Think O_2

A short aviation article.

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The Piper Arrow climbed through 7,500 feet on its way to 8,500. The pilot, a businessman who had just clinched a deal during a protracted lunch, was in trouble. His eyesight was fading rapidly. Worst of all, he didn't immediately realize what was happening – it just seemed to be getting darker. It was only 2:30 in the afternoon and the sun was brilliant in a bright blue sky. Approaching 8,500, he could hardly see a thing – his world was quickly becoming black.

After a short panic attack and quick prayer, he had the presence of mind to throttle back the Arrow to what sounded like the proper cruise descent power setting. As the aircraft started down, his eyesight gradually returned. Breathing a sigh of relief, he returned to his departure airport, landed, and tied down the Arrow. After a little reflection on his experience and some advice from his instrument flight instructor, he vowed to improve his physical conditioning – and he did.

So what happened to the pilot's eyesight? Why did it fail him?

Your body needs oxygen (O_2) to function properly. O_2 attaches itself to the hemoglobin in your blood. Hemoglobin is an iron-protein compound in red blood cells which transports O_2 throughout your system. In a normally healthy person, at low altitudes (usually below 10,000 feet) and in good light, all physical systems are go. However, there are many situations that can reduce the amount of O_2 in the blood or limit the O_2 carrying capacity of the hemoglobin.

One obvious limiter is altitude. At 18,000 feet, with only half the atmospheric pressure, a breath would only contain half the normal amount of O_2 and other gases. So, as the airplane gains altitude, there is less O_2 available for your system to utilize, causing your normal activities and physical operations to begin a steady decline.

Altitude is not the only limiting factor. A person's individual physical makeup will also limit the effectiveness of O_2 use. Your heredity, level of aerobic health, age, diet, and the substances you put in your body can decrease the effectiveness of your O_2 transport system. Combine the effects of altitude, smoking, unsound physical practices, and a pilot's unique physiology, and a scenario is created which may end in disaster.

The pilot in the illustration was an overweight, non athletic man in his mid 50's. He practiced no form of aerobic exercise and ate much more junk food than was good for him. His physical condition was further compromised by his excessive smoking. All these factors taken together added up to rob his system of its necessary O_2. All things considered, the Piper pilot was fortunate – the result of his indiscretions had a positive ending.

O_2 deprivation brings on a condition called hypoxia – technically, hypemic hypoxia, a type of hypoxia that is the result of O_2 deficiency in the blood (Hypemic means "not enough blood").

Some of the more common effects of hypoxia in its initial stages are; euphoria, visual impairment, impaired judgment, and drowsiness – any one of which can be deadly. Let's investigate some of the common aviation occurrences that can cause hypoxia.

As the introductory story illustrated, both an unhealthy body coupled with altitude can bring on hypoxia. If you intend to fly higher than 10,000 feet during the day – 5,000 feet at night – you should have supplemental O_2 ready to use. Now-a-days, there is no excuse for not having the necessary O_2 equipment on board – it's readily available and affordable.

It is also important to know when the onset of hypoxia is more likely to occur in your particular system. Each person is a little different in his physical makeup. What is good for one is not necessarily good for the next person. Most pilots start to feel the effects of

O_2 deprivation around 10,000 feet. If you will be flying in this range, be safe, have supplemental O_2 at the ready. Initially, you might consider flying with a pilot who knows his limit or is breathing O_2 and see how you fare as the airplane gains altitude. The onset of hypoxia for many pilots is indicated by a feeling of complacency and euphoria, so going it alone is not a good idea. Not knowing the conditions which can bring on hypoxia, coupled with the all too common phrase, “It can’t happen to me,” is a prescription for a catastrophe.

Some pilots think that because they can have a couple of alcoholic beverages and drive their car safely they can also imbibe and fly an airplane. Alcohol severely limits hemoglobin’s ability to transport O_2. It actually destroys hemoglobin. A person should never consume alcohol and fly. Check out the FAA regs (14 CFR 91.17) regarding the use of alcohol and drugs.

Many pilots don’t consider the need for supplemental O_2 at night. Your eyes are comprised of two kinds of light sensitive cells, rods and cones. Rods are responsible for light reception and cones are the organs that allow you to see color. Cones don’t function well after dark and rods are not very effective in low light conditions. That leaves the human animal at a bit of disadvantage as darkness approaches. Furthermore, both rods and cones need a sufficient amount of O_2 to operate effectively. Anything which diminishes the level of O_2 in your system will cause a lessening in the sharpness of your eyesight – as the Piper pilot found out.

Take the simple “Need for Supplemental O_2” quiz below. It will help you think about the importance of supplemental O_2 as part of your flight preparation. If you answer “no” to any of the following questions you may want to consider having supplemental O_2 at the ready.

- Do you get enough regular aerobic exercise like walking?
- Do you get enough sleep at night?
- Do you eat well balanced meals daily?
- Is your body weight appropriate for your height and body type?

- Are you taking medications that don't hinder proper O_2 transport?
- Are you a non-smoker?
- Do you live or work in a non-smoking environment?
- Are you stress free?
- Are you a young person? – your susceptibility to hypoxia increases with age.
- Will you be flying at or below 10,000 feet?
- Will you be night flying at or below 5,000 feet?

Of course, your need for supplemental O_2 increases as more of the above factors are added to the equation.

As an aside, even if you are in great physical condition, there is an interesting device on the market that can quickly tell your percent of blood oxygen saturation – the Nonin *FlightStart* Pulse Oximeter. Even though pulse oximeters have been on the market for quite some time, the *FlightStart* is small, portable, and affordable. It's a dandy way to always know how your body is responding to the various factors that affect the percent of O_2 in your blood. An interesting experiment would be to either monitor your O_2 level continuously in flight, or do a number of spot-checks as the flight progresses. In this way you could chart your systems O_2 requirements.

A pilot needs to evaluate any flight situation that might lead to O_2 depravation and take the appropriate steps to ensure success. The Arrow pilot made a mistake in judgment believing that his physical condition would not affect his eyesight at altitude. He learned his lesson the hard way. If you think about it, there is no reason for anyone to experience the consequences of O_2 deprivation. With proper planning, some altitude experience with your flight instructor, and a common sense approach to physical conditioning, hypoxia can easily be kept at bay. Anticipating when you might need supplemental $O_{2,}$ and using it, is smart. Think O_2. You will not only be able to see better, but think and feel better as well. Good flying.