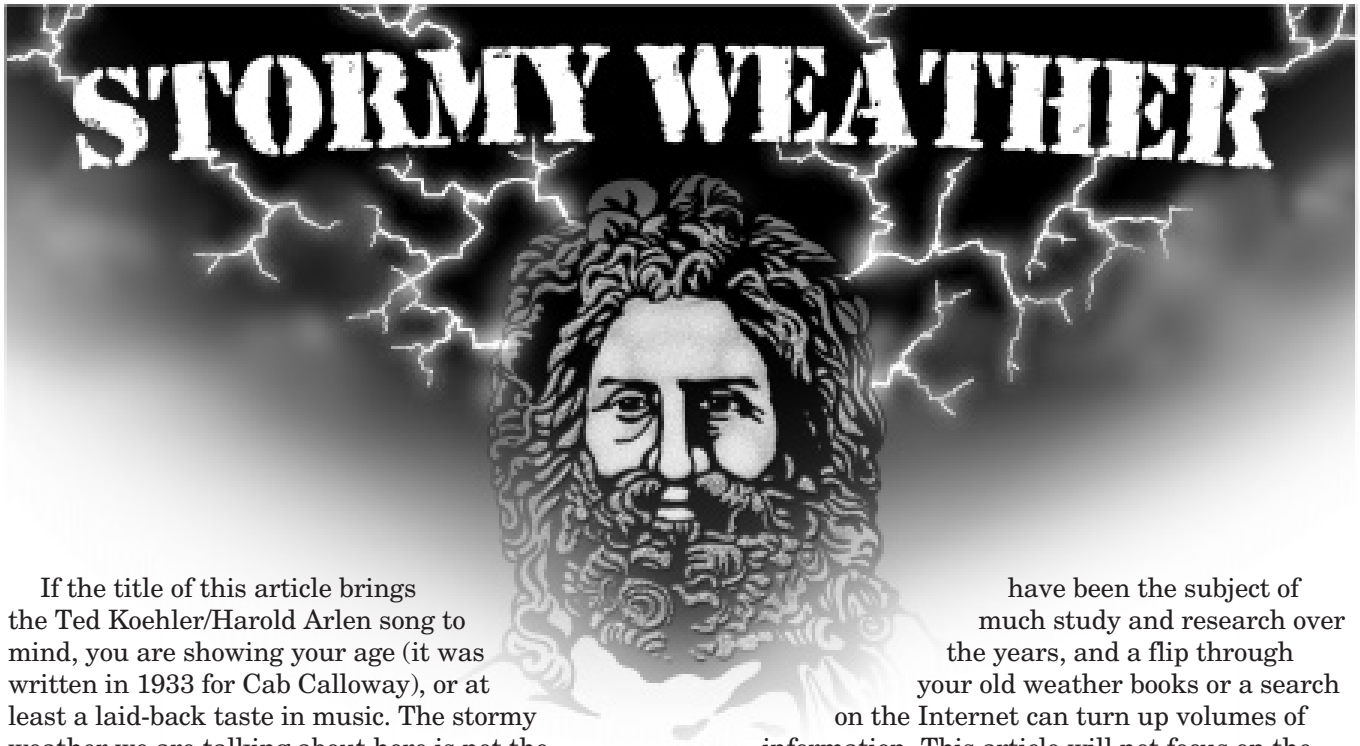
Transport Canada Transports Canada

Aviation Safety

Vortex

Learn from the mistakes of others; you'll not live long enough to make them all yourself . . . ***Issue 3/2004***



If the title of this article brings the Ted Koehler/Harold Arlen song to mind, you are showing your age (it was written in 1933 for Cab Calloway), or at least a laid-back taste in music. The stormy weather we are talking about here is not the love-sick variety referred to in the song, but the kind we typically see on those hot summer days when harmless cumulous clouds, nurtured by daytime heating, mature into dark grey cumulonimbus clouds, and thunderstorms rumble across the landscape.

Thunderstorms can occur at any time of year, as long as there is sufficient moisture and a lifting mechanism, but they are much more common in the summer months. They are fascinating examples of nature's power—so much so that in Greek, Roman, and Norse mythologies, the God of Thunder (Zeus, Jupiter and Thor, respectively) wielded the most power, and was ruler of all gods. But the power and unpredictable nature of thunderstorms is no myth, and *avoidance* is the only real strategy helicopter pilots have for dealing with them, in either IFR or VFR conditions.

