Editorial

Enhancement of +Gz Tolerance

G-induced loss of consciousness (G-LOC) is an area of strong interest in aerospace medicine because of its continuing threat to the aircrew flying modern generation combat aircraft. The problem has been existing for many decades but it has assumed much more importance in the past decade due to increased incidence of G-LOC reported in USAF and US Navy in the aircrafts like F-16 and F-15. These aircrafts have comparable performance envelopes in terms of high and sustained +Gz loads to some of our own viz the Mirage 2000 and Mig-29. Loss of consciousness not only precludes effective aircrew performance and full use of the weapon system but has resulted in significant loss of expensive aircrafts and much more precious aircrew lives. The United States Air Force alone has lost 10 aircraft and almost as many aircrew between 1984-88 as a result of G-LOC. Besides this, several near mishap physiological incidents have been documented. These factors have motivated aeromedical scientists all over the world to re-initiate the research efforts aimed at preventing G-LOC in-flight.

Various methods like anti-G suit, high flow-rapid pressure anti-G valves, assisted positive pressure breathing and reclining seat, to enhance +Gz tolerance of fighter aircrew have been and are continuing to be developed. But anti-G straining manoeuvre (AGSM) still remains the most important method to enhance tolerance to +Gz. One of the important result of high-G research is the demonstration that subjects could be trained to tolerate high-G loads for prolonged periods (9 G upto 45 sec) in a centrifuge. This was possible due to the training given to the subjects on performance of an optimally effective anti-G straining manoeuvre (AGSM) under high G in a centrifuge. This led to initiation of high G centrifuge training which is being imparted to fighter aircrew in many countries all over the world. In the Indian Air Force, this training has been introduced recently and is being regularly conducted to minimise possible attrition of our aircraft and aircrew due to in-flight G-LOC.

Another major thrust of the aero-medical community has been the enhancement of +Gz tolerance of aircrew through physical training. Physical training, resulting in an increased capacity of the cardiovascular system and in an enhanced oxidative capacity of the exercising muscles, is an important mean of improving +Gz tolerance. Various studies have shown that anaerobic weight training enhances the ability of subjects to perform the AGSM more effectively, allowing them to withstand increased G forces longer during centrifuge testing. In addition, aerobic training was not demonstrated to increase +Gz tolerance. Consequently, anaerobic training is given higher priority than aerobic training in physical fitness programme for aviators. Besides, physical training must include neck conditioning programme to increase force generation capacity of neck muscles and to increase their time to onset of fatigue. This would significantly enhance the ability of the neck muscles to resist cervical sprain/injury during high, sustained +Gz.

Considering the importance of physical training and high-G centrifuge training in the prevention of G-LOC and related effects of high sustained +Gz, a symposium on "Physical conditioning and High-G training to increase

Aircrew +Gz tolerance" was held during 33rd Annual Meeting of the Indian Society of Aerospace Medicine on 18th Sep 91. The three papers presented in this symposium have been published in this issue of our Journal. One of these discusses, the basis and the type/programme of physical training required to be followed by the fighter aircrew. The recommended strength conditioning and endurance resistance training programme, both long version (12 weeks) and short version (5 weeks) along with the maintenance programme, has been dealt at length in this article. Other two papers are on the centrifuge training programme being followed in the Indian Air Force and the results of our limited experience so far in this field. Our experience has shown that the centrifuge training is beneficial and an adequately trained aircrew can withstand high, sustained G loads likely to be encountered in the modern combat aircraft. A case report on "Chronic Cervical Sprain due to +Gz Stress" is also reported in this issue in which a young aircrew lost his flying medical category due to inflight +Gz stress resulting in loss of trained manpower.