MAY 1995

Astronaut graded exercise test (Space Biomedical Research Institute, NASA Johnson Space Center, Houston, TX; and Louisiana Tech University, Ruston, LA): "We developed and validated a graded exercise protocol suitable for operational use on space station. The new treadmill protocol has three level-grade stages (3-rain each) at 70, 80, and 90% of estimated VO_{2peak}. The protocol maintains the third stage speed while grade increases each minute to produce work rates equivalent to 100, 107, and 115% of the estimated VO_{2peak}. We compared the new protocol's peak and submaximal responses to those observed during a NASA graded exercise test. All mean protocol differences, including peak work rate (-1.8%), VO_{2peak} (-6.4%), HR_{peak} (-2.4%), and Vt_{peak} (-9.7%), were not significantly different from the expected measurement errors. We observed similar results for indices (the oxygen uptake at a HR of 150 and the HR's at 70, 80, and 90% of VO_{2peak}) of the submaximal HR-VO_2 relationship. The new protocol is an acceptable graded exercise test for periodic operational fitness tests…

"We conclude that the new protocol is an acceptable graded exercise test for periodic operational fitness tests. The new protocol produces equivalent physical loads and physiological measures are within, the expected measurement error of the NASA protocol. The concept of the new protocol should be examined with other exercise modalities (bicycle, rower, etc.)."[3]

MAY 1970

Medical observations in the Apollo Program (National Aeronautics and Space Administration Manned Spacecraft Center, Houston, TX): "The 3105 hours of exposing man to space flight during the Apollo program have added greatly to knowledge of man's response to space travel. The spacecraft cabin environment has been suitably maintained for the crew. The radiation environment has been benign, no solar flares occurring during the Apollo program missions. Crews have generally adapted well to weightlessness, and have learned to utilize it to their advantage. Improvements have been made in in-flight food, with the addition of moisturized packs and such items as sandwiches and dried fruit. The body weight losses, which have continued to occur during space missions, are not entirely due to body fluids loss. Work-sleep cycles have been improved somewhat by having all crew members sleep at the same time, and by having cycles more closely related to those during training period. Cardiovascular deconditioning has been identified postflight with both lower body negative pressure and 90° passive standing techniques. Microbiological studies have shown that organisms transfer between crewmembers. Moreover, the growth of opportunist organisms appears to be favored by these shifts. Extravehicular activities on the lunar surface during the Apollo 11 mission were conducted within expected energy costs, at an average of 1,200 BTU per hour. The liquid-cooled-garment-temperature method of energy cost estimation is the most suitable. It appears that lunar surface time can be expanded safely. The Apollo 11 quarantine was a demanding operation, conducted very successfully."[1]

MAY 1945

Applying military advances to the future of commercial aviation (Medical Department and Flight Engineering Section of Pennsylvania-Central Airlines Corporation, Washington, DC): "World conflicts such as the one in which we are presently engaged seldom bring any comforts to the human organism. The proper prosecution of the war has stimulated the necessity for advances in the field of aviation medicine and produced many techniques which can be used for the purposes of promoting human comfort in the postwar period of commercial aviation.

"In this report we have attempted to show how the programs of night vision, pressurized cabins, pilot fatigue and nutrition, low-pressure chamber indoctrination, mental pre-selection, and air evacuation studies can be applied to postwar commercial aviation.

"The work which the Office of Scientific Research and Development is doing in the study of specialized problems in military aviation medicine can be looked upon as a bulwark for the foundation of postwar comforts in commercial aviation. The coordinative work of the National Research Council and the Army and Navy service laboratories should continue to develop the principles already evolved which apply to commercial aviation. It is sincerely hoped that in the overall peace plans proposed at the close of the present conflict some provision will be made to continue the work of these service laboratories. Their future work should be stimulated by advances in commercial aviation, and, conversely, the progress of commercial aviation should be stimulated by the work of the service laboratories. It is sincerely hoped, too, that the services of men with outstanding scientific ability will continue to be drawn upon for consultation purposes to advise the service laboratories, and that the recommendations of such civilian consultants will be reported to and endorsed by the National Research Council."[2]

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