

Night Flight (Part 1)©

The hazards of night flying are directly related to the physiological limitations of the human body. Night flying will be different. Night flight is more stressful than day flying and very near to IFR flight without the required training. It should be, a moderate amount of stress will improve performance, keep the pilot awake and motivated. However, subtle events occur at night that would be easily detectable in day light. Night flight requires the pilot be very familiar with the area and have special knowledge that can be acquired only through experience. I suggest you get this experience along with a pilot who has already acquired the experience.

One of the most difficult operations at night is taxiing. Many aircraft have inadequate taxi lights and even lighted airports have unlighted areas. A tower signal light can be used to show the center taxi line. As age enters the picture, night vision fails. A year or so ago I taxied the nosewheel into the mud while showing a student how to taxi without lights. It was a good lesson, for the instructor. When taxiing use as much lighting as you can and get any available assistance from ATC. Being totally lost on your home airport is not uncommon. Once had airport truck assist taxiing at night in heavy ground fog.

Night flight is so completely different from day that it requires careful introduction. Any pilot deficiencies become magnified at night. The night horizon is often less visible and more indistinct. Night flight is semi-IFR with considerable reliance on the instruments. Terrain and clouds are difficult to impossible to see. On moonless nights, the objects seen are those which are illuminated enough to stand out. There can be a gradual loss of visual clues when flying into darker terrain. This leads to disorientation and loss of control. Not having instruments easily visible/readable is bothersome. A 30 degree turn that is unobserved can cause complete disorientation. The absence of a horizon can cause loss of control. Both situational and geographic disorientation is more likely.

Fatigue has greater influence on pilot skills at night. The retina is the first and fastest part of the body to react to reduction of blood oxygen. Cigarette smokers start out with an immediate night vision problem. Night vision can be improved by the use of oxygen. Night flying errors happen because of human lack of capability. Night vision is the key limit. Without surface lights, it is hard to know your altitude above the ground, with surface lights it is difficult to locate the airport beacon. Most night accidents occur on 'dark night' flights. 4% of flying is done at night with 25% of accidents.

The eye is much like a video camera. A view is focused on the retina, converted electrically to data sent to the brain. Rods and cones make the visual to electrical conversion. Cones, near the focal center give colors, brightness and sharpness when light is good. Rods are the night-vision part of seeing. The peripheral region of the retina is rod territory. Rods make it so we can see at night but not in color. Complete night adaptation of the eye to darkness can take over 30 minutes and be destroyed in seconds.

There is an oval shaped region of the retina known as the blind spot. It cannot see light. Binocular vision compensates for this in daytime. At night we often are unable to see objects if we look directly at them. To see at night we cannot look directly at what we want to see. Your

central vision is inoperative. Looking off center at night uses peripheral vision which is 100,000 times more sensitive than central vision at night. Your eyes can be adapted to night vision by wearing red glasses, patching one eye and using dimmed lighting. No matter how well you do this one flash of a strobe taxiing out destroys it all. It the lighted airports of today I prefer to work in a lighted cockpit. I like to see my strange charts clearly with all obstacle heights known and avoided. 90% of our orientation is visual even in the cockpit. NASA has proven that there is less oxygen at night than during the day. The eye is quite susceptible to oxygen deficiency so vision at night at 9000' gives the visual acuity that you would have at 15000' during the day.

The use of colors other than red in the cockpit has become more common in the 1990's. Light-emitting diodes are more efficient than other systems and will be in all cockpits of the future. Blue lighting such as common in military aircraft requires much more lighting than white.

FAR Part 1 defines official "night" so pilots can log the conditions of flight, day or night required by FAR 61.51 (b)(3)(i). Twilight is the time of incomplete darkness after sunset or before sunrise. FAR 6157(d) defines pilot proficiency requirement that must be complied with before the pilot can be pilot in command of an aircraft carrying passengers at night. This is the time one hour after sunset and one hour before sunrise. This more restrictive "night" is designed to assure pilot proficiency. The less restrictive requirement can be used for meeting certificate requirements. FAR 91.209 requires that position lights and anti-collision lights be used from sunset to sunrise.

Night flight adds to the risk of single-engine flying. Emergency options are reduced. The new VFR minimums have increased the impact of weather. Mandated preparation for the flight such as lights and flashlights make a difference. You will be much more able to cope if you maintain radio contact with ATC and have a readily available frequency list. I avoid night training flights that have less than 1/4 moon. Common mistake is flying when combination of pilot, conditions, aircraft, and preparation are not up to making the flight. AIM recommends oxygen use above 5000' at night and at 10,000' daytime.

The ability to judge distances and heights at night is reduced at night. The absence of haze or its presence can cause illusions at night especially when using landing lights. Lights will vary in intensity and cause illusion effects. A mis-identified light source can cause total confusion. A single light gives no altitude information. Multiple lights may be in different geometric visual planes. Freeways become visible while country roads disappear. Aircraft and lighted towers become visible for miles. Airports have beacons, look for them.

Preparation for night flight must be more intensive and comprehensive. Make your initial night flight preflight during the day. Check all the lights and carry a spare bulb. Visual checkpoints are much closer. Fuel reserves are doubled. Charts are marked with black felt tip pens. Frequencies are written large. Terrain altitudes are noted and crossing extra altitude added. Weather makes a big difference. At night you can't see weather unless there is a moon. We get very used to seeing weather change during the day. Weather changes much the same way at night but quicker. You must expect weather changes at night to occur suddenly simply because we cannot see the changes as we can in daytime.