

night flying

chapter 11



Night flying is a very important phase of your pilot training. It is another step toward making you an all-round Air Force pilot. This phase is designed to make you as proficient a flyer at night as you are in the daytime. Do you remember how surprisingly easy it was to learn to drive an automobile at night? The transition from day to night flying is just as easy. In the first place, you fly an aircraft at night in the same manner as in the daytime. Moreover, night flying is smoother than day flying because of the absence of thermal or convection currents. As with an automobile, even the engine of your aircraft will sound smoother than it does in the daytime. Generally speaking, any apprehension that you might have about night flying will result from the restrictions placed on your visibility. Once you overcome the feeling of strangeness because of the visual limitations, you should have very little difficulty in flying at night.

NIGHT VISION

Many persons do not know the facts about night vision; others do not even know anything can be learned about it. You will never see as well as an owl, but you can learn to do a better job of seeing at night.

There are three reasons why it takes training and practice to improve your night vision. Your mind and your eyes are a team. To see well, both members of this team must be used

effectively. Your eyes are formed in such a fashion that you must learn to use them differently at night than you do during the day. Your eyes do not automatically tell you what you see, as they do in daytime, and familiar things appear differently. Therefore, it takes practice to recognize objects which your eyes see at night.

It is important that you understand how your eyes are constructed and how they are affected at night.

The light-sensitive nerves ending at the back of your eyes are of two types — rods and cones. Cones are located in the center of your eye or rather in the center of the retina, the layer upon which all images are focused. This layer may be compared to the film in a camera. Surrounding the cones, then, are the rods. These rods and cones are innumerable. The cones, in the center of the eye, are used to see color, details, and far-away objects; the rods, on the other hand, located around the cones, do not see color but only shades of gray. Neither do they pick up any details. Rods are working when you see something out of the corner of your eyes. These rods pick up objects, particularly those which are moving, but do not give you a detailed picture of these objects. Both rods and cones are used in daytime vision.

Although there is no rigid division of functions, the rods, generally speaking, make night

vision possible. The rods and cones function in daylight and in moonlight, but in anything darker than moonlight, the process of vision is placed on the rods. In other words, as the cones lose their efficiency, the rods take over; the rods are sensitive to 1/5000th of the intensity at which the cones lose their effectiveness. You may recall that the last time you walked into a darkened theater you had difficulty in finding a seat and seeing people for the first few minutes. You could not see anything until your eyes became adjusted.

As you go from a well-lighted room into a dimly-lighted or a darkened room, your pupils first enlarge to let in any light that may be present. After the first 5 to 10 minutes your cones become adjusted to the dim light, and your eyes become 100 times more sensitive than they were when you first entered the room. It takes much longer for your rods to become adjusted; but when they do, your eyes are 100,000 times more sensitive than they were before you entered, and you can see a great deal if you know how. This adjustment of the rods takes at least 30 minutes.

Now, take just the opposite of this process. As you walk out of a theater or darkened room into bright light, your eyes are dazzled by the brightness, but in a very few minutes they become completely adjusted. This reaction is so rapid that only seconds in bright light will result in your eyes losing all of their adaption to the dark. If you now re-entered a darkened room, your eyes would have to go through the long process of adapting to the darkness again.

Since you cannot see in the dark unless your eyes are adapted, and since it takes 30 minutes for this process to take place, the first rule is to adapt your eyes and keep them adapted.

Obviously, you could sit in the dark for 30 minutes before every night flight. There is, however, a better method of night adaptation. It has been found that you can see with the cones in red light while the rods are still not sensitive to red light and, for all practical purposes, are "in the dark." This means that if

you sit in a red-lighted room or wear red adaptation goggles in ordinary light, the rods will adapt themselves while you use the cones to read or play cards. After 30 minutes in this light your eyes are ready for the real experience.

Incidentally, red light is harmless and will not injure your eyes. It has only one disadvantage — you will not be able to see red markings on maps and charts.

Now that you know how to develop your night vision, you must learn the precautions or rules to keep your night eyes. Ideally, this would be to avoid all but red light. However, it is not as easy as that; you must learn the practical way as well as the ideal. You can avoid many things injurious to your night eyes. Even the flare of a match or a brief flash from your flashlight will seriously interfere with their adaptation to darkness. Use only as much light in your aircraft as is essential. Practice blindfold drills. Pilots should train themselves to do all manual operations without light. The pilot who does not need a light to find his way around a cockpit is well on his way to becoming an effective night pilot.