Cumulonimbus clouds, thunder, and lightning have been the subject of much study and research over the years, and a flip through your old weather books or a search on the Internet can turn up volumes of information. This article will not focus on the science of thunderstorms, rather on the hazards that exist in and around them. In the *Tips and Tails* section of this issue, you will find a story of a pilot who pushed a little too close but was lucky enough to have escaped with nothing more that a scary story and lesson that won't soon be forgotten. Sadly, not everyone has been that fortunate—even the highly experienced can be surprised by the intensity of a thunderstorm, and the speed with which they can overtake an area.

On May 2, 1992, a Bell 204B was employed on an aerial construction operation at an automotive plant in Oakville, Ontario. The job had been going smoothly, with 40 of 47 scheduled lifts completed in the morning before shutting down for fuel and lunch. After lunch, things went horribly wrong.

In its report into the accident (A92O0144), the Transportation Safety Board of Canada (TSB) states: "*The first lift of the afternoon was taken to the*

TP202E
ISSN 0823-5554

Canada

roof, but, because of flight conditions, the load was not as stable as the earlier morning lifts… After placing the load, the helicopter returned to the loading area and picked up another load. The weather conditions further deteriorated such that the load was unstable and the workmen on the roof could not handle it. The pilot took the load off the roof and hovered over a parking lot area adjacent to the loading area. While hovering in this area, the thunderstorm precipitated what was described as a torrential downpour with associated hail. The aircraft was observed to suddenly bank to the left and pitch nose-down 45 degrees, then turn quickly to the south and fly away with the slung load trailing behind. While in forward flight, the load was jettisoned and the helicopter was observed to pitch tail over nose twice. The aircraft struck an asphalt surface behind a building about 2,000 feet from the loading area and then struck a wire mesh fence. A post-crash fire engulfed the cockpit. The pilot was thrown clear of the aircraft and sustained fatal injuries."

The report also says: "*No direct observations of downdraft speeds were obtainable for this event; however, analysis of the vertical sounding of the air mass indicated potential downdraft speeds of 40 to 50 knots in any significant cell developing in the air mass. Conventional radar returns indicated that a sudden onset of heavy rain began at the accident location between 1250 and 1300 EDT. The strength of the radar echoes indicated a rain rate of approximately 35 to 50 millimetres per hour*." To put that in perspective, a 50 kt downdraft is approximately 4 000 ft/min—difficult to overcome in any helicopter, and the monthly average rainfall for Toronto (Pearson Airport) in May is 67 mm.

The accident pilot was considered very skilled and well respected, with almost 15 000 hr of helicopter time, and significant sling experience. It is easy for all of us to put ourselves in his position—almost at the end of the job, just a few more lifts to go, the pressure to finish the work in the back of our minds. *Just one more lift, and if that doesn't go well, I'll call it off*.

Thunderstorms sometimes form in groups of cells known as a squall line. This narrow band of active storms creates a significant hazard to aviation, as it may be too long to detour around, and too severe to penetrate. They develop in moist, unstable air, often on or ahead of a cold front, but may occur with no associated frontal activity. They frequently contain steady-state thunderstorms and form rapidly, usually reaching maximum intensity in the late afternoon and early evening.

The cumulonimbus cloud packs just about every weather hazard known to aviation, often in one vicious bundle. Some of the individual hazards helicopter pilots face around thunderstorms are:

Turbulence—Potentially hazardous turbulence is present in and around all thunderstorms, with severe storms having the ability to destroy an aircraft, whether parked or in-flight. The strongest turbulence within the cloud occurs in the shear between updrafts and downdrafts. Outside the cloud, shear turbulence may be found several thousand feet above, and up to 20 mi. from a severe storm. Gust fronts can extend up to 15 mi. ahead of precipitation associated with a major storm, causing rapid and sometimes drastic changes in surface winds.

Precipitation—Usually intense in and around storms, and may fall as rain, hail or both. Rain can reduce visibility to zero, and may do so almost instantaneously, posing a serious threat to VFR flight. Hail is formed when supercooled droplets are carried aloft and freeze. Once a drop has frozen, others attach to it, and the hailstone grows—sometimes into a huge ball of ice. Eventually, they fall, possibly some distance from the storm core—hail may be encountered in clear air several miles from large storms. It goes without saying that hailstones can cause severe damage to a helicopter rotor system or fuselage.

Altimeter Error—Atmospheric pressure usually falls rapidly with the approach of a storm, then rises sharply with the onset of the first gust and arrival of the cold downdraft and rainfall, falling back to normal as the cell passes. This can have a significant effect on altimeters, creating dangerous errors in altitude information.

