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 3/2002**

Stacking the Deck in Your Favour

During much of my career, I had the good fortune to have worked for operators who had an excellent dispatch system. Using high frequency (HF), company aircraft would call dispatch on each departure, giving destination, route, passenger load, and report in again upon landing. Each transmission was logged in a book, with all the pertinent information, and it was taken very seriously if a pilot didn't call in when he or she should have. It felt good to have someone on the other end whose mission was to ensure everything played out as it should.

After working in that environment, one really misses the security blanket when it's not available. I recall days in the Arctic, picking my way through the hills around bad weather, far off the direct track, when not a living soul on Earth knew where I was. Had anything happened, it might have been days or even weeks before someone found me; if ever.

Sometimes we find ourselves in a situation we haven't planned for and we must make on-the-spot decisions that may have far reaching effects. Or, what may seem routine can turn ugly in a hurry, like the circumstances surrounding a recent accident near Baker Lake, Nunavut. Fortunately in this case, technology and the fact that the accident happened close to a community meant the outcome wasn't disastrous.

At supper, the pilot was told that there was a shipment of core samples to be delivered to the community of Baker Lake, approximately 50 NM away. A person who would forward the core samples to their destination, would meet him there. The weather had been poor all day, but it was starting to clear and there was enough daylight left to complete the return flight. Camp personnel advised the shipping agent in Baker Lake that the flight was a go, and he was to meet the helicopter at the airport.

The pilot did not advise the community aerodrome radio station (CARS) in Baker Lake of the flight, nor did he complete a written flight itinerary, even though the company operations manual required it. He reasoned that the intent had been fulfilled, because the camp had notified the shipper of the flight. Shortly after departure, bad weather was encountered and the pilot deviated from his direct routing around a snow squall. A few minutes later, in cruise flight at 500 ft above ground level (AGL), he heard a loud bang and the cyclic control began to vibrate. A second bang followed almost

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immediately and now he had a vibration in the pedals. The pilot decided to make a precautionary landing 26 NM north of Baker Lake to investigate the cause of the noises and vibrations. During the approach to touchdown, visual references were lost in blowing snow, and the helicopter rolled on its side. The pilot was uninjured and when the dust settled he pulled the fuel shut-off, climbed out of the heavily damaged aircraft, and moved a safe distance away. It was now 55 minutes before dark.

Because he was not injured in the accident, the pilot felt that the situation may not be an emergency and he was unsure whether to use the emergency locator transmitter (ELT). He turned it to ON for a while, then back to OFF. Procedures outlined in the company operations manual, the *Aeronautical Information Publication* (A.I.P.), and the *Canada Flight Supplement* (CFS) direct that the ELT be turned ON and remain that way until rescue.

The Rescue Coordination Centre (RCC) in Trenton, Ontario, received the signal via SARSAT, and was able to determine the location despite the short duration. As luck should have it, the shipping agent was at the CARS station when RCC Trenton called to report the ELT signal, and he was able to confirm the helicopter was operating in the area. A call to the camp revealed the aircraft had not returned and the full search and rescue process was activated. Ground search parties were organized from Baker Lake and the camp, and a Hercules aircraft was dispatched from Winnipeg.

Back to our pilot, who is now sitting next to his helicopter in the dark. Upon seeing the lights of the search vehicles, he attempted to fire off three flares from the aircraft survival kit, but none of them worked. In each case, the flares (which were two months from their expiry date) exited the tube and fell to the ground. Still not defeated, he managed to get the attention of the rescue team by turning the helicopter lights on, and was rescued approximately four hours after the accident.

In this accident, the pilot was very fortunate that a number of things worked in his favour—RCC Trenton was able to pinpoint the brief ELT signal; the shipping agent was at the CARS station when RCC called; the camp had a telephone; the community was nearby and search parties were organized quickly; and the helicopter still had a serviceable battery and lights. This occurrence could have had much more tragic results.

Let's look at the lessons learned.

The correct procedures for using ELTs have been established and outlined for years. In an emergency, turn it on, leave it on, and don't turn it off until you can touch the person rescuing you. Comprehensive discussions of the proper emergency and non-emergency use of ELTs can be found in Section F of the *CFS*, and in the SAR section of the A.I.P., so I won't repeat them here. They should be a part of every company's recurrent training and operations manual, still, every year we have accidents where the crew turns the ELT off for one reason or another.

Many long-in-the-tooth pilots have learned to take their own precautions, in addition to those mandated by regulation. In remote locations, it is wise to carry your own survival gear, and it should be considered *part of the aircraft*—don't leave home without it! Extra food, water, clothing, and a few extras like fresh matches and a good flashlight can go a long way to making the time spent waiting for rescue less adventurous. Outdoor specialty shops now carry inexpensive pocket strobes, which can supplement the use of flares or even take their place, should the flares get wet or fail to function, as in this accident. These strobes and the newer flashlights are waterproof, lightweight, can be seen for miles, and have excellent battery life. They also provide a constant signal for rescuers to fix upon, which is something a flare cannot offer. Some pilots carry their own flares, but they are difficult to legally transport—if you're flying the aircraft to and from the job, it can be an option, but commercial travel makes it a little more complicated.

