Transport Canada Transports Canada

Aviation Safety

Vortex

Learn from the mistakes of others; you'll not live long enough to make them all yourself . . . **Issue 3/2003**

Be Wrong on the Ground

One of the most common things about accidents is that they all could have been prevented in hindsight. *How could they have done that? What were they thinking? Didn't they know that…?* But with rare exceptions, most pilot's reactions are the best ones they have at the time, given the available information. Often, the actions of the pilot are based on logic and easily explained, but the results are still tragic.

The experienced pilot and his passenger were on a day VFR flight from a hunting camp on the South Nahanni River to Fort Simpson, Northwest Territories in a Hughes 500. During the flight, the pilot, who was also the owner of the helicopter, observed that the fuel gauge was indicating a much higher level than it should have been for the time flown. He knew something was wrong, so he began following a cut line, and later a road as a precautionary measure.

The helicopter was fitted with an auxiliary fuel system, mounted in the cabin behind the rear seat. The system transfers fuel to the main cells by gravity when the auxiliary fuel valve is placed in the OPEN position. The system is activated by a control knob on the floor adjacent to the door on the pilot's side. When the valve is opened, the rate of fuel transfer to the main fuel tank approximates the burn rate; therefore, the fuel quantity gauge indication remains fairly constant for the duration of the transfer.

During the last 15 min of the flight, the pilot checked the caution panel lights twice to verify the function of the FUEL LOW light, which tested normally. As the helicopter neared the landing pad at Fort Simpson, the engine flamed out, the helicopter struck trees and descended rapidly. The pilot was fatally injured, and the passenger suffered serious injuries. The FUEL LOW light did not illuminate prior to the engine flame-out.

In its report number A01W0255, the Transportation Safety Board of Canada (TSB)

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found that the fuel system of the helicopter had been partially modified during the installation of a cargo pod. The Supplemental Type Certificate (STC) for the pod required that the original single fuel cell vent fairing be removed and replaced with a drain spigot, and that an alternate vent fairing be installed.

At some point during the installation of the pod kit, the pilot reconsidered his decision, and requested the pod be removed. At that time, the modification was incomplete, as the drain spigot had been installed, but the alternate vent fairing, required by the STC, had not.

The TSB report states, "The fuel cell vent system had been partially modified, and an alternate vent had not been installed as required by the [STC]. As a result, it is probable that negative pressure within the fuel cells resulted in partial collapse of the left cell, preventing full motion of the fuel sensor arm, which induced an erroneously high fuel quantity reading and disabled the FUEL LOW caution light." The report explains in detail the mechanics of this occurrence, and points out several maintenance and design links in the accident chain as well, including:

- an unfinished maintenance task/non-compliance with an STC;
- an older fuel system design in which the fuel quantity and low fuel indications are not from independent sources;
- no quantity indication for the auxiliary fuel tank.

But there is another side of this accident that teaches very valuable lessons for helicopter pilots.

The pilot knew there was something wrong. He noticed the gauge was not indicating sufficient fuel burn, so he began following a cut line and road, and tested the low fuel system on two occasions. However, he did not elect to land and investigate, or open the auxiliary fuel valve because the information presented to him offered a plausible explanation:

- the fuel gauge was behaving the same as it did during fuel transfer;
- the auxiliary tank was full of fuel at the beginning of the flight; and,
- the FUEL LOW light tested normally, which he took to mean the low fuel level had not been reached.

With this information, it was logical to assume that the transfer valve was malfunctioning, and that fuel was transferring from the auxiliary tank into the main tank. This could also explain why he didn't turn the valve to the OPEN position. Still, in deciding to follow the cut line and road, and by testing the FUEL LOW light again, he demonstrated a level of discomfort with what he was seeing.

The lessons?

1. If you feel like something is wrong, it probably is. Pay attention to these feelings because your brain has an enormous capacity to take in much more information than it sees fit to make you consciously aware of. We all have many examples of how "a little voice," "intuition," "a gut feeling," "spider sense," or "alarm bells going off" saved our bacon. Whatever term we use for our subconscious brains, ignoring these warning signs can be perilous.
2. Even if there is a seemingly logical explanation for a problem, it only takes a few minutes to set down and check it out. This is a luxury most VFR helicopter pilots have that the majority of our other aviation colleagues don't. In this case, the act of landing and opening the fuel cap to check could have alerted the pilot to the tank being negatively pressurized, and prevented the disaster.

Of course, hindsight vision is clear indeed, the trick is to try and use preventative forethought to learn the same lessons.

Tips and Tails *cont. from p. 11*

This is a feeling that I will never forget. Hovering low over the lake, looking at my bucket stuck in a tree with no way to get it out, no way to get it off me and nowhere to land. I had gone from being a king to a fool in an amazingly short amount of time. I figured that I should have one more good look up and down the beach before I call in the reinforcements. Like a dog on a run, I scoured my 300 ft of beach, up and down. Eventually, at the very end of my rope, I found a spot that would work. I had to put the toes of the skids on first, then slide the rest of the gear up on the beach, being very careful not to send the main rotor into the trees. Finally, I was down, and had no time to waste.

I shut off the engine, got the seatbelt off, and unplugged my helmet. I figured I could still salvage this situation with my pride intact after all, if I hurried. With my helmet still on and the blades still spinning, I ran down the beach and, you guessed it, climbed the tree.

You have to picture it. It was 30°C, I was up a tree in all my flight gear, swinging back and forth and madly fighting with my bucket. Sweat was pouring off me. The only saving grace was that nobody knew what an idiot I'd made of myself. That's when the B2 showed up to see what was taking me so long. Never have I been so busted. It was going to be hard to convince anybody that this was "ops normal."

I managed to learn several things from this event, and I'm a better pilot for it. After hearing about it, somebody told me, "You can't look cool all the time." I still get a laugh over it.