Lightning—Helicopters and lightning do not mix well. Nearby lightning can temporarily blind the pilot, disrupt radio communication on some frequencies, and induce permanent errors in the magnetic compass. Lightning strikes can damage communication equipment, puncture aircraft skin, and cause unseen thermal damage to rotor systems, engine bearings and other internal components, as the electricity passes through the aircraft.

In July 2002, a Sikorsky S-76 helicopter operating in the North Sea crashed, killing 11 people. The British Air Accident Investigations Branch (AAIB) report concluded that one main rotor blade had failed in fatigue. A manufacturing anomaly in the scarf joint between the two titanium leading edge strips of the rotor blade was found in the investigation. In addition, the area exhibited thermal damage. From the report: *"The fatigue initiation point of the blade's titanium spar was on the upper surface in the area of the inboard edge of the scarf joint between the two piece titanium leading edge erosion strip. Microscopic examination of the initiation point indicates that it had suffered intense thermal damage. The area has the appearance of and discolouration similar to an electrical 'spot weld'."*

Continued on page 4

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The **Aviation Safety Vortex** is published quarterly by Civil Aviation, Transport Canada, and is distributed to all Canadian licensed helicopter pilots. The contents do not necessarily reflect official policy and, unless stated, should not be construed as regulations or directives. Letters with comments and suggestions are invited. Correspondents should provide name, address and telephone number. The Vortex reserves the right to edit all published articles. Name and address will be withheld from publication at the writer's request.
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 • Canada Place 1100-9700 Jasper Ave. Edmonton AB T5J 4E6 780 495-3861
Pacific	3600 Lysander Lane Richmond BC V7B 1C3 604 666-9517

Sécurité aérienne — Vortex est la version française de cette publication.

Agreement Number 40063845

Dave Blackburn Retiring, Welcome Luan Huynh

On May 20, 2004, after 15 years at Transport Canada, Flight Training, Dave Blackburn retired to pursue a life of leisure. He tells me that with all this new time on his hands to do nothing but play golf, he hopes to break 100 this year without using his "foot wedge" or the "preferred lie rule." We thank Dave for his long and exemplary service to Transport Canada, the flight-training sector, and the helicopter business in general—it is truly a better industry because of his involvement. I join everyone in wishing him the very best for a long and happy retirement. See you on the links, Dave!

We extend a warm welcome to Luan Huynh (pronounced "win"), who has taken over the position and is already ensconced in the same office, with the same telephone number. Luan joins us from Transport Canada, Quebec region, where he has held positions in Flight Training, Commercial and Business Aviation, Enforcement, and Aerodrome Safety for the past 18 years.

Luan started flying in Vietnam in 1969 with the Vietnamese Air Force. He came to Canada in 1975 to fly safer missions with Okanagan Helicopters, Olympic Helicopters, and Heli-Craft before joining Transport Canada. He has been an instructor since 1973, and has over 10 000 hrs on too many types to list here. We have yet to determine his golf skill level. You can reach Luan at 613 990-1019, or huynhl@tc.gc.ca

Lloyd H. Cummings—In Memoriam

On New Year's Day 2004, the helicopter industry said "adios" to one of its pioneers. Lloyd Cummings started his career flying fixed wing, beginning with the famous Spitfire in World War II, in the Battle of Britain. On his return to Canada after the war, he flew various types of airplanes on the initial construction of the Distant Early Warning (DEW) Line in the High Arctic.

Then began a long career that spanned almost 30 years and 21 000 hrs in many helicopter types.

I flew with Lloyd for 8 years on the James Bay Hydro project during the 1970s. His machine was always the first in the air at dawn, and the last one back to camp at dusk. He loved the wilderness, and would pass on many of his rotations out (unlike most of us!). All he asked for was that crossword books be sent up from Montreal. He excelled at those like nobody I've ever known.

At the age of 56, his career came to an abrupt end when he crashed in white-out conditions during a ferry trip in the High Arctic. It took search and rescue crews three days to find him, severely frostbitten and near death. Both hands had to be amputated, and a leg that had been partly severed in the accident was repaired by a long series of operations to implant metal rods. Still, Lloyd soldiered on, his sense of humour intact.

Many, many pilots across Canada enjoyed the privilege of meeting Lloyd over his long career in aviation. It was an honour for all of us to have known him during his 79 years on this earth.

Soar upward at full throttle, my friend.

