

**ASCI 357**  
**G-LOC**

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Here are some additional notes on acceleration in the flight environment:

1. G's made simple:

- If blood is pooling your head, then you are experiencing negative  $G_z$ 's. Remember when Maverick was inverted improving foreign relations?
- If blood is pooling in your legs, then you are experiencing positive  $G_z$ 's. This happens when you start a loop.

2. G's in the z-axis usually cause the most problems, especially during positive  $G_z$  maneuvers.

3. Warning signs that your brain is not getting enough blood, and thus oxygen:

- Tunnel vision: This is when you start to lose your peripheral (ambient) vision. It is also called gray-out, sparkles, and other various names.
- Black out: This is when you lose both your peripheral and focal (central) vision. That is, you are awake, but cannot see!
- G-LOC: This is when you lose consciousness and take a nap!

4. Please note that tunnel vision is your first warning sign that your brain (more specifically your eyes which are an extension of your brain) is not getting enough oxygen. This is an annoyance, but is not life-threatening. Blackout is more serious depending on a number of factors such as height, attitude, etc., but G-LOC is a life-threatening situation. Many people have died because of G-LOC. Thus, if you start to experience gray-out, you need to stop what you are doing or make sure you are doing a good anti-G straining maneuver.

5. Anti-G straining maneuver (AGSM): The AGSM is a means that allows you the pilot, to increase your G-tolerance, and thus pull more Gs. A properly executed AGSM, can provide you with 3 to 4 Gs of protection. The AGSM consists of two parts: contracting the legs and cyclic breathing.

- Contracting the legs: This first step is extremely crucial. Here you want to squeeze all the muscles in your legs, starting at your feet and working your way up to your mid-section. This squeezing action (skeletal muscle pump) will force blood up from the legs to the heart (right atrium, via inferior vena cava). Additionally, by contracting the leg muscles you will also prevent pooling of blood in your legs. This is good!
- Cyclic breathing: This is more commonly known as the “Hook” maneuver. Here you want to take in a deep breath, and then hold the air in by saying “Hook” or any other 4-letter word that ends in “ck”. By saying “Hook” you close the top of the trachea (windpipe) by causing the glottis to close. Thus air cannot escape out of the trachea. Next, while the air is trapped inside your trachea and lungs, you want to bear down and squeeze your stomach and chest muscles. This will cause the air pressure inside your chest cavity to increase, which will push on the heart and thus increase your blood pressure! Again, this is good. The only difficulty associated with cyclic breathing, is the time period. For this portion of the AGSM to be effective, it must be done on a 3-second interval. That is, say “Hook”, bear down and hold all for 3 seconds, then repeat.
- You can practice this maneuver in a 1 G environment, but be careful, you could cause cerebral artery damage if you squeeze too hard.
- The AGSM should be done before, during, and until the Gs are over. And remember, this maneuver is for positive  $G_z$  conditions only.

6. Who is the best G monster? Normally, a short individual (heart is closer to the head) can tolerate more Gs than a large individual. Additional factors include adipose tissue (fat), hydration, gender, and flight experience. Thus, a short muscular female who is well hydrated and has lots of recent flight time, will be able to tolerate more Gs than a large fat dehydrated man who has no flight hours.

7. Finally, in which direction can the body sustain the most Gs? The answer is the not in the vertical ( $G_z$ ) direction, but in the transverse direction ( $+G_x$ ). Note that the picture in figure 12-1 labeled transverse motion is not correct. It has incorrectly labeled  $+G_y$  and  $-G_y$  as transverse, where it should be  $+G_x$  and  $-G_x$ .