MARCH 1997

DCS risk in space (KRUG Life Sciences Inc.; University Space Research Association; NASA-Johnson Space Center, Houston, TX): "Several previous studies indicated that exercise during prebreathe with 100% O_2 decreased the incidence of hypobaric decompression sickness (DCS). We report a meta-analysis of these investigations combined with a new study in our laboratory to develop a statistical model as a predictive tool for DCS… A dose-response probability tissue ratio (TR) model with 95% confidence limits was created for two groups, prebreathe with exercise (n = 113) and resting prebreathe (n = 113), using nonlinear regression analysis with maximum likelihood optimization… The model predicted that prebreathe exercise would reduce the residual N_2 in a 360-rain half-time compartment to a level analogous to that in a 180-rain compartment… The incidence of DCS for the exercise prebreathe group was significantly decreased (Chi-Square = 17.1, $p < 0.0001$) from the resting prebreathe group… The results suggested that exercise during prebreathe increases tissue perfusion and N_2 elimination approximately 2-fold and markedly lowers the risk of DCS. Based on the model, the prebreathe duration may be reduced from 240 min to a predicted 91 min for the protocol in our study, but this remains to be verified. The model provides a useful planning tool to develop and test appropriate prebreathe exercise protocols and to predict DCS risks for astronauts."[2]

MARCH 1972

Pacemakers and airport metal detectors (Federal Aviation Administration, Washington, DC): "The history of hijacking of aircraft reveals that as of 26 July 1971 there have been 118 separate hijackings, 106 of commercial air carriers. The serious threat to lives and property that results from such crimes has necessitated considerable attention, money, and man power being directed toward decreasing or eliminating the threat. The main goal is to prevent a hijacking from starting; thus methods must be found to prevent a hijacker from boarding an aircraft… The use of intelligence data, hijacker profiles, passive magnetometers, and physical search have been employed to prevent hijackers from boarding aircraft…

"An external electromagnetic field used in a weapon detector system (WD-4) may produce minor changes in the rate of certain pacemakers, specifically the sensitive unipolar atrial or the atrial or atrio-ventricular pacing systems. These changes were clinically insignificant to the patient and to the pacing system. Other systems, such as unipolar fixed rate, and unipolar and bipolar ventricular pacemakers, were totally unaffected. The weapons [WD-4] was determined to be safe for use in the public environment of an airport. Recommendation for its use was made to FAA Research & Development officials. The WD-4 may now be implemented as another method for detecting objects that could be used in the hijacking of aircraft."[1]

MARCH 1947

Oxygen warning device (University of California, Berkeley; Office of Scientific Research and Development, Washington, DC; Aero Medical Laboratory, U.S. Army Air Forces, Wright Field, OH): "The need for improved oxygen safety, devices and an adequate warning system became apparent to us in a series of test flights at high altitude in a heavy bomber. Soon reports appeared from theaters of operations where extended missions were flown at altitudes above 20,000 feet. In spite of the many improvements which were constantly made in oxygen-breathing equipment, in masks, demand regulators, indicating devices, et cetera, the hazards involved in demand oxygen breathing were not wholly removed. This was clearly demonstrated by the considerable accumulation of case histories and statistics on the incidence of anoxia in aircraft as early as 1943. In these reports, the case histories particularly indicated a very wide variety of causes for oxygen failure, ranging from inadequate preliminary training in oxygen breathing to destruction of oxygen systems by enemy gun fire…

"On the basis of this accumulated experience, it appeared that the most satisfactory means of reducing the accident rate resulting from oxygen failures would involve a central warning system which would immediately indicate an interruption in the functioning of any oxygen station, whatever the cause might be… Briefly, the kind of failures for which a warning system must respond would include: disconnection from the oxygen supply, destruction of tanks or lines, empty tanks, mechanical failure or malfunctioning of regulators, loss of or leaks in masks, obstructions in oxygen lines, freezing of valves or lines, and injury to crew members…

"An electronic warning system is described for use in aircraft equipped with oxygen demand or pressure breathing systems. The device functions on the respiration rate and is designed to indicate at a central warning panel any interruption in the respiration cycle greater than fifteen seconds for all oxygen stations.

"Operation of the system has proven satisfactory in both laboratory and flight tests."[3]

REFERENCES

1. Hood OC, Keshishian JM, Smith NPD, Podolak E, Hoffman AA, Baker NR. Anti-hijacking efforts and cardiac pacemakers – report of a clinical study. Aerosp Med. 1972; 43(3):314–322.
2. Loftin KC, Conkin J, Powell MR. Modeling the effects of exercise during 100% oxygen prebreathe on the risk of hypobaric decompression sickness. Aviat Space Environ Med. 1997; 68(3):199–204.
3. Tobias CA, Siri W. An electronic warning device for oxygen breathing systems. J Aviat Med. 1947; 18(2):133–138, 164.

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