▲ A city at night is a good landmark but its lights sometimes are confusing to a pilot seeking to land. Here is Glendale, Calif., as seen from a Cessna 175 after sunset

Photos by the author

There's nothing really new about night flying. If you've done it, you've shared the almost mystic enchantment of boring through a velvet void toward a distant destination. Night flight can be flying at its best. If you haven't flown at night, you should.

"We won't recommend any student for a private license unless he has had at least three or four hours of night dual," says Larry Hunt, president of Air Oasis, Long Beach, Calif.

"Recently the chief engineer of a nearby aircraft company bought a new *Skylane* from us and was headed east about the middle of the afternoon. He mentioned to me that he would possibly make Albuquerque before dark. Despite over 15 years as a pilot, he had never flown at night. To rectify this, I sent one of my instructors, George Briggs, along to pick up a new plane at the factory and the pair flew straight through to Wichita that evening."

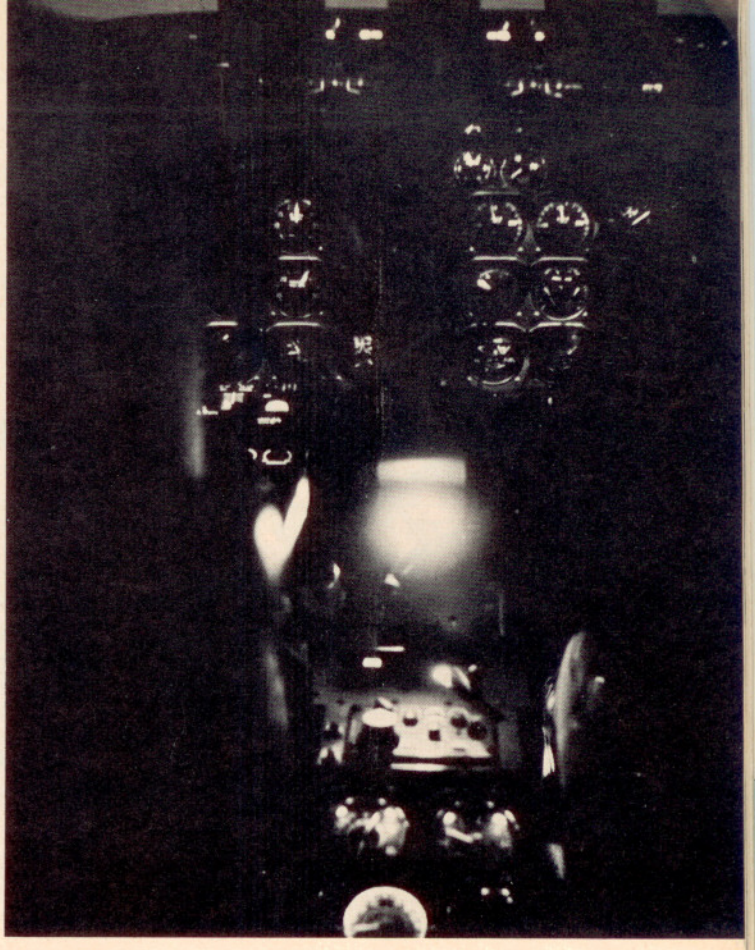
More and more night flying is being logged by single-engine aircraft. Latest FAA statistics show that over 8% of all VFR flight plans within continental United States departed between six o'clock in the evening and midnight. Another 2½% departed before 5 a.m. In areas outside the contiguous 48 states, Alaska, Hawaii and Puerto Rico, the average of night VFR flight plans was even higher. Ten percent filed between 6 p.m. and midnight and another 1½% between midnight and 5 a.m.

There are many advantages to flying at night, in addition to the obvious economies of traveling after normal working hours. Night flight, particularly over the deserts in summer months, is almost always smoother than during daylight hours. Quite frequently, aircraft performance is improved at night in the lower altitudes because of the cooler,

There are nights for VFR flights and those where IFR must be used, but night-flying experience is something the experts say all pilots need

▲ Landing short is one of the prime causes of night-flying accidents. Mistaking street lights for runways and other lights for beacons, etc., get pilots into trouble. Well-lighted airports, such as Los Angeles International shown here, help cut down the probability for error—note the high-intensity approach lights

William Eccles photo



▲ Proper lighting for the cockpit is one of the problems connected with night flying. Here is how the cockpit of a Howard "500" transport plane looked while in actual flight

Flying After DARK

by DON DOWNIE • AOPA 188441

denser air. Cross-country navigation is simplified at night because lighted highways stand out against the blackness of the earth. At the same time, navigational errors—when they are made—can be more difficult to rectify than those made in daylight.

