Up to the Task

OSU-CHS flight research now part of Oklahoma aviation history

The new Boeing 787 Dreamliner aircraft now in production have down-to-earth ties to Oklahoma State University Center for Health Sciences and more than 500 Tulsa area research volunteers.

Paul Rock, D.O., Ph.D., professor of medicine and director of the OSU-CHS Center for Aerospace and Hyperbaric Medicine, says those volunteers have helped to add a new chapter to Oklahoma's role in aviation history.

"This hardly group of 24 to 25 year-olds included OSU staff and students as well as community participants. Together, they may have helped bring about a change in aircraft design," Rock said. "The volunteers took part in research from October 2002 through April 2003 funded by the Boeing Company to determine the effect of barometric pressures on oxygen saturation and the occurrence of acute mountain sickness symptoms (headache, nausea, vomiting, anorexia, fatigue and sleep disturbance) and discomfort.

"My understanding is that the results of this study contributed to Boeing's decision to lower the cabin altitude in the new aircraft," Rock said. "Its maximum cabin altitude ceiling is the pressure equivalent of 6,000 feet altitude, 2,000 feet lower than the industrial standard of 8,000 feet.

"After a two-hour informed consent briefing and a medical evaluation, the volunteers took part in a 24-hour session that included a 20-hour simulated 'flight' at a barometric pressure (altitude) between sea level and 8,000 feet in the OSU center's altitude research chamber. The chamber was fitted out to be similar to a passenger cabin in a commercial airplane. Some younger participants were asked to perform mild walking exercise on a treadmill during 10-minute segments at nine different times during the 'flight' to simulate the extra physical work of flight attendants.

"The OSU study looked at effects of pressures equivalent to 6,000, 4,000, 6,000, 7,000 and 8,000 feet. According to the article by Rock and others about the study "Effect of Aircraft Cabin Altitude on Passenger Discomfort," published in the July 2007 issue of The New England Journal of Medicine, the level of hypoxemia (low blood oxygen) at 7,000 and 8,000 feet altitude-equivalent pressure was associated with a statistically significant increase in measures of physical discomfort after three to nine hours. Although between five and ten percent of volunteers experienced symptoms of acute mountain sickness above 650 feet, the result was not statistically significant.

"We did a later sleep study in our chamber with Boeing and sleep experts from Macquarie University in New Zealand to determine the effect of sleeping at the different cabin altitudes," Rock said. "Long flights require two flight crews on each flight, so that one crew can sleep and then trade off with the other crew in flying the aircraft. Again, Tulsa customers took part in the sleep study, all 'wired up' with EEGs (electroencephalograms to record brain activity) and EOGs (electrooculograms to record eye movement and stage of sleep,' he said.

"The study showed much lower blood oxygen levels for longer periods of time during sleep at 8,000 feet compared to ground level sleep. This study was another contribution by Tulsa citizens and OSU to Boeing's Dreamliner and was certainly appropriate for the Dreamliner name."

Rock said all of the volunteers deserve recognition for their contributions. "Through their generous efforts, scientific evidence was collected to justify the change in the design of the 787 to limit the cabin altitude pressure to the 6,000 foot equivalent pressure. Most industry experts expect this will become the new industry standard."

-Karin Schaefer

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