Transport Canada / Transports Canada

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Call for Papers—CASS 2004: The Future of Aviation Safety

The 16th annual Canadian Aviation Safety Seminar (CASS) will be held in Toronto, Ontario, April 19-21, 2004. The theme for CASS 2004, "The Future of Aviation Safety," calls for nothing less than gazing into the crystal ball to get a sense of the safety issues the industry and regulatory authorities will face between now and the end of the decade.

Over time, the industry has experienced various shocks such as 9/11, war, and economic peaks and troughs. Sometimes, these have short-term effects and tactical responses mitigate the risks. Other times, however, the impacts have been more serious and required strategic or systemic changes. Inevitably, the industry will be confronted with these and other such shocks between now and the end of the decade.

Plenary topics: Speakers from all facets of the industry and academia are called upon to provide, in plenary, their perspectives and insights into what they think these shocks may be and their effects on safety. They are also asked to propose ways and means of eliminating the shocks or mitigating their associated risks.

Workshop topics: Notwithstanding these system shocks and their potential impact on safety in the future, aviation companies can build a degree of resilience against them by developing and implementing Safety Management Systems (SMS). Therefore, building on the theme, a series of workshops to guide companies in the "safety proofing" of their organizations will also be on offer. Notionally, these workshops will address some of the following safety management topics: Safety Leadership, Safety Planning, Organizing for safety, Controls, Managing Safety Performance, Continuous Improvement Strategies, Managing Safety Partners and Suppliers, Managing Human Resources, Safety Communication and Tools.

Submission Form: If you wish to present a paper at CASS 2004, please complete the instructions found at http://www.tc.gc.ca/CASS/. **Abstracts** must be submitted by **Monday, August 25, 2003.** Papers will be selected on the basis of content and applicability. **Written papers** and **formal presentations** are due on **Monday, February 23, 2004.**

For more information, contact Bryce Fisher, Manager, Safety Promotion and Education, System Safety (AARQB), Civil Aviation, Transport Canada, Ottawa ON K1A 0N8 Canada. E-mail: **fisherb@tc.gc.ca** Fax: 1 613 991-4280.

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Australian Air Ambulance Loses Engine Power During Approach in Dense Fog

The following article is adapted from Vol. 28 No. 6 (Nov. – Dec. 2002) of ***Helicopter Safety****, a publication of the Flight Safety Foundation (FSF)* (www.flightsafety.org). *The FSF article, except where specifically noted, is based on the Australian Transport Safety Bureau (ATSB) final report on Occurrence No. 200003130. The report comprises 12 pages. This accident took place in Australia, but it highlights some of the issues we've been exploring in* ***Vortex*** *of late, and is an excellent example of how an accident is the culmination of a long chain of events.—Ed.*

After diverting a flight because of low fuel, the pilot was told that visibility was approximately 5 m (16 ft) at the highway intersection where he attempted to land a Bell LongRanger III. The engine stopped producing power during the approach, and the helicopter struck terrain.

On the night of July 24, 2000, a Bell 206L-3 LongRanger III—with a pilot, a crewman-paramedic and an intensive-care paramedic aboard—was flown from Rockhampton [on the coast of Queensland, Australia] to Yarandoo Station, approximately 90 NM northwest of Rockhampton. The crewmembers loaded an injured child and the child's mother aboard the helicopter, and it departed from Yarandoo Station to fly to Rockhampton Hospital.

During the flight, the pilot reported "a fairly high fuel-burn rate" and said that he was diverting to Marlborough [approximately 54 NM north of Rockhampton]. The helicopter struck terrain at 02:03 local time during an attempted landing on a highway intersection in dense fog. The three crewmembers and two passengers were killed. The helicopter was destroyed.

In its final report, the ATSB said that the following were significant factors in the accident:

- "The helicopter departed [from] Rockhampton with insufficient fuel to carry out the intended flight, and the pilot was apparently unaware of this until some point during the return flight;
- "By the time the helicopter arrived at Marlborough, thick fog had formed in the area, preventing a landing at the normal landing site;
- "The pilot did not attempt to divert from Marlborough to look for a fog-free landing site;
- "While maneuvering in preparation for an approach to an alternative landing site, the engine lost power, possibly due to interruption of its fuel supply;
- "Darkness and thick fog, possibly aggravated by the [helicopter's] illuminated 'Nightsun' [searchlight] denied the pilot visual reference with the ground; [and,]
- "The investigation was unable to determine why the pilot was unable to carry out a safe landing following the loss of engine power."

The pilot was a former military pilot who held commercial pilot licenses for both helicopters and airplanes, and a night visual flight rules (NVFR) rating. He had 3 928 flight hours, including 3 185 flight hours in helicopters and 50 hr on type. His military flying experience included 968 hr on Bell 206, 2 059 hr on Bell 47 helicopters, and a command instrument rating, which was no longer valid.

The pilot was employed as a relief pilot, working tours of full-time duty with the operator, as the need arose. He had completed 43 flights for the company during several tours between September 1997 and September 1999. Between tours of duty, he did not fly.

Nine days before the accident, in preparation for his current tour of duty, the accident pilot had undergone a flight review with the operator's chief pilot, which included day and night emergency procedures. In the two days following the flight review, he had flown two trips—one short NVFR flight, and one short day flight. The pilot was off duty for the next five days before taking over as standby pilot from the operator's senior pilot at 07:00 on July 23, 2000. The senior pilot told the accident pilot that the helicopter was fully serviceable and had 500 lbs of fuel aboard.

The report indicated that, "The operator's procedure was to leave the helicopter on standby with 500 lbs of fuel, approximately two-thirds of a full fuel load. When the operator received a task, the pilot would calculate the required fuel load and the maximum fuel load the aircraft could carry, given the configuration and payload for the task."