In past years, many pilots learned how to fly at night when they were delayed on cross-country flights and started home too late to land before dark. However, a more prudent modern approach is dual instruction at night so that the newer pilot is ready to do it on his own when the problem arises.

There are two completely different types of VFR night flight. In clear weather, and with a substantial portion of a full moon, night flight is not much different than flying in daylight, except that some instrument lights must be used to read the panel. Under these ideal conditions, it's a simple matter to make precise landings merely by watching the shadow of the airplane as it approaches before touchdown.

Pilots who have flown under these ideal after-dark conditions frequently fly in far beyond their depth when the moon goes down or the weather gets marginal. Flight on a black, horizon-less night is exactly like flight on instruments—and requires the same pilot experience. Pilots who cannot, or have not, made a complete takeoff under the hood, should never attempt a black-night takeoff. Once that double string of runway lights has disappeared, you're on instruments.

Orientation after a black-night takeoff with a quick look over the shoulder is a sure invitation to all kinds of trouble; disorientation, vertigo or an instinctive turn back toward the field in an effort to keep the lights in sight. If you're not prepared to make a complete instrument departure, don't attempt a takeoff on a black night, particularly if the airport is located far away from the city lights.

Much of the open cockpit night flying was done without lights of any kind. W. H. "Hank" Coffin

(Continued on page 58)

Flying After Dark

(Continued from page 29)

manager of the Whiteman Air Park in Pacoima, Calif., has been flying commercially since 1924.

"When I first started night flying in an old OX-5 Waco, we had no running lights, no cockpit lights or landing lights. In fact, the airplane didn't have an electrical system outside of the power plant. We'd keep track of speed by the feel of the wind on our faces and the sound of the flying wires. Fuel consumption was gauged by a 'guestimate' of the length of time we'd been in the air," said Coffin.

Approved flight schools, such as Hank Coffin's, require at least five hours of night flight, including solo, for all private pilot applicants. Ten hours is required prior to a commercial license.

"The thing that I think is most lacking these days is night cross-country time," continued Coffin. "The way courses are set up at the moment, no cross-country is required at night. Normally a pilot won't get lost, even at night, if he's shooting landings at his own home airport. I believe that a good, long cross-country flight should be required, at least for all commercial license applicants. After all, that's the only way that a pilot is going to get full utilization out of his license."

Coffin has been operating at night out of the Whiteman Air Park, where no runway lights have ever existed, since 1951. "We average 75 hours every day on our airplanes," said Coffin. "At least 15% of this time is logged at night, and we have never had the slightest trouble in operating from an unlit airport. Of course, we have obstruction lights on the approach end of the runway and the flight strip parallels the brightly lit San Fernando road. All a pilot has to do is to line up with the red light on the "short end" of the field, come in parallel to the highway and cut back on his power when he crosses the end of the airport. His landing light will pick up the runway."

During the early days of the G.I. program, Coffin taught one student, an automobile mechanic who could not come to the airport during the day, his complete private course at night. The first time that this student flew in daylight was the day he went up for his private-license flight test.

During the early days of World War II, Coffin operated his flight school at Baker in the California desert at the southern entrance to Death Valley. There he taught all courses, including acrobatics, at night merely because the days were so hot and turbulent that precision flying was impossible.

"Night flight at Baker was a cinch," said Coffin, "even on the blackest nights. The old CAA emergency airport where we were based, was brightly lighted with boundary lights that formed a mile-square block of illumination.

"I firmly believe that single-engine operation at night is completely practical with the modern equipment that is available. We haven't had an actual forced landing, aside from someone running out of fuel or forgetting carburetor heat, in any of the new Cessnas we've operated since World War II, and we have logged over 20,000 hours a year.

"The only forced landing I ever had at night was at Baker, in an old Waco UPF-7. I was giving acrobatic instruction at 6,000 or 7,000 feet and the engine quit cold. We had some sort of a clog in the fuel system. We landed safely on a broad dry lake south of town, thanks to a little moonlight, and I hitched a ride back into town on a truck."

