Hypoxia, Hyperventilation, and Supplemental Oxygen Systems Introduction

Eric Bick, Editor

This month we are focusing on the effects of too little oxygen while flying at higher altitudes. This article will point out some fallacies of popularly held glider pilot beliefs regarding hypoxia, hyperventilation, pulse oximeters, and supplemental oxygen systems. It will also provide guidance on how to ensure you are flying at minimal risk while in the upper atmosphere, and what the danger signals are.

As background, at the 2018 SSA Convention, a presentation by Jean-Marie Clément on low-level hypoxia caught the attention of those in the audience. Data were shown that the onset of hypoxia occurs at significantly lower altitudes than the FARs mandate for supplemental oxygen use. The presentation also showed data for Mountain High EDS oxygen systems, pointing out some risks associated with it if used improperly.

This is a very important topic for glider pilots whether they fly below 10 kft consistently or reach Class A altitudes on a regular basis for prolonged periods. Therefore, we are taking this opportunity to provide in one article that which you need to know to prevent hypoxia and its side effects, and to effectively use an EDS supplemental oxygen system.

Using input from Patrick McLaughlin, Jean-Marie Clément, and Dr. Heini Schaffner, Dr. Dan Johnson (biographies are shown following the article) has put together what I think is an extraordinary article of utmost importance to glider (and other) pilots.

If there is one message to take from this, it is: Don't mess with hypoxia and hyperventilation – they are each a different aspect of lower oxygen levels, and each is life-threatening. Learn about your oxygen system and how to use and maintain it.

As prelude to the materials being presented, there are some points that each of us has encountered during student training, and should be emphasized in annual safety reviews, and perhaps in-flight reviews regarding flying at higher altitudes (anything over 5-8 kft).

Humans, in general, are not physiologically designed to survive and thrive at high altitudes. There are levels of adaptability, but starting at 5–8 kft, the human body begins to experience a variety of symptoms, from hypoxia to hyperventilation to altitude sickness. As the altitude increases, the danger of hypoxia and hyperventilation becomes greater. Hence, we take precautions when going to higher altitudes. In the case of glider pilots, we carry supplemental oxygen onboard and use it, typically, according to the applicable regulations like CFR FARs in the U.S.A.

Once we venture into the higher altitudes, we have put our well-being, and even our lives, at greater risk due to the decreasing amount of oxygen available (not to mention the sub-zero temperatures). Hence, we start to breathe more deeply, take more rapid breaths – or use a supplemental oxygen system. Once we are at altitudes that require supplemental oxygen to avoid hypoxia, or for survival and well-being, our lives are now dependent on the use and proper functioning of that system.

The primary burden for flying safely at high altitudes lies with the pilot in command. S/he must (not should) be fully trained and vigilant regarding the system performance, its correct use, and safety of any passenger(s). This necessitates the PIC understand the equipment, onset of hypoxic and hyperventilation effects, and what to do if these effects are suspected.

Those flying routinely in wave are perhaps more aware of this than pilots that spend most of their time flying below 10 kft. To ensure a low risk, these pilots have systems and standard operating procedures (SOPs) that mitigate the risks of flying so high, and also account for the risk of a system failure or malfunction. Due to the hostile nature of flying at 10-18 kft and above, even a slight degradation in equipment performance can lead to hypoxic and/or hyperventilation states for the pilot and passenger(s). These pilots know that to ignore their SOPs is to put their lives and well-being at risk.

Soaring magazine has previously published articles on hypoxia. The following article contains information and data that provide an extremely important update to this topic – please read and absorb ... your life could depend on it.