

Aviation Safety

Vortex

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

Issue 1/2000

Passenger Briefing—A Must Prior to Flight

One of the most important yet often ignored portions of helicopter operations is the passenger briefing. Every year passengers suffer injury or even death for want of a proper and detailed briefing about the machine they are riding in. Rotor blade strikes on people, door and window damage, and cargo compartment doors being left open are only a few of the more common occurrences. Each of these has the potential for tragic consequences.



The airlines community gives a detailed briefing prior to flight, giving information on a wide variety of topics all intended to make your trip safer. In addition to all the information given, you get a nice neat brochure that you can read later when you have forgotten what the flight attendant had said. Often, you get the information in video format as well. Prior to takeoff, we are shown seat belts, emergency exits and so on, in both English and French.

Go from the comfort of a 747 to a Jet Ranger, balancing on one skid on a rocky ledge, picking up some passengers. The pilot can't shut down or leave the controls.

What kind of briefing can these people expect? Have you never said "I hope these guys know how to get in!" If you're lucky, one of the passengers will have a cell phone and you'll be able to give them a detailed list of do's and don'ts before perching yourself on the rock.

The amount of information included in your briefing is also dictated by what your passengers are going to be doing at destination and on pickup. If you're going from A to B and you're shutting down at B, for example, you can tell them to stay strapped in till the rotor stops and you are outside at the door.

If, on the other hand, they'll be getting out on a slope on a mountain at 8000 ft. with the rotor turning, you better tell them what to do on exiting, where to go and how to get there. Don't assume that just because the guy in the front passenger seat says he knows all about helicopter operations that he really does. The truth is, machismo and testosterone have probably caused him to stretch the truth a bit. If you go on the assumption that none of your passengers knows anything about helicopters, you'll seldom go wrong.

Your briefing should include the following:

- Location and operation of the emergency locator transmitter(s) (ELT).
- Location and operation of all doors and windows.
- Location and operation of cargo compartment(s) or pods.
- Operation of seat belts and shoulder harnesses.
- Location and operation of fire extinguisher(s).
- Location of first aid kit(s) and survival gear.
- Hazards associated with main and tail rotor.
- Special instructions covering the job to be done.
- Hand signals for ground crew.
- Direction to approach or depart a helicopter with the rotor turning—do not approach or depart on the uphill side.
- Hand signals to be used for approaching the helicopter (rotor turning). A

good plan would be to instruct your passengers not to approach (under the disk) till you have given visual approval (a thumbs up works). The same holds true for departing. Also include the direction relative to the nose of the helicopter from which they should approach and depart.

The 2 and 10 o'clock positions are ideal (if possible).

- How long the trip is going to be and at what altitude you plan to fly.
- What the en-route weather forecast is.
- What you are going to do after dropping them off. If you're going to stay with them, why off load them and their equipment prior to shutting down?
- Emphasize that if they are going to open a door or compartment, they must close and secure it.
- Remind them to never throw anything away from or toward the helicopter with the rotor turning. Thrown things have a way of getting into rotor blades.

Along with being a must for safety reasons, a detailed passenger briefing helps establish a better rapport between you and your clients. Happy well-briefed passengers often pass good reports back to management, which is good news for you.

Time permitting, encourage your passengers to open and close doors and compartments but don't

assume they are going to remember how to do it under the turning rotor. If possible, position the helicopter with the tail away from the direction of their approach. They are likely to take the shortest route to and from the machine, even if this means walking near the tail rotor. Whenever possible, shut down, load the passengers and their equipment, then start again and depart.

The following fictitious story tragically depicts the consequences of an inadequate briefing:

"Ladies and gentlemen of the jury, my name is Cochrane and I represent these three grieving families. These families have a common bond for they all lost loved ones in the fatal crash of a helicopter last September 10. I will prove to you that the pilot of that helicopter not only acted in an unprofessional manner, but he was also grossly negligent in his preparation for flight. I have no doubt that after hearing the testimony you will agree."

"The court calls Mr. Luther P. Savage to the stand." The bailiff administers the swearing-in ritual as he had thousands of times before. "Mr. Savage, please be seated."

