyn

On 31 May 2022, while working in 103 Sqn Maintenance Bay, Mr. Derek Coffey, an Aircraft Structures (ACS) Technician, noticed a small piece of metal on the hangar floor. Unable to determine the nature of the metal piece or its use, he consulted an Aviation (AVN) Technician. The AVN Technician was able to confirm the metal item was a woodruff key and was used in the installation of the main gear box (MGB) oil pump assembly the previous day. This key provides a positive locking feature for the oil pump to shaft installation. Mr. Coffey conferred with the Crew Chief on his findings, leading to the disassembly of the recent oil pump installation. This investigation confirmed the woodruff key was missing from the oil pump installation. Mr. Coffey is commended for his keen situational awareness in spotting the woodruff key on the hangar floor and following up to determine if it was an aircraft part.

Without Mr. Coffey's keen attention to detail and follow-on actions to determine the metal part was from an aircraft, there is every possibility the MGB oil pump could have failed resulting in the MGB being operated without sufficient oil pressure, potentially leading to a significant emergency.

It is for these reasons Mr. Coffey is well deserving of the *For Professionalism* Award.

DM/CDS Excellence in Defence Award
Excellence in Profession

Left to Right: LGen Frances Allen, VCDS, Mrs. Pamela Lewis, Mr. David Hurst and Mr. Bill Matthews, Deputy Minister National Defence.

The Celebrating Excellence Award represents the highest expression of recognition and highlights the achievements of exemplary individuals and teams who have provided outstanding service to the Defence Team. In total, 22 Celebrating Excellence Awards are being presented across seven award categories to hard-working individuals and teams across the Defence Team. The DM/CDS Excellence in Defence Award is one of those categories.

This year's recipients for the DM/CDS Excellence in Defence Award – Excellence in Profession – are Mrs. Pamela Lewis and Mr. David Hurst from the Directorate of Technical Airworthiness and Engineering Support (DTAES). They are awarded for their outstanding leadership and contribution to the DND Technical Airworthiness Program and as experts in the domain of military airworthiness, both nationally and internationally.

Mrs. Lewis and Mr. Hurst have been and continue to be key players in ensuring that RCAF flying operations are conducted in a safe manner. Their work directly supports the aim of the Flight Safety program which is to prevent accidental loss of aviation resources while accomplishing the mission at an accepted level of safety.

Mrs. Lewis and Mr. Hurst are leaders of the highest caliber and the Director Flight Safety, along with the entire Flight Safety team, would like to congratulate them for being the recipients of such a high-level recognition.

DOSSIER

NEVER STOP FLYING THE AIRCRAFT!

This article first appeared in the US Army FlightFax magazine May 1998. It is reproduced here under permission for Flight Comment.

DFS Comments

This article is about an earlier US Army CH47 model and should not be confused with the current RCAF CH147F now in service with the CAF. During the investigation that followed, the situation could not be duplicated by maintenance, but an actuator problem including possible contaminants from the flight hydraulic systems was suspected. Several preventive measures have been implemented since that incident.

The main lesson learned applies to all types of aircraft as a reminder that despite all the odds against you, never give up and keep flying the aircraft.

Introduction

MAJ Herb Burgess, US Army Safety Center

"First and foremost, control the aircraft."
"Fly the aircraft all the way to the ground."
"Never stop flying the aircraft."

These are all words our instructors have used to drive home the important point of aircraft control during simulated emergencies in the aircraft and simulator. They stress the importance of controlling the aircraft when responding to real emergencies: "The most important single consideration is aircraft control."

In 1998, four crewmembers survived inverted flight in a CH-47 because the pilots never stopped flying the aircraft – even when it appeared the aircraft was unrecoverable.

The two pilots, the flight engineer, and a mechanic had done everything right. They had spent two days completing inventory, inspecting, and test-flying the aircraft they were receiving from the depot.

Although not required, they had performed a full maintenance test flight of the aircraft and found and corrected a few minor problems. They were more than merely satisfied that the aircraft was suitable to accept and fly; they agreed that this was one of the smoothest flying CH-47s they had ever flown.

The first leg of their planned 2-day mission back to their unit was without incident. They were about an hour into the second leg-and only 18 minutes from their destination when they encountered their emergency.

The PC, (pilot in command) who also was an instructor and maintenance test pilot, when the nose of the aircraft began a slight pitch down applied aft cyclic to correct for what seemed to be a normal divergence in the CH-47. But as he applied aft cyclic, the nose began a slow left yaw that he could not control with full right pedal.

Continued on next page

The aircraft then began a slow left roll to about the 90-degree point and then continued with what seemed to be a snap roll through the remaining 270 degrees.

But it didn't happen that fast; it felt like an eternity to the crewmembers. As the aircraft inverted, the PI, (pilot/co-pilot) figuring he had nothing to lose, joined the PC on the flight controls. (I am not advocating that two people try to fly an aircraft, but this action confirms that both pilots knew they were in a desperate situation.) Instinctively responding by doing what they had been trained to do, the pilots continued to fly the aircraft even as they saw the ground through the greenhouse and it appeared there was no hope of recovering control of the aircraft.

The aircraft miraculously returned to a wheels-down attitude at about 250 feet above ground level (AGL). The pilots were able to control the aircraft to a near-normal touchdown, although full right pedal was still necessary to control aircraft heading. As the crew performed an emergency shutdown, the aft rotor blades contacted the fuselage since the damaged droop stops did not operate normally.

They had, in the words of the PC, "killed the beast" – all with only minor injuries to the mechanic, who had been standing at the onset of the emergency. The aircraft was severely damaged, but four extremely valuable aviation resources who unexpectedly found themselves in a life-or-death situation that was not of their making, are still with us today because they did not give up.

