HUMAN AD

Heliprops

HELIcopter **PRO**fessional **P**ilots **S**afety Program
Volume 11 ✯ Number 1 ✯ **1999**

Loss of Visual Reference

The *1998 Nall Report*, published by the Aircraft Owners and Pilots Association's Air Safety Foundation indicates that 1997 was an excellent year for General Aviation in the United States.

The number of accidents and fatalities reached a record low.

Unfortunately, as has been the case for some time now, the *1998 Nall Report* indicates that *"The majority of accidents … were the result of pilot-related causes."*

Furthermore, the *Nall Report* indicates that 82.6% of fatal accidents were VFR into IMC, and that *"Most scud running crashes probably don't happen the first time out. The pilot may be emboldened by early successes and might get away with it for months and even years. But in 1997, over 80 percent of these accidents involved fatalities – the highest fatality rate of any type mishap."*

Obviously, losing external visual reference of the horizon is a serious, deadly situation.

In the last issue of the *Human AD* we asked you to describe your procedures for dealing with an in-flight loss of external visual references. Replies to this question can be seen in the *Your Answers* article in this issue.

If these replies are indicative of the general helicopter operational world, the loss of external visual references is synonymous with suddenly being in the clouds when you don't want, and haven't planned, to be.

Being in cruise and punching into the clouds is the most common report of loss of external visual references because it is the most common of this type of occurrence. Many helicopter pilots can associate with struggling to remain visual and then getting trapped in the clouds/fog/rain/snow/smoke.

Losing external visual references often is the first step toward spatial disorientation, loss of aircraft control, and high speed impact with the ground or obstacles.

The loss of external visual references, and an accompanying spatial disorientation, can be frightening and anxiety provoking; but they need not result in loss of control and a crash.

PREVENTING.

VFR helicopter pilots invariably say that they will do everything they can to prevent losing their external visual references. That frequently takes the form of aborting a flight, getting progressively lower and slower, or landing when the weather gets too bad.

Staying out of the clouds, and seeing the necessary visual references, is quite effective in preventing spatial disorientation.

Training, experience and knowledge are the primary means of preventing Spatial Disorientation.

Several points that should be considered in preventing spatial disorientation:

- Never fly without a visual horizon reference.
- Delay control inputs until visual confirmation of sensations.
- Avoid staring at one light at night.
- Avoid unnecessary and rapid head movements during turns and when flying on instruments.

Visual Reference… pg. 1 cont'd.

- Avoid flying IMC and VMC at the same time.

As effective and prudent as it is to avoid losing external visual references; it is equally wise to have a plan to overcome spatial disorientation in the event of Inadvertent IMC.

OVERCOMING

Many VFR helicopter pilots are adamant that they will never allow themselves to become Inadvertent IMC. This is certainly an excellent plan. The trite old saying is true - "An ounce of prevention is worth a pound of cure."

However, if indeed you do find yourself in an unplanned and unwanted Inadvertent IMC situation you must be able to overcome Spatial Disorientation should it occur. Your life depends on it.

Several points that should be considered in Overcoming Spatial Disorientation:

- Get on the instruments. Believe the instruments.
- Develop a sound instrument scan/check.
- Fly straight-and-level until you are oriented.
- Transfer control of the aircraft if there is another pilot.
- Develop Inadvertent IMC Procedures.

OTHER STUFF

Loss of external visual references, however, can occur in several other situations.

Taking off, hovering, or landing over snow, sand, or water can develop a rotor-wash- induced cloud. This cloud may last for only a few seconds, but that may be enough time for an unprepared pilot to lose control.

SNOW

The helicopter flew into recirculating snow (a snowball) as it approached the ground. The pilot lost visual reference and control of the 350. The main rotor blades hit the ground and the machine came to rest on its side. All five people on board suffered minor injuries and the Astar was heavily damaged.

SAND

The crew of the AH-1 lost control of the helicopter when they became enveloped in the sand that was blown up around the aircraft by its own rotor wash. The aircraft was airborne for only a few seconds before rolling over on its side. The crew was unharmed, but the aircraft sustained substantial damage.

There is yet another situation where a pilot may lose effective external visual references.

It is entirely possible to be flying in clear, unrestricted visibility, but over a surface that lacks sufficient features to determine speed, direction of flight, or altitude.

WATER

Calm wind conditions produced a glassy water surface. Witnesses stated that the helicopter appeared to maintain a constant heading and rate of descent until it contacted the water, pitched over on its back, and sank. Neither the aircraft nor the two occupants was recovered.

Creating your own rotor-wash-induced cloud, or losing effective external visual references, or flying into the clouds at altitude are separate situations that require separate methods to prevent or overcome.

