

Oxygen Para-what?

The Oxygen Paradox Phenomenon

By Lt. Greg Ostrander



Most people never have heard of oxygen paradox. The condition is rare and, until just a few years ago, was poorly understood.

Oxygen paradox is a physiological phenomenon that occurs upon reoxygenation after periods of either prolonged or severe hypoxia.

This phenomenon has two causes:

1. When you are severely hypoxic, it takes a few seconds for the effect of reoxygenation to occur. You continue to get hypoxic because the 100-percent oxygen has to go through the hose and mask, then into your lungs, where it diffuses through various membranes and such. This process may take a few seconds.

2. The effect of reoxygenation may not be positive at first. As the oxygen hits your pulmonary vascular bed, some vasodilation may occur, which slightly drops your blood pressure. The lowered pressure may make blood delivery to the brain more difficult because the blood vessels may be constricted. The reason why this occurs goes back to the prolonged or severe hypoxia part of this discussion. As you get hypoxic, you start to hyperventilate, which reduces carbon dioxide. A reduction of carbon dioxide tells the central nervous system to constrict the blood vessels, which will stop the hyperventilation. Your body drives ventilation and blood-vessel constriction off the amount of carbon dioxide in your blood, not oxygen. The lack of oxygen stimulus is much weaker and doesn't occur until far down the process. You get lowered blood pressure and blood flow and continue to get hypoxic, all while breathing 100-percent oxygen. So, you put on your mask, and, bam, you start to feel worse, not better.

Aviators must understand this issue because the natural tendency in an oxygen-paradox-phenomenon case is to do exactly the wrong thing: Remove the mask. In the past, we also thought teaching this concept was counterproductive—that it would confuse people. This belief since has changed, and keeping the mask on is taught in quadrennial training.

Controlled runs on the reduced oxygen-breathing device (ROBD) indicate this phenomenon occurs more often than we thought (21 of 30 trainees reported a strong desire to remove their mask). However, this feeling only lasts for a few seconds and then passes. The key point is the feeling will pass. If you understand what is going on and trust your emergency oxygen, you will be OK. 🦅