The crewmembers share their perspective of the stories below. What you'll read comes from the first-person accounts they gave only hours after the incident.

View From the Cockpit

CW3 Bric Lewis, Pilot in Command (PC)

It was cold, but we couldn't have asked for better weather – you could see forever. We were going along at 1100 to 1500 Feet AGL, running between 130 and 135 knots indicated, and I was letting it float. I didn't have altitude hold engaged. I had my feet resting on the pedals and my hands lightly monitoring the controls. The aircraft would float up, and I'd bring it back down to between 1500 and 1100 feet, depending on the terrain.

I'd made a correction in altitude because it was climbing a little bit; we were somewhere around 1100 feet AGL when I felt satisfied that I was at an altitude that was okay. We were about 135-140 knots when I noticed that the aircraft nosed over. I let it go for a second, and then it yawed. The tail end was coming around the right side. I applied right pedal and a little bit of aft cyclic to stop the descent. It got worse. The yaw rate increased dramatically, and I had full right pedal. It continued around and Pat, the co-pilot (PI), grabbed the dash. I didn't hear anything from the guys in the back. There were no indications on the dash that there was anything wrong, no lights, nothing! And then the aircraft got on its side. Pat was screaming, "Catch it, Bric! Catch it!"

Photo: Sgt Matthew McGregor

At that point, I had the pedal jammed against the stop, and it was still yawing to the left. By this time, we were on our left side. The seat of my pants told me that the tail was coming around, so I applied full right cyclic.

The stick wouldn't move; it was like it was in concrete. Just about the time I noticed the stick wouldn't move, the nose pitched up, and the aircraft rolled over on its back.

I yelled, "Oh, God!" and Pat got on the controls. I didn't know which way we were going. All I knew was, it's upside down. I was looking through the ceiling, and I could see the ground rushing up towards us. Pat was beneath me-from where I was, I could see the top of his head below me, and the aircraft was falling upside down. The nose was low, and I knew that the cockpit was going to hit first. I still hadn't heard anything from the crew chiefs. I could sense Pat on the controls with me. And they weren't moving.

I saw my wife.

Then the stick hit me in the leg, and I said, "This thing ain't gonna kill me!" We were flopping the cyclic around, but it wasn't doing anything. We were getting fast, real fast. I had that elevator feeling in my stomach. And I thought, "This is the way it is. They lied. They tell your family it's instant." But you have that two or three seconds, and you know what's going on. It made me mad.

I remember thinking to myself, "It's upside down. There ain't nothin' you can do."

And then it flipped over! I don't know why; I don't have any idea why it did. Pat was on the controls with me. And we were FAST, fast. I looked at the airspeed indicator, and it said zero. I said, "No! It's FAST!" And he screamed, "250!" I thought he was calling out airspeed, but he meant altitude. The ground was rushing up.

Something flashed by the window, and I said, "We're close to the ground." I honked back on the stick, and Pat was with me. It was yawing terribly to the left, and we went-I know he was there-full right pedal and applied just as much aft cyclic.

I felt it lift. And I thought, "Yeah, we ballooned. Airspeed's coming back." I looked at the rotor, and it was coming back down through 115%- I don't know where it had been. And it was SCREAMING. I thought, "I'm gonna MAKE it!" It was slowing down; everything was coming in good. We *had* back some altitude, and there was nothing in front of us. Just level ground. I thought, "Yeah, we're gonna make it." And then the nose kept coming up. "No," I thought, "we're going to end up stopped, but we'll be 25 feet off the ground!" So we pushed the stick forward, and the nose came down. We were getting ready to come down. This time it was SLOW; it was REAL slow. I don't know how slow it was. We got ready to cushion, but I couldn't lift the thrust. With all my strength, I couldn't lift the thrust.

I could feel that little jump you get when it's in the hangar and you move the controls- a little inch or so of movement. Pat was pumping it, and I was pumping it, and it wouldn't move. The aircraft was yawing BAD to the left, and we still had full right pedal. Finally, I just flared a little bit more with the cyclic, and the back wheels touched. And then the front wheels touched. And it STOPPED. We didn't hit brakes; it just stopped.

For the first second or two-and it was SCREAMING-we sat there. And then WE started screaming, "We made it! We killed the beast!" And we gave each other the big high-five right there in the cockpit.

Pat did the emergency shutdown while I tried to center the controls. The cyclic came back. We could move the thrust. The right pedal was stuck all the way to the front. And Pat was excited. He was hollering, and the blades were starting to wind down. And then he asked the crew chiefs to see if there was any fire. But we could tell; it wasn't coming apart. I mean, it felt *normal*. Pete, the flight engineer, said, "I don't see any fire." That was the first we'd heard from him.

Then there were three real fast bangs. The whole airframe shook. And then three more, not as fast. After the first three, we knew what it was. Pat tried to lean down over the console, and I tried to get down between the pedals, but our shoulder harnesses were locked and we were fighting with that. I was thinking, "Man, this thing is still trying to kill us!"

Suddenly, it came to a stop. Everything stopped. We didn't holler again. We just shut off the battery. Pat was going to go through the checklist. "Just leave it like it is," I said. "Just leave it. Just make sure we're all okay." We got out, and we were pumped. We looked at it; it was torn up, but we were on the ground.