The one thing really essential in the cockpit at night is a good flashlight. Prudent pilots usually carry two flashlights in their "brain bags" or an extra one in the glove compartment of the airplane. Proper use of the flashlight in the cockpit can take considerable practice since the full force of the light can virtually blind a pilot who has become accustomed to the darkness. Everyone is familiar with the amount of time it takes for the eyes to adapt themselves to the darkness of a movie theater or a cocktail lounge, after coming in from bright daylight.

An important difference between day and night vision is caused by the different sensitivity of various parts of the retina of the eye. The central part of the eye is not sensitive to starlight illumination. In order to see clearly at night, pilots should not look directly at the subject, but slightly to one side. This technique of averted vision is common knowledge for woodsmen and hunters, and can be learned with practice by city dwellers.

Under ideal atmospheric conditions, Air Force medical reports indicate that a completely dark-adapted eye can detect the flare of a match at 25 miles.

Medical tests have shown that night vision deteriorates rapidly at altitude. Vision at 12,000 feet is only half as good as at sea level unless supplemental oxygen is carried aloft. Military requirements call for oxygen use "from the ground up" on all night flights. These same Air Force tests show that carbon monoxide affects night vision in a manner similar to lack of oxygen. "Smoking three cigarettes may cause a carbon monoxide saturation of 4%, with an effect on visual sensitivity equal to that of an altitude of 8,000 feet," says the most recent Air Force pamphlet, "Physiology of Flight."

In the past, three basic types of cockpit lighting have been used. Most surplus aircraft dating back to World War II were equipped with ultraviolet (black light) and fluorescent instruments. More recently, indirect red lighting was used where only the face of the instruments was lighted. However, the simplest, most common instrument lighting system is the red flood light that covers the entire interior of the

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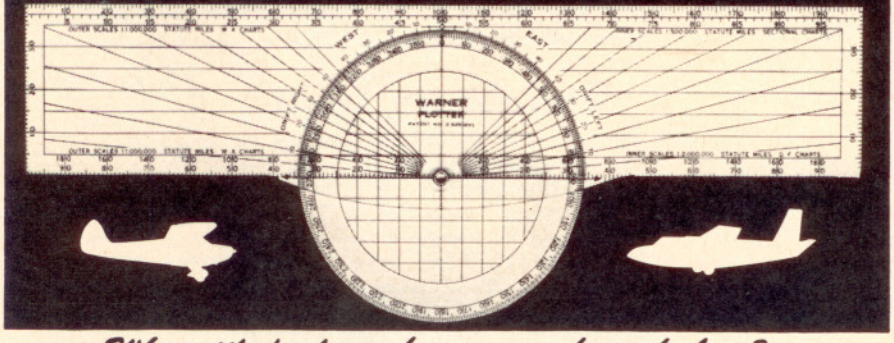

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cockpit. Usually these lights are mounted between the two pilots' seats in the headliner of the cabin. There are two obvious disadvantages to the red floodlight system; maps are almost impossible to read under red light and shadows from the pilot's head can make instrument faces invisible. Thus, most experienced night pilots keep a flashlight readily available; either in the side pocket of the cockpit or on their lap, ready for immediate use.

Many pilots put red lenses or filters over one flashlight. Others cup their hands over the light so that only a tiny sliver of light comes through. Either approach is satisfactory.

Just as in daylight flying, care should be taken not to place metallic objects—flashlights, photo exposure meters, tools or portable radios—near the compass. Any metal object containing iron will pull the compass off. Naturally, this precaution need not be taken if the compass is remote-reading, where only the indicator is on the instrument panel.

Cockpit lights should be kept at the lowest level where the gauges can be read. The dimmer the light inside the cockpit, the more clearly can the pilot see things outside.

Most night landing accidents are caused by undershooting the airport. On final approach, the pilot can see the field perfectly because of bright obstruction lights, runway lights and surrounding city lights. This usually makes the airport appear much closer than it actually is and the pilot frequently drops more and more flaps, comes back more and more on the power setting and can get so slow that he is flying "in back of the power curve" where no amount of throttle will get him back to flying speed without some slight loss of altitude.

This viewing of a brightly lit airport at night can be very confusing. Early in the Korean conflict, I was flying copilot for Ed Pinke, later chief pilot for the Flying Tiger Lines. We were returning from Japan and had taken off before dawn, flying eastbound from Wake Island to Honolulu, in a weatherbeaten Flying Tiger DC-4. It was my turn to make the landing. We approached the John Rogers Airport in Honolulu somewhat after sunset on one of those clear, moonlit nights that the Hawaiian Tourist Bureau uses for their advertisements. The tower cleared us for a straight-in approach. As we came in fairly close to the airport, I throttled back, ran through the pre-landing check list and dropped the gear. Ed sat in the right seat and said nothing. I slowed up to 140 m.p.h. and dropped approach flaps. Then we flew, and flew . . . and flew some more before the landing lights finally picked up the numbers on the end of the runway.

