



DEPARTMENT OF THE NAVY

CHIEF OF NAVAL AIR TRAINING
CNATRA
250 LEXINGTON BLVD SUITE 102
CORPUS CHRISTI TX 78419-5041

CNATRAININST 6110.1
N7

3 DEC 2008

CNATRA INSTRUCTION 6110.1

Subj: G-TOLERANCE TRAINING PROGRAM

1. Purpose. To provide policy and guidance for the implementation of the G-Tolerance Training Program for the enhancement of G-tolerance in the Navy Flight Demonstration Squadron (Blue Angels).

2. Cancellation. NAVFLIGHTDEMROININST 6110.2C

3. Background. Blue Angel jet demonstration pilots do not wear G-suits. G-suits can induce uncommanded stick movement, shift body position and inhibit full stick deflection maneuvers. Modified G-suits are of limited value in combating the adverse effect of G-forces. Therefore, for the jet demonstration pilots, G-suits induce more risk than benefit.

4. Policy. Initial/refresher centrifuge training, a personal strength exercise program, and proper hydration, nutrition and rest will be adhered to by jet demonstration pilots. The main purpose of the program is to improve G-tolerance, but the additional benefits to physical and mental health are of equal importance.

5. Responsibilities. Given that jet demonstration pilots do not wear anti-G devices, it is essential that each pilot master the anti-G straining technique, maintain G-tolerance through regular fitness training and be prepared to fly every day through proper hydration, nutrition and rest. Jet demonstration pilots shall:

a. Complete initial and annual refresher centrifuge training without G-suits in order to refine and perfect their anti-G straining techniques.

b. Understand the importance of a strength training program in improving and maintaining G-tolerance.

3 DEC 2008

c. Understand the importance of proper hydration, nutrition and rest when combating G-forces. A proper diet that incorporates full hydration, limits alcohol and caffeine greatly enhances G-tolerance.

d. Be aware that frequent flight in the high-G environment builds G-tolerance. Any break from the regular Blue Angel regime of flying six days a week will lead to a decrease in G-tolerance.

6. Centrifuge Training. Annual Centrifuge Training (CFIT) will occur at Naval Air Station Lemoore (NASL), CA for numbers one through seven prior to the start of winter training in El Centro, CA. The Blue Angel Flight Surgeon shall be present during the training and have initial training in the centrifuge during his first year with the Blue Angels. All newly selected jet demonstration pilots will complete an additional two-day training period at NASL designed to improve their anti-G straining maneuver (AGSM) technique. This training period will take place prior to new jet demonstration pilots flying Blue Angel aircraft and preferably prior to checking aboard the Blue Angels. The CFIT program shall include a series of lectures relating to G-tolerance, G-loc/A-loc, anatomic/physiological effects of G-forces, G-related spatial disorientation, nutrition and physical fitness. These lectures are conducted at NASL and are tailored to meet the needs of the Blue Angels by the Blue Angel Flight Surgeon.

a. The centrifuge profile consists of five rides as described.

(1) Resting G-tolerance (RT): The member is spun without a G-suit until there is 60 percent visual degradation. This determines the members RT.

(2) Member is spun to one G above his RT without a G-suit for 15 seconds. During this spin the member's anti-G straining maneuver is critiqued and refined, concentrating primarily on lower body technique.

(3) Member is spun to 1.5 G's above RT for ten seconds, rest for 20 seconds and then one G above RT for six seconds. This spin tests sustained G-tolerance and refines technique.