CW2 Pat Nield, PI (Pilot/Co-Pilot)

We were at about 1000 to 1100 feet AGL, between 135 and 140 knots. The aircraft was tracked really smooth; it flew better than anything I'd ever flown out of Corpus. I was looking down at the map when I felt the nose pitch down, and I got a little bit of a shudder. I looked up and saw that the airspeed had picked up. At that point, Bric, the PC, started pulling back on the cyclic. That's the last time I looked at him because we started an abrupt yaw that made me grab onto the dash. My perception is that the nose pitched UP and continued to yaw really strongly. At this point, I knew things were bad; I didn't think we were going to be able to recover. All of a sudden, the aircraft just snapped over; it felt like it went upside down. I was seeing ground through the greenhouse. Maps were flying everywhere in front of me. I heard Bric say "Oh, God!" a couple times and things got really frantic. I remember thinking, "Oh, God, this is bad if HE's saying 'Oh, God'," because Bric's the best pilot I know.

Continued on next page

When we went upside down, I figured I had nothing to lose, so I went ahead and got on the controls. I was fishing around, but nothing would bite. It was just like the rotor system was unloaded. I couldn't see anything inside the aircraft, because everything was shaking too much. There was lots of noise, lots of vibration.

I was trying to obtain a ground reference point; I didn't get one until I could see the ground through the windscreen right in front of me. It was just rushing up, and we were turning. At that point, I remember trying to put in full right pedal, and I felt a response. I don't know if that was the response I felt or the billions of others I was doing. But something bit. Something took hold, and we got an input. I can remember pulling back aft left, and the aircraft started coming up. It was then that I realized that Bric was on the controls with me. He was still there. When we were upside down, I had no idea.

When the aircraft finally recovered, we were about 100, 200 feet AGL and screaming out of the sky. We were both pulling back on the cyclic, flaring the aircraft. We started getting to where we were flared a little too much, and we thought the bottom was going to drop out on us. We attempted to pull up on the thrust and got maybe an inch at the most. Thrust just wouldn't go anywhere. So we started pushing it through. Bric said later that I was yelling out instructions; I don't really remember that. I just remember pushing the stick down.

We made a pretty good approach angle, and I remember touching down at what I'd estimate at 10 to 20 knots. It was really a relatively smooth touchdown. At that point, I released the controls, turned off the AFCS, and took both engines to stop. After that, I told the chief to check for fire on board. Then I looked at Bric; we got a little emotional and high-fived each other.

We thought it was over. And that's when the rotor blades started slamming into the fuselage.

I knew that was a pretty bad thing because it could come through the companionway and chop up a crew chief or get Bric and me up in the cockpit.

But, luckily, it slowed down and stopped.

I don't know how this thing righted itself other than God reached down and snatched this aircraft and turned it over. But it was like Bric and I had been joined at the hip at birth. We had worked together real well.

View From the Cabin

Pete Biessener, Flight Engineer

We were in level flight. I had done a ramp check, so I was looking at my watch and listening to the pilots and looking out the left forward window and thinking I probably needed one more ramp check before we landed. I looked over at Bill, the mechanic, in the other seat. Suddenly, the aircraft pitched down, and it started picking up speed. I thought, "That was kind of a strange descent." And then it started yawing. I thought, "Gee, we're out of trim. This isn't right." And then there was this tremendous lateral g force. The aircraft was really popping, and I thought, "This is really bad." I saw Bill wasn't in his seat anymore; he was up by the right-hand post of the companionway, right by the heater closet. I saw the ground rotating around in my window, and I thought, "Oh, Jesus. We're going upside down."

We rolled to the left. Out the left window, the ground was going around. And then Bill was up by the ceiling. We were upside down, and the aircraft was shaking really bad. "This is it," I thought. "We're upside down, and this aircraft's coming apart."

I heard Bric say, "Oh God!" And then it got really quiet. I never heard anything else from anybody.

I don't know why, but I started thinking, "I gotta get Bill." He was up on the ceiling. I was being pulled all over in my seat, but I was there; my seatbelt was holding me in. And I had to get Bill because he was flying. I could see the terror in his eyes. The next thing, he kinda came down on top of me, right in front of the radio closet, and I held on to him.

It started getting really noisy, a lot of wind noise. Everything was really FAST. Like the engines and the rotors-really noisy. Bill was trying to get up, and I was just hanging on to him. And then I looked out the window. The ground was not above us anymore. It wasn't on top of the window, it was on the bottom. And I thought, "God, we're right side up."

The ground was coming up really fast. I was thinking, "I have to get Bill into a seat! He has to get into a seat because this is going to hit hard." He was trying to get up and go across the aircraft, and I was pushing him over there. He was looking at me, and I was pushing him. I was yelling, "Bill, get in the seat!" He grabbed the seat, and he fell back on the floor. And then I started calling, "Put your seatbelt on!" I don't know why, but I grabbed mine, and it had become disconnected. I looked out the window, and the ground filled the entire window. Bill was in a seat, but he didn't have a seatbelt buckled. I rebuckled mine and again looked out the window. The ground was right there, and it wasn't moving. I thought, "This is impossible; there was no impact!"

Everything was really quiet, and I got up. Looking down, I saw my mic cord on the floor; that's when I realized I had come unplugged. That's why I hadn't been hearing anything. I picked up the cord and plugged it in. From the companionway, I looked up front at Bric and Pat. They said something like, "We did it!" and gave each other a high-five. Then Pat said, "Okay, guys. Let's check for fire. We're okay. We're on the ground."

So I turned around, and that's when I noticed that the entire cabin was a mess. All our baggage had come out from underneath the cargo straps; it was thrown everywhere. I saw an oil can underneath my seat. The first-aid kits were on the floor. I couldn't believe it. I turned and went to the ramp and hit the ramp down. I stayed on the ramp. I didn't want to get off; I looked out to the left at the engine. There was no smoke or fire or anything. Then I turned to go to the other side. That's when the pounding started. Everything started hammering, and I looked up at the aft transmission. I started moving fast; I wanted off that ramp really bad. I'd seen a Chinook where the aft transmission had fallen out and onto the ramp, and I didn't want to be there. Somewhere toward the front of the ramp, I fell down. At that point, with all the shaking, I realized that the blades were actually pounding on the fuselage. As I was crawling on the floor toward the front, I saw that Pat and Bric were laid over in their seats. Pat was down by the center console, and he started hollering, telling me, "It's okay! Stay back! Stay back!"