For instance, your plan for handling an Inadvertent IMC situation may not be appropriate for making an approach to a snow covered field, or to a smooth, glassy lake.

What can you do to make an approach and landing before the snow/sand envelopes you?

When you are in the snow/sand cloud what can you do? Do you know how to execute enough of an Instrument Takeoff to escape the cloud? Have you ever practiced one?

Are you aware of the surface conditions that can deceive you about your speed, direction or altitude? What other information do you have available to cross-check your speed, direction, or altitude? What can you do to place or create some visual aids for landing, hovering, and takeoff?

Losing external visual references is largely dependent on your flying environment. If your environment offers one or more of the ways we described for getting into trouble, then you must develop and have available the appropriate tools to prevent or overcome these problems.

There I Was...

Here are accounts submitted to us by readers.

Freezing Rain

"In 1986 I was flying for the U.S. Army in Montana. We had been in Helena for over 2 weeks doing special ops work. I was assigned the task of inserting a team to an Air Base to the north, and then returning to Helena. Weather was checked and the flight would have clear skies and deep cold enroute, and scattered clouds with some light snow on the way home. Should be VFR all the way. The weather enroute was perfect, but on the way back to Helena clouds closed in and snow started getting real bad. We had a UH-60 and all icing equipment was working. After trying to get to the nearest airport or landing site, we contacted Flight Service and filed an IFR flight plan home. Now this is where the best laid plans fall apart. Weather checks out to be good. No icing. Snow level should be below our flight path, and we looked at all the options. Called and received out IFR clearance and climbed to altitude. Clear at flight level and smooth air. Cold as all get-out and our crew in the back was freezing, but it looked like the flight home would be a safe one. As you know Murphy will strike at any time. About 25 miles short of Helena clouds closed in, all anti-ice was on and working – rotor, pitot heat, tail rotor system. And then we ran smack into freezing rain. Not predicted, nor reported by anyone. Aircraft started to collect ice as we tried to figure out what to do. Tried climbing up. No help. Going lower in the mountains was out of the question. Weather was bad. No other route to go but on, and try to get there as fast as possible. Systems were working great but visibility was limited through the windows. Power was starting to climb, so we knew the ice was building up on the aircraft.

To make a long story short, we made an IFR approach and landing. Tower told us to stay on the runway because we were throwing ice all over the place. I thought my heart would stop, and then my crew chief slapped me on the shoulder with a piece of ice that must have been 2 inches around and 1½ feet long.

That came off the homing antenna. I don't know what we could have done different, except land when the snow was mentioned, but I don't think we could have explained that, when another helo made it home before the unexplained freezing rain started. If it had been any other helo except the UH-60 with anti-icing systems, I would not be here to talk about it. Also, our maintenance officer (who we all thought was nuts for requiring the systems to work) made us check them all the time and then spent untold hours fixing them. We would have lost a ship and the crew. Needless to say, he earned my respect and I will always remember him for being the pain in the rear that saved us."

Sinking Jetranger

"I was flying a crew of claim stakers in northwestern British Columbia during November. The weather during that time of year can be pretty crummy with marginal VFR, clouds, rain and snow. The temperature was just below zero Celsius and there was a couple of feet of snow on the ground. My job was to drop off the men in the bush, let them walk a mile or two hacking a line through the forest then pick them up at a predesignated spot – usually a swamp, meadow or lake shore.

The day was proceeding very well with the inclement weather holding off to about 3 miles (visibil-

There I Was pg. 3 cont'd.

ity) in light snow. The crews were working hard to make it to their LZ's on time as flying days are limited to nine or ten hours of daylight. The 206 was performing efficiently in the cool weather. I was a little ahead of schedule so I landed in a swamp and shut down to wait for my passenger. It was a good time to get caught up on the ever increasing amount of paper work the government and accountants seem to throw at pilots.

Our JetRangers are equipped with HF radios to communicate with our bases that are up to two hundred miles away. The antenna for these are four foot long fiberglass whips that extend out the nose of the aircraft. Most are mounted on the horizontal plane but a few, because of the restrictions inside the aircraft, tilt up a few degrees. After having my head down doing the paperwork for a few minutes I looked up, and noticed that the antenna seemed to be pointing upwards a bit. "That's strange" I said to myself. "I thought that this machine had a horizontal antenna, not one that pointed upwards." It slowly dawned on me that in fact it DID have a horizontal one. I opened the door and looked down to see the bearpaw slowly being covered with water as the helicopter sank through the soggy ice into the swamp beneath.