Of course, you cannot read instruments or charts without lights, but you can use as little light as possible. Always study your charts thoroughly before a flight so that you will not have to pore over them during flight. Staring at instruments tires the eyes and may reduce effective vision as much as 50 per cent. While flying with lighted instruments, look at them as briefly as possible and keep all lights turned low.

When you do use white light, slip on your adaptation goggles. Or, in a pinch, preserve the adaptation in one eye by covering it or shutting it. When you open it again in darkness, you will be able to see with it while the other eye is re-adapting.

Searchlights can blind pilots instantly and, during the war, often caused the pilots to crash or to be thrown off the target. Protect yourself from these harmful effects and learn a discipline to follow while flying at night. It

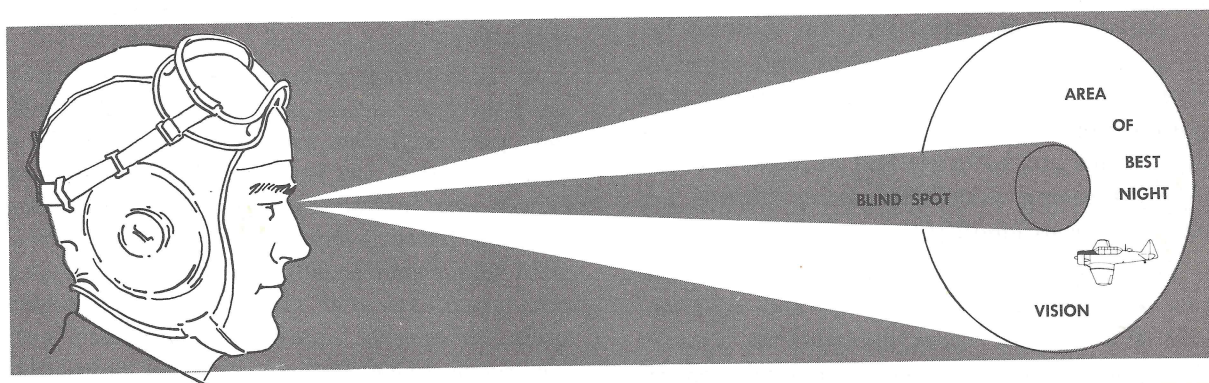
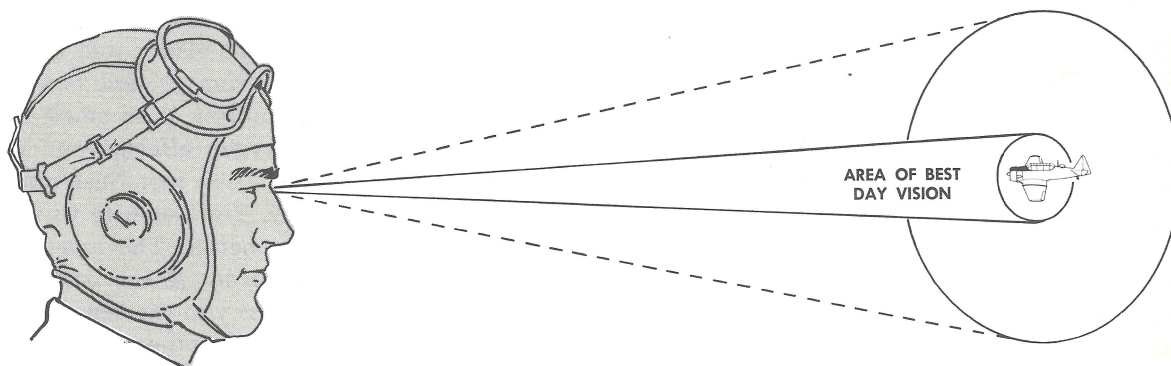
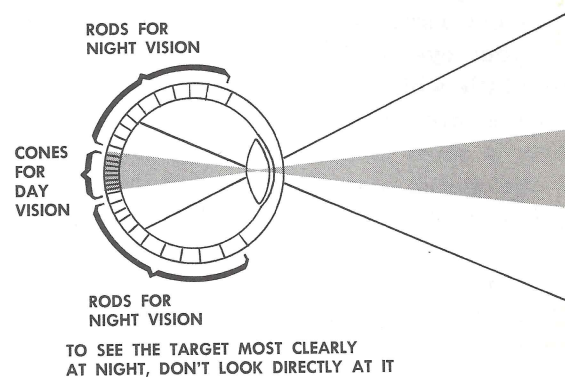
will benefit you on any flight and may save your life in combat flying.

