IHST International Helicopter Safety Team

Our Goal is to Reduce the Civil Helicopter Accident Rate by 80% by 2016.

Training Fact Sheet - Visibility

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The "Minimum" You Should Know…

Flight visibility is defined as the average forward horizontal distance, from the cockpit, at which prominent unlighted objects may be seen and identified. More simply, it is how far we can see. Unfortunately during flight, visibility can become complicated and greatly affected by a multitude of factors. When you consider that most accidents caused by low visibility occur during the "enroute" phase of flight, vigilance and good ADM become paramount.

How is visibility determined?

METARs, TAF's, and other aviation weather reports report prevailing **ground visibility** and are reported in feet or statute miles. Automated airport weather stations use a forward scatter sensor which determines the local air clarity and translates it into prevailing ground visibility. Current sensors available cannot detect differences in visibility that are less than 1/4 mile or greater than 10 miles. Thus, visibilities are only reported at a maximum of 1/4 mile increments, with visibility significantly below 1/4 mile being reported as "M1/4" (less than 1/4 mile); visibilities above 10 miles are reported as equal to 10 miles. What is important to understand, is that these two systems are limited. They cannot see over the horizon or report patchy fog that is not located directly on the station. These systems report prevailing ground visibility, the 51% average. This means that if the airport is 51% "Scattered", the other 49% could be "Broken". In many cases, there is a human observer that corrects what the system sees and reports it accordingly. There are three times when a pilot in flight needs a specific ground visibility – when landing, taking off or entering a traffic pattern at an airport in Class B, C, D or E airspace (FAR 91.155 (d)(1)).

Pilots should understand the ground visibility they hear on ATIS may not be anywhere close to their actual flight visibility. **Flight visibility** is determined by the pilot. When determining flight visibility, the key word is "forward"; you have to look forward to determine your visibility. Since a pilot must look forward to determine the visibility, it is not uncommon for two pilots in the same general area but traveling in two different directions to have completely different flight visibilities. For example, a pilot flying westbound into a smoggy setting sun has a totally different visibility (perhaps as little as 1 or 2 miles) than the pilot he passes flying eastbound who has a visibility of up to 30 miles. If you are the eastbound pilot you need to understand that the westbound pilot likely cannot see you until the last minute. Proper scanning techniques in all conditions are critical to safety.

Factors Affecting Visibility

When we think of obscured visibility, images of low overcast skies and fog come to mind. Inadvertent IMC remains the number one killer. For this reason, other low visibility conditions that are not atmospheric in nature may be forgotten or marginalized, but are equally important to consider during flight. These conditions include flat light, glassy water, glare from the sun, haze, white outs and brown outs.

Clouds/Fog

VFR flight into the clouds is a deadly scenario. Things go very badly, very quickly. This danger has been beaten into us since our "pre-solo endorsement", yet pilots still fall victim to what they can see. Why? Often, pilots are surprised by the layer of fog that has formed below them or the clouds that have formed around them. To avoid this carelessness, pay close attention to the difference

between the temperature/dew point spread. When temperature and dew point meet, the air has reached full saturation. Warning! Visible moisture will form (clouds, fog, or precipitation). When the air temperature cools to the dew point, or when moisture is added to the air, it reaches saturation. The air cannot hold any more water vapor, so any excess condenses onto condensation nuclei into water droplets.

Glare/Flat Light

Glare is difficulty seeing in the presence of a bright light, direct or reflected. Heading west into the setting sun with a dirty windscreen and no sunglasses is the perfect example of how disabling glare can be. Glare can come from the sun, off water or snow and can be compounded by haze or smog. Trying to maintain visual references and looking for traffic can become difficult to impossible. Your first defense is a clean windscreen and a pair of sunglasses. Buy a pair of shades that live in your flight bag. Second, use your resources. Contact ATC and request flight following. They can identify and call out traffic that might be dangerous. They will even make sure that you are aware of obstacles at your altitude. Third, keep shiny, objects in the cockpit to a minimum. These objects can flash in sunlight and cause a lapse in vision. Flat light is equally dangerous. Flat light reduces your ability to make out terrain features. Again, a good pair of sunglasses can go a long way in accentuating the shadows on the terrain. Fly only as low as required. In both cases, continually scan your gauges and set a minimum safe altitude as necessary for your flight operation.

Additionally, flicker vertigo caused by the sunlight flickering through the rotor blades can be unpleasant and produce dangerous reactions for the pilot. A light flickering at the rate of 4 to 20 cycles per second can produce this condition. It can result in nausea, vomiting, or, on rare occasions, unconsciousness. Pilots can be especially vulnerable when flying by reference to instruments. At night, anti-collision lights reflecting off the clouds can produce the effect. If possible, try to turn eyes away from the light source.

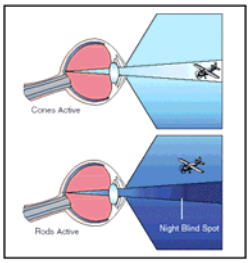
Glassy Water/ Visual Illusions

Helicopter pilots spend much time below 500ft. Low flight over glassy water, however, can be deadly. The pilot's depth perception is easily lost and can result in the pilot flying directly into the water. As you fly further from shore, you lose your visual references.

To help prevent this ask "Is this necessary?" If not, then fly at a reasonable altitude. If it is, scan your gauges, mainly your altimeter and VSI. They will show you if you are slowly descending your helicopter into a watery grave.

Night/ Darkness

At night, the ability to see an object in the center of the visual field is reduced as the cones lose much of their sensitivity and the rods become more sensitive. Looking off center can help compensate for this night blind spot. Along with the loss of sharpness (acuity) and color at night, depth perception and judgment of size may be lost. For better clarity, try looking 10 degrees adjacent to an obstacle at night. Additionally, allow 30 minutes for your eyes to adjust to the darkness before flying. Once your eyes adjust, use a red light to maintain good night vision. Keep in mind that some ink (red) may not be visible on your sectional.



White/Brown Outs

White Outs (snow) and Brown Outs (dust, sand, dirt) primarily occur during approach or departure. It is caused by a loose surface being stirred up and blown around the helicopter by the main rotor downwash. It causes the pilot to lose ground reference and situational awareness and can create spatial disorientation. Combat this by good situational awareness. Be aware of surface composition prior to landing. During approach, white/brown outs can be prevented by keeping forward momentum and terminating the approach to the ground.

Conclusion

Unfortunately, even the most educated pilot can fall victim to low or obstructed visibility situations. In any situation, vigilance and situational awareness of your surrounding conditions are your best defenses. Always leave yourself an escape route. Call it out and make your crew aware. Remember, complacency kills.

More information can be found in the Instrument Flying Handbook, Ch 1 & 6, in the Helicopter Flying Handbook Ch 11,12 & 14, in the Helicopter Instructor's Handbook or at www.IHST.org.