Satellite telephones are becoming cheaper, lighter and better. They are proven lifesavers, and there is simply no better way to communicate from remote areas. More and more operators are using them these days, and that is a welcome trend—their value in an emergency cannot be overstated. See the February 28, 2002, accident in the *Occurrence Synopsis* of this issue for an example of how a satellite phone contributed to the timely and effective rescue of four people.

A comprehensive flight itinerary or flight plan, with explicit SAR instructions is vital, especially when working in remote areas. Let as many people as possible know where you are and what you're doing. Of course, weather or last minute changes can alter these plans, but each situation must be assessed for risk. Although not a factor in this accident, many pilots flying in remote regions will follow geographic features like roads or rivers in bad weather, even if more direct routes are periodically open. The idea is, if someone has to come looking for you, and you're not on the direct route, the next logical place to look will be the 'bad weather route.'

The operator in this accident has taken some positive steps in improving the safety of their flight operations and no doubt the pilot involved learned some valuable lessons. If you don't have the luxury of dedicated company dispatch, take all the steps you can to stack the deck in your favour. In this game, it isn't considered cheating.

Dedicated to the memory of Glenn Martin: the world's greatest dispatcher, who did much to contribute to aviation safety in eastern Canada. —Ed.

Transport Canada Transports Canada

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Address correspondence to:
Editor, Brad Vardy
Aviation Safety Vortex
Transport Canada System Safety AARQ
Place de Ville, 7th Floor, Tower C
330 Sparks St.
Ottawa ON Canada K1A 0N8
Tel.: 613 990-5444 Fax: 613 991-4280
E-mail: **vardyb@tc.gc.ca**
Internet: http://www.tc.gc.ca/vortex

Brad Vardy

Regional System Safety Offices

Atlantic	Box 42 Moncton NB E1C 8K6 506 851-7110
Quebec	700 Leigh Capreol Dorval QC H4Y 1G7 514 633-3249
Ontario	4900 Yonge St., Suite 300 Toronto ON M2N 6A5 416 952-0175
Prairie & Northern	• Box 8550 344 Edmonton St. Winnipeg MB R3C 0P6 204 983-5870
	• 61 Airport Road General Aviation Centre City Centre Airport Edmonton AB T5G 0W6 780 495-3861
Pacific	4160 Cowley Cres., Room 318 Richmond BC V7B 1B8 604 666-9517

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Letters to the Editor

I operate a small crop-spraying service and flight school in South Louisiana, USA. I have been receiving Vortex for years and have always been fascinated with the reality content thereof. We have nothing (helicopter-wise) in the US that comes close. You are off to a good start, and seem to hammer a little harder on the nuts and bolts mechanical realities and consequences of mistakes along those lines—an approach I find refreshing. I have an aeronautical engineering and aircraft maintenance background, and I think articles such as *Freewheel Units* go a long way toward tuning up owners, pilots, and mechanics with the not so obvious mechanical issues. More articles on these topics are much needed in our industry.

Ken Squires
Penn-Tex Helicopters, Jeannerette, LA

Looking for Your Input

In this issue, we're once again looking for your opinion. We hope you'll take the time to send your thoughts via e-mail, fax, or snail mail, to the addresses listed in the Editorial Bar on page three.

Company Training Pilots

Anyone who flies commercially in Canada is exposed to company training pilots throughout their career. These folks do your annual recurrent training, and usually hand out the type endorsements. Some have stood out as being exceptional, and some for falling somewhat short of that mark. A number of relatively low time pilots have turned out to be excellent trainers while some high time pilots with exceptional flying abilities have shown no talent for imparting this knowledge. These cases are certainly generalized, but the point is that flying time by itself does not necessarily guarantee a good training pilot. So, if flying time alone is not the best gauge of a good training pilot, what is?

Question, in four parts: (and please note, we're not talking about instructors here, but company training pilots).

1. What positive and negative qualities have you encountered in the training pilots you've flown with?
2. If you were going to describe the ideal training pilot, which of the following categories would be the most important: training ability, years of operational experience, minimum number of flight hours, or some combination of these? Feel free to add your own category if it is not listed here.
3. Should company training pilots be required to have an instructing background, or some formal training in instructional techniques?
4. Should they have to undergo 'training pilot' recurrent training / certification?

In This Issue

I Need a Drink

The classic image of a dehydrated pilot—stumbling through the desert in a torn flight suit, a tattered parachute in tow, kicking up dust with every scuff of his worn-out boots. He's sweating bullets, trying to suck the last drop out of a dirty canteen, and gasping "Water! Water!" The sun is a huge fireball in the sky, and the heat is shimmering off the ground like it's alive. While this version is great for movies and beer commercials, the dehydrated pilot can take on a much less dramatic profile, one you probably see more often than you think.

Our Canadian climate is one of extremes, and helicopter pilots in this great land just happen to be exposed to all of them on a regular basis. In summer, traditionally our busy time, we have our share of nice, sunny, 35ºC days. Many pilots spend those days inside a poorly vented, greenhouse-like structure, with brief periods spent outside to load cargo, throw around a few 100 lb nets, or roll some fuel drums across a soft bog. This is in contrast to the northern winter, with lows of -40ºC or better, often accompanied by high winds. Rolling fuel drums around in the snow is just as much fun as the soft bog example above, and in winter we have the added pleasure of putting the aircraft covers on in the evening. This is best accomplished in a nice 35 kt breeze.