After you have adapted your eyes and learned to keep them adapted, your night-seeing problems have just begun. When something catches your attention out of the corner of your eyes, ordinarily your eyes turn toward the object to get a better look at it. This is the right way to look in daylight when the point of sharpest vision is at the center of your eye. It is all wrong at night. When you look directly at an object, you are trying to see through your night blind spot in the center of your eyes. Night vision is impossible at the center of the eye. To take advantage of the rods at night, always look slightly to one side of the object you want to see.

When you catch an object out of the corner of your eyes, try to hold your eyes just a bit off center so that you will have the object at the point of maximum sensitivity. If your eyes

move irresistibly toward the object, let them swing through so that you can pick it up again at the other corner of your eyes.

If you see an aircraft or object and then lose it, do not try to bore through the darkness to find it again. Instead of staring at the spot where you lost it, move your eyes around



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the spot in a circle, focusing always slightly away from that point. If the aircraft or object is there, you will spot it again by looking to one side of it, or over or under it. It takes practice, but it works.

Learn to move your eyes frequently in dim light. The rods tire quickly and are at their best only for short periods. As you search, do not sweep the sky or sea at random; scan by searching a small area carefully and then jumping your eyes to the next area. You can see very little while your eyes are in rapid motion, but they are sensitive just after moving. Move them in short jumps so that you see all parts of the search area in succession. Move your eyes more slowly than you would move them in daylight. Blink your eyes if an image becomes blurred.

Since this type of seeing is not second nature, you will have to practice it until it becomes automatic. Remember that every bit of training and practice you give night seeing will repay you in better seeing.

NIGHT RECOGNITION

In daylight you see the color and detail of an object as well as its size and the contrast it makes against its background. From a lifetime of experience and practice you interpret what your eyes pick out and thus identify the things you see. You use your night eyes in the same way, except that your rods, when adapted to darkness, are insensitive to color and do not see detail. Therefore, you depend entirely on the size of an object and the contrast between the object and its background to see it. This means that at night familiar things look quite different from the way they look in daylight. Since you have not had as much practice in night seeing as in day seeing, objects are also harder to identify.

Your eyes furnish you with so little information at night that you must be able to interpret the smallest clues in order to identify the objects your eyes pick out. Night conditions are so varied that it is impossible here to go into detail on night recognition. The im-

portant thing is for you to use every night flight to learn more about night seeing.

A common experience in night flying is vertigo, dizziness, spacial disorientation, or whatever you want to call it. It is sometimes worse just after a take-off from a lighted runway. The sharp change from bright light to utter darkness brings on an eerie feeling that everything is going awry. To aid in overcoming vertigo, you must learn to trust your instruments completely.

At night, even more than in daylight, it is important for you to keep your windshield and windows clean and unscratched. Tests prove that a thin film of oil or dust on a windshield will reduce visibility by more than 50 per cent. Haze, fog, dirt, scratches — anything that absorbs or scatters light — reduce contrast and make things harder to see. You cannot do much about haze or fog, but you can keep your windshield clean.

At night, vision is the first thing affected by the lack of oxygen. If your job in the air calls for sharpness of night vision, and if oxygen is available, use it from ground level on up. Your night-seeing margin is so small that the slightest lack of oxygen affects your seeing. At altitudes over 5,000 feet, instrument markings seem dimmer. You begin to turn up the panel lights to see better. The more you turn up your lights in order to see better inside your aircraft, the less you can see outside. You impair your night adaptation at the same time the lack of oxygen is making your eyes less efficient.

At 12,000 feet without oxygen, you cannot see nearly as well as on the ground. At 16,000 feet your sight is seriously impaired. Even though you do not realize how much it is affected, you cannot see as far and your vision becomes fuzzy around the edges. If you wait until you reach 16,000 feet before using oxygen, your eyes will not reach full efficiency again for several minutes. Do not wait until you reach 16,000 feet. If you need your night eyes, use oxygen from ground level up.

If you are a victim of vitamin shortage,

this deficiency will impair your night vision. However, if you eat a well-rounded diet, extra doses of vitamins will not increase your night-seeing ability.