Cochrane slowly paced back and forth, his eyes firmly fixed on Savage. When the murmuring, whispering, and rustling of the audience subsided, his pacing ceased and he was

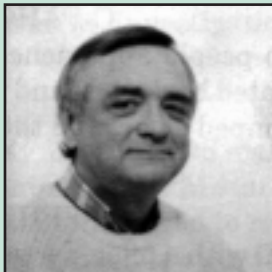


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standing directly in front of the defendant. He gave him a relaxed smile and started. “Mr. Savage, where were you on the morning of September 10?”

“Well, I was flying three men to a drilling location 80 mi. south of Watson Lake.”

“Describe for the jury what happened during that flight.”

“About 20 min after take-off, the engine began surging, then it decelerated to near idle. A couple of seconds later, it quit.”

“What did you do then?”

“I entered autorotation and headed toward the only opening I could see, a small clearing about half a mile away.”

“Would you describe the landing area, please?”

Cochrane resumed his pacing, he could see that it was unnerving Savage.

Savage was irritated by the attorney’s pacing—it seemed every time he answered a question, Cochrane had his back to him. It was as if the answer wasn’t important, only the question. “It was 80 ft. in diameter, was covered with low brush and some rocks, and was surrounded by 50- to 60-ft. trees.”

“Was the ground level?”

“No, it had some slope to it, along with the rocks and brush.”

“Tell the court, Mr. Savage, how badly was your helicopter damaged during the landing?”

“I had to stretch the glide a lot just to get to the clearing, so when we were past the trees there wasn’t a lot of rotor RPM left and we came down very quickly from about 60 ft. Touch-down was quite rough, and on contact the upslope skid collapsed . . .”

“That was the side where the front-seat passenger was sitting, was it not?”

“Uh, well, er, ah, yes, that’s correct.”

“Go ahead Mr. Savage, describe what happened next.”

“Well, like I just stated, we hit pretty hard. Then one of the blades hit the tail boom and I think we bounced. There was a lot of noise and dust, and loose objects were flying around the cockpit and cabin.”

“Did the helicopter roll over?”

“No, it stayed up right, but it was leaning a lot because of the collapsed gear.”

“Was the engine still running and were the rotor blades still turning after the crash?”

“Yes, I could hear the engine and the blades were still turning.”

“Was there fire after the crash?”

“Yes.”

“When did the fire start?”

“I’m not sure.”

“Well, was the aircraft on fire while you were still in it, or did it start after you exited the wreckage?”

“All I remember is that I was dazed for a moment.

When I unbuckled my seat belt to get out I noticed smoke coming from some where behind me and I yelled for everyone to get out, fast. The guy in the left front seat was already climbing out so I jumped out and ran. When I'd gone about 75 ft., I stopped and looked back and by that time the helicopter was completely engulfed in flames."

"When you stopped and looked back, where were your passengers?"

"I couldn't see the front-seat passenger, but since he got out his side at the same time as I was leaving my side, I assumed that he was hidden by the smoke and was all right."

"What about the two passengers in the cabin, where were they?" Cochrane had stopped his pacing. He was leaning with both hands on the railing surrounding the witness box. His eyes were riveted on Savage and his voice was growing more impatient and accusing with each question.

Savage was slow in answering, you could see he was searching for the right words; when he found them, he was having trouble getting them out. Cochrane asked again, raising his voice. "What about the rear-seat passengers, where were they?"

"They were still in the aircraft."

"Were they unconscious?"

"No." Savage was visibly shaken now. His face was flushed and perspiration

was starting to bead above his upper lip. He wrung his hands, stopping occasionally to wipe his sweating palms on his trousers.

"How could you be sure they were conscious?"

"Because I could see them struggling and thrashing about in the cabin. I could hear their screams above the roar of the engine and the fire."

"Did you try to help them?"

"Yes, but the flames were too intense to get near the helicopter," whispered Savage. "One was beating on the Plexiglas with his fists while the other seemed to be struggling with his seat belt." Savage was almost destroyed by now. His voice was cracking and tears were rolling down his face.

"Where was the front-seat passenger?" Cochrane was relaxed and pacing again, but the smile was now gone.

"I moved around the front of the aircraft and saw him lying on the ground, about 15 ft. uphill from the helicopter."

"Tell the court what you saw as you approached the passenger."

"He had a very large open wound on the right side of his head. The sight of it caused me to be sick. After a moment or two I checked him for a pulse and couldn't find one."