Much of the work we do, and the environments in which we work, expose us to a greater than average rate of dehydration. In this article, we'll discuss how and why our bodies use moisture, the mechanics of dehydration, what effect it has on our performance and health, and how we can prevent it in our working environment.

The human body is primarily composed of water, about 70%, in fact. To put this in perspective, the standard 182 lb man in your weight and balance calculation will contain over 11 imperial gallons, or 50 L, of water in and around all the cells of his body, and in his bloodstream. This water is used for virtually every function the human body performs—regulating its temperature, eliminating waste, digestion, transporting nutrients and disease fighting agents, and even has a role in neurological functions and the thought process. It is truly what keeps us alive.

Water enters our bodies when we eat and drink, and exits in three primary ways—urination, perspiration, and transpiration (breathing)—but can also lose fluids through vomiting, diarrhea, excessive mucus production etc. Under normal circumstances, a body will lose between 2 and 2.5 L in a 24-hour period, or about 2-3% of the total body weight.

As mentioned above, water is used in virtually all of our metabolic processes. Urination is one method the body uses to dispose of its waste material, and urine is a good indicator of our state of hydration. Normally, it should be relatively clear with a yellowish tint, whereas darker yellow, and often pungent smelling urine is a signal that you need more water. This will often be your first sign of dehydration, even before you get thirsty. Use of diuretic substances (those which increase the production and excretion of urine) like alcohol, caffeine and many carbonated soft drinks, will have a major impact on dehydrating the body. In these cases, the urine may not appear dark in colour, but fluid levels are being significantly depleted. Less frequent, but still very significant, are the excessive fluid losses through diarrhea and vomiting. The average body loses approximately 200 ml of fluids per day through normal bowel movements. This can literally become *litres* if the person suffers from diarrhea.

Perspiration, which is one of the body's ways of temperature regulation, is another large consumer of fluid reserves. Our brain senses an increase in body temperature and takes action in two ways, which team up to bring the core temperature down. The body secretes the saline solution we all know and love, which cools the surface of the skin through evaporation. At the same time, there is increased blood flow to the skin as the blood vessels have expanded (vasodilatation). The temperature of the blood is lowered as it flows through the cooled skin, then the newly cooled blood returns to the body's core. There, it picks up excess heat, and the process continues until a satisfactory temperature is reached. Temperature alone can cause the body to heat up and perspire, but performing work will exacerbate the creation of heat, hence we sweat more when working hard.

Some facts about perspiration:

- It only works when the sweat can evaporate, so tight clothing, or that which doesn't 'breathe,' will hinder cooling.
- When perspiration drips off or is wiped away, it has afforded no cooling benefit and is wasted.
- In high humidity, less evaporation occurs; therefore less cooling. This is why we feel hotter on a 'muggy' day.

We also lose water when we breathe, as evidenced by breathing on your sunglasses before cleaning them, and by the ability to see your breath when it's cold. In fact, it's during cold, dry weather that we lose the most moisture through transpiration. The Arctic winters in Canada are extremely dry, so much so, that steam doesn't form on the mirror when showering. Lips and skin develop painful cracks and splits, and static electricity in day to day life can be almost unbear-

able. In this environment, when the cold, dry air is inhaled, it is warmed by body heat. While the air is in our lungs, it absorbs moisture, which in turn leaves the body when exhaled. In the northern winter, this can be a significant cause of dehydration, made even more insidious by the fact that we don't usually *feel* thirsty when it's cold.

Now we know how and why water is lost, so what happens when it isn't replaced? The onset of dehydration appears in stages. After the loss of approximately 1.5 L of water (about 2% of the total body weight), we get thirsty. At the 3 L mark, we're getting sluggish, tired, maybe nauseated and irritable. This is a very dangerous level for pilots, as this is where your faculties start to become affected, but you may not be aware of the deteriorated performance. United States Army experiments on helicopter pilots clearly indicate that self-reporting is notoriously inaccurate, even at relatively early stages of dehydration. Aircrew who felt no adverse effects had clear, objective difficulty with cognitive tests.

when passing through the urinary tract, and other symptoms like fever, chills, blood in the urine, nausea and vomiting. There are several manners in which kidney stones may be treated. Shock wave lithotripsy (breaking stones) literally pulverises them into smaller pieces that can be passed more easily. Other methods are a little more invasive. Diagnosis of a kidney stone may have an affect on pilot licence privileges. In Canada, Civil Aviation Medical Examiners treat each case on an individual basis, with an emphasis on getting the pilot back in the air as soon as safely possible. Anyone who's ever had stones will tell you, you don't want to be dealing with one of these things while flying an aircraft—as stated above, the pain can be overwhelming and debilitating. Thankfully, simply keeping the body well hydrated can prevent stones in most people. A friend who suffered a bout of kidney stones a number of years back is rarely seen without his water bottle these days. I took it as a lesson learned.

Table 1 Symptoms of Dehydration

	Symptoms
1.5 L	Thirst
3 L	Sluggishness, fatigue, nausea, emotional instability
4 L	Clumsiness, headache, elevated body temperature, elevatedpulse, elevated respiratory rate
5 L	Dizziness, slurred speech, weakness, confusion
6 L	Delirium, swollen tongue, circulatory problems, decreased blood volume, kidney failure
9 L	Inability to swallow, painful urination, cracked skin
12 L	Imminent death

Source: Maidmont, Graeme. "Chapter 15: Thermal Physiology." Aviation Medicine, third edition, edited by Ernsting, John; Anthony, N.; Rainford, David J. - Oxford, England: Butterworth Heinemann, 1999.