The senior pilot told investigators that he had offered to brief the pilot on the aircraft systems prior to the flight. He reported that the pilot had indicated that he was satisfied with his understanding of the global positioning system (GPS) and the Shadin electronic fuel-management system.

The area forecast for the accident night called for isolated areas of smoke and scattered patches of fog along the coast. The senior pilot also reported that he had shown the accident pilot the weather forecast and had warned the pilot to expect fog during his shift.

Investigators found that the pilot "spent the day quietly" and "retired to bed early in the evening."

At 23:26, Rockhampton Ambulance Service Communications (CAPCOM) telephoned the pilot and requested that he transport Queensland Ambulance Service (QAS) personnel to a patient at Yarandoo Station. The pilot and the QAS personnel departed from Rockhampton at 23:40. The pilot maintained radio communication with CAPCOM throughout the one-hour NVFR flight to Yarandoo Station.

According to the report, "After arrival at [Yarandoo Station], a decision was made to transport the patient (a child) and his mother to the Rockhampton Hospital."

At 01:14, the pilot told CAPCOM that the flight had departed from Yarandoo Station. At 01:26, he told CAPCOM that the estimated time of arrival at Rockhampton was "10 min past the hour."

At 01:32, the pilot told CAPCOM that he was diverting the flight to Marlborough "because of a fairly high fuel-burn rate." He said that the flight would arrive in Marlborough in about 10 min, and he asked CAPCOM to arrange for surface transport for the patient, the patient's mother and the intensive-care paramedic from Marlborough to Rockhampton Hospital. In response, CAPCOM directed a Marlborough-based ambulance vehicle to deploy to a school sports field to meet the helicopter.

While enroute, the weather deteriorated and dense fog had developed in the Marlborough area. At 01:41, the pilot called the officer in charge of the ambulance vehicle, now deployed to the school sports field, and asked him to switch on all of the vehicle's external flashing lights. The ambulance officer replied that the vehicle's lights were on and reported that visibility on the ground was "about the length of a football field."

The helicopter arrived at the school sports field at 01:44. Fog extended to approximately 300 ft AGL, and there was "little or no cloud" above the fog. The pilot used the helicopter's searchlight during two approaches and go-arounds at the school sports field. The searchlight was illuminated for the remainder of the flight.

"The pilot could see the vehicle when the helicopter was directly overhead, but the fog was sufficiently thick to deny the pilot any slant visibility of ground objects," the report said.

"At 01:54, the pilot asked the ambulance officer to reposition the ambulance vehicle to the northern intersection of Bruce Highway and Perkins Road, which was illuminated by overhead orange lights," the report found. "The pilot said that he could see the cross-pattern of lights and that he would use the cross as an approach reference … and that he would aim his approach to the center of the cross-pattern."

The pilot asked the ambulance officer to check the road west of the intersection for cables that might be a hazard during final approach.

The investigation revealed that, "At 02:01, the ambulance officer informed the pilot that visibility was about 5 m [16 ft]. The pilot replied, but the reply could not be understood. At 02:03, and again 1 min later, the ambulance officer called the pilot but received no reply. Around that time, he heard a sound consistent with a ground impact."

At 02:06, a local resident arrived at the highway intersection and told the ambulance officer that he believed the helicopter had struck terrain. A search was begun immediately by State Emergency Service personnel, a police officer, the ambulance officer and several residents.

According to the report, "About 1 hr later, two residents searching in fog with 20 m [66 ft] visibility located the accident site. The helicopter had been destroyed, and all occupants had received fatal injuries."

The helicopter had struck the ground in a steep nose-down attitude and in a left bank. The helicopter then rolled forward and came to a stop inverted.

Investigators found that, "Damage to the engine, the main- and the tail-rotor assemblies and drive systems was consistent with the engine delivering little or no power at impact."

Laboratory examination of the helicopter's caution/warning panel showed that four warning lights—'LOW RPM,' 'TRANS CHIP,' 'BATTERY RLY' and 'TRANS OIL TEMP'—were missing from the panel, and the lights were not found in the helicopter wreckage.

Inspection of the filaments of the recovered warning lights indicated that the 'FUEL LOW' and 'LITTER DOOR OPEN' lights were illuminated at impact. Results of examination of the 'GEN FAIL,' 'L/FUEL PUMP' and 'R/FUEL PUMP' warning lights were "inconclusive." Examination of all other warning lights, including the 'ENG OUT' warning light, indicated that the lights were not illuminated at impact.

The report said that the 'FUEL LOW' warning light normally illuminates when 50 to 75 lbs of usable fuel remain in the helicopter's fuel system. The 'ENG OUT' warning light normally illuminates when engine speed decreases to about 55 percent of maximum rpm.

The investigation revealed that, "The apparent non-illumination of the 'ENG OUT' warning light following the power loss might have been due to a very short time between loss of engine power and impact."

During post accident tests, the engine started and ran normally, and no technical fault could be found that would have prevented it from producing power before impact. Damage to all other helicopter systems was consistent with impact. The wreckage examination did not reveal any pre-impact technical fault that could have contributed to the accident. The maintenance records for the helicopter showed compliance with all applicable airworthiness directives, and all required maintenance had been carried out. The helicopter's fuel system remained intact during the accident, except for one fuel line that fractured between the engine and a bulkhead. The report indicated that there was no evidence of fuel spillage or any fuel smell in the wreckage. Analysis of a fuel sample from the accident helicopter showed that it conformed to density specifications and was free of water and contaminants.

Investigators found a total of 40 lbs of fuel remaining in all tank cells. Of the total, 31 lbs were usable. The report stated that this quantity of usable fuel was sufficient for 8 min of flying—if all the remaining usable fuel was in the rear tank.

