Helicopter Control:

Night Flying (Part 1)

By Johan de Villiers

The human eye is better adapted for day vision. Full stop. Before getting into the physiological reasons behind that, it is important to realise that flying at night provides its own unique set of challenges to a helicopter pilot. The experience itself is very much worth it though for a number of good reasons. None withstanding the great view at night, your helicopter will generally perform better owing to the cooler temperatures providing better lift. Generally turbulence should be less, owing to less convective thermal activity and wind. On top of that radio reception/transmission is generally clearer with less air traffic around, which means more air space for you. Seeing that less than 5% of General Aviation flying is done at night, ATC should have more time to communicate with you as well! In regions prone to thunderstorms, flying at night should be safer as well as they tend to die down at night.

Understanding Night Vision

Human vision is made up of photopic vision for daytime and scotopic vision for night time. Simply put, there about 7 million thick cones on the eye's retina (the photo sensitive layer at the back of the eye) that is used for daytime vision and approx 120 million thin rods specifically for night time vision. The low illumination of night time requires a massive increase in these receptor cells in order for any light reception to take place at night.

These special visual receptor cells (the cones and rods), convert light into nerve impulses which travel through the optic nerve to the brain.

Our vision becomes more sensitive at night time to light. This is commonly referred to as dark adaptation or night vision. A normal human eye requires approx 30 minutes to adjust to full night vision, although it is achievable with dim red cockpit lighting in 20 minutes There is a downside though. Red light in the cockpit becomes a problem for reading aeronautical charts as it completely washes out the colour red and makes focusing on objects inside the cockpit difficult. Therefore it is necessary to have additional white light available in the cockpit of the helicopter, such as a small flashlight or LED device for chart reading. Also ensure that the illumination of your instrument panel is as dim as possible. This will assist with seeing outside visual references at night as well.

Your night vision is also affected by exhaust fumes (CO), Vitamin A & C deficiency, cabin altitude pressures above 5000 ft (lack of oxygen) and smoking. Remember that your dark adaptation or night vision can be destroyed within seconds by looking into a bright light such as a flashlight in the cockpit. The reason for this is that the rods on the retina of the eye don't adapt rapidly to changes in light intensities. The trick is too close one eye when this happens, as it preserves a margin of night vision.

Night Accident Statistics

Seeing that 95% of all GA flights occur in daytime, but that 50% of all VFR into IMC conditions accidents occur in night time, it therefore holds that you are 10 times more prone to have this kind of accident at night! The FAA & NTSB has been collecting data on aircraft accidents and flight safety for years and what has transpired is that the survivability of an aircraft crash at night is approx 50% less than one in daytime. During 2003 for example in the USA, of the 1072 daytime accidents, 160 (14.9%) were fatal. But of the 149 night time accidents, 44 (29.5%) were fatal.

Interestingly enough, there is also a huge difference between flying at "night" accidents and flying in "dark night" accidents. "Dark night" being defined as a night with a new moon or overcast obscuring the moon. The Pilot's Night Flying Handbook, by Buckwalter, cites NTSB statistics that shows the relationship between night flying accidents and flying in "dark night" conditions. Here's an example below, showing the advantage of having moonlight during night flight to increase your chances of not having an accident by a factor of 10. Some flying instructors simply won't fly without at least quarter moon being visible. Your chances of surviving an accident is also nearly 40% better if it was a "Bright" night

In an article "Into the Night" by Phyllis Anne Duncan, she analyses night VFR accident statistics during a three year period to provide us with details during which stage of flight a night accident is most likely to occur.

During this period, 46 of the accidents had a probable cause concerning pre-flight, 14 occurred during the taxiing or standing phase of flight, 73 occurred during the takeoff and climbing phase, and 223 occurred during the approach and landing phase. It is thus clear that approach and landing have nearly double the probability of an accident then all of the other flight phases combined

Risks and challenges to consider:

During a moonless night, it may be impossible to avoid flying into clouds before it is too late. Night flying also means that standard daylight procedures and routines become more complex. This includes pre-flighting your helicopter, navigation without the aid of visual check points and handling emergencies, such as engine failures. Doing an auto rotation in daytime is challenging enough, but night time becomes white knuckle stuff. Remember that more altitude would provide you with additional decision making time to find a suitable confined area, obstacle free and into wind for a safe auto-rotation. It isn't always possible to see hidden hazards such as telephone lines and actual surface conditions so be extra alert and concentrate on airspeed, navigation and lastly communication if time permits.

Even a stock standard issue, such as alternator failure, can become a full emergency if it occurs during night time. Imagine no instrument lighting or landing lights in your helicopter for that matter!