By the time the body is 4 L low, it has entered a stage of clumsiness. Headache is likely, along with an increase in core temperature, heart rate and breathing rate. At this level or beyond, you have ceased to function effectively, as the body copes with the fluid loss. Refer to Table 1.

One serious episode, or several repeated moderate episodes of dehydration can result in kidney stones, which are stone-like masses of mineral salts. They can cause intense, incapacitating pain

So we've determined that dehydration is a bad thing—how do we prevent it? Well, the simple answer is 'drink plenty of water,' but we can do better than that.

- Recognize environments where the risk of dehydration is increased.
- When changing environments, like going from a cold climate to a warm climate or vice versa, the body can take *up to two weeks* to acclimatize. During this time, it may use more fluid reserves

than it normally would.
- Do not rely on thirst to be the signal that you need water. By that time, you're already on your way to dehydration. In addition, drinking a small quantity of water, insufficient to rehydrate, may fool the thirst mechanism.
- Carry a container or bottle that allows you to monitor how much fluid you drink.
- Avoid excessive use of diuretics like caffeine, alcohol, etc.
- Monitor your activities such as exercise or heavy work, and rehydrate accordingly.
- Monitor your health state. Vomiting, diarrhea, fever, and many illnesses like influenza or the common cold will all cause the body to lose fluids at a much greater rate than normal.
- As a guide, drink enough water throughout the day to keep the urine relatively clear.
- Plan to carry sufficient water, and ensure it's readily available. This can mean up to 8 L/day in some environments, or even more in extreme cases.
- If water doesn't do it for you, try a sports drink. They're commonly sold everywhere these days, are great for replenishing fluids and restoring electrolyte levels, which may become depleted in episodes of heavy perspiration. If you find these drinks a tad expensive, or unavailable in your bush camp, then make your own—here's a recipe that works great.

Vortex-ade

1 L water
1/3 cup sugar
1/2 tsp salt
1/2 cup unsweetened orange juice, or add lime juice, lemon juice or lime cordial to taste.

As we can see, preventing dehydration is important all year round. Cold dry winter weather can sneak up on us and deplete the body of vital fluid without our even knowing it. In summer, keeping the body's fluid reserves topped up goes a long way to help prevent another killer—heat exhaustion. That will be the subject for discussion in an upcoming Vortex (if you have any stories, I'd love to hear them).

Know the Tin You're In

We often hear about the dangers of complacency and over the years it's been the subject of countless articles and accident profiles. Usually, the focus of these discussions is on a lack of diligence stemming from familiarity with a task—like flying the same aircraft everyday on the same job. There are other facets to our business, however, which also demand careful attention to detail.

Often, helicopter pilots fly more than one helicopter, and are expected to stay current on several types or models. These skills develop as we gain experience, but the differences between aircraft, even within the same type, can bite you if you're unaware.

Helicopters, like most machines, are in a constant state of change as manufacturers or operators learn from experience, upgrade, or modify to suit operational needs. This can run the gamut from the simple placement of switches to fitting engines from different manufacturers.

Some examples:
- Manual cargo releases may be cyclic or collective mounted, T-handles, or floor pedals. Even within the same type, like the AS350 series, the release may change depending on which hook is installed.
- Power instruments—we have percent torque, PSI torque, pitch angle, differential Ng, first limit indicators, etc.
- Rotor tachs—percent Nr vs. actual RPM.
- Fuel gauges—pounds vs. percent vs. Gallons vs. Litres.
- Many operators change cyclic heads, or the location of Force Trim Release, NAV Stand-by or Cargo Release buttons.
- Some IFR platforms like the Sikorsky 76 series has almost as many avionics configurations as there are helicopters.
- Emergency floats can be activated by buttons on the collective, triggers, or handles, depending on the installation.

You get the picture. When new to a machine, or when a variety of different aircraft are flown, it is very important to familiarize oneself with each ship. Failure to do so often results in forgotten fuel valves, generators, cross feeds, rotor brakes, or dropped sling loads during normal operations, and can cause critical delays and mistakes when confronted with an emergency. That extra few minutes you take to get acquainted could be the start of a lasting friendship.

Call For Nominations for the 2003 TC Aviation Safety Award

Do you know someone who deserves to be recognized?

The Transport Canada Aviation Safety Award is presented annually to stimulate awareness of aviation safety in Canada by recognizing persons, groups, companies, organizations, agencies, or departments that have contributed in an exceptional manner to this objective.

You can obtain an information brochure explaining award details from your Regional System Safety Offices, or by visiting the following Web site: http://www.tc.gc.ca/aviation/syssafe/brochures/tp8816/english/index_e.htm.

The closing date for nominations for the 2003 award is December 31, 2002. The award will be presented during the fifteenth annual Canadian Aviation Safety Seminar, which will be held in Montreal, Quebec, April 14 to 16, 2003.

A Look Back

40 Years Ago:

February 4, 1962 Hong My, Vietnam
First US helicopter lost in Vietnam is shot down by Viet Cong troops.