3 DEC 2008

(4) Member undergoes a series of peak G's in the following manner. (NOTE: This profile represents some of the solo maneuvers and diamond/delta rendezvous.):

5 G's for six seconds
Rest for ten seconds at 2 G's
7 G's for four seconds
Rest for 20 seconds at 2 G's
6 G's for six seconds

(5) Member is spun to 7 G's for five seconds, then 5.5 G's for ten seconds. (NOTE: This profile represents some of what the lead solo experiences during the minimum radius turn, and what the delta would experience during the Pitch-Up Break.)

b. As previously mentioned, all newly selected pilots will complete an additional two-day training period at NASL. The training will consist of lectures relating to G-tolerance, specifically focused on the AGSM and G-tolerance improvement, visual illusions and the high-G environment. Each day will be divided into a morning and afternoon session in the centrifuge. The profile consists of a series of rides as described below:

(1) RT: The member is spun without a G-suit until there is 60 percent visual degradation. This determines the members RT.

(2) Member is spun to one G above his RT without G-suit for 15 seconds. During this spin the member's anti-G straining maneuver is critiqued and refined, concentrating primarily on lower body technique.

(3) Member is spun to 1.5 G's above RT for ten seconds, rest for 20 seconds and then one G above RT for six seconds. This spin tests sustained G-tolerance and refines technique. (NOTE: For the afternoon sessions, this profile may be modified to be 2 G's above RT for the first ten seconds.)

c. Based on performance, the member may elect to repeat profile (3) with an additional G-load, or if remediation is necessary, the director of Aviation Survival Training Command (ASTC) may substitute a separate training profile.

d. A member must discontinue centrifuge training after two episodes of A-loc, G-loc, or a combination of the two. Based on the requirement and the limited training time available, the possibility for performing the higher G-profiles are reserved for the afternoon sessions. Additional remediation profiles may be conducted by the director of ASTC, but there shall be no more than five rides per session.

e. All results shall be documented by the Blue Angel Flight Surgeon. Members returning for their second and third year should be encouraged to improve upon their previous results. There is a twelve-hour downing period following the training and travel on Fat Albert is recommended.

6. Strength Training. Strength training plays a role in improving G-tolerance, but the most effective means of improving or maintaining G-tolerance is through frequent exposure to the high-G environment and a proper AGSM. It is still important that aviators maintain their own level of fitness through a personal strength program.

a. Based on recommendations from the Director ASTC at NASL, the greatest benefit obtained from a workout program for improving G-tolerance is through working the lower body. Specifically, a combination of squat-type exercises, leg curls, leg extensions and calf raises. These should be performed at least once per week. Also, because the number one musculoskeletal injury in jet aviators is neck strains, it is also important to include neck/trapezius exercises in a weekly program.

b. Aerobic training actually improves "staying power" by allowing rapid recovery from straining against G-forces. However, excessive training, such as needed for marathons, has been shown to produce abnormal heart rhythms in the centrifuge and is actually a detriment to G-tolerance. It is recommended that aerobic training be included in the program to allow for 20-30 minutes of moderate aerobic training three times per week and not to exceed five times per week.

c. Proper nutrition/hydration is the cornerstone of G-tolerance. The recommended daily caloric intake should be in the range of 2,300 to 2,800 calories. Keep in mind that all calories in any form (protein supplements, amino acids) get

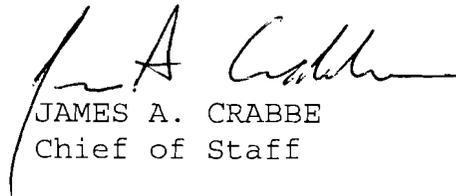
3 DEC 2008

converted to fat if not utilized. The Naval Operational Medicine Institute (NOMI) currently forbids the use of Creatine and other supplements by aviation personnel.

7. Responsibilities

a. The jet demonstration pilots, Narrator, and Flight Surgeon are required to follow the G-tolerance training program and a personal strength program.

b. The Flight Surgeon will brief G-tolerance to the new jet demonstration pilots and Events Coordinator. A comprehensive turnover on the subject will be conducted between flight surgeons. The Flight Surgeon will also provide guidance explaining various strength training programs to all new jet demonstration pilots and Narrator. The Commanding Officer will be kept abreast of the program through the Flight Surgeon.



JAMES A. CRABBE
Chief of Staff

Distribution:
Blue Angels