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## JUNE 1996

*Flying and hypercoagulation (Universiti di Cagliari and Italian Air Force):* “We were able to show increased thrombin and plasmin activity both in jet pilots compared to the control group, and after flight in the 6 pilots who were evaluated twice... We conclude that a hypercoagulable state due to flight activity is present in jet pilots after flight. Possible mechanisms involve an effect of psycho-physical stress mediated by a neuroendocrine response to flight activity, or an effect of chronic +G<sub>z</sub> exposure on cardiovascular structure and function...”

“[E]pidemiological studies should be designed to assess whether flight activity should be considered a risk factor for cardiovascular disease.”<sup>1</sup>

*Losing situational awareness (Texas Tech University, Lubbock, TX):* “Situation Awareness (SA)... errors were classified into one of three major categories: Level 1 (failure to correctly perceive the information), Level 2 (failure to comprehend the situation), or Level 3 (failure to project the situation into the future)... Of the errors identified, 76.3% were Level 1 SA errors, 20.3% were Level 2, and 3.4% were Level 3. Level 1 SA errors occurred when relevant data were not available, when data were hard to discriminate or detect, when a failure to monitor or observe data occurred, when presented information was misperceived, or when memory loss occurred. Level 2 SA errors involved a lack of or an incomplete mental model, the use of an incorrect mental model, over-reliance on default values, and miscellaneous other factors. Level 3 errors involved either an overprojection of current trends or miscellaneous other factors... [F]ailure to monitor or observe available information forming the largest single category. Many other causal factors [include]... vigilance, automation problems, and poor mental models.”<sup>4</sup>

## JUNE 1971

*Rudders with prosthetics (Walter Reed General Hospital, Washington, DC):* “Between September 1965 and May 1970 six Army aviators with below-knee amputations have been returned to flight status... The recommended guidelines are: Service need; type of lower extremity amputation and proper prosthetic fit; age of aviator; motivation and career potential; number of hours flown at time of amputation; total time in the military...”

“We plead that these are only guidelines and that experienced Orthopaedic surgeons, Flight surgeons and Personnel management people consider each case on its own merit.”<sup>6</sup>

*Sudden incapacitation in flight (Ohio State University, Columbus, OH):* “As expected, rates of career termination and death from natural causes increase with age. Coronary heart disease plays a major role in this finding. However, the age-specific incidence of coronary heart disease is significantly lower in the airline pilot population than in the U.S.

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male population... Between the ages of 25 and 34, the data suggest a higher incidence of death than in the overall white male population of the same age range... The primary factor in the high death rate among younger pilots is the airplane accident...

“The potential impact on flight safety of these events will depend in large measure on the phase of flight, command status of the affected pilot, and competency of the remaining crew...”

“Immediate recognition of the problem by the remaining pilot and competent, rapid control takeover are essential under these conditions. Airline transport crew training and cockpit design must therefore be compatible with this type of response to in-flight pilot failure.”<sup>5</sup>

## JUNE 1946

*Knock-it-off chamber flights (Aviation Cadet Center, San Antonio, TX):* “The symptoms which caused forced descents from 38,000 feet in the altitude chambers at the Altitude Training Unit, San Antonio Aviation Cadet Center, have been tabulated and analyzed for more than thirty-six thousand aircrew trainees over a period of one year from February, 1943, to February, 1944.

“The aircrew trainees were largely Preflight Aviation Cadets from eighteen to twenty-six years of age and were in excellent physical condition. Some trainees were advanced cadets, and some were experienced flyers...”

“Sudden dizziness, faintness, and collapse with no discernible pain occurred in 0.2 per cent of all trainees ascending to 38,000 feet for fifteen minutes in the low pressure chamber while using oxygen.”<sup>3</sup>

*Future of flight safety (Editorial comment):* “It is all very well to raise the physical standards for airline and commercial pilots; and of this we approve, but no matter how well selected they may be, what chance has one of them flying a jet-propelled plane from New York to Washington in less than 30 minutes, if a private pilot gets in his path—that pilot being one who is ‘negligent,’ ‘disregards orders,’ has ‘poor judgment,’ and ‘has a tendency to get excited too easily,’ or is in poor physical condition?”

“The answer is, of course, not entirely one of physical selection; but to permit individuals who have known physical handicaps or personality defects to handle aircraft, is at least one factor in keeping up the accident rate. Such procedure can hardly be claimed as furthering ‘air safety.’