Art Read, retired helicopter pilot, Quito, Ecuador

In This Issue

Tips and Tails

Calm Before the Storm

The following article is adapted from "Calm Before the Storm," by Lt. Vince Johnson, an SH-60S Seahawk pilot. The original appeared in Approach*, the United States Naval Safety Center magazine (*www.safetycenter.navy.mil*), and has been used with their kind permission.—Ed.*

I launched on a warm, starry night on a search and rescue (SAR) exercise, with my squadron maintenance officer (MO) and one of our more senior anti-submarine warfare officers (AW). We took our time flying down the St. Johns River, through Jacksonville, enjoying the city lights along the way. After clearing Naval Air Station (NAS) Jacksonville's airspace to the south, I ran my crew through a couple of SAR scenarios, and both pilots rebased their night Doppler-approach qualifications—piece of cake, I thought. We had time for another river run and a few laps in the pattern before we called it an evening.

As we climbed to let base know we were headed back, a nasty surprise hit me. The squadron duty officer (SDO) had been trying to recall us because of a fast-moving storm system working its way from the north. My AW turned on the radar, and all three of us looked intently as our gadget painted a huge wall of storms coming at us.

A smart man would've flown the five miles to NAS Jax and sat this one out, but I've never claimed to be a smart man. Dinner, *Seinfeld*, and my bed were calling me. I think everyone in the helicopter heard the same tune because, just then, the MO said, "I think we can beat it." After a big "affirmative" from our AW, we were headed back up the river as fast as our Seahawk could take us.

As we cleared downtown Jacksonville, the clouds were bearing down on us. The green radar display showed we weren't going to win this race. Did I decide to turn back for NAS Jax? Nah! I decided to call approach and request VFR direct to Mayport. This plan involved leaving the safety of the river, but cutting the corner would be quicker. Besides, the Jacksonville area is flat, no big towers (except downtown) exist, and nobody else is dumb enough to fly in this weather. We pressed on.

We had just gotten the helicopter pointed to the head of the TACAN needle when we ran into the storm—a great big rain-and-lightning fest, the kind that slaps your plane and loosens fillings.

We already had descended to 400 ft to clear the clouds. Mayport was about nine miles away on the DME, but I couldn't see anything. "Turn around," I thought. I considered turning, but that would mean flying back though the storm, with all the towers and buildings in the city.

We were cinching down our harnesses and talking about options when some benevolent being whacked me upside the head. We were flying over Craig airfield, about five miles to the west of Mayport! Those runway lights were the only things I could see, and that was through the chin bubble. We quickly called Craig and requested a full stop. Tower granted us any runway and any way we could get there. I think the controller then ran to get a video camera.

I turned south to set up for a left downwind. My airspeed dropped, but we sure were hauling the mail over the ground. Turning to final, the strong headwind meant we hardly were moving, even with relatively high airspeed. I could make out the runway lights but not the ground. I set up to land somewhere between the lights, checked the VSI, and waited for terra firma. Contact, collective down, and we taxied clear of the runway.

We held on the taxiway, unable to see. Shutting down was not an option—the winds were way out of limits. We passed our time by betting on getting hit by lightning or getting blown over. After 30 min, the weather cleared enough for us to hop over to Naval Station Mayport—home sweet home.

You never are too close or too far from home to catch get-home-itis. Those of you shaking your heads probably can think of a time when you pressed home, rather than diverted for weather, fuel, or mechanical problems—it's natural. This flight is one case where experience allowed us to make the wrong decision.

Stormy Weather *cont. from page 2*

The blade had been struck by lightning in 1999. The report concluded that the manufacturing anomaly, exacerbated by the thermal damage from the lightning strike had caused the blade to fail.

Contrary to what we might think, lightning strikes may be relatively benign events, and may not always be obvious to the pilot. But every strike has the potential to cause serious damage to the helicopter. If you suspect that you have been struck by lightning, have the aircraft thoroughly inspected immediately.

As mentioned earlier, give these powerful weather phenomena a wide berth, and make the decision to land or clear the area at the first sign of an approaching storm. If you are lucky enough to have a dispatch facility with radar information, or are in contact with Flight Service, monitor storm activity through them. If the storm cannot be avoided, the safest place to weather it out is on the ground, shut down, with the blades tied—preferably while you are safely inside a building, drinking coffee.

With information from the TSB, the AAIB, and the United States Department of Transportation Federal Aviation Administration (FAA) Advisory Circular 00-24B, *Thunderstorms*.