"What do you think caused the injury to the passenger's head?"

"I'm certain he was struck by the rotor blade when he ran uphill from the helicopter."

"The court will adjourn till one o'clock," stated the judge as her gavel rang out like a pistol shot.

"Why me?" thought Savage as he sat waiting for court to reconvene. "I did everything the way I've always done it. It's not my fault that the engine quit. In fact, I think I did pretty well just getting to the clearing. I'm sorry that those men were killed, but what could I have done differently? It's not my fault that the guy ran up the hill, or one of them couldn't get his seat belt off, or the other didn't know how to open the door." Savage was jarred from his thoughts by the judge's gavel signaling the reconvening of the trial.

"Mr. Savage, I'll remind you that you are still under oath."

Cochrane resumed his pacing and waited for quiet before he softly inquired, "Mr. Savage, do you consider yourself a professional pilot?"

"Why, yes, of course I do."

"The term 'professional pilot' would imply that you are, or should be, more competent and skilled and have a higher set of standards than the pilot who does not fly for a living—the weekend pilot. Would you agree with that, Mr. Savage?"

"Yes, I suppose so."

“And shouldn’t these higher standards apply to the safety of your passengers, before takeoff, during, and after the flight?”

Cochrane had stopped his pacing, and was now looking directly at Savage as he fired his questions with increasing intensity.

“Yes,” Savage answered, avoiding Cochrane’s eyes.

“Are you familiar with the regulations, Mr. Savage?”

“Yes.” Slightly relieved to be back on familiar ground.

“And do you abide by these regulations, Mr. Savage?”

“Certainly, I do.”

“Does your company have a manual that indicates how you are to operate their helicopters?”

“Yes.”

“Have you received a copy of this manual and have you read it?”

“Yes.” Savage was starting to sweat again and his mouth was dry. He took a

drink of water and noticed that his hand was trembling.

“Do you understand and follow the instructions laid out in this manual?”

“Yes,” he whispered.

“Don’t your company manuals and the regulations, which you have stated that you have read and follow, require that you give your passengers a thorough and complete briefing before flight, including a thorough safety briefing covering how to exit while the blades are turning, how to open the doors and emergency exits and how to operate the seat-belt release?”

Savage’s throat was too dry for him to speak and he felt the tears start to flow once more.

In his summation to the jury Cochrane stated, “Ladies and gentlemen of the jury, you have listened to testimony in respect to the helicopter accident of

September 10, which resulted in the tragic and senseless deaths of three passengers. We have established that all three died not on impact but as a result of post-impact circumstances. In fact, they were not even seriously injured as a result of the initial impact. One safely escaped from the wreckage, only to be struck and killed by one of the still-turning rotor blades. Another died because he was unfamiliar with and could not open the seat-belt buckle. The last died because he didn’t know how the door release operated or how to activate the emergency release. The question that you must answer is who is responsible for these three tragic deaths? The answer, ladies and gentlemen of the jury, is the pilot is responsible, for he failed to carry out his duties as a professional pilot.”

Dynamic Rollover

We’ve all heard the term and most of us have read about dynamic rollover and the hazards associated with it. Some believe that the condition can only be encountered if one skid/wheel is stopped from moving sideways or up, but the truth of the matter is that you can run into the problem under a diversity of circumstances. The main upsetting moments are due to a tilted thrust vector with respect

to the C of G and, for multi-bladed helicopters, a hub moment. Factors that can accentuate the onset of dynamic rollover are:

- crosswind;
- slope;
- lateral C of G displacement;
- tail-rotor thrust;
- skid/wheel obstruction; and
- main-rotor thrust.

There are two issues with rollover—the static and the dynamic.

Statically, the moment that keeps the helicopter upright comes from the lateral position of the C of G staying between the skids/wheels. The closer the lateral position of the C of G comes to a wheel/skid, the smaller the restoring moment becomes. If the lateral position of the C of G goes outside the skid/wheel because of a slope, or excessive bank angle on liftoff, the helicopter will fall over.

Dynamically, lateral movement of the cyclic

combined with thrust can introduce a rolling moment that could also be sufficient to put the machine on its side. Restricting items below the C of G, such as a stuck wheel/skid, will generate a similar moment and further compound the problem. Crosswinds can either help or make things worse, depending on the direction relative to the slope.