Smoking and drinking heavily, as well as the use of many drugs, may reduce your night vision; so avoid these harmful habits. Since fatigue also impairs your vision, get plenty of rest.

Although your first night flights while in pilot training will not necessitate the best night vision, it may help you to get out of a difficult situation. Night vision will also be useful later on in your career; take heed, therefore, of the facts presented here; practice night seeing and increase your effectiveness as a pilot.

Things To Remember

Adapt your eyes and keep them adapted.
Discipline yourself in the use of red goggles.

Concentrate on seeing.

Learn to look off-center.

Learn and use the techniques that give your eyes a break.

Practice blindfold drills.

Watch your physical condition and keep in training.

Later on in your flying career, when going to high altitudes, use oxygen from ground up, or at least above 5,000 feet.

NIGHT FLIGHTS

Although you may be somewhat tense and apprehensive during your first night flight, you will find that the same techniques and procedures used in day flying will apply. This apprehension is quite normal, since flying an aircraft at night will be a new and different sensation to you. For example, on your first flight you will notice flames coming out of the exhaust stack toward your canopy. This is normal, since the exhaust flames are present even in the daytime but cannot be seen. You may also notice a series of lights being reflected from your canopy which could be glare from your instrument or cockpit lights; however, do not confuse these with lights of other aircraft. Once you realize that many things which appear strange at night are really quite normal,

you will have overcome the biggest obstacle in successful night flying.

Night flying will demand more of you than day flying. You must be constantly alert for other aircraft in the area and may have to rely on your flight instruments to determine the attitude of the aircraft. Instrument lights should be adjusted to minimum brightness to avoid undue tiring of the eyes and to keep canopy reflections to a minimum. With bright instrument lights, you will be unable to distinguish objects, as you look out of the cockpit, until your eyes become accustomed to the change. To eliminate confusion and the need for turning up the cockpit light unnecessarily, you should have a thorough knowledge of all flight and taxi cockpit procedures before the flight.

Prior to night flight you will be given a blindfold cockpit check to determine your knowledge of the location and various positions of all switches and controls. The ability to locate switches and controls should become second nature, because you will have to make most changes by feel alone. A prescribed number of instrument flying hours and instrument take-offs will be required before your first night flight. This is necessary in case reference to your flight instruments is needed during flight. After take-off, this reference to your instruments may sometimes be needed as you leave the lighted area of the airfield and fly into sudden darkness.

CHECK-OUT

Dual instruction will be comparatively brief. Your instructor, however, will show you the local flying area, any prominent landmarks, cities or towns, and any points of interest that may help to keep you orientated. You will then be asked to lower your head or close your eyes, and at a safe altitude the instructor will place the aircraft in a spiral. You will then be instructed to recover from the spiral and return the aircraft to the level-flight attitude assisted by reference to your flight instruments. Should you become disorientated while solo flying, you must trust your flight instruments to

aid in controlling the attitude of the aircraft. Therefore, a satisfactory spiral recovery will be required before you are allowed to fly solo.

Normally a regular day-traffic entry will be used in the traffic pattern with the exception of light signals. The instructor will usually demonstrate the first landing to you. You will then take over the aircraft and execute landings until your instructor releases you for solo. Dual landings with and without landing lights will be required. At least one practice go-around will be required, using the same techniques and procedures that you have previously learned except for the wing lights. Generally, traffic at night will be controlled by light signals from the control officer; and you will be required to have a thorough knowledge of all light signals. These light signals will be covered in the local flying regulations, and you

will receive a thorough briefing prior to night flying.