March 1, 1962 Los Angeles, California
Los Angeles Airways become the first airline to put the S-61L into commercial service.

May 9, 1962 Stratford, Connecticut
The Sikorsky S-64A Sky Crane began flight testing. The six-blade main rotor and twin 4050 HP Pratt and Whitney T74 engines make it the most powerful helicopter in the Western world. Delivered to the US Army as the CH-54 Tarhe, it could carry 10 tons, including a pod with 68 troop seats.

December 8, 1962 Hurst, Texas
Floyd Carlson and Bill Quinlan carried out the first flight of the Bell OH-4A Model 206, N73999, from Bell Helicopter Plant 1 in Hurst, Texas. This helicopter was originally designed for the US Army Light Observation Helicopter competition, which Bell eventually lost to Hughes. After some major cosmetic changes by Dwayne Jose, Vice President of Marketing, the OH-4A became the Bell Model 206A in 1966. Jim Atkins—Bell's president at the time—was reportedly not pleased with the changes Mr. Jose made, but the aircraft went on the be a phenomenal success for Bell.

30 Years Ago:

June 21, 1972 Istres, France
Jean Boulet takes an Aérospatiale SA315 Lama to 40 820 ft (12 442 m), setting a world altitude record for helicopters which stood for 30 years. It was finally broken this year on March 23 in South Africa by a Eurocopter AS350B3 which flew to 12 954m or 42 500 ft. (For more information on the Lama and the record, visit www.geocities.com/Lama315)

Photo: Pierre Gillard

October 26, 1972 Easton, Connecticut
Igor Sikorsky dies at the age of 83. Sikorsky was born in Kiev, Russia, May 25, 1889, and fled Bolshevik Russia in 1919 at the age of 30. When he arrived in the US, Sikorsky raised a small amount of capital; much of it from Russian expatriates, and in 1923 organized the Sikorsky Aero Engineering Company which started out building flying boats. From the late 30s, his main concentration was on helicopters, and in 1939 he achieved success when he flew the Vought-Sikorsky 300, a superstructure of welded pipes carrying a 75-horsepower automobile engine linked to a three-blade rotor.

How Much Fuel Do We Need?

Will the search for this answer continue to result in fuel management accidents? One of my former base managers once told me, "There's no excuse for running out of fuel in a helicopter." I suppose one could argue extenuating circumstances and come up with wild scenarios where fuel exhaustion would be 'forgivable,' but I took his point and carried his words with me for my entire career. Whenever the fuel gauge crept below the comfort zone, I would hear his unmistakable voice, admonishing me. That voice, and a ton of good luck, has followed me ever since.

A look at files from the past five years paints an unenviable picture—in that time we have had 23 incidents relating to fuel management issues in Canada, and the problem doesn't seem to be going away, in fact it appears to be getting worse. Last year (2001) had the most incidents in the study period with six, which is almost twice the average of recent years. Looks like 2002 is keeping that trend—as of May 30, 2002, there were already four incidents in the Civil Aviation Daily Occurrence Reporting System, with one fuel starvation resulting in an accident.

Let's look at the types of incidents we're talking about. Six in-flight engine failures from fuel exhaustion were reported, which resulted in four injuries and one fatality. The use of improper fuel (Jet A/B instead of Avgas) caused two more in-flight shutdowns. On the maintenance side, there were two cases that involved instrumentation problems or fuel system factors.

There were 13 *reported* precautionary landings prior to fuel exhaustion, and this statistic is a

Bell 212 after fuel exhaustion. Photo: TSB

double-edged sword. On one hand, it may indicate poor flight planning or bad weather decisions. On the other hand, it indicates good decision making, because the pilot landed safely. Most certainly, that decision to land makes up for any weather issues or planning errors, and those who make it are to be commended for their good judgement. Of course in reality, the incidents reflect both the poor decisions and the pilots who just get caught short in a bad situation. Problem is, these statistics are likely just the tip of the iceberg, as the vast majority of precautionary landings due to low fuel state are probably never reported.

Does personality play a significant role? Why of course it does! If we can figure out what kind of pilot runs out of fuel, then we could solve the problem, right? Linking accidents to personality is very tempting, because it serves two identifiable purposes:

- It is easy, *"He crashed, because he was lazy."*
- It protects us, *"I'm not lazy, so I am safe."*

However, decades of research (which we will explore in an upcoming issue) have shown us that a focus on personality factors is ineffective and that *situations* overwhelm personality variables. If this is the case, then what is the situation that is fuelling our high rate of fuel management incidents?

- Does personal, customer or company pressure contribute to poor fuel management?
- Does pilot training (initial, recurrent, and/or pilot proficiency checks [PPCs]) adequately address fuel systems, fuel consumption, C*anadian Aviation Regulations* (CARs) requirements etc.?
- Will you operate in worse weather with the aid of GPS than you would without it?
- Do you carry less reserve fuel when using GPS than you would without?
- Are you more comfortable flying in a low fuel state if you're 'close to your fuel?'

It's interesting to note, that the 20-min fuel reserve for helicopters still exists in legislation. Except in extenuating circumstances that require dipping into those reserves, operation with less than 20 min of fuel on board is in violation of CAR 602.88.3(b). In spite of this, in some operations, pilots are almost *expected* to burn below this limit as a matter of course, and are applauded for it.