Obviously, a combination of an offset C of G, excessive lateral cyclic movement, an unfavourable crosswind and a skid that is hung up on a snow crust can make this a very complicated and dangerous situation.

The moment that keeps the helicopter upright and stable comes from keeping the weight between the skids/wheels and the more you roll the helicopter, the more you diminish the stability. The stability goes to zero if one skid/wheel rises far enough to place the

C of G directly over that skid/wheel. Narrow landing gear, slope and shifting C of G (perhaps from fuel movement or loose cargo) can also compound the problem.

A rollover can take place in calm air if the cyclic is displaced far enough from centre during takeoff. A crosswind can make this event more likely.


If your corrective action to a pending rollover is a reduction in collective to get back on the ground, remember to be firm but gentle. If you are too aggressive in reacquiring the ground, you may bounce on the gear that was in the air and start a rollover in the opposite direction.

The most effective methods of preventing dynamic rollover are:

- Make sure that the helicopter is properly loaded and that all cargo is well secured.
- Check around the area

prior to start-up, looking for deadfalls, wires, ropes, stumps, rocks grounding cables, hard snow crusts and anything else that may impede a clean liftoff.

- Conduct a slow, smooth, vertical liftoff to a height sufficient to confirm that the C of G is OK.
- If any resistance is felt during liftoff, get back on the ground quickly but smoothly and remember that if you left from a slope you're probably going to land back on a slope, so be ready.
- When the low hover C of G check is completed, continue the vertical takeoff to a height that will ensure clearance and continue with a normal takeoff.

If you follow these basic guidelines on every takeoff, you'll greatly reduce the chance of falling prey to the dreaded *dynamic rollover*. 

Exposure To Laser and Other Directed Bright Light Sources— Pilot Procedures

PURPOSE

This article contains information and guidelines for flight crews encountering laser illuminations or other directed bright light sources while in flight and is being published as an aeronautical information circular. It also contains a reporting format for pilots to report directed bright light illumination incidents.

BACKGROUND

Directed bright light sources projected near airports or into any airspace can create potential flight control disruptions and/or

eye injury to pilots, crew members, and passengers of aircraft. The number of laser illuminations of aircraft has significantly increased during the past few years. In particular, the reporting of laser incidents involving law enforcement helicopters has substantially increased.

The U.S. and UK have both recorded numerous instances of laser exposures that have been disruptive to flight operations. The effects of these occurrences to flight crews have ranged from startle to glare and, in some instances, flashblindness and afterimage.

DEFINITIONS

- **Afterimage**—The perception of light, dark, or coloured spots after exposure to bright light that may be distracting and disruptive. Afterimages may persist for several minutes.
- **Directed bright light source**—Devices capable of emitting a beam of high-intensity light such as a laser, searchlight, spotlight, or image projector.
- **Flashblindness**—A temporary vision impairment that interferes with the ability to detect or resolve a visual target following exposure to a bright light.
- **Glare**—A reduction or total loss of visibility, such as that produced by an intense light source, such as oncoming headlights, in the central field of vision. These visual effects last only as long as the light is actually present and affecting the individual's field of vision. Visible laser light can produce glare and can interfere with vision even at low energies, including levels well below that which produce eye damage.
- **Laser**—An acronym for “light amplification by stimulated emission of radiation.” A device that produces an intense, directional, coherent beam of light.
- **Startle**—Sudden shock from surprise or alarm, which can cause an adverse psychological or physiological effect.

DISCUSSION

Directed bright light sources, particularly laser beams, projected near airports or into any airspace can cause two flight safety concerns:

1. The primary concern is when non-injurious, bright levels of directed light unexpectedly enter the cockpit. Depending on the brightness level, the light could startle the pilot(s); could cause glare, making it difficult to see out the windshield; or could even create temporary vision impairment (flashblindness and/or afterimage). The illumination and glare may be short—one or a few bright flashes—but the startle and afterimage effects could persist for many seconds or even minutes.

2. A secondary concern is if a laser beam is so powerful that it causes temporary or permanent eye injury to anyone (pilot, crew members, passengers) viewing it. Fortunately, this is only a remote possibility because the laser power required to cause eye injury to a pilot in flight greatly exceeds that of lasers in common use today.