SOLO

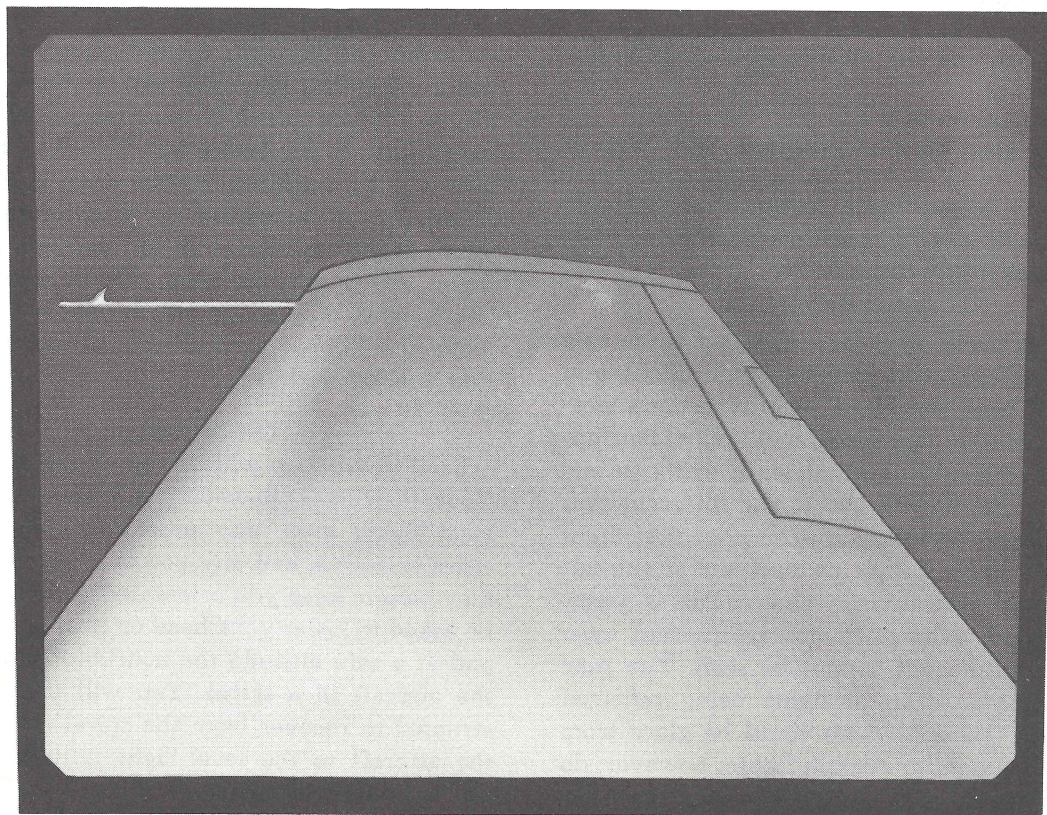
Turn up your radio volume before take-off. Adjust your instrument lights as low as practical. Make sure your canopy is open to eliminate canopy reflections. When you are cleared for take-off, line the aircraft up with the runway and make your take-off assisted by reference to boundary lights or other definite reference points.

CAUTION

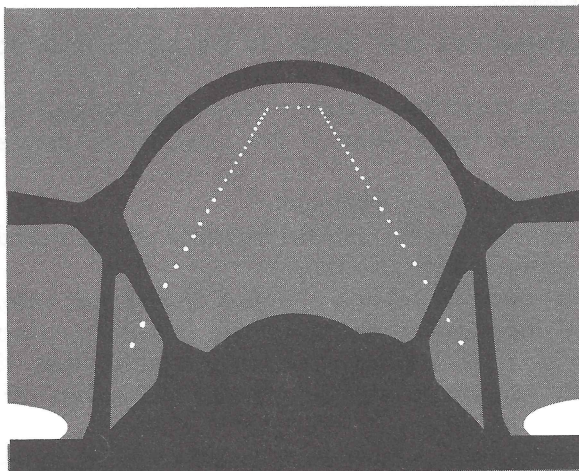
If your engine should fail on take-off, there is only one thing to do — *land straight ahead* or you may make a slight turn, but only to avoid obstructions. *Don't ever try to turn back to the field.*

