

# Executive Summary

## Aviator Physical Stress

The effect of physical stress on the tactical aviator and its impact on mission performance was examined. The physical stresses identified, all consequences of rapid-onset or sustained acceleration during flight, include G-induced Loss of Consciousness (G-LOC), Spatial Disorientation (SD), and neck injury.

Though SD as a predominate cause of controlled flight into the terrain has been known for many years, widespread reporting of G-LOC and cervical injury has only occurred during the past decade, coincident with the introduction of high performance, agile aircraft (F-15, 16, 18). The Naval Medical Research and Development Command (NMRDC) requested that the Naval Research Advisory Committee (NRAC) convene a panel to study these problems.

Emerging Tactical Aviation (TACAIR) technology will increase the adverse effects of Aviator Physical Stress (APS). The next generation of aircraft will be highly maneuverable and capable of sustaining high-G levels without severe energy tradeoffs. Additionally, the extra weight attributed to helmet-mounted video display systems, night vision aids and laser protective devices will increase the hazard of neck injury in flight.

The study begins with a discussion of the historical perspective, changing operational environment, and the impact of emerging technology on APS. A multi-faceted approach to reducing such stress requires modification of training, equipment, research, and organizational responsibility.

The Panel summarized its observations as follows:

1. High performance, agile tactical aircraft used in complex mission environments have exacerbated APS, including G-LOC, SD, and neck injury. These worsening problems require immediate attention if the Navy is to minimize costly consequences.
2. The Panel recommends that project area coordinators be identified for each type of physical stress. OP-05 and MED-02 should assure coordination between fleet requirements, equipment, and training on the one hand, and the medical research and development (R&D) labs on the other. We suggest that progress be reported to the Assistant Secretary of the Navy for Research, Development and Acquisition [ASN (RD&A)], at least annually.
3. The Naval Safety Center (NSC) has obtained insufficient data to effectively document the magnitude of the APS problem. This lack of data has impeded focused R&D, training modifications and equipment validation.

4. While some research has been directed towards understanding APS, there remain a number of areas of research which require additional focused resources and priority support.

5. New and/or modified equipment can be employed to inhibit G-LOC, cervical injury, and SD. These include positive pressure breathing (PPB) and extended coverage G-suits; advanced cockpit orientation awareness and automated ground-proximity systems; and lighter protective helmet systems.

6. Significant reduction of the consequences of APS will improve the effectiveness and safety of naval aviation.