I'd really like to get some good industry feedback on this; our contact info is in the editorial bar on page 3, or visit www.tc.gc.ca/vortex and do it on line. Of course, you may remain anonymous if you wish. What factors do you think contribute to fuel planning issues? Why do you think we still have these accidents? Do you have an incident you could share? How do you think we could address this problem? I'll report the findings in an upcoming issue. Until then, whether it's for Mom, or the kids, or the pet goldfish, try and make sure the only time you see that FUEL LOW light is when you test it in the morning.

Bell 212 after fuel exhaustion. Photo: TSB

Occurrence Synopsis

The following information may change as investigations progress.

21 January 2002 AS350BA
Squamish, B.C.
TSB Occurrence No. A02P0017
The A-Star had just departed Squamish airport with a sling load of antennae on a long line with a remotely operated electric hook. The load was to be delivered to the top of Hospital Hill, about 6 NM SE. At approximately 800 ft, while over flying high voltage power lines, the load inadvertently released from the remote hook and fell into the wires. Company maintenance personnel inspected the installation and no defect was found. It is suspected that the electric release suffered electromagnetic interference from the proximity of the power line, and the company has replaced the release cable with 'high impulse protected wire.' *This drives home the practice of never over flying people or property with a sling load. Last year we had nine reported events where the sling load didn't make it to destination because of an inadvertent release. —Ed.*

14 February 2002 B206B
Lac la Biche, Alta.
TSB Occurrence No. A02W0025
While on approach to Lac la Biche into a bright setting sun, the aircraft struck and severed a wire with the right skid tube. The pilot, the lone occupant, landed successfully and the aircraft was inspected by an aircraft maintenance engineer (AME). It was returned to service with only minor scratches to the paint.

22 February 2002 AS350
Val d'Or, Que.
TSB Occurrence No. A02Q0021
During the final stages of an autorotation to the runway at Val d'Or, the pilot could not pull up on the collective. The locking plate had found its way into position, securing the collective in the full down position, and the pilot didn't have time to unlock it. At approximately 30 ft, the pilot flared in an attempt to reduce speed, but aircraft landed very hard. Both crewmembers received minor injuries and the helicopter was substantially damaged.

28 February 2002 B206B
Lac Charest, Que.
TSB Occurrence No. A02Q0022
The helicopter was employed on a moose survey with a pilot and three passengers at approximately 300 ft above ground level (AGL) when the engine failed. The ensuing autorotation to a riverbed resulted in a hard landing and the aircraft rolled on its left side. Two of the passengers received minor injuries. The pilot called the company on a satellite telephone, and arranged for pick up at a road approximately one mile from the crash site. He then equipped all the passengers with snowshoes and walked to the road where company vehicles were waiting to take them to hospital for treatment. *Always carry your survival gear above all else. A well-equipped helicopter and a level headed crew helped minimize the severity of this accident. Satellite telephones are gaining popularity in helicopter operations and are gradually coming down in price. They're only expensive until you need them. —Ed.*

07 March 2002 B205A1
14 NE Oxford House, Man.
TSB Occurrence No. A02C0047
While preparing to pick up a sling load in a fuel cache, the helicopter drifted to the right and the main and tail rotors contacted trees at the edge of the clearing. The pilot reported that he did not realize the helicopter had sustained any substantial damage, and continued with the operation, slinging the load back to Oxford House. Upon landing, it was discovered that both main rotor blades and both tail rotor blades had to be replaced.

17 March 2002 R22 Mariner
Victoria, B.C.
TSB Occurrence No. A02P0050
During practice autorotation to touch down on muddy ground, the helicopter nosed forward and the main rotor contacted the tail boom, causing substantial damage. There were no injuries.

25 March 2002 SK61
Stephenville, Nfld.
TSB Occurrence No. A02A0047
The helicopter was 7 NM back from Stephenville when the number 2 engine failed. The crew secured the engine and landed at Stephenville without further incident.

26 March 2002 AS350D
12 NW Blairemore, Alta.
TSB Occurrence No. A02W0057
While attempting a landing in mountainous terrain, the helicopter experienced gusty winds and

an increased sink rate. The pilot aborted the approach and turned down hill, but was unable to arrest the rate of descent. During this manoeuvre, the low rotor horn sounded and the helicopter settled into the trees and rolled onto its right side. The pilot was seriously injured and two passengers received minor injuries.

07 April 2002 R22 Beta
20 W Manning, Alta.
TSB Occurrence No. A02W0064
Trenton Rescue Coordination Centre received a SARSAT ELT hit 20 mi. west of Manning. A high-flying aircraft confirmed the emergency locator transmitter (ELT) signal, and the aircraft was found a short time later by company personnel. The pilot, who was the sole occupant, was flown by air ambulance to hospital, but did not survive.

11 April 2002 B47G4A
Rougemont, Que.
TSB Occurrence No. A02Q0041
During a practice autorotation, the tail rotor made contact with the ground. The rotor blades and shaft were damaged and required replacement. No injuries.

11 April 2002 B206B
41 S Rocky Mountain House, Alta.
TSB Occurrence No. A02W0066
The two occupants sustained serious injuries when the tail rotor struck the top of a tree and the aircraft landed hard and broke up.