"However, the fuel was removed from all three tanks and the interconnecting fuel lines," the report said. "If fuel in the forward tanks had not transferred to the rear tank, the remaining flight time would have been less than 8 min."

Findings indicated that given the very low fuel quantity, the engine fuel supply might have been interrupted (unported) during an uncoordinated flight manoeuvre, either initiated by the pilot for visibility reasons, or inadvertent. "The pilot then would have been faced with conducting an approach in autorotation in adverse conditions."

Investigators also said that reflection of searchlight illumination by fog droplets likely would have aggravated the pilot's visibility problems, causing "virtual whiteout conditions" during the autorotation.

The company's operations manual specified that a minimum fuel consumption of 250 lbs/hr must be used in planning for flights in the LongRanger, regardless of weight, altitude and temperature, and a minimum fuel reserve for 30 min of flight (i.e., at least 125 lbs of reserve fuel) during night operations. The flight from Rockhampton to Yarandoo Station and return to Rockhampton would have required about 2 hr; therefore, the flight required a minimum fuel load of 625 lbs. The helicopter could have been loaded with 675 lbs of fuel to depart at gross weight from Rockhampton.

Investigators found that, "Whether the pilot miscalculated his fuel requirements or did not consider them at all could not be determined."

Sleep inertia

According to investigators, if the pilot was awakened by the telephone call from CAPCOM, he might have been affected by sleep inertia during the predeparture period and the early stage of the flight.

"Sleep inertia refers to a feeling of disorientation, mental dullness or sluggishness that occurs after awakening from a period of sleep. In broad terms, sleep inertia may affect mood, memory, attention, concentration, cognitive processing, performance accuracy and reaction time. It is a recognized state of transition from sleep to wakefulness.

"A variety of factors can influence the effect of sleep inertia on performance. When awakening from sleep normally, the effect of sleep inertia is believed to last for less than 5 min. When abruptly [awakened], the effects have been identified as typically lasting up to 30 min, with some research indicating that performance can be impaired for over 1 hr."

According to the report, even if the pilot had been affected by sleep inertia during the pre-departure period and the early stage of the flight, he would have recovered from it after departing from Yarandoo Station for the return flight to Rockhampton.

When the pilot reported his intention to divert the flight to Marlborough, the helicopter had been flown about 78 min and had used about 325 lbs of fuel.

"At that time, approximately 175 lbs of fuel would have remained, representing 42 min of flight time available," the investigation reported. "It is likely that the flashing light in the Shadin fuel-management system, which was set to illuminate when 45 min of fuel remained, had illuminated some minutes earlier and that the pilot had used the intervening period to decide to divert, to determine his new destination and, in consultation with the paramedics, to determine the further ambulance services required for the patient."

When the helicopter arrived over the school sports field in Marlborough, about 125 lbs of fuel remained. The accident occurred 19 min later.

The report found that, "During that time [i.e., the 19 min], the pilot made three attempts to position the helicopter for an approach to the sports field and one attempt to position for an approach to the road intersection. There is no evidence to indicate whether the pilot had considered leaving Marlborough to seek a fog-free landing site."

Medical findings

A post-mortem medical examination of the pilot indicated that he had severe calcific arteriosclerosis (coronary artery disease).

The report stated that, "The post-mortem also found a localized area of scarring and myofiber hypertrophy consistent with ischemia [inadequate blood flow]. The histology indicated coronary vessel disease (narrowing of the arteries causing a degree of blockage) of long standing. The changes were indicative of long-term effects (progressing over many years) of nutrient starvation to focal areas of the heart muscle, caused by significant narrowing of the critical coronary vessels responsible for supplying oxygenated blood to those areas.

"Aviation medical opinion was that, given the presence of advanced ischemic heart disease coupled with high levels of stress, the possibility that the pilot suffered an incapacitating medical event before impact could not be ruled out." According to the report, "If the pilot had suffered severe chest pain during the attempt to land at Marlborough, he might have attempted an immediate landing and lost control of the aircraft."

The exact chain of events in this tragic accident will never be known, but the information we have teaches valuable lessons about currency, fuel planning, fatigue and medical fitness.

Transport Canada Aviation Safety Award Presented to Dr. Waldron

The Minister of Transport, the Honourable David Collenette, presenting the award to Dr. Robert Waldron.

The Transport Canada Aviation Safety Award was established in 1988 to foster awareness of aviation safety in Canada and to recognize persons or organizations that have contributed to this objective in an exceptional way. The 2003 Award was presented to Dr. Robert James Waldron on Tuesday, April 15 in Montréal, at the Canadian Aviation Safety Seminar (CASS).

Dr. Waldron studied Metallurgical Engineering at the University of British Columbia, graduating in 1965 with a B.A.Sc., and earning his Ph.D. in 1970. During his early engineering career, he held management positions at Tree Island Steel Company, a large steel and wire manufacturer, and the mining giant, Noranda Metal Industries. He also did engineering work for several companies as a self-employed consultant.

In 1975, he created the firm R.J. Waldron & Co. Ltd. Around the same time, he began to concentrate his scientific focus on aviation. He soon acquired a solid reputation through his groundbreaking accident investigation work on several high-profile occurrences.

Dr. Waldron has worked on over 500 air accident investigations, in 25 countries, encompassing everything from small home-builts to wide-body commercial transport aircraft. Approximately 60 percent of these investigations involved helicopters, and he is well known in the helicopter industry.

One of his most celebrated cases came in 1979, following the fatal accident of a de Havilland Twin Otter that crashed into Vancouver Harbour. While the investigation concentrated on a sudden in-flight propeller reversal, Dr. Waldron took a different approach. When the wreckage was released, Dr. Waldron's team rented a warehouse and began to reassemble the aircraft. The reconstructed Twin Otter soon revealed that the flaps on the left wing had not been deployed at impact, but those on the right wing were fully down.