I guess I stopped moving near the cargo hole. I was on the floor, and that's when everything just got quiet. And everything quit moving. I got up and took my helmet off. Bill was pulling on the door and looking to the back. When everything stopped, he kinda stood up, holding his back. His face was cut below his eye. He was hurting.

I looked around. I'm still amazed by the way everything flew around the cabin. The scary part was the oil cans that were underneath my seat. I remember thinking that I don't always lock the ramp fire extinguisher in; a lot of times I just set it in its mount. And I thought, "Yeah, this time I locked it in, and it stayed there. It's a good thing." I guess I thought a lot about securing equipment in the aircraft; I kept thinking about that. I was amazed. Stuff came out from behind the seats. It was in the cockpit. I mean this stuff that had been properly secured was thrown *everywhere*. The crossed straps on the boxes of gear worked well. I have to remember this, that it's not all just forward loading or a hard landing or something. This stuff could be thrown *sideways* out of its straps.

We were just really happy. We thought that if they ever put this aircraft back together, we want it back. Because it stayed together. I mean, no matter what it did wrong, it still *stayed* together.

At the hospital, I started thinking that this was really a good day. Because we should have been a big pile, just a smoking hole. Chinooks don't go upside down and come back to life. They just don't do that. It's like God reached over and set us right side up again.

Bill Gorenflo, Mechanic

We were flying along. Pete does his ramp check. I'm impressed with ol' Pat; I can see him sitting in the front seat. He's got his map, and he puts an X and says, "I've got this tower over here. Bric, did you see that tower?" I mean, they're a good team. And Pete and I give thumbs up; these guys are *all right*. I said, "Man, it was a good trip." The aircraft's flying smooth. We're just flying along, fat, dumb, and happy. Another ramp check comes up, and Pete says, "Systems okay. Ramp check good."

It was cold. We had the heater going, but I was cold, so I went to my suitcase and got my flight jacket out and put it on. I don't know how much time went by before I decided to unbuckle and see how ol' Bric was doing up there. I had just unbuckled my belt and started to get up when, all of a sudden, it's like catching one of those big updrafts. As I was getting up, it just threw me, slammed me up on the structure between the heater and the closet area. It Just slammed my face up there. And I'm telling you, holy hell broke loose.

I turn around, and it slaps me up against the radio compartment. I'm airborne. I'm going, "What's going on?" It rips my headset off, and I can't hear anything but transmissions screaming. I can't see anything. I mean, my face hit that post and then, like when something pops you in the eye and you see a little bit of stars, and then all of a sudden, I'm spinning back toward the closet. I can't grab anything. Pete's in his seat, strapped there. He's trying to grab me. All I know is we're just rolling. I'm going, "Oh God, no!" And I picture my 6-year-old boy right there. And I go, "God, no!" And Pete's trying to hold me, and I'm looking at that seatbelt over there. I say, "Oh, God, no!" I know-we're waiting for the impact. You know, here comes the impact. It throws me to the floor, and I'm trying to go for the seatbelt over there. It's just happening so fast.

I'm on the floor. When the aft gear touches down, I'm still on the floor. Finally, I look at Pete. He mouths, "We made it." I can hear the pilots hollering up front, and I look up there. All of a sudden, the pounding starts.

I knew THAT sound; I knew the blades wanted to come through. It was just POW, POW, POW! I try to reach the knob to the lower cabin door so I can get the hell outa there. But the handle was turned; it was catching the top cabin door and I couldn't get out. I looked back, and Pete already had the ramp down.

He makes a beeline-I think he set a speed record for the low-crawl. Finally, it gets quiet. I look up. My face is hurting; my back is hurting. And we get out of there.

It's cold out there; I'm shaking and I'm hurting. I'm thinking, "What just happened?" I go back in. Pat's still inside, standing there. We just hug each other. I say, "Man, you guys saved our lives. What in the world...?" He says, "I don't know. Just thank God we're on the ground."

All I've got to say is that those two guys were a team up there, and with their ability and their experience and their training or whatever and the grace of God got us out of that or else it would have killed all of us. I don't know how they did it.

DOSSIER

The Dirty Dozen Redux — 12 Common Causes of Aviation Mishaps!

by Col (Retd) Steve Charpentier

Everyone in aviation must have heard about the "Dirty Dozen." If you haven't, it first referred to a blockbuster 1967 American film about 12 renegades conducting an essential sabotage mission behind enemy lines during WW2. The term also refers to 12 of the most common human factors behind accidents or incidents in aviation maintenance. The concept was developed by Gordon Dupont in 1993, while he was working for Transport Canada. It developed into part of an elementary training program for Human Performance in Maintenance. These 12 elements are the root cause of mistakes and have since become a cornerstone of Human Factors in Maintenance training courses worldwide.

Although there are more than 12 human factors to explain common mistakes and errors, I have kept with the title "Dirty Dozen" but expanded past aviation maintenance. Several "Dirty Dozen" concepts can be extracted for different aviation groups including but not limited to ground crew, aircrew, logistical support, and air traffic controllers. In this article, I am focusing on the last decade of RCAF investigations and list the commonalities for both ground crew and aircrew.

