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Anti-G Suit



The anti-G suit, or just G suit, is a garment that is used to prevent hypoxia in individuals. Hypoxia is a condition in which blood drains from a region in the body and oxygen deprivation occurs. Aviators and astronauts wear the anti-G suit to prevent the blood from draining from their heads when they experience gravitational acceleration many times that on earth. The symptoms start with grey-out, followed by tunnel vision, blackout then G-LOC, or G-induced loss of consciousness.

To prevent blood from leaving the head, pressure is applied to the abdomen, legs and sometimes the lungs. These are added by filling up pockets in the suit with enough air or water to apply pressure to the body. The amount of pressure necessary in the suit depends on many factors, including fitness, hydration, time spent enduring G-forces, body temperature and time spent in space/space simulations.

The anti-G suit was invented by Wilbur R. Franks from the Banting and Best Institute. He used pockets of water only on the legs to keep circulation going at higher Gs. This worked to increase G tolerance only by about 1 G and was considered uncomfortable for use by pilots. Later, Earl H. Wood, Edward Baldes, Charles Code and Edward Lambert of the Mayo Clinic performed many experiments and came up with a new design that added pressure to both the abdomen and legs. In addition, they pressurized the suit with air and not water, which was considered a more comfortable invention. These four people performed experiments on themselves to test their tolerance and reactions to various levels of Gs in different climates and conditions.

Because Gs change so often and quickly in the air, people cannot react quickly enough to regulate the pressure in their G-suits. Instead, a pressure regulator is used. When the pilot moves the control stick, the signal is sent to a computer program called "Preview Control." This program analyzes the movement of the control stick and predicts future movement and resulting Gs on the plane. It then sends signals to a servo or stepper motor to angle the airflow aperture. If the opening is increased, the pressure in the suit will decrease and if the opening decreases the airflow pressure will increase. Higher pressures are needed to counteract higher Gs.

In addition to aviators and astronauts, G-suits are used by people with a condition called Orthostatic Intolerance. People with this condition have poor circulation and so when they stand up, their blood rushes away from their heads and to their feet. This causes temporary loss of vision and feelings dizziness. Used or leaky suits can be found on the internet for anywhere from \$50 to \$500 dollars. Most suits are still in good enough shape to supply enough pressure to help people with OI, because they probably will not be experiencing anything more than 1 G. However, the newest, most effective anti G suits are not sold directly to the public and are kept for government use.

Sources:

http://www.dnaindia.com/india/report_air-force-looks-for-g-suits-as-prez-gets-ready-to-fly-su-30_1307765

<http://www.mayoclinic.org/news2009-rst/5219.html>

<http://en.wikipedia.org/wiki/G-suit>

<http://www.ncbi.nlm.nih.gov/pubmed/15815936>

<http://www.patentstorm.us/patents/5536232.html>

<http://books.google.com/books?id=aO6zut2K7IsC&pg=PA300&dq=anti+g+suit#v=onepage&q=anti%20g%20suit&f=false>