In reconstructing the flap control system, Dr. Waldron found crucial parts missing and engaged a team of divers to try and recover them from the murky harbour. At the end of the third day of searching, the divers recovered the missing section, and it showed clear signs of failure. Dr. Waldron examined the parts under a scanning electron microscope and found the failure had been caused by longitudinal stress corrosion cracking. This prompted Transport Canada to issue an *Airworthiness Directive* requiring inspection of flap control rods on Twin Otter aircraft worldwide. As a result, control rods exhibiting stress corrosion fracturing were found in numerous aircraft around the world, and the entire flight control system on the Twin Otter was modified.

Dr. Waldron and his group have performed investigations on helicopters, airplanes and power plants from virtually every major manufacturer, too numerous to mention here. Their investigations involved a variety of disciplines, including search and recovery, accident sequencing, failure analysis, design reviews, flight data and cockpit voice recorder analysis, to name but a few.

His reputation and expertise have seen him invited to lecture at a wide range of organizations, such as:

- Air Transport Association of Canada;
- Imperial College London;
- University of British Columbia, Department of Metallurgy;
- British Columbia Institute of Technology;
- The Insurance Institute of London; and
- The University of Southern California.

Throughout North America, Dr. Waldron is recognized as an expert in aircraft accident investigation, and he has been called upon to give expert testimony. Though his technical achievements are by themselves impressive, they are accompanied by an integrity and perseverance that has gained him the respect of his peers, manufacturers, the insurance industry, academia, and the international aviation industry. He is generous in giving his time and resources to the furtherance of aviation safety through lectures, tours of his facility, and the donation of parts and aircraft to educational institutions.

He is known as an excellent teacher, with the ability to clearly explain highly technical analysis. Through his relentless pursuit for the truth, Dr. Waldron has inspired operators, regulating authorities and manufacturers to mitigate previously unknown deficiencies in procedures, regulation, and design. He has picked up where others have left off, never accepting the obvious until it could be proven beyond challenge. In doing so, Dr. Robert Waldron has contributed to aviation safety worldwide in a profound and tangible manner, and has certainly been responsible for saving hundreds of lives.

Letter to the Editor

This is further to the excellent article on human factors in the last issue of the *Vortex*. The article could be summed up as trying to show that **situations** influence pilots' decisions much more than their personalities.

I would like to tell you about a situation that happened to me at the very beginning of my career. Fortunately it did not end in an accident, but I could easily have lost my life.

It was my very first contract as a pilot. After a year of hard labour sweeping the hangar floors, I finally got my chance—I was given my PPC. Let's just say that, after all that time waiting, I was eager to please the client …

The contract was to serve various wells and booster stations belonging to a natural gas company. The weather was bad that day. At the plant where I was based, the ceiling was 300 ft with visibility of about 3 mi.

I received a call from the foreman (the man in the white lab coat in the 'situational factors' article). He told me that it was time to go pick up a crew at a booster station 70 mi. north of the plant. It was at an altitude 800 ft higher than the plant (and therefore "in" the ceiling).

I told the foreman about the weather, and that it was unlikely that I could make it there, etc., etc. He gave me **very clear** instructions that I **had** to go pick them up because the crew was changing; the guys had been there for two weeks; they were in a hurry to get out; and the aircraft was coming to get them—in short, I had to go no matter what …

Listening only to my courage, I started my JetRanger, with a flood of butterflies in my stomach, and took off for the booster station. The terrain rose steadily, creating an even lower ceiling.

Let me set the scene. I was now at tree-top height, my speed was 40 mph, and visibility was 1/8 mi. in a valley with high terrain on either side of me. I started to get really worried, but I could not consider turning back, because there were only 8 mi. left to the booster station; besides, I had been "ordered" to go pick up these people, and I was low on the totem pole, and had not learned how to say "no." I was also under quite a bit of pressure from the client.

All of a sudden, without any warning, POOF!, I was in total white without any visual references. There was no question of attempting a 180-degree rate-one turn: there was high terrain on either side of me, and besides, I was at tree-top height when I lost visual reference. The only way out was to climb in IMC until I broke through the cloud layer, return to the plant using a GPS, without ground reference, and find a "hole" in the clouds to go through. In the worst-case scenario, the ceiling would still be at 300 ft at the plant, and I would land in IMC…no sweat!

So that's what I did. I increased the engine torque to 80 percent (it was 40 percent at 40 mph) and began my improvised IFR climb. At about 6 000 ft ASL (2 000 ft AGL), I noticed something strange was happening. A quick scan of the instruments showed that I now had zero airspeed and was still climbing, but I was losing control of the aircraft and the artificial horizon was all over the place. Also, I had a funny feeling, a feeling I had never had before.

I vividly remember that my breathing increased dramatically when I realized what was happening, and that I would probably not get out of this alive. My very short career would end in an accident report concluding that, "the pilot lost control of his aircraft when he lost visual reference; a fatal ground collision ensued. The pilot was the sole occupant."

Despite the apparently hopeless situation, I fought with the helicopter for about 30 seconds until I finally regained control. My inner ear was completely thrown off: all my instruments indicated a step climb at a steady speed and heading, but I could have **sworn** I was in a steep right-hand dive.

At last, after what seemed like a never-ending climb, I finally broke through the cloud layer at 9 000 ft ASL! I then turned back towards the camp using the GPS and found a hole I could go through so that I could land at camp in VFR.

Once at the camp, I contacted the foreman, and he said, "Bah, it doesn't matter. The plane can't come because of the weather anyway."(!) The next day, my base manager called me to tell me that I would not be paid for this flight because the foreman told him that I had not informed him that he would have to pay for the flight even if I had to turn back because of weather.