Let's just say that my take on the RCAF Dirty Dozen is a method to encourage an open dialogue concerning human factors in order to increase awareness, diminish their influence and ultimately prevent accident reoccurrence. Here is my list and suggested countermeasures based on several discussions during annual visits, various research, RCAF investigations, and reports.

Communication

Failure to transmit, receive, or provide enough information to complete a task. Only 30% of verbal communication is received and understood by either side in a conversation. The majority of absorption occurs during the first and last part of a conversation.

- Be clear and concise.
- Repeat and summarize at the end what is expected.
- Make certain the task is understood.
- Use checklists and adequate verbal procedures.
- Never assume anything.

Distraction

Anything that draws your attention away from your current task. Distraction is the number one cause of forgetting steps.

- Use checklists.
- Ensure technicians/aircrew are not disturbed by establishing distraction-free zones in critical areas.
- Turn off personal wireless devices.
- If disturbed, follow the 3-steps back process when returning to task.

Photo: Cpl Roxanne Shewchuk

Complacency

A general lack of vigilance and loss of awareness to potential dangers that appear during routine activities perceived as risk-free. Too few challenges, repetitive tasks and overconfidence can result in boredom and complacency.

- For maintainers, always expect to find faults!
- For aircrew, ask yourself: "what should I be doing to improve this flight, what am I possibly missing, what are my next steps?"
- Avoid working from memory and assuming that something is OK when you haven't confirmed it.
- Challenge yourself to stay vigilant.

Ineffective Supervision

Ineffective supervision is often a latent cause of multiple cascading effects that lead to human factors mishaps. It can be related to inadequate planning, poor risk management and failure to monitor and correct unsafe practices.

- Lead, communicate and "walk the talk."
- Ensure risk is known and managed at the right level.
- Trust but verify work execution.
- Plan adequately and control external pressures.

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Lack of Knowledge

Aircraft systems are so integrated and complex that it is nearly impossible to perform tasks without substantial technical training, current relevant experience and accurate reference documentation. Furthermore, systems and procedures can change frequently and employees' knowledge can quickly become out-of-date.

- Continue seeking professional development.
- Never make assumptions.
- Ask when you don't know.
- Always refer to checklists and publications.

Pressure

Pressure is to be expected in the military environment. It may be direct, or indirect pressure from the organization, colleagues or ourselves. Supervisors have a key role to shield technicians and aircrew from external pressure.

- Learn to communicate your concerns.
- Take the time to do the task right.
- Be aware of your limits, ask for help.
- Leave the time stressors to the supervisor.

Stress

A physical, chemical, or emotional factor that causes physical or mental tension. It can be acute and chronic. Learn to recognize and manage stress before it affects you.

- Discuss and rationalize your thoughts.
- Take short breaks when needed.
- Practice breathing and relaxation techniques.
- Seek help to manage chronic stress.

Fatigue

Physical or mental exhaustion due to prolonged physical activities and/or mental stress. Fatigue impacts our ability to concentrate, remember and make decisions. Studies show that being awake for 24 hours is the equivalent of having .08 alcohol blood level. It is a proven fact that we tend to underestimate our level of fatigue and overestimate our ability to cope with it.

- Watch for symptoms of fatigue in yourself and others.
- Have others check your work.
- Get adequate rest.
- If chronic, seek medical help.

Not Taking Ownership

We need to take full ownership of our work and the work of others; tasks, operations and Flight Safety are team efforts. We are all responsible for the safe outcomes of all tasks. It is the "not my job" attitude that opens the door to incidents and accidents.

- Understand your job and the jobs of others.
- Ask if unsure about your work or the work of others.
- Report any safety concerns.

Overconfidence

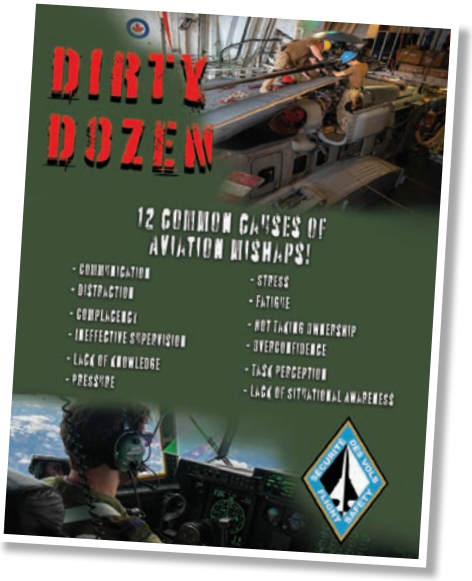
A safe "can do" attitude is desired in any military, but overconfidence in our abilities has triggered multiple incidents and accidents in aviation.

- Don't gamble with your task execution.
- Know your limits and ask for help.

Task Perception

The task could be perceived as being so important as to disregard procedures, cut corners and take unjustified risks. The more a task is perceived to be important coupled with operational timeline pressures, the more it leads to procedural deviation.

- Be realistic about your task.
- Focus on your work, not on the timeline.



Lack of Situational Awareness

For pilots, spatial disorientation has caused at least four catastrophic accidents in the RCAF in the last 20 years and possibly more incidents related to depth perception during autorotation and landing. For ATC, lack of situational awareness can lead to airspace violations and near/mid-air collisions. For ground crew, there are several towing events related to confusion and loss of situational awareness.

- Reinforce aeromedical training.
- Trust your instruments.
- Understand and follow policies and procedures needed to complete a task.
- Learn to see the big picture and predict the possible results.
- If it doesn't feel right, take action to remove your concern.