Flight Suits—Functional Protection

The slash-burning contract was in its 7th day and going well. The Bell 206 and drip torch were both working well, and the ground crew had perfected the mixing and loading operation to ensure safe and expedient turnarounds. During the second run of the day, ground workers heard the pilot transmit, "I've got trouble," when the helicopter was mid-way on its down-slope track. This was followed by a high-pitched whine, believed to be from the engine. The helicopter entered a rapid descent in a nose low attitude and crashed on the stump-ridden hillside. There was a short pause, followed by an explosion, and then a slightly longer pause, followed by a second explosion. It is believed that the helicopter's fuel tanks ruptured on impact and sprayed the pilot with fuel. Ignition from the drip torch is thought to have ignited the fuel. The pilot was wearing jeans and a T-shirt, which provided little or no protection from the subsequent fire.

The pilot was found approximately 100 m below the wreckage, alive but very badly burned. A second helicopter was called in to MEDEVAC him to hospital. The injured pilot was conscious and coherent, and when questioned, he confirmed the engine malfunction. He told the rescuers that he had difficulty undoing his seat belt and evacuating the ship, which had impacted on a stump and was lying partially on its side. He said he had seen the rescue helicopter fly over and waved at it. Lying on a stretcher, clothed only in boots and socks, he was transported downhill to the waiting helicopter. On the way, he commented that he was glad to get out because when it blew, it went with, "a hell of a bang."

When they reached the MEDEVAC helicopter, he lifted himself onto the rear seat without assistance. He was flown to a regional hospital for stabilization, and then on to a major burn centre for further treatment, but succumbed to his injuries the following day.

On those hot summer days in the greenhouse (sometimes referred to as a cockpit), the desire to stay cool increases the temptation to shed protective clothing. We may even justify the decision to fly in shorts and T-shirt by telling ourselves that the risk of dehydration or overheating is higher than that of having an accident where a flight suit may come into play. But the fact is, a well-chosen combination of garments can give us the protection we need, and not significantly contribute to an internal thermal runaway.

For some reason, many helicopter pilots in this country resist wearing a flight suit. There are usually a few standard reasons given for this—they are too hot, they look goofy, they are uncomfortable—but the reality is, flight suits can be one of the most useful tools in the pilot's arsenal. In one neat package, you have a place to keep your licence wallet, pens, a small multi-tool, some tissue, sunscreen, a signal mirror, your ramp pass, a granola bar, etc. It provides excellent protection from UV radiation, keeps useful items on your person in the event of an accident where you are immobilized, and helps defend against the one we all worry about—fire. But not all flight suits are created equal. Choosing a material is one of the prime decision factors.

Fabrics and Flammability

Materials and fabrics have been tested in many different fire situations and environments. The most important factors to the level of protection provided to a wearer in a fire situation are ignitability, self-extinguishing characteristics, and behaviour when exposed to heat. A fabric's weave, the type of fibre, the size of the fibres in the weave, the density of the weave, and the thickness of the material affect these traits. How they burn if ignited can affect what they do to the wearer. Most synthetics for example, shrink before they melt. Some fuse into molten or burning globs, which drip on anything underneath them. The temperature at which they degrade is also important. Some of the common clothing fabric's fire characteristics are listed in Figure 1.

Burn Characteristics of Common Fibres

Fibre	Melting point (°C)	Dripping	Behaviour	Ignites
Acetate	140–225	Yes	Melts, burns, fuses	Easily
Polyamides (nylon)	160–260	Yes	Softens, shrinks, melts	Easily
Polyester	175–290	Yes	Softens, shrinks, melts	Easily
Rayon	175–200	No	Melts, burns, fuses	Yes
Cotton	None	No	Decomposes above 225°C	Slowly
Wool	None	No	Decomposes above 200°C	Slowly
Nomex® III (aramid fibre)	None	No	Decomposes above 425°C	Slowly

William Waldock, Embry-Riddle Aeronautical University

Figure 1

Embry-Riddle Aeronautical University Tests

In February 1997, a series of fabric burn tests were conducted at Embry-Riddle Aeronautical University (ERAU) as part of the Aircraft Crash Survival Investigation course. The tests were conducted using 5-in. square samples of common

clothing types, which had been identified (by labels) as to the type of fabric used in them. The tests were intended to develop an understanding of the burning characteristics of the materials, including behaviour of the fabric when exposed to heat, and the time it took to consume the material. A test stand was constructed so that the sample could be suspended vertically over an alcohol burner (*a relatively low temperature flame)*. Flame contact was limited to the lower edge of the fabric only. In each case, the flame was removed after the material started burning. Time of removal was subtracted from time to consumption. Each type of material was subjected to two test runs, and the times were averaged. Each test was photographed. The results are in Figure 2.