Let's go back over that: I almost got myself killed on a flight for which I would not be paid, and that was pointless anyway because the airplane that was making the crew change did not even show up?!?!

Later that day, I flew back and tried to understand how I could have lost control so quickly. Apparently, when I increased the torque from 40 percent to 80 percent, I failed to compensate for the helicopter's nose-up tendency, something that we correct for automatically with visual reference. And not having an instrument rating, I made the classic mistake of focusing on one instrument: the altimeter—I really wanted to get away from the high terrain as fast as I could.

The airspeed decreased to zero. As I did not change the position of the pedals, the aircraft began to spin around, because the absence of speed and increased torque.

Today, sitting in front of my computer screen, I find it completely ridiculous to say, "I can't turn back, there are only 8 mi. left—anyway, I have been 'ordered' to go to the destination"—probably like all of you. But I can tell you that, given the circumstances, it seemed completely logical to me 3 years ago as I sat in that cockpit with my 150 flight hours.

Many of you are saying to yourselves that such a thing would never happen to you. You would not let yourself be pushed into it. My answer to that is that people who know me well could confirm that I am a person with character who is not afraid to assert himself and is very safety-conscious. So how could someone like me let himself be pushed into such a situation?

In the same way as even "good" people (priests, doctors, etc.) in the situational factors article were pushed into applying "virtual" 450V currents to a "guinea pig" who was actually a co-conspirator of the "man in the white lab coat," that is, the authority figure. Let me go back over the situation for you: I was a beginner pilot who was finally being given his chance, who therefore really wanted to please the client and who found himself with a very authoritarian foreman who visibly had considerable experience in the field—you do not question what he says.

Nowadays, of course, if the same scenario cropped up again, I would not react in the same way, because the overall **situation** has changed (not my personality): although I am still eager to satisfy the client, I now have 1 100 flight hours and an established reputation. I am therefore no longer afraid to make a decision that goes against my client's request, if I feel that my safety, along with the safety of my aircraft and its passengers, is at risk.

In conclusion, I agree that, if we want to decrease the number of accidents in our industry, we have to start seriously and thoroughly examining the situations that lead to accidents and try to prevent them from recurring, rather than analysing pilots' decisions using traditional human-factors standards.

Name withheld by request.

A Perfect Day—But Almost Ruined

Fatal accident investigations usually establish what happened, but frequently are unable to establish why the accident occurred.

This very honest report provides an insight into 'why;' the lessons learned by the author are worthy of wider consideration.

It was the first flight of the day, the previous shift having been on standby, so it was a relief to get airborne. The weather was clear and bright aided by a light covering of snow from the night before.

We were tasked with locating recently stolen vehicles and on completion of the task we were en-route back to base for another task. Throughout the journey various remarks had been made with respect to the scenery and how picturesque it all looked. With this in mind I made the decision to lose height and get a closer look. The chosen location was a reservoir surrounded by snow covered fir trees which then narrowed at one end, finishing with a gentle right hand bend and rising ground.

By this time I was very low and concentrating on clearance from the trees when the front observer suddenly drew my attention to power cables ahead. Due to my height, going over them was not an option, so I pushed the stick forward and we flew under them. By coincidence the following sortie was in the same area, which enabled us to re-visit the cables and see just how lucky we had been.

The causes and the lessons learned are numerous and include:

1. Lack of crew brief beforehand to determine what was about to happen and whether or not the crew as a whole felt it was a good idea.
2. Poor recce of the area to determine the hazards and layout of the route.
3. Once low level, poor airmanship and crew co-ordination with regard to lookout and updating of surroundings.
4. The realisation that regardless of how experienced or safe a pilot I might consider myself to be, because of the environment I work in, even the smallest lapse of concentration can lead to a serious incident.

Not the proudest day in my long flying career, but one that has taught me several lessons. Lessons that have injected some renewed and perhaps much needed professionalism into the way I operate in what had become a very comfortable and unchanging environment.

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Tips and Tails

In this issue of Tips and Tails, we have two stories of pilots getting themselves into trouble by getting wrapped up in the production mindset, getting the job done, and bending normal procedures to fit the job. The tales are also excellent examples of how these things can happen to very experienced and current pilots, who are at the top of their game. —Ed.

Inadvertent Logging with a Bell 212

I was flying a Bell 212 on a longline job, supporting several drill rigs and two camps. The majority of the work was slinging material into the site from a staging area about 20 NM away, and moving the drills when they were ready.

It was a beautiful day, but a little on the windy side. One of the camps was situated about $\frac{1}{2}$ mi. from a 1 600-ft cliff, and when the winds were from the northwest, certain areas of the operating region were tricky.

On this day, I was slinging a large shipment of fuel and oil in drums, seven at a time, to the camps and drill rigs. At some point during the job, the dispatcher informed me that there was a 2 600-lb load of lubricants in cardboard cases that had to be taken internally, and not in the sling.

Instead of dropping my longline for one load, I decided to take the internal load with the empty line attached. This would not be a problem, because I'd still be almost 1 000 lbs under the 11 200-lb gross weight allowed. The departure from the staging area was uneventful, and I picked up the empty line with plenty of power to spare.

On the way into camp, the engineer called me on the FM asking if I could get a power check for his weekly report. No sweat. I told him to meet me at the pad—we'd go out on the frozen bay and do it now, while I was heavy and could get some nice high single engine torque values without getting light on the skids. I picked him up and off we went. The power check completed, I dropped him off back at camp, and started picking up my line to finish delivering the load of lubricants.