WE NEED THAT PLANE

by MCpl Andrew Montgomery

This story starts off with our crew departing Cold Lake, AB for an operation in the late summer of 2019. I was being deployed on what I thought was going to be a very mundane mission as the Tool Crib and Air Maintenance Support Equipment (AMSE) In-charge (I/C). Upon arriving, I quickly realized that my niche expertise as the unit's Fuel Systems and Aircraft Confined Spaces subject matter expert (SME) would be relied upon, as we had a severe fuel venting scenario on one of our aircraft on the first day of operations. This aircraft would not be available to perform its assigned duties for an indeterminate amount of time.

As the first week flowed into the second, and as aircrew began meeting their NATO mandated timings, I was hard at work troubleshooting the aircraft and determined that this would not be a quick fix. It would require maintenance provided by a 2nd line facility. The weight of the situation began to set in as both the Squadron Aircraft Maintenance Officer (SAMEO) and Aircraft Maintenance Officer (AMO) pulled me aside and informed me that everything I required would be on its way without question, except a Mobile Repair Party (MRP) from our home unit due to manning shortages. I handed in my wish list of equipment, and a list of personnel on-site who held qualifications required to create a "confined spaces" team.

Less than two weeks later, the first shipment of equipment arrived: a combination from both fighter wings under the caveat that it be returned by a specific date, as shops had to shut down to provide said equipment.

While our team set up the workspace, unbeknownst to me, some equipment and safety procedures had not been properly set up. Under the extreme pressure to have a functioning asset for the operation and return the equipment by a specific deadline, I had not initially checked the equipment and spent most of my time in a confined space with malfunctioning gear. I discovered several items in the aircraft fuel system that were incorrect and worked hard to complete the maintenance on time. During the Foreign Object Damage (FOD) checks and clean up, I began to feel the effects of prolonged exposure to fuel vapours. I became ill for multiple days, meanwhile the confined spaces jobsite shutdown, and the equipment was returned to Canada without the aircraft being tested. Perhaps not the best course of action, but we had little control over the time constraints.

During the flight functional, the venting snag re-occurred and we were unable to gain access to the equipment that had just departed!

We had to once again wait for some equipment to be shipped, however, once those items arrived, it was discovered they had never been calibrated and could not be used. This, added to the growing pressure that we were now at the halfway point of a five-month mission without flying the aircraft once, did not make for a good combination. It was after the second shipment that the tensions grew and ideas of "cutting corners" became regular discussions.

At this point, feeling uncomfortable with where this was leading, I involved a member who was a confined space SME on multiple fleets. After hearing what was happening and understanding the situation, they stepped forward and became a commanding force in safety and shut everything down. We then spent an additional two days building the proper equipment. A second confined spaces workspace was set up, maintenance was carried out and the aircraft returned to a mission state roughly a week later.

Regardless of the pressures applied upon a team for whatever reason, even if the directive comes from a higher rank—if you know something is unsafe, say something. Be mindful of your surroundings and know your limits. Follow your gut feeling and talk to someone if something seems off, even if it seems like it is a "no fail" situation. Safety is the key proponent of the Flight Safety model and it's how we avoid dangerous and unnecessary situations.

Photo: S1 Zach Barr

Photo: MCpl Mathieu Gaudreault

NIGHT ERRORS

by Capt Olivier Savaria

I've always loved to fly at night. The calm air, the stars, and the near absent radio chatter have been a personal favourite of mine ever since my post-private pilot licence days. On the Hornet, the addition of night vision goggles (NVGs), air-to-air refuelling, weapons employment, and other tactical tasks made night flying even more satisfying. However, having been to Alert, NU early in my career, the cause of the Boxtop 22 CC130 Hercules night crash was always very salient in my memory: unforeseen weather, spatial disorientation, false horizon, hidden obstacles, black hole effect, etc. have always been taken seriously in my flying career.

This night was no different as I took off solo in a CT155 Hawk for regular night currency training. I felt at ease and in my element. The night was unusually dark, but the flight went well consisting of a very benign mission. On the last circuit, ATC requested I extend my downwind in order to accommodate another aircraft on final approach to land. I did so and began my final turn much farther away than what is common practice. In the last third of the turn, lining up with the extended runway centreline, I noticed four reds on the Precision Approach Path Indicators (PAPIs), and my altitude showed as low as I'd expect to be ¾ nautical miles (NM) from the runway, but I currently was four NM away! I immediately levelled out until reaching a 3-degree glidepath to the runway and landed. I was angry at myself; I'm the guy that keeps telling students and colleagues to treat night flying like IMC flying. I always recommend using the Instrument Landing System (ILS) or visually use the PAPIs on approach if possible, and not let complacency set in.

My mistake was that I had always felt that I was nearly immune to most of the night illusions, because I knew about them, planned and trained for them. Yet here I was, getting completely caught off guard by the *black hole effect*. Had there been an obstacle between my final turn position and the runway threshold, I could have suffered the same fate as the Boxtop 22 CC130 Hercules crew. All it took was 10 seconds of staring at a runway without crosschecking the PAPIs or my dive angle. This wasn't a difficult nor complex mission, and I wasn't busy with other tasks, wasn't operating near the limit of my capacities or that of the aircraft.

I had simply failed, for a few seconds, to follow basic night flying recommendations. The darkness made sure to remind me I was being a fool.

Approach Path Mishap

by Sgt Matthew Reicker

My experience with flight operations has been primarily with Small Uncrewed Aerial Systems (SUAS). As an Operator, Detachment Commander and Troop Sergeant Major, I was specifically familiar with the CU165 Scan Eagle and the CU172 Blackjack. I have deployed the capability both operationally and domestically and, unfortunately, witnessed Flight Safety occurrences within both settings and with both platforms.