18 April 2002 H269C
Hare Field, Ont.
TSB Occurrence No. A02O0105
Practice autorotation with an instructor and student aboard resulted in a hard landing. The aircraft was substantially damaged, but the occupants received only minor injuries.

18 April 2002 R44
Bitscho Airstrip, 70 NW High Level, Alta.
TSB Occurrence No. A02W0069
Pilot experienced an apparent loss of power and a low rotor RPM horn. The aircraft touched down hard and skidded 150 m down the runway, sustaining heavy damage to the skids and underside of the fuselage. No injuries to the pilot or passenger.

01 May 2002 R22 Beta
Near Springbank, Alta.
TSB Occurrence No. A02W0074
The helicopter landed hard and was substantially damaged during an autorotation exercise. Both occupants received minor injuries.

10 May 2002 B206B
13 SE Pikangikum, Ont.
TSB Occurrence No. A02C0096
The aircraft was making several trips to remote sites, landing on a log pad near shoreline. During the landing, logs from one side of pad rolled away and the aircraft rolled onto its side. Pilot was sole occupant and not injured.

13 May 2002 Enstrom 280C
Lethbridge, Alta.
TSB Occurrence No. A02W0080
The aircraft was being repositioned closer to the company hangar when the main rotor blades contacted the building. Pilot reported the sun was in his eyes. No injuries to the pilot or passenger.

21 May 2002 B206L4
20 W Revelstoke, B.C.
TSB Occurrence A02P0096
The Long Ranger departed Kelowna for Golden, B.C., and was scheduled to stop at Revelstoke for fuel. It was reported overdue by the company when it did not arrive. After a two-day search, the aircraft was located by another company helicopter. The pilot, who was the lone occupant, did not survive.

27 May 2002 AS350B
Torch Lake, Alta.
TSB Occurrence No. A02W0089
The aircraft was engaged in forest fire fighting operations using a water bucket with a short line. The surface of the lake was glassy, with a 500 ft ceiling and approximately 3 mi. visibility. During the approach to pick up another load of water, the bucket contacted the lake while the helicopter still had forward speed. An attempt was made to arrest the speed, but the tail rotor struck the water and the helicopter began to rotate uncontrollably. The aircraft rolled and sank in 4 ft of water, but the pilot escaped injury.

28 May 2002 AS350BA
Torch Lake, Alta.
TSB Occurrence No. A02W0090
The aircraft encountered heavy smoke at low altitude and the pilot elected to turn around. During the 180º turn, the tail rotor struck a tree, and a vibration was noticed. The pilot made a precautionary landing at a well site, where the tail rotor was found to have sustained damage. No injuries.

30 May 2002 **R22**
Québec, Que.
TSB Occurrence No. A02Q0067
The helicopter drifted sideways during a training exercise and rolled. Both crewmembers sustained minor injuries, and the aircraft was substantially damaged.

30 May 2002 **B206L3**
3 N Mariana Lake, Alta.
TSB Occurrence No. A02W0092
The helicopter was returning to the fire base when the engine failed from fuel exhaustion. An autorotation was attempted, but power lines obstructed the intended landing spot. The aircraft was substantially damaged when it descended into trees, but the pilot escaped injury.

02 June 2002 **B205A1**
Tobin Lake, Sask.
TSB Occurrence No. A02C0114
The crew noticed an engine fire warning and a burning smell while water bucketing. They landed in a field, activated the fire extinguisher and shut down. The fire continued to burn, and was eventually suppressed by water from another helicopter who was bucketing in the area. There were no injuries.

Canadian Aviation Safety Seminar (CASS 2003)

Aviation Human Resources: The Core of Our Industry

The 15th annual Canadian Aviation Safety Seminar (CASS 2003) is being held at the Montreal Hilton Bonaventure hotel on April 14-16. The theme for CASS 2003 is "Aviation Human Resources: The Core of Our Industry". It was developed to address the challenges the industry will face in the areas of personnel selection and recruitment, training, retention and knowledge transfer as they relate to safety.

People are an invaluable resource in any field. But with the impending retirement en masse of the boomer generation, the aviation industry faces a significant challenge: managing the transfer of knowledge and skills from one generation of operational, technical, managerial and safety professionals, to another.

Two obvious solutions emerge: the boomer generation must be prepared to retire later with the commensurate challenges associated with an aging workforce, or the groundwork for succession must be initiated now. Both will be needed to ensure business continuity against a backdrop of continued growth in aviation activity causing an increased demand for better safety performance. Moreover, various sectors of the industry will be competing against one another for quality personnel from an ever-shrinking pool.

The challenge, regardless of the solutions adopted, will remain the management of the transfer of knowledge and skills from one generation to another where each possesses vastly different characteristics and expectations.

To meet this, the aviation industry must understand the issues revolving around these generational differences to devise strategies to ensure a seamless transfer and improve safety simultaneously. It must recruit and retain quality staff and provide the means for transferring knowledge and skills successfully.

CASS 2003 creates an opportunity to hear high profile speakers from the academic, operational, regulatory and management worlds on this subject. In addition, participants will have the opportunity to discuss and find solutions to their mutual human resource problems in a workshop setting.