Just as I got airborne and started moving forward, a huge blast of wind rifled down from the hill in front of me. The helicopter started to settle and I pulled to full power. The heavy aircraft continued to descend, so I tried to fly away by nudging the cyclic forward to gain more airspeed into the wind. Problem was, the area was heavily treed, and I was now dragging the empty longline through thick spruce. Of course, the cargo hook release was not armed because we were working above the drillers most of the time, and didn't want the line inadvertently dropping on them. Besides, we were using the electric hook at the end of the longline for delivering loads, not the belly hook. So, I couldn't drop the line with the electric release. I briefly thought about punching the line off with the manual release, but for some reason while my eyes were glued to the torque and RPM gauges in the door, and my left foot was busy trying to push the left pedal through the chin bubble, I couldn't work up enough brain cells or courage to take a foot off the pedals to hit the release pedal.

My longline was now snagging trees and breaking the tops clean off them. As I descended further, it began to wrap itself around small spruce trunks, and I could feel the helicopter jerking as it would pull tight, then let go as the tree broke off. I kept the cyclic stable, and the torque steady at 100 percent and eventually the rotor managed to grab enough air to stop the descent. As I gained momentum, altitude and airspeed, the line-turned-chainsaw continued its assault on the forest until finally, it climbed out of the trees.

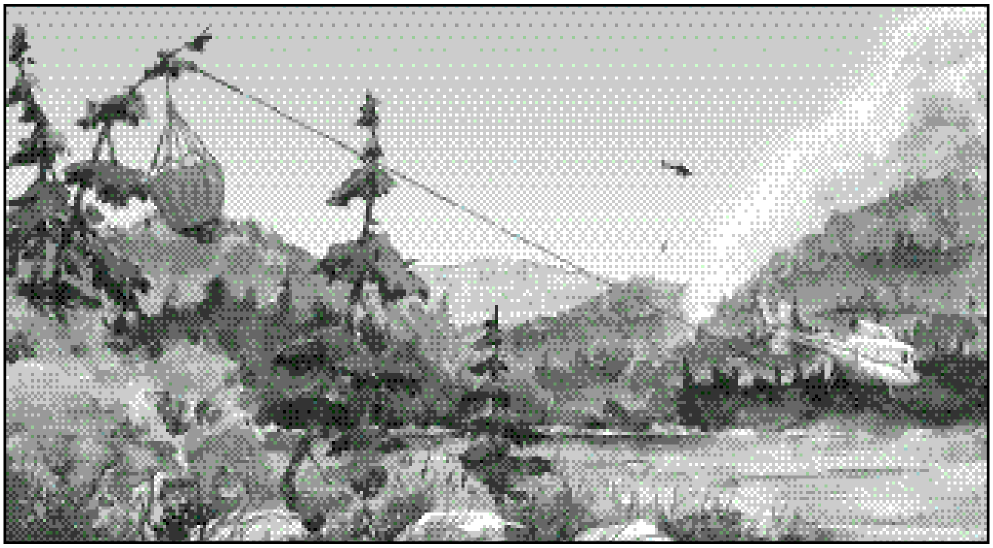
My longline was ruined, the electrical cable was shredded, and several trees had come to an ugly and untimely end. I delivered the oil, and came back to camp to replace the line and lick my ego. I consider myself very lucky the line didn't snag anything the helicopter momentum couldn't break, as many pilots before and after have lost this same battle. Needless to say, for the rest of this and subsequent tours, all my internal loads were carried with no longline attached.

Up a Tree

I think that the best stories are the ones that are so unbelievable that you couldn't make up, even if you tried. Some have good endings, where everything works out OK, while others don't turn out so well, and in hindsight, you would have done something different. This story is one that I usually tell to try to get a laugh out of people (at my own expense). I suppose that it's a good example of how one thing leads to another, and it might be worth telling for more than just a chuckle.

I've been a helicopter pilot for 13 years, and in that time I've made a few mistakes, but this one is a classic. About five years ago, I was on a fire in southeastern British Columbia, and things couldn't have been going better. I was put up in a good hotel, working with good people, having a good time. I was flying a 350 BA, a clean, light, tight ship. The job for this day was to support crews on a fire that had been established for a couple of days—primarily bucketing—a dream come true! Together with a B2 from another company, we were running full tilt, keeping a relay tank filled using Bambi buckets on 150-ft lines. Turns were to a very large lake about 1 000 ft below, straight down.

Now, like most pilots, I have my pride. I like to think that I'm pretty good at my job, especially driving a longline, so keeping the pace was on my mind because the B2 driver was no slouch. One hundred and fifty feet of line through 130 ft of trees to an



8-ft target, again and again. The tunes were going on the CD player, the bucket was going where I wanted it to go, this was exactly why I became a pilot. I was having a great time.

I had just dropped another load into the relay tank and was at full power climbing the bucket out of the trees. As I turned and nosed the machine over to head back down the hill, the B2 appeared in my window, holding short to place his load. With more horsepower, he had the speed advantage and had managed to get far enough ahead that by now he had "lapped" me! No problem, I simply pitched up and right, then back down to the lake—not even a close call. The B2 driver and I had a laugh about him showing up in my way, and like I said then, "no big deal."

Well this is where it starts to get interesting. Of course, now I was motivated to keep pace with this guy, so I quickly headed down to the lake, dipped the bucket, and pulled up at full power, but something was wrong. As I increased power, the helicopter began to tip over. I thought to myself, "What's going on?"

Lesson one on roll over, *put the collective down,* so I dropped the water and looked in the mirror to see that the longline had hooked over the spring aft of the bear paw. This new situation was cramping my style—I was going to fall at least one more lap behind while I was getting this sorted out. Fortunately for me, there was a small beach on the other side of the lake that would be just right to put the bucket on and unhook the line, so off I went. I was going to be able to do all this without even getting out of the machine.

I had a plan. Sure, I'd be down a lap or two, but I'd try to make them up. With the tail rotor in mind, I put the bucket down on the beach and started to slowly fly out over the lake. The idea was to get low enough that the line would simply fall off the spring. This turned out to be a bad idea—as soon as I turned away from the shore and headed out over the very calm, glassy water, I lost reference, and control along with it.