Most helicopters have rather poor cockpit lighting compared to commercial planes, which makes map reading and access to instruments and switching gear even more difficult. Human fatigue also plays a role at night, seeing that most general aviation pilots flying at night have already had a 10-12 hr workday behind them. Their response times and judgement levels are thus already impaired before the rotor blades have started to turn.

Total Accidents	Fatal Accidents	% of Accident	Fatal
Night, Dark	466	146	31%
Night, Bright	42	8	19%

Taking this thinking a step further, a number of uncontrolled airports do not have landing lights or fuel available at night to further complicate your flight planning.

Some Night Flying Tips:

- Have a passenger onboard to assist you keeping awake
- Don't fly when you are tired
- Increase your personal daytime safety margins. (More fuel, higher altitude)
- Do your pre-flight in daytime
- Check your destination airport' elevation & surrounding terrain before lift-off
- Always land on the first third of the runway .

In our next article we will look at visual illusions that a pilot may experience at night. These includes Auto kinesis, Night Myopia, False Horizon and more that may lead to spatial disorientation (and thus possible "unscheduled landings") at night. Safe flying!

How to Work Out a Cross Wind Component in Seconds When on Final Approach to Land

By Chris Puddy - EzineArticles.com

When coming in to land it is often difficult to work out the cross wind component quickly. There are 2 quick methods I know to be able to do this and when you understand them choose the one that suits you best.

The first one is known as the clock code and with it you assume that any wind that is more than 60 degrees off the runway heading is a full strength cross wind. So if landing on say runway 27 which is 270 degrees from North, then if the wind direction is less than 210 or more than 330 degrees, whatever the strength is it is regarded as full cross wind. So if the wind is say 200 at 15 knots then it is a 15 knots cross wind.

Now to work out how much of a cross wind there is between these 60 degrees either side of the runway heading you imagine that the number of degrees off the heading are the numbers of minutes round a clock face. Then imagine how far round the clock face that is, and that proportion round the clock face is the proportion of the wind strength.

So if the wind is 20 degrees off the heading, say for example 290 at 30 knots, then 20 minutes is one third of the way round the clock face, so the cross wind component is one third of 30 knots which is 10 knots.

If the runway was 03 which is 030 degrees, and the wind was 070 at 20 knots, this is 40 degrees off, and 40 minutes round the clock face is nearly three quarters of the way round the clock face so the cross wind is three quarters of 20 or 15 knots.

As wind constantly varies in strength and direction, then you do not need to be highly accurate with your calculation. If the wind is roughly 30 degrees off, it is half strength so roughly half the wind strength is the cross wind component. 45 degrees off is 3/4 of the strength of the wind and 60 degrees or more full strength.

Another easy way to work out cross wind and head wind component is using this simple mathematical formula.

For calculating cross wind. If the wind it 30 degrees off the nose it is.5 the wind strength, 45 degrees off.7 the wind strength, 60 degrees off it is.9 the wind strength, and if 90 degrees of then obviously it is full strength. This applies on cross country flights, or for working out the cross wind when coming in to land.

If for example when coming in to land the wind is 60 degrees off the runway heading it is.9 times the wind strength, so using simple arithmatic on a 20 knot wind just multiply 9 by 2 which is 18 knots. For a wind of 30 knots and 45 degrees off the runway heading the calculation is 3 X 7 which is 21 cross wind component. If like me you learned your multipliction tables as a child, this is easy.

If you reverse the formula, you can use it to work out head wind or tail wind component as well. So if the wind is directly towards you, it is full strength, if 30 degrees off it is.9 of full strength, 45 degrees off.7 of full strength, and 60 degrees off it will be half strength.

If it is 90 degrees off then there is no head or tail wind component. However bear in mind that any strong wind will be affecting the aircraft by drifting and turning into wind will in effect mean that you have to fly a longer track than a straight line so it will slow you down a little bit.

If the wind is coming from behind you, then the same proportions can be applied to work out the tail wind component, so if it is 30 degrees off your tail, it is.9 of the strength of the wind and so on.

For working out a diversion, you can apply this percentage to your airspeed to get the groundspeed, and then to work out drift interpolate the following formula as well. The formula is that at 120 knots airspeed, half the cross wind component is drift. So if you are flying at 90 knots then your drift would be 25% more than half the drift.

This method can be used to quickly calculate heading and groundspeed if a diversion is necessary, or if you want to check your calculations after using a computer to plan your journey.

Chris Puddy has been flying since 1965 and had had a variety of flying since then, mostly on light aircraft, and much of it single crew with no autopilot with many landings. He also has over 2500 hours instructing, and his varied experience is a huge benefit to his students especially as much of his flying was single crew without an autopilot.

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