UH OH! Looking back I could see the stinger was now a few inches above the snow. In a flash I decided to try a start and get out of there before I became a non-flying member of the aviation community. The start was quick and fast and the machine came up into a hover with no thumps, bangs or whirs. "Good, now I'll find a better place to land." I hovered to another flat spot, put the machine down, pounding it into the snow with a very firm seating check and shut down. That was close. I had to check the snow to see if there was evidence of a tail rotor strike and if so to get some help. That was when I did a stupider thing – if you can imagine.

I walked over to the site of the first landing and examined the snow for the tell-tale marks. None to be seem. Great! Then I looked up and saw to my horror the JetRanger once again sinking into the swamp. I sprinted back to the helicopter, jumped in, and promised the powers that be that I would never shut down in this swamp again if only they would let me fly out of it.

Well, somebody must have been smiling on me as the machine became airborne once again and I was safe. I hovered to another spot in the swamp, called my passenger on the FM radio and decided to leave the machine running for the ten minutes it took him to show up, constantly checking the bearpaw. He was delighted to see the warm and waiting helicopter after a day of slogging through the bush, but I think I was the happier one as we lifted out of that swamp."

Know Your 5 Critical Numbers

Pilots know all the critical airspeed numbers for their aircraft; but, unfortunately, most of them do not know the few (only five) critical numbers for blood fats (lipids). Cholesterol is the one most people hear about. But, you are far more liable to die from dangerous cholesterol levels than dangerous airspeeds. Here is all you need to know about blood lipids.

Cholesterol is a substance found in foods of animal origin, such as beef, lamb, cheese, eggs, poultry, and dairy products. Everyone has and needs cholesterol for such things as building cells, making hormones, and making vitamin D. Young children especially need it for development of the nervous system.

Problems begin only when the level of cholesterol becomes too high. Cholesterol – in the form of the "bad" low density lipoprotein cholesterol or LDL – can become deposited in the walls of the arteries, narrowing them – "clogged arteries" – and reducing or even shutting off the blood supply to vital organs and tissues. Think of it as "rusting your pipes." If the artery is one of the coronary (heart) arteries, insufficient blood supply to the heart muscle may result in a heart attack.

Critical Numbers pg. 4 cont'd.

Elevations in cholesterol are directly related to the risk of having a heart attack. Good news: For every 1% that high levels of cholesterol are reduced, your risk of heart disease is lowered by 2%.

HDL (high density lipoprotein) cholesterol is called the "good" cholesterol because it acts as a scavenger and removes the bad cholesterol from the blood. Think of it as a "Pac Man" if you are old enough to remember this computer game where the Pac Man gobbled up his victims.

Really, all you need to do initially is to get your total cholesterol (TC), HDL cholesterol, and triglycerides measured. The LDL is then calculated from these numbers. Triglycerides are the chemical form in which most fats exist in food as well as in the body. High levels are associated with heart disease.

The American Heart Association would like everyone ideally to have a total cholesterol of about 160 mg/dl and an HDL of over 35 mg/dl (mg/dl means milligrams per deciliter). The higher the HDL the better. I would like to see it over 50. A high HDL is great news.

Here are the important numbers you should know:

Total Blood Cholesterol

- Less than 200 mg/dl = desirable blood cholesterol
- 200-239 mg/dl = borderline blood cholesterol
- 240 mg/dl or more = high blood cholesterol

Triglycerides

- Under 200 m/dl

LDL Cholesterol

- Under 130 mg/dl

HDL Cholesterol

- Over 35 mg/dl

Total Cholesterol to HDL Cholesterol Level

- Not over 5 to 1; ideally 3.5 to 1

Your body gets cholesterol in one of two ways: in your diet or from your cholesterol manufactured by your liver. Your liver makes about 80% of your cholesterol and heredity plays a big role in how much it produces and how much is removed from your bloodstream. Even if you eat no cholesterol or saturated fat, your liver will still make as much cholesterol as your body needs, often way too much if you are genetically predisposed.

Dietary cholesterol (eggs, liver, shrimp) plays a significant part, but dietary fat (especially saturated fat) is the bigger culprit. (Fortunately there is no cholesterol in plant foods like fruits, vegetables, and cereals.) Saturated fat is the "building block" of cholesterol. If you want to look at saturated fat, just look at the marbling on red meat.

The American Heart Association recommends a maximum of 30% of our daily calories from fat. I would like to see it at 20%. Dietary fat comes in three varieties – limit each to a maximum of 10% of your diet .

Saturated Fat: Mostly from animal sources such as meats (lamb, pork, and beef) and dairy foods such as cheese, whole milk and ice cream. A few vegetable products (coconut oil, palm oil, palm kernel oil, and vegetable shortening) are high in saturated fats. All are bad news for your arteries.