The line was still over the spring, so it was time to come up with a new plan. I figured I'd better just land and take the thing off the old-fashioned way. Thinking that finding a spot to land should be easy, I re-positioned to a spot on the beach. The beach was small, and finding a good area where I wouldn't get the main rotor into the bush was taking longer than I expected. All this time, I was losing laps to the other guy, and I should have been giving him a clinic on how to run a 150-ft line.

Eventually, I gave up on the beach, as it was just too small. I had noticed some confined areas just inland of the beach, and went to have a look. The new plan was to stuff the bucket in the bush so I wouldn't land on it while setting down in the tight spot—yet another bad idea. The area turned out to be too tight to land in, so it was time to find another. This is where this tale gets good.

There appeared to be several confined areas to chose from adjacent to the beach, so I began searching up and down the shore, losing time and pride with every second. Eventually, I managed to get the bucket hung up in a small tree in an attempt to land. I figured that this was no big deal—I'd just pull it out with power. Of course, since the longline was still tangled in the skid spring, the more I pulled, the more the aircraft rolled. The bucket was really stuck—this wasn't working at all. Time for another plan…

Desperate times call for desperate measures, so the latest plan was to punch the whole line off and sort this mess out once and for all. Unfortunately, the portion of the longline between the cargo hook and the skid spring was at such an angle that the hook wouldn't release.

At this point, I wasn't looking cool at all. The bucket was in a tree, I couldn't get the line off the belly and there was nowhere to land within my 300-ft stretch of beach that my 150-ft leash would allow. As you can imagine, keeping the pace with the competition was no longer my main concern. I was stuck, and I had 40 min of fuel before I flamed out into the lake. My pride was going to take a huge bath when I got on the forestry frequency to call in for some help. My day had "gone south," big time.

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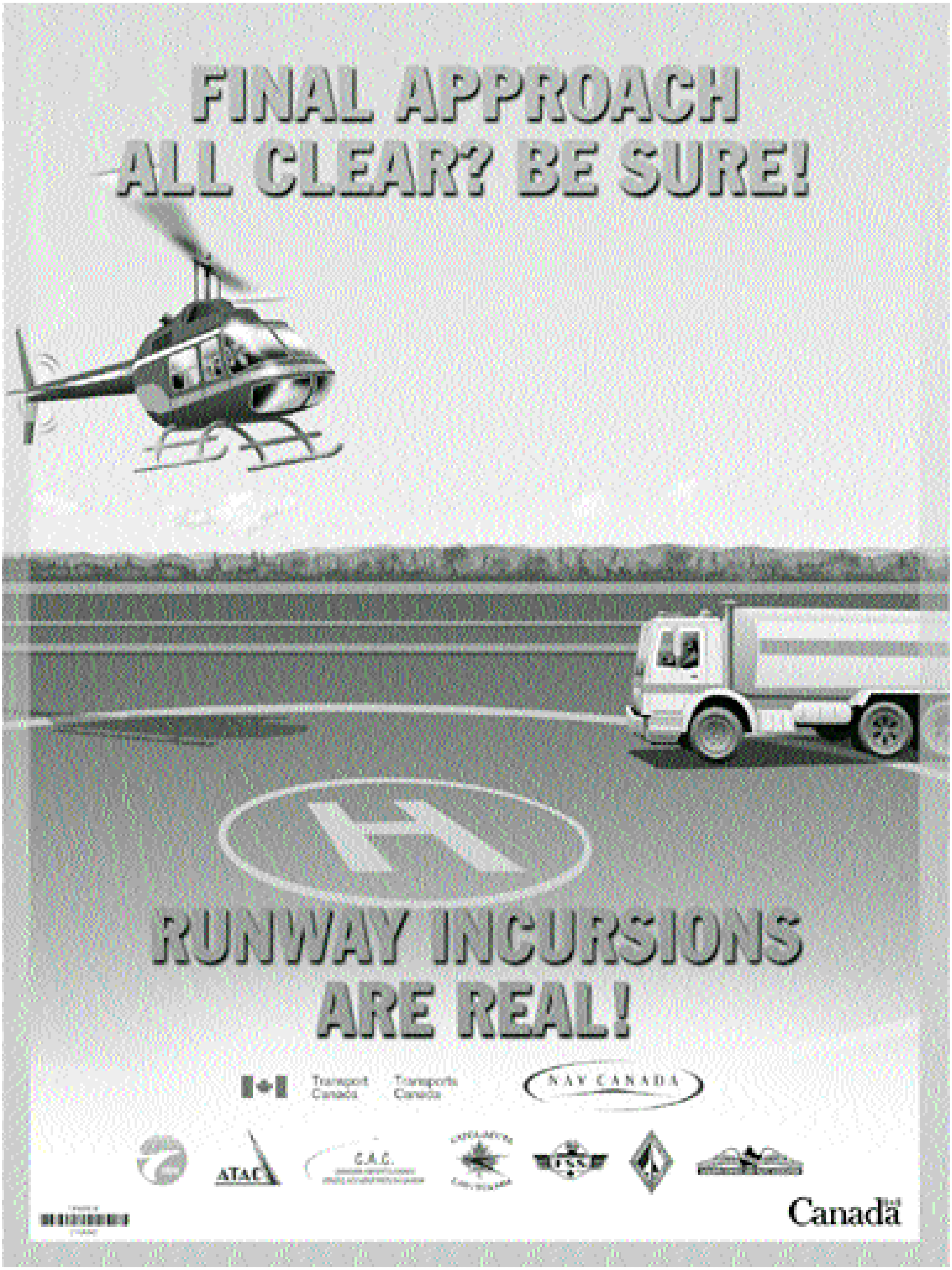
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