LANDINGS

The same techniques and procedures used in

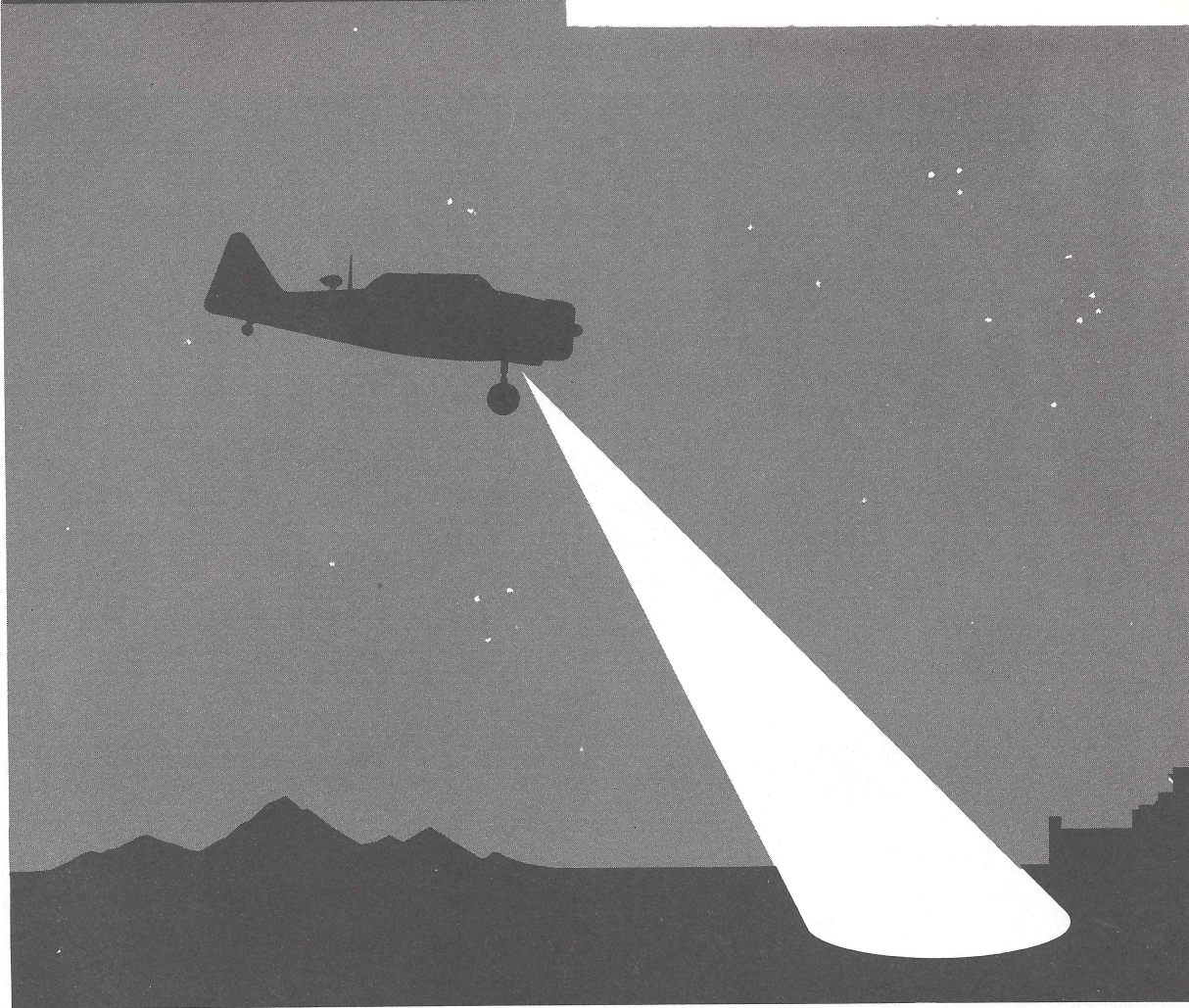


You're Not On Fire! It Is Just Exhaust Glow



day landings will be used at night. When using wing lights for landing, do not turn them on until you have received proper landing clearance and you are near enough to the runway to obtain proper benefit from your lights. If you find that you are under-shooting on your final approach, apply power immediately; do not hesitate.

Any other policies or specific procedures peculiar to your base will be covered in the thorough briefing you will receive prior to night flight.



Don't Sight Down The Winglight Beam

Things To Remember

Make time allowances for the additional procedures and checks to be made prior to any night flight.

Because of the increased load on the aircraft's electrical system, while it is stopped on the ground you may have to idle the engine slightly faster than in the daytime to assure operation of the generator.

Keep your instrument and cockpit lights turned down to a minimum.

It is difficult to determine movement of the aircraft on the ground because of restricted visibility; so be certain that the aircraft does not creep during the run-up.

Because of restrictions on visibility at night, the aircraft should be taxied at a slower rate.

Usually at night there is relatively less wind than during the daytime; therefore, prop wash caused by an aircraft taking off ahead of you will be much more noticeable. Thus, if you are shooting a landing or taking off at night just after another aircraft has taken off, anticipate this prop wash.

When taxiing at night, do not shine your landing lights where they may "blind" a landing aircraft.