Polyunsaturated fats: Cold-water fish oils (tuna, cod, halibut) and vegetable oils such as safflower, corn, sunflower seed and soybean. Much better for you, and will actually lower your cholesterol, but will still put on the pounds.

Monounsaturated fats: Olive oil and peanut oil are good examples. Olive oil (plus a modest amount of red wine) may be a reason the Mediterranean people have fewer heart attacks. Monounsaturates are the best of all dietary fats.

What about the trans fats? Newspaper and magazine articles have been inundating us with information about these "bad" fats. Essentially they are polyunsaturated fats that have been artificially hydrogenated by food manufacturers and processors. This "hardening" also makes them almost as bad for us as saturated fats. Essentially, these hardened fats harden your arteries.

These trans fats were designed for two purposes. The first is that they extend shelf life of the products by reducing oxidative spoilage. But, the main reason is that they make the product firm. This is desirable for stick margarine, cookies, doughnuts, pastries, and dessert buns. Right up there with the hot dog as nutritional poison is the glazed doughnut (a favorite with pilots and police officers) – loaded with trans fat. This doughnut comes out of the oven dripping oil and is so floppy it has to be eaten with two hands. But when it cools to room temperature, it is firm and dry.

Stick margarine is almost as bad as butter. Soft (tub) margarine – used sparingly – is a better choice. Best of all is no-fat margarine. Unfortunately, about five to ten percent of our processed foods, mostly bakery goods, contain those trans fats, and the labels at this date do not tell you this.

With diet and exercise you can reduce your cholesterol level at least by 20%, not much more because of the large amount of cholesterol the liver is genetically programmed to make.

If you cannot get your cholesterol below 240, medication may be indicated, and it is usually effective. Try to get maximum results from diet and regular, vigorous exercise before seeking medication. Remember also that soluble fiber, especially oat bran, reduces the absorption of cholesterol. A researcher at the University of Kentucky thinks that several helpings of oatmeal a day may be almost as good as medication to reduce your cholesterol. (Even if he is wrong oatmeal is good for you.)

Conclusion: Get a lipid profile. Know what the numbers mean, and if any are out of line consult your physician. In any case, exercise, a low fat diet, and maintaining ideal body weight may not only be life prolonging but lifesaving. (Keep checking your airspeed numbers too.)

Yours for good health and safe flying.

By Glenn R. Stoutt, Jr., M.D.
Senior FAA Aviation
Medical Examiner

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YOUR ANSWERS. . . . .

In the last issue we asked "What procedures do you or your company have to respond to a situation in which, during flight, you lose external visual references?"

Here are some of your answers.
Human AD.

"First, let us assume that the helicopter you're flying isn't equipped with any instruments required for IFR flight, only having your basic VFR equipment. If in flight, you fly into a cloud or lose external references, you have only a few options and little time to carry them out, there's only one I think is the safest and the one which I was taught in my training. One option being to continue on, with little input, hoping you might come out on the other side. I would definitely rule out this one because disorientation or spatial illusions could easily take over and also, there is no guarantee that what you flew into you'll soon fly out of. The second option, turn around hoping you'll come out where you entered. I would also rule this one out because attempting to turn around with no external references increases the chances of disorientation even more, and if you did regain reference to the surface you might be in an unrecoverable attitude. I think this third option is the safest available, I say options because regardless there is some risk involved. During my training, I was taught to initiate a rapid descent with power or even in an autorotation, from the bottom of the cloud. Though in many situations, this might make problems worse if you take into consideration obstacle clearance from the surface, or also if you were at a much higher altitude with more cloud layers, fog, etc., below. All in all, I say lower the collective and minimize your cyclic movements, and hopefully you'll regain visual reference to the surface."

"Level the aircraft, descend 500 feet per minute straight ahead. No turns. Aircraft in trim. Airspeed 60 knots. Once visual reference has been regained, land at the nearest available area."

"With a pilot and aircraft non-IFR: 180 degree turn. Then if visibility is not restored, autorotate."

"Personal procedure – execute 180 degree turn away from known obstacle while maintaining altitude."

"Instrument posture. Climb, contact controlling agency, notify condition, file plan (pop up clearance). Assess the obstacles and terrain for obstruction clearance. Make the determination."

"Pilot is trained in immediate action steps:

- *Attitude: Level aircraft.*
- *Heading: Maintain…or turn away from known obstacles.*
- *Torque: To climb at best rate.*
- *Airspeed: To attain at least 70 knots.*

Transponder to emergency…contact nearest facility on guard frequency and request best approach at nearest airfield. Army aviators are all proficient at GCA approaches and will request those.

