

SYMPTOMS OF G'S EFFECT ON PILOTS Part 1 of 2

Consciousness is a direct result of oxygen to the brain. A drop in oxygen level will result in a decrease in brain function varying in intensity from changes in visual acuity to a complete loss of consciousness. Anything that decreases the supply of oxygen to the brain will increase the loss of brain function. This can include smoking, dehydration, loss of blood, low heart rate, hangover, intoxication, carbon monoxide poisoning and more. We can control some of these. Some, we cannot. Below you will find some typical effects of positive G's.

1. Gray-out. There is graying of vision caused by diminished flow of blood to the eyes. Although there is no associated physical impairment, this condition should serve as a warning of a significant impairment of blood flow to the head.
2. Tunnel Vision. It is a transitional stage between gray-out and black-out. Once color is lost during sustained positive Gs (gray-out), a gradual and continued increase in G force will cause a tunneling of the vision. Additional increases in G force will cause the tunnel to close further until a complete loss of vision occurs: black-out. It is possible to modulate tunnel vision by gradually decreasing G forces as many of us have learned to do; however, it has been repeatedly shown that it is very possible to go directly from fully functioning to GLOC skipping those intermediate conditions. At this point, oxygen deficit is critical and loss of consciousness may be only one pull away.
3. Black-out. Vision is completely lost. This condition results when the oxygen supply to the light-sensitive retinal cells is severely reduced. Contrary to other common usages of the term, consciousness is maintained. In blackout, some mental activity and muscle function remains, thus the occurrence of blackout warns of seriously reduced blood flow to the head and of a high risk of loss of consciousness. Note: In some centrifuge studies, 50 percent of the pilots had simultaneous blackout and loss of consciousness. Therefore, a pilot cannot rely on blackout to precede loss of consciousness.
4. G-induced Loss of Consciousness (GLOC). When the blood flow through the brain is reduced to a certain level, the pilot will lose consciousness. He or she may have jerking, convulsive movements; these have been seen in many subjects of centrifuge studies and in some pilots during actual flight. The pilot will slump in his or her seat. Possibly, the pilot will fall against the controls, causing the aircraft to enter flight configurations from which it cannot recover even if consciousness is regained. In centrifuge studies, many pilots lost (and regained) consciousness without realizing they had done so.
5. How long does induced unconsciousness last? In a series of studies of pilots in centrifuges, the pilots were unconscious for an average of 15 seconds. Following this, there was an additional 5- to 15-second interval of disorientation. Thus, if there is loss of consciousness due to positive G forces, there will be a 20- to 30-second (or longer) period during which the pilot is not in control of his or her aircraft.

In Part II of this series we will describe the effect of dehydration on a pilot's ability to sustain positive Gs.