Therefore, the most likely in-flight safety hazard is that of a bright non-injurious flash causing disruption in the cockpit workflow. Such effects pose significant flight safety hazards when the cockpit workload increases: below 10,000 ft. above ground level (AGL), in critical phases of flight (approach and landing), dense traffic areas (terminal environment and en-route areas), and in proximity to airports. This safety hazard is applicable to both single or dual aircraft cockpit operations.

Even laser pointers can cause adverse effects that could cause pilots to be distracted from their immediate tasks. Exposures to pilots from persons using laser pointers have been reported in increasing numbers, particularly against law enforcement helicopters.

PROCEDURES

The primary purpose of this section is to outline preventative measures and incident procedures pilots can follow to either prevent potential illuminations or minimize cockpit disruption if one occurs. For simplicity, the following procedures refer to laser illuminations incidents; however, the same procedures should be applied regardless of the source, whether it be laser or any other directed bright light, such as a searchlight.

Preventive procedures—During aircraft operations into navigable airspace where laser or other directed bright light activities are anticipated, flight crews should:

1. Consult NOTAMs for temporary laser activity. The NOTAM should include the location and time of the laser operations.
2. Avoid known permanent laser displays (e.g., Disney World). In the U.S. these sites are published in the *Airport /*

Facility Directory. Currently there are no permanent sites within Canada; however, when one is established it will be advertised and published in flight publications.

3. Turn on additional exterior lights to aid ground laser safety observers in locating aircraft so they are able to respond by turning off the laser beam.
4. Turn on thunderstorm lights to minimize cockpit illumination effects.
5. Engage the autopilot.
6. Keep one pilot on instruments to minimize the effects of a possible illumination while in the area of expected laser activity.
7. If flying a helicopter engaged in surveillance or medical evacuation, consider using notch filter eye spectacles that protect against 514- and 532-nanometer laser wavelengths.

Laser incident procedures—If a laser beam illuminates a pilot in flight, the pilot should:

1. Immediately look away from the laser source or try to shield the eyes with a hand or a hand-held object to avoid, if possible, looking directly into the laser beam.
2. Immediately alert the other pilots and advise them of the illumination and its effect on your vision.
3. If vision is impaired, immediately transfer control of the aircraft to the other pilot. If both pilots have been illuminated, engage the autopilot.
4. Be very cautious of spatial disorientation effects (the “leans”). After regaining vision, check cockpit instruments for proper flight status.
5. Resist the urge to rub the eyes after a laser illumination as this action may cause further eye irritation or damage.
6. Contact air traffic control (ATC) and advise of a “laser illumination.” Use this terminology for all laser incident/accident reports. If the situation dictates, declare an emergency.

7. When time permits, provide ATC with an incident report, which would include the location, direction, beam colour, length of exposure (flash or intentional tracking), and effect on the crew.

NOTE: As a follow-up, to ensure Transport Canada has sufficient information to analyze and investigate occurrences, please report your encounter to:

Director Air Navigation Systems and Airspace (AARN)


*Tower C, Place de Ville
330 Sparks St.*

Ottawa ON K1A 0N8

Tel: (613) 991-9924 Fax: (613) 998-7416

Medical follow-up procedures—After an in-flight illumination:

A crew member that has been subjected to a significant illumination causing persistent symptoms such as pain, visual abnormalities (e.g., flashblindness and/or afterimage), should seek immediate medical attention. In addition, contact a Regional Aviation Medical Officer (RAMO) or Aviation Medical Officer (AMO) at the earliest opportunity. They will provide assistance in locating the nearest ophthalmologist or medical facility with experience in evaluating laser injuries. If outside Canada, contact the Civil Aviation Medical Branch (CAM) in Ottawa. An eye damaged by a laser beam starts to repair itself immediately. Therefore, it is strongly recommended that an ophthalmologist familiar with laser injury examination requirements evaluate the crew member within five hours of the exposure to determine the nature of the injury and if it needs further follow-up action.

NOTE: Because diagnosis can be difficult, especially for medical personnel who rarely, if ever, see laser eye injuries, it should not be automatically assumed that a particular symptom, abnormality or injury was caused by a given laser exposure. 

**Transport Canada's Canadian Aviation Safety Seminar
CASS 2000, May 8-10, St. John's, Nfld.**

<http://www.tc.gc.ca/aviation/syssafe/cass2000/homepage.htm>