The most significant incident was while deployed on Her Majesty's Canadian Ship (HMCS) Charlottetown in support of Operation ARTEMIS. We had just completed a night mission and were preparing to have the Aerial Vehicle (AV) recovered. During this time, our unit was employing the CU165 Scan Eagle UAS, 4 Regt members were tasked to execute in-flight procedures, while the original equipment manufacturer (OEM) civilian company was contracted to conduct the launch, recovery and maintenance procedures.

We had just handed the AV over to the OEM and they were continuing with the recovery procedure. The remainder of the crew and I reported to the flight deck to assist with the AV once it had been recovered. All AV recovery approaches required the AV to fly on a preconfigured flight profile advancing from Stern (Rear) to Bow (Front) of the ship. As we waited on the AV to be on it's final recovery approach, the OEM operator who was in command of the AV communicated that the AV was on final approach. We were all confused since we should have been visual with the AV's strobe and navigation lights on final, astern of the ship. As the operator was counting down that the AV was on short final and looking clear for recovery, it was then that we realized that the AV approach settings were configured in the wrong direction, resulting in the AV approaching from the ship's bow and nearly striking the bridge of the ship.

As a supervisor, it is critical to trust but verify all parameters that are put into the AV are correct and to ensure all Flight Safety procedures are adhered to. There should have been confirmation upon handover to ensure both parties were on the same page to ensure proper situational awareness. Another important aspect to think about is complacency. It is so easy to fall into that trap when you are conducting the same procedures repeatedly. Complacently is a clear example of human performance in military aviation (HPMA) and can often lead to a flight incident or accident. Although no personnel were injured or equipment damaged during this incident, it could have resulted in a drastically different outcome.

Photo: Cpl Michael Bastien

Photo: 51 Victoria Loganov

Think Inside the Box

by Mr. Simon Brown

Being in the Canadian Armed Forces, we have all heard the saying "*hurry up and wait*" and can agree that perhaps it can be a very frustrating circumstance.

We have also possibly thought: there must be a better way to resolve whatever issue we are dealing with and take matters into our own hands in order to solve a problem? In general, thinking outside the box is a good trait to have; however, there are also times where rules are in place for a reason. Even though we may think we can deal with something more efficiently, maybe all the "ins and outs" of the procedure are not obvious and therefore, we should at the very least, start asking questions before we make changes.

A very well-intentioned infantry officer made this same mistake. Out of concern for slow communications through the chain of command and unreliable radios, they made plans with a pilot that if they needed a casualty evacuation (CASEVAC), the infantry officer would call the pilot via cell phone to allow a more effective rescue, rather than wait for all the small details to be hashed out and in their mind cause "unnecessary delays."

During this exercise, a CASEVAC was required when a soldier was seriously injured during a complex mission. The infantry officer called the CASEVAC pilot via phone and the pilot was airborne within five minutes. Normally, the procedure would be to conduct a "9-liner" (standardized message) through radio communications. However, this call was only made 10–15 minutes later since the pilot was contacted directly in order to "save" time.

The problem was that by changing the order of notification and skipping the radio net, very important background preparation was missed, which then led to the following issues:

- Because the CASEVAC pilot took off to the incident site without coordination, an airspace conflict occurred. A drone was operating directly above the exercise and had to conduct an emergency landing in order to avoid an incursion with the approaching CASEVAC.
- The Exercise Surgeon was only notified of the incident when the 9-liner was sent and did not have time to notify the local town hospital of an inbound CASEVAC before it arrived. This meant that the helipad to the hospital was not cleared, no orderlies or triage team were prepared, and gates, traffic and bystanders were not cleared by Military Police (MPs).
- The hospital triage team determined it was beyond their ability to provide care and the member had to be redirected to the city hospital.

It is worth noting that, had the Exercise Surgeon received a proper radio message of the incident and injuries as per the regulation, the helicopter would have been directed straight to the city hospital as the Exercise Surgeon was already aware of the limitations at the local hospital.

It was estimated that calling the pilot directly, allowed the helicopter to be airborne roughly five minutes faster than the official "9-liner" message; however, this caused the delayed preparation of a landing zone and de-confliction of airspace, followed by a flight to the wrong hospital (approx. 30 minutes delay in medical care).

We train as we fight. More importantly, we train this way in order to have a clear understanding of the logical steps required when there is an emergency. All emergency responses are standardized for a reason, and although you may think you are helping by cutting corners, you could potentially be causing a bigger problem by not knowing the "why" of a situation. Ensure that if you make a change, you know the consequences.

From the Investigator

TYPE: Cessna 150 C-GSWM
LOCATION: Regina Airport (CYQR), SK
DATE: 26 Jul 2022

On 26 Jul 2022, a Cessna 150 experienced a hard landing on the third touch and go attempt at the Regina airport (CYQR). The nose landing gear collapsed and the aircraft stopped on runway 31 in a nose down attitude.

The accident flight was part of the Air Cadet Power Scholarship Program and flown under contract by a civilian flight training unit. The purpose of this flight was to conduct solo pilot training.

A cadet pilot took-off from the Regina airport and conducted a series of circuits with touch and goes on runway 31. The first two circuits were uneventful and the aircraft was set-up correctly for a third attempt. The cadet pilot landed flat, touching down all three landing gears almost simultaneously, before bouncing off the runway and started oscillating in an increasing fashion along the lateral axis (porpoising), boucing off the runway for a total of six times. The aircraft's nose landing gear collapsed and the aircraft came to rest on the runway slightly right of the center line.

There were no injuries and the aircraft sustained very serious damage in this occurrence.

The investigation did not reveal any evidence of technical issues with the aircraft and is now focusing on human factors, training and procedures.