During cross country flights aviators are required to determine a minimum safe altitude to climb (to) along segments of the route and determine recovery airfields.

During multiship operations an IMC breakup plan is always briefed with altitudes, turn-to headings, and contact frequencies along the route of flight.

I am in a CH-47 Chinook helicopter company and Inadvertent IMC is not a crisis for our crews. We maintain IFR proficiency and practice the IIMC procedure. Our aircraft are equipped to fly IFR which makes it easier to recover just about anywhere.

Other units are not so fortunate and smaller aircraft are not equipped for IFR which also results in the aviator's proficiency being less than optimal. IFR practice during VMC is a help, but not the real thing.

I have personally gone IIMC in an AH-1 Cobra with an inoperative ADF, and utilizing the above procedures recovered at Little Rock AFB on the precision approach.

Planning is the key to success and we address this issue before every flight."

"Straight and level flight: Stabilize aircraft using instruments. Check heading and altitude – verbalize indications – 180 degree turn.

Hovering: (dust or snow) Increase altitude."

"I used to work with a heavy lift helicopter company … for a period of just under ten years. I have seen many strange practices and beliefs due to having three different branches of the military involved in decision making. We used to fly in some pretty adverse conditions. It is always nice to have another set of eyes in the cockpit when flying for visual cues. The best procedure I have been involved in for flying into the soup or the white curtain as we called it was:

Drop the collective, back on the cyclic. Right pedal (depending on rotor rotation) at the same time to bring back the aircraft to a hover stop as quickly as possible. Pedal turn and go back the way you came looking for the earth in the path you have already passed."

It was the early part of summer 1972 in the Canadian high Arctic. The day was a grey one with light snow, and the Arctic ice had not melted yet. I was trying to get from Grinnell Peninsula on the lower end of Ellesmere Island to a point on Ellesmere where Eureka Sound started. I had been sitting for quite some time waiting weather to cross. Finally, after about three or four hours things looked better or at least I thought they looked better.

I and my apprentice set off in our FH1100 helicopter to cross the inlet. Somewhere about 4 to 5 nautical miles it closed in on us over the ice. The next thing I noticed my Directional Gyro (DG), Attitude Indicator (AI), and Airspeed Indicator (ASI) becoming very erratic. By this time my apprentice was turning a greenish color and I was probably as white as snow on the ice.

I had very basic instrument time, but fortunately just before I had come up I had done some time in a little Link Trainer.

I settled down, got the DG, AI, and ASI stabilized, climbed to 500 feet, as there were numerous icebergs in the area. Told the apprentice to "Keep your eyes open and start timing. We should see the large black cliffs on the other side in about 12-13 minutes."

Staying on the clock, I finally heard a yell over the headset "There they are." We had made it.

Thank heaven for that little old Link Trainer. The time spent in that little thing had paid off two-fold. Two lives and a helicopter had been spared a possible nasty end to a flight.

A little training is better than none."

Thanks to each of you who took the time to send in your comments. As you can see, we have a variety of procedures mentioned.

Our question was purposely stated to avoid defining precisely the conditions that can produce a loss of external visual references.

As we explore this issue we see that an appropriate pilot response to a loss of external visual references is dependent on several factors.

Amongst them are: the configuration of the aircraft, the skills of the pilot, the condition which produces the loss of external visual references, the terrain and obstacles nearby, the availability of instrument approach resources, and the time/fuel remaining.

No one procedure may be appropriate for all loss of external visual reference situations.

For example, lowering the collective and descending to get below a known ceiling may be the best action for a VFR pilot flying over water.

That may not be the best choice for an instrument rated pilot in an IFR certified aircraft to get below a ceiling in mountainous terrain when an airport with an instrument approach is within range.

And neither of these actions may be appropriate for escaping from a whiteout created by rotorwash in a hover.

You are the one who must determine the best procedure.

You are the one who must take into account the factors that apply in your flying situation. You must develop the procedures that you will use.

Keep in mind that you may need more than one procedure, and that you may have to be flexible to change as the situation dictates.

The moral is that if you have these procedures in your tool bag you won't have to invent one at a critical time when you need it.

WHAT'S YOUR ANSWER ?

QUESTION:

Under what circumstances do you refer to the performance and flying qualities charts in you Flight Manual? Which charts do you use?

_____

_____

_____

_____

_____

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Volume 11 Number 1

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The primary objective of the HELIPROPS program and the ***HUMAN AD*** is to help reduce human error related accidents. This newsletter stresses professionalism, safety and good aeronautical decision-making.

Letters with constructive comments and suggestions are invited. Correspondents should provide name, address and telephone number to:

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