“The Civil Aeronautics Administration still seems more interested in increasing the number of flyers than it does in protecting qualified pilots or the public.”<sup>2</sup>

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## JULY 1996

*Medicine of Biosphere (UCLA School of Medicine, Los Angeles, CA; University of Arizona Health Sciences Center, Tucson, AZ; Space Biospheres Ventures, Oracle, AZ; Paragon Development Corp., Tucson, AZ):* “Biosphere 2 is a 3.15-acre, 7-million ft. 3 enclosed ecological space near Tucson, AZ. It contains five wilderness and two domestic biomes (rain forest, savanna, desert, ocean, marsh; agricultural station, living quarters), an original introduction of 3,800 species (~20% extinctions have occurred), and a large basement ‘technosphere.’ Sealed inside Biosphere 2 in September 1991, four women and four men, including two of the authors, maintained themselves and the various systems for 2 yr, the longest-sustained ‘isolated confined environment’ period on record. MMPI psychological profile scores for Biosphere 2 crewmembers correlated closely with those reported for astronauts and shuttle applicants. Major medical problems encountered during the 2 yr included adaptation to a low-calorie (1800–2200 kcal·d<sup>-1</sup> per person) but otherwise nutritionally adequate diet, with substantial weight loss (18% for men, 10% for women), and a declining oxygen atmosphere (down to 14.2%).”<sup>3</sup>

## JULY 1971

*Regulations of aeromedical transport (FAA Civil Aeromedical Institute, Oklahoma City, OK, and Clearwater, FL):* “Fixed-wing secondary ambulance service is growing at a rapid rate without the benefit of studies such as those pertaining to helicopter primary ambulance service. Problems associated with this growth relate to equipment, crew training, and knowledge of the physiology of flight...”

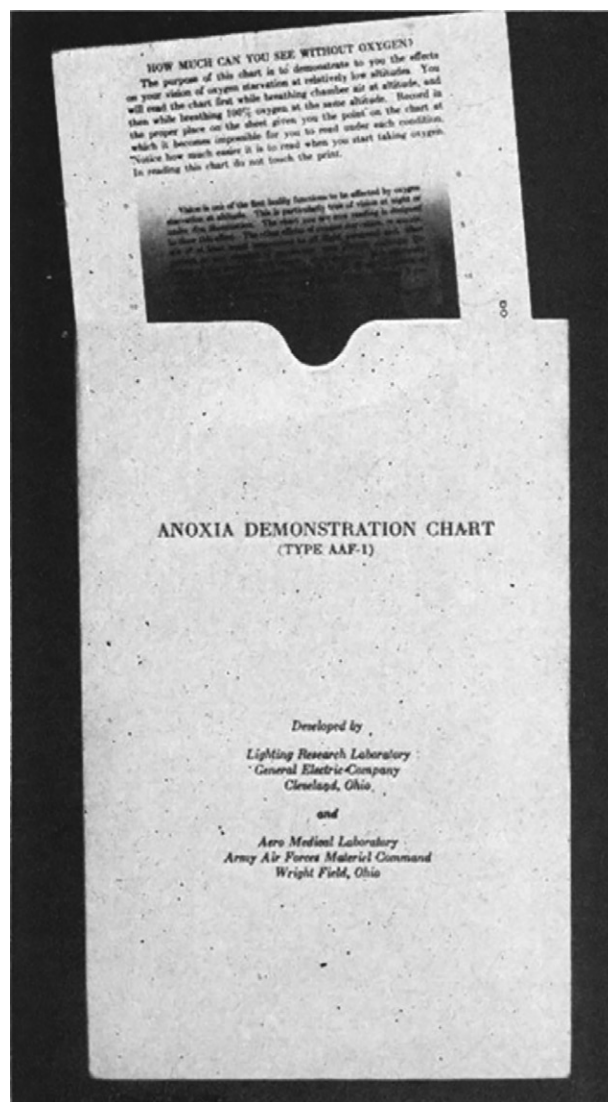
“Recent changes in Federal Aviation Regulations, Part 135, provide much higher operational standards for the air-taxi operation than previously existed. These changes affect any air-ambulance operator, but at present there are no regulations which mention the specialty of air-ambulance operation.

“Efforts are necessary... to bring the care of the patient being transported by air to the same level provided by surface transportation in those states and cities with regulations. The fact that a patient is being transported does not alter his patient status.”<sup>2</sup>

*Communication with ear plugs (Naval Aerospace Medical Research Laboratory, Pensacola, FL):* “Direct person-to-person speech communication is sometimes required in rotary-wing aircraft where high levels of noise make the use of hearing protective devices desirable... Intelligibility test data obtained in flight as well as in a simulated flight situation indicate that the use of earplugs in rotary-wing aircraft will improve the reception of direct person-to-person speech communication. Moreover, their use will afford protection against the deafening, fatigue, and annoyance effects of the hazardous noise present in rotary-wing aircraft.”<sup>4</sup>

## JULY 1946

*Easy hypoxia demo (Aero Medical Laboratory, Wright Field, Dayton, OH):* “Studies by various investigators have shown that certain visual functions, notably dark adaptation and contrast sensitivity,



**Fig. 1.** The Luckiesh-Moss-Army Air Forces Anoxia Demonstration Chart, Type AAF-1. This is merely an illustration. The original has a carefully prepared and much smoother contrast gradient.

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