So, now we have seen the benefits of a fire-resistant suit over a flammable garment, but is that enough? No, it is not. The fact that the suit will not support flame or melt does nothing to prevent heat transfer to the skin. Therefore, what you wear *under* the flight suit is as important as the outer garment itself.

Testing done by DuPont, using their instrumented mannequin (Thermo-Man®), shows that an insulating layer under a fire-resistant flight suit can substantially reduce burn injury. In these tests, the mannequin was clad in a flight suit made from DuPont™ Nomex® fibre that was developed for the Canadian Forces, and subjected to a three-second flash fire. In the first test, the mannequin was clad only in the flight suit. In the second test, the mannequin was wearing a second layer, consisting of short-sleeve T-shirt and briefs. Note the burns on the lower arms and legs as illustrated in Figure 3, on page 7. In the third test, a second layer of long underwear made from DuPont™ Nomex® fibre was used. **IMPORTANT! It should be noted that these results were for the specific garments tested in a controlled environment. Their inclusion here is to illustrate the concept of an engineered approach to fire protection, and not a guarantee of actual protection.**

Of course, the value and effectiveness of the insulating layer depends on the material chosen. There seems little point in wearing a flight suit made from Nomex® III if you are going to wear polypropylene long underwear that will melt and fuse to your skin in a fire. An aramid or cotton garment is a much better choice. Fit is also very important—the suit should be loose-fitting to provide an insulating layer of air between the outer and inner clothing.

That covers the body area, but we should also apply the same logic to the head, hands, and feet. Leather boots are a safer choice than synthetic varieties, and should be coupled with natural or aramid fibre socks. Thin, fire retardant gloves are available, and quite comfortable, though many pilots feel that they somehow reduce the ability to use switches or controls. I have been wearing them for years, and would be inclined to disagree—my hands now feel naked without them. A skullcap under your helmet completes the setup, and helps keep the helmet liner clean at the same time.

Embry-Riddle Fabric Burn Test Results

Sample	Behaviour of Material	Time to Consumption (seconds)
100% cotton (linen) jacket	Burned, charred	24
100% cotton sweatshirt	Burned, charred	33
Poly/wool (60/40%) pants	Melted, ignited	21
Poly/cotton (70/30%) shirt	Melted, dripped, ignited	14
100% cotton pants (Dockers®)	Charred, decomposed	75
100% cotton pants (thin)	Charred, decomposed	35
100% flannel shirt	Ignited, charred	19
100% Dacron® blouse	Melted, dripped	24
Polyester pantyhose	Melted with flame, went out when flame removed	48
100% cotton pants (Levis®)	Charred, decomposed	72
Pyjamas, fire-resistant	Melted with flame,went out when flame removed	66
Nomex® III undershirt	Local charring only	Test stopped at 180 seconds