"These clear nights will really fool you," was Pinke's only comment as we taxied into the transient parking area. I didn't say a word.

This undershooting of the airport at night usually stems back to an improper traffic pattern. Pilots usually get too low on their downwind leg, lower on base leg and extremely low on final approach. A simple time-and-heading procedure can be used on virtually all airports to eliminate the tendency to get too low in the pattern and "lose" the runway. If a pilot will fly a crosswind leg at 90° to the airport, he can continue for 15 seconds (plus or minus wind) and turn downwind with a compass heading 180° from his landing runway. As he crosses abeam the approach end of the runway, he can fly for 30 seconds and then begin a standard 3°-per-second turn in toward the field. As he completes this 180, he will be lined up with the runway and have just 30 seconds before crossing the end of the runway, This technique applies as well in daylight, but it makes every night landing, even on a completely strange airport, completely routine.

In turning from downwind leg to final approach on dark nights and in isolated areas where few lights exist, close reference should be made to the instrument panel until the runway or boundary lights come into sight.

It's a simple matter to see things at night that just aren't there. The halation of a blinking star can look like a flashing landing light. The rotating headlight on a railroad locomotive can look like a rotating beacon. The base of a hazy cloud can suddenly look like the horizon, and be 45° above it. The white tail light of another airplane in the

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traffic pattern can disappear against the city lights and the headlights of an automobile can seem to take its place. Many of these illusions are psychological, just like the "automatic rough" that invariably comes in single-engine planes after dark, over water or in flights atop a solid overcast.

In high-density traffic areas, many pilots tune in the area surveillance radar, particularly on crystal clear nights, for additional traffic information. On these "too-clear" nights, it is virtually impossible to see the nonblinking lights of another aircraft against the pattern of multi-colored city lights.

"You can look at a steady running light and never see it," says "Hank" Coffin. "Flashing navigation lights are a great help and are quite inexpensive. Rotating beacons are an additional aid. I teach my students to turn on their landing lights while on base leg, even though they won't pick up the ground until the airplane comes across the fence, just so that other airplanes can see them and tell what they're going to do."

Actually, an aircraft can be flown legally at night with only navigation and cockpit lights. Landing lights are not a legal requirement nor are runway lights, though many safety inspectors feel that a pilot might be charged with reckless flying if he damaged an airplane while landing on an unlighted airport after dark.

Use of landing lights on night takeoffs has been the subject of many a "hangar flying" session. There is no set procedure; some airlines use them, others do not. Just about the only thing that all senior pilots agree on, in this respect, is not to use landing lights after takeoff if there is an overcast. This also applies on landings out of instrument approaches.

Most pilots turn on their landing lights while quite a distance from the airport so that tower operators and other aircraft can more readily spot the airplane.

Most pilots use landing lights on takeoff until the aircraft has at least broken ground. Landing lights help the pilot keep in a straight line on takeoff and eliminate the possibility of running into a dog, cat, cow or car.

During the early days of World War II, I was pilot of a glider-tow plane at Twentynine Palms in the California desert. We were flying Vultee L-1-A observation planes to tow training sailplanes. The L-1-A was not equipped with landing lights, but pressures of the glider program forced us into night towing. No one had any trouble with these nonlighted observation planes until someone left a rope truck parked in our normal taxi area between the hangar and the runway. It cost us a bent propeller.

Actually, landing lights should be used sparingly while taxiing so that the eyes will retain as much dark adaptation as possible.

Possibly more so at nighttime than in daylight, pilots should plan as far ahead of the airplane as possible. A pre-landing check should be accomplished well out from the airport. All radio frequencies should be set up in advance. Normal pattern procedures can put airspeeds slightly on the high side for newer pilots. Wheel landings with just a bit of extra speed are normally preferable to full-stall landings that can be 15 or 20 feet in the air for the neophyte.

Night flight gives the pilot true efficient utilization of his transportation time. Approached with caution and some good after-dark dual instruction, cross-country flights at night can be some of the most enjoyable hours ever spent by a pilot.

The night was made for many things—and flying is certainly one of them. END

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