Photo: Directorate Flight Safety


Photo: Regina Airport Authority

From the Investigator

TYPE: CT114 Tutor (CT114051)
LOCATION: Fort St. John (CYXJ), BC
DATE: 2 Aug 2022

The accident aircraft was initially one of the nine Snowbirds stationed in Fort St. John airport in support of the Fort St. John International Air Show, on July 30-31st 2022. Two days after the airshow, the aircraft was to be ferried from Fort St. John back to Moose Jaw, SK, on a standard IFR transit flight. There was a single occupant onboard and the aircraft was not in formation.

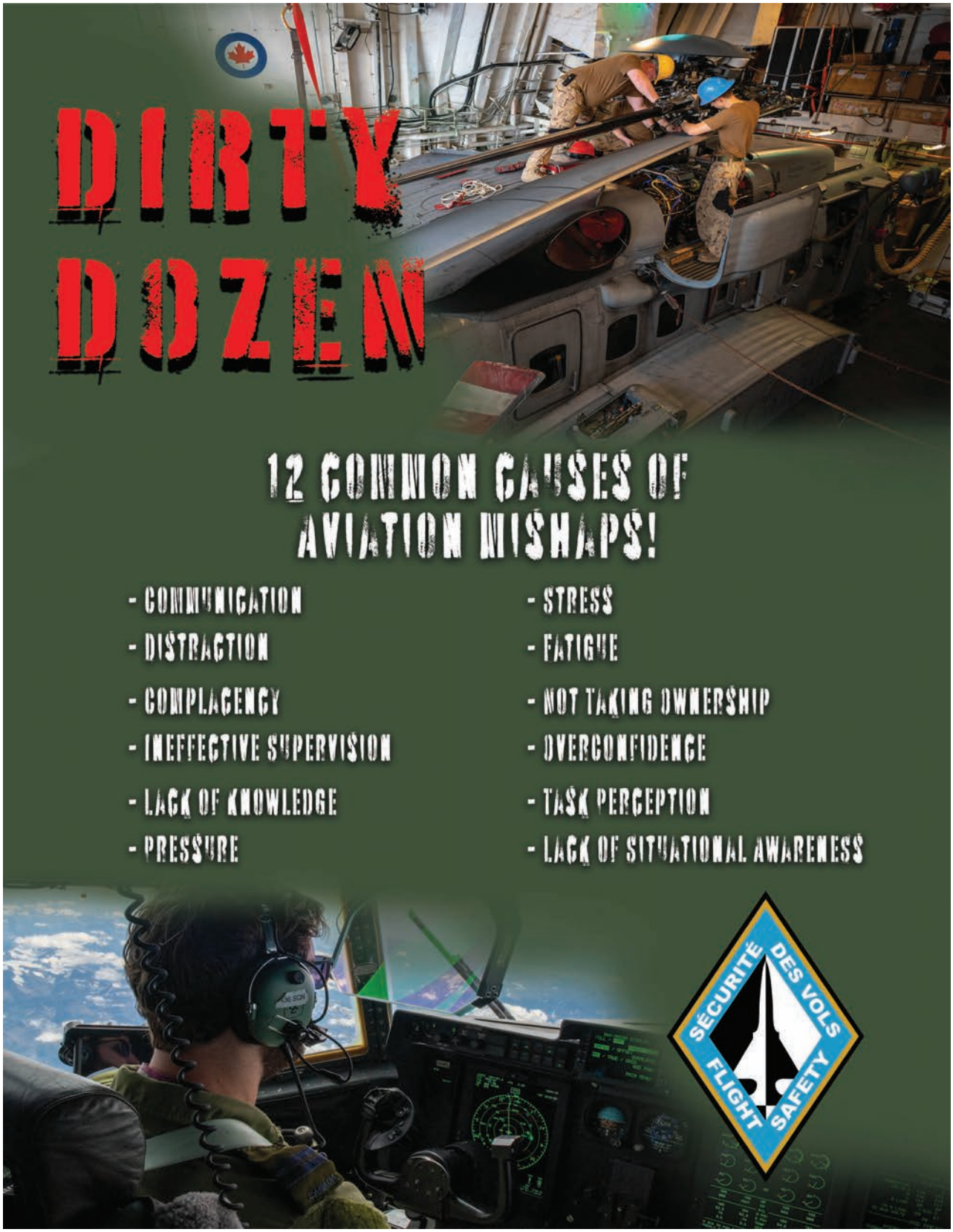
On the morning of the accident, the pilot conducted a routine series of pre-flight checks before proceeding to the active runway for a standard departure. Shortly after liftoff, the pilot confirmed a positive rate of climb and selected the landing gear up.

Immediately after gear selection, the pilot heard a loud noise and the engine failed. The aircraft rapidly started decelerating and descending back to the runway. The pilot selected the landing gear back down and elected to land the aircraft straight ahead, however the landing gear did not have sufficient time to fully cycle back to the locked-down position. The aircraft touched down with only approximately 500 feet of runway remaining. The unlocked landing gear collapsed under the weight of the aircraft, and the aircraft skidded off the departure-end. After approximately 1000 feet of travel, the aircraft impacted the airport perimeter fence at low speed and came to rest. The pilot secured the engine and immediately egressed the aircraft.

The aircraft sustained very serious damage but the pilot sustained no injuries.

The engine failure was due to an improperly assembled oil filter. The investigation is now analyzing the human factors that may have contributed to this occurrence.

Photos: QETE


DIRTY DOZEN
12 COMMON CAUSES OF AVIATION MISHAPS!
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- COMPLACENCY
- INEFFECTIVE SUPERVISION
- LACK OF KNOWLEDGE
- PRESSURE
- STRESS
- FATIGUE
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- OVERCONFIDENCE
- TASK PERCEPTION
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SÉCURITÉ DES VOLS
FLIGHT SAFETY