Flight Safety Foundation—*Cabin Crew Safety,* March/April 1999

Figure 2

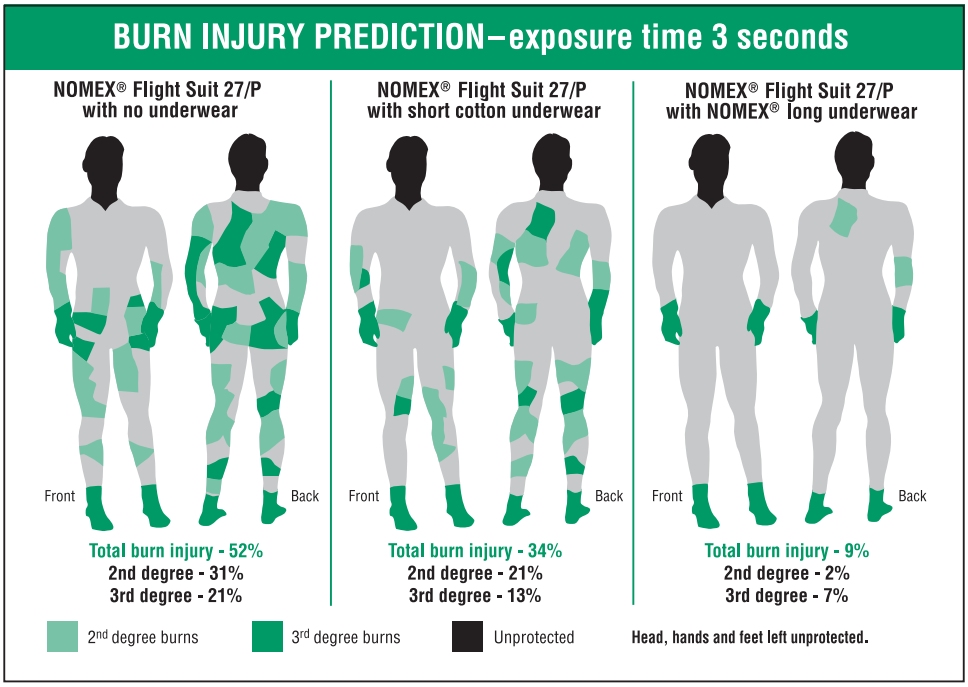
Care of Flame-resistant Equipment

One thing we sometimes hear about clothing made from aramid fibres is that their resistance to flame reduces with washing. This is not true. They can be machine-washed using household detergents, but chlorine bleach is not recommended as it may fade the dyes and weaken the fibres. It does not, however, change the fire resistant properties. **Fabric softeners should be avoided**, as they contain paraffin, which is flammable and adheres to the material. There is not much sense in wearing a flame-resistant suit coated with a flammable substance. If aramid-fibre clothing is to be laundered at home, it should be washed separately to avoid picking up flammable lint from other clothing.

It should be noted that some cottons are available that have been treated to be fire resistant, and these

properties can be negatively affected by improper laundering.

Wouldn't a flight suit with a full set of long undergarments be too warm? Sometimes, but steps can be taken to minimize the impact of heat and sun. It would be unwise, for example, to choose a dark blue suit in the middle of summer—a light tan or sage-coloured one would be much better. Light-weight underwear is also preferable in summer. Physical exertion can cause overheating, but remember, insulation can keep heat out, as well as in. Next time you are in the desert, have a look at a Bedouin.



See important note on page 6.

Figure 3

The editor wishes to thank: William Waldock of Embry-Riddle Aeronautical University; Flight Comment—*The Canadian Forces Flying Safety Magazine; The Flight Safety Foundation*—Cabin Crew Safety*, March/April 1999; and DuPont Canada, for their contributions to this article.*

Care of Portable Hydration Systems

In issue 3/2002, we ran an article ("I Need a Drink!") on the physiological effects and behavioural impact of dehydration, and the importance of drinking sufficient water throughout the day. I am sure that upon reading that piece, those who were not already so equipped ran out and bought all of the available hydration systems and water bottles to be found. Now that we are all flying around with our Platypus® or CamelBak® systems, or big plastic water bottles, there are some things we should know about caring for them.

It should be obvious that anything from which you eat or drink must be clean. Basic screw-top water bottles are the easiest to maintain, requiring daily washing with warm, soapy water, including the suction hose and mouthpiece, if they are fitted.

Any hydration system that consists of a plastic bag with a long drinking tube and mouthpiece or bite valve require special attention during cleaning. These are closed systems, and can be prone to mould or fungus growth if not properly cleaned and stored.

Sugar accelerates the growth of bacteria, mould and fungus, so if your kit is being used for sports drinks or other sweet beverages, it must be rinsed after each use, and thoroughly cleaned daily. Failure to do so will quickly result in a mini science experiment. The small cleaning brushes that most manufacturers sell as accessories are a good investment in your health.

If the system won't be used for an extended period (weeks), clean and dry the reservoir, and store it in a refrigerator with the filler cap open so the plastic can breathe. Remove, clean and dry the drinking tube, and store it separately.

After prolonged storage, or when you suspect the system may be contaminated, fill the reservoir and drinking tube with water, then add a couple of teaspoons of bleach. Let this sit for an hour or so, wash thoroughly with warm, soapy water, and rise well. Some new products are treated with a silver-ion compound that inhibits bacterial growth, but cannot take the place of good cleaning and maintenance habits.

Accident Synopsis—January 1 to March 31, 2004

(Source: Transportation Safety Board of Canada)

A04P0010, Robinson Helicopter, R22, Campbell River, British Columbia, 2004/01/14—The Robinson R22 helicopter crashed at the Campbell River airport during a practice autorotation with two pilots onboard. During the last stages of the autorotation, the pilot did not open the throttle sufficiently enough to re-engage the engine and return to powered flight. Subsequently, the aircraft sustained a hard landing and sustained substantial damage. Neither pilot was injured in the accident.