For more information, visit our Web site: http://www.tc.gc.ca/CASS

Erratum

In Vortex Issue 2/2002, the article "Have You Checked Your Longline" on page 7, contained a mysterious misprint. Under the heading October 1997, British Columbia, the text read "A resident was in his backyard feeding his chickens, when a 4 in x 1.5 in metal bolt fell from the sky, burying itself 6 ft in the ground." Of course, this should have read ***6 inches in the ground****. For some reason the correct version found its way on the web, and in the French Vortex, but the English somehow became 'feet'. I don't know how it happened, but it did. Thanks to those share-eyed readers who pointed it out. —Ed.*

Fuel Drum Etiquette

Prior to the first takeoff, make sure that the aircraft tool box contains rubber gloves, a bung wrench, filters, a standpipe and collar, a diaphragm and nylon valve repair kit, grounding cables, and enough tools to do the job. Make sure that you know how to use them.

Okay. You have just landed at a fuel cache, perhaps one that is not familiar to you. All things being equal, the fuel cell in your aircraft is presently uncontaminated, and the trick is to refuel, without incident, while maintaining this uncontaminated state!

THE BASICS

1. Ensure that the drum you are using contains the proper fuel, regardless of what is printed on the outside! Also note: different oil companies have different colours for drums, but a drum's colour is not a foolproof indicator. Confirm by the appearance and odour of the fuel each time.

   Be suspicious of any drum that seems light or heavy: water weighs 20% more, and AvGas 10% less, than Jet B. Whatever is printed on the drum cannot be trusted if the original seal is broken or missing.
2. Somewhere on the drum is a fill date. Most oil companies discourage using fuel that is more than two years old. One reason is that a nasty fungus (cladosporium resinae) can thrive in small amounts of water in jet fuel, and will clog fuel lines. Older fuel can be used safely with caution. Check for any strange odour, or a dark or cloudy condition. If you have any doubt, do not use it.
3. Check all unsealed drums for an "X" marked on the end. This is the accepted marking for contamination. However, the lack of an "X" is no guarantee of quality! Many pilots who use a part drum will mark the date, aircraft registration, and approximate amount used, near the bung. (If you have any doubt, don't use it!)
4. Store the drum in the proper manner, and be suspicious of any drum that is not, especially if you have reason to doubt whether it has been well resealed (bung or vent loose; gaskets torn, missing, or twisted). Even when properly resealed and stored, a part drum is more likely to contain moisture because of the increased "breathing" (more air content equals greater compressibility.)
5. All fuel drums should be stored on their side, with bungs and vents at the 3 o'clock and 9 o'clock positions. Make sure that the top of the drum (with the openings) is lower than the bottom. This will minimize breathing (air and moisture exchange from the outside).
6. When opening a drum, observe the following:
   - Stand the drum on end and block it with the high side at 12 o'clock, the bung at 3 o'clock, and the vent at 9 o'clock. This prevents water or dirty fuel from reaching the openings.
   - Ensure that the standpipe cannot reach the lowest point in the drum. Thus, any small amount of water or dirt will remain in the drum. You should not need the last gallon badly enough to risk using it.
   - If possible, stand up your drums prior to their usage (up to two days, if dry conditions can be assured) to allow contaminants time to settle out. Avoid agitating the drums when refueling.
7. If you have a helicopter and you must hot-refuel, avoid putting loose items such as bungs and wrenches on top of the drum.

Note: Hot refueling from drums should be done only during an emergency, or under very controlled conditions in compliance with CAR 602.09 and the approved Company Operations Manual (lots of ground crew, no passengers on board, pilot at the controls, and a developed refueling procedure complete with individual duties and signals). The potential for disaster normally outweighs the potential for time saved.

8. Upon emptying the drum, locate it (with bung and vent reinstalled) so that it will not become a rolling or flying hazard to yourself or others using the fuel dump.
9. Proper grounding is critical, especially during winter operations. Dry winter air and blowing snow transform the rotors into powerful static generators. Moreover, snow insulates, and static may not dissipate on touchdown. Avoid wearing nylon clothing or wiping plexiglass when refuelling. Dusty or sandy conditions are also conducive to static buildup. Check the condition of the ground cables, and replace any doubtful connections.

Note: The proper sequence for grounding is: drum to ground (anchor post), drum to pump, pump to aircraft, nozzle to aircraft, then open cap. When finished, reverse order.

10. Fuel caches should be located clear of sandy, dusty, or debris-strewn areas. They should be organized to expedite refueling, with a good approach/departure path. (Remember: you will be heavier leaving, than arriving, unless you arrived with a load of uranium)
11. Always carry and use water finding paste, such as Kolor Kut. A tube will fit unobtrusively in your map case and last for a long time. A dab on the end of the standpipe will give a positive indication of water.
12. Ensure that the pump is equipped with a clean and serviceable go-no-go filter and particle filter in series, with intact o-rings. The go-no-go is designed to bind up and prevent flow in the presence of water. Increased pressure usually means blockage or contamination. Observe the sight glass for dirt or water in the sediment filter.
13. Squirt the first pump strokes into a container before putting the nozzle into the aircraft. Any dirt downstream of the filters will be flushed out of the hose, and can thus be examined.
14. Dispose of plastic caps, metal rings, and date tags from your used drums carefully to prevent the risk of foreign object damage (FOD) in the refueling area.
15. Don't forget that the first preflight of the day should include a draining and catching of the aircraft's sump/airframe fuel-filter contents. Do this before disturbing the aircraft.