A04W0026, McDonnell Douglas Helicopter, 369D (500D), and Bell Helicopter, 205A-1, "Pink Mountain, 15 NM E," British Columbia, 2004/02/12—The pilot of a MD500D, had landed adjacent to a fuel bowser, and shut down the engine. While the blades were coasting down, a Bell 205A-1, lifted off from its position on the opposite side of the bowser and proceeded to vertical out with an attached long line. The down wash from the Bell 205 flexed the blades sufficiently to drive them into the tail-boom, resulting in substantial damage to the main rotor system and tail boom. There were no injuries. The two helicopters were positioned about 50 ft apart and a 12 kt wind was blowing.

A04P0033, Robinson Helicopter, R22 Mariner, "Prince Rupert, 40 NM SSE," British Columbia, 2004/02/20—The Robinson R22 helicopter had been missing after departing Prince Rupert, B.C. on a flight to a logging camp at Kumealon Inlet. A day later, the wreckage was located in the forest near its intended destination. The helicopter was broken-up and parts were spread up to 100 meters apart, except for one main-rotor blade which was found three days later, about 150 meters from the main wreckage site. The pilot, who was the sole occupant, was fatally injured. There was no fire.

A04Q0020, Schweizer, 269C (300C), "CYHU Montréal/St-Hubert, 16 NM N," Quebec, 2004/02/23—The Schweizer H-300 helicopter was on a training flight with a pilot and student on board. The student was to practice takeoffs and landings. While practicing a run-on landing, a skid broke through the crust of the snow, which caused the helicopter to roll onto its side. The two passengers received minor injuries. The helicopter was substantially damaged.

A04C0051, Bell Helicopter, 206B, Swift Current 3.8 NM SW, Saskatchewan, 2004/03/04—The Bell 206B was en route from Regina, Sask., to Medicine Hat, Alta., at low level in low visibility. The helicopter crashed into the terrain near Swift Current, Sask. The pilot and one passenger sustained minor injuries; the helicopter sustained substantial damage.

A04Q0026, Schweizer, 269C (300C), CTG2 St-Hubert Helicraft, Quebec, 2004/03/08—The pilot of the Schweizer 269C-1 helicopter was conducting a ground run-up to test the transmission that had just been replaced. The pilot heard an unusual noise and cut the engine power. The main rotor separated from the mast and landed approximately 100 ft away.

The transmission has just been opened for a special inspection.

A04P0073, Bell Helicopter, 206B, King Salmon Lake, British Columbia, 2004/03/12—The Bell 206B helicopter on a flight from Atlin, landed on soft snow at King Salmon Lake. The engine was left at idle for the cooldown period when the aft skids broke through the snow crust and the tail rotor contacted the snow. The helicopter was substantially damaged. The pilot, the only occupant, was uninjured.

A04P0082, Bell Helicopter, 206B, "Mackenzie, 7 NM SE," British Columbia, 2004/03/18—The Bell 206B helicopter took off from Mackenzie airport on a VFR flight to Prince George with one passenger on board. Enroute the pilot encountered a 1 000-ft ceiling and 5 mi. visibility in light snow. At McLeod Lake the visibility deteriorated to less than one half mile and the pilot decided to return to Mackenzie. While flying over a densely wooded area, following highway 39, the engine failed. Weather conditions at the time were one half mile visibility in snow and fog patches. The pilot completed an autorotation onto the highway; however, in order to reach the highway the pilot had to stretch the glide and the landing was hard. The helicopter was substantially damaged, but there were no injuries.

The helicopter was equipped with snow deflectors and a particle separator but auto ignition was off at the time of the engine failure.

A04C0064, Baby Belle, Ralph, Saskatchewan, 2004/03/20—The Baby Belle homebuilt helicopter was on a local flight near Ralph, Sask. The helicopter descended suddenly and struck the ground. The pilot, the sole occupant, sustained fatal injuries. The helicopter was destroyed.

A04Q0036, Schweizer, 269C (300C), CYRC Chicoutimi/St-Honoré, Quebec, 2004/03/25—The pilot of the Schweizer 269C had just completed a training flight with a flight instructor. After fuelling on the south ramp at the St-Honoré airport, the pilot, alone on board, took off to reposition the helicopter to the airport's north ramp. Visual flight conditions were reported, with the ceiling at 3 000 ft, and the visibility was more than 6 mi. in light rain showers. The pilot manoeuvred the helicopter to an altitude of approximately 4 ft AGL, at a speed of approximately 10 kt. The rain reduced the visibility through the windshield, and the pilot had difficulty judging his height above the ground. The right skid caught a snow bank, and the helicopter rolled onto its side. The pilot evacuated the helicopter and did not suffer any injuries. The helicopter sustained major damage.