Aircraft Cabin Air Quality

By J.E. Cox, Ph.D., P.E., and Charles R. Miró
ASHRAE Director of Government Affairs *ASHRAE Associate Director of Government Affairs*

PHILADELPHIA--Aircraft cabin air quality, as a governmental issue, was a topic of considerable interest recently, both at a well-attended session during the Society's winter meeting and within a federal regulatory agency.

ASHRAE Winter Meeting

Martha A. Waters, Ph.D., an industrial hygienist with the National Institute for Occupational Safety and Health (NIOSH), reviewed five studies in various stages, all jointly administered with the Federal Aviation Administration (FAA). Federal researchers elicited the cooperation of the three to four airline companies that are participating in the studies. In addition, flight attendants' unions are reviewing protocols and being kept updated.

The objective of the studies is to assess the impact of aircraft cabin exposures and cosmic radiation dose on reproductive health, including the incidence of spontaneous abortion, low birth weight, and so on.

The overall scientific question that NIOSH and the FAA are addressing is whether or not work by female flight attendants has any effect on reproductive health. There are two specific hypotheses: whether circadian rhythms are disrupted, and whether exposure to cosmic radiation has an effect on reproductive health.

The first study is an epidemiology feasibility assessment, which was started in 1995 and is in the final stages of data review. The purpose is to collect background data in preparation for other studies and to determine the feasibility of certain practical issues.

The second is an exposure assessment study that started in 1995 and will be completed in 1998. The purpose is to characterize cabin exposures to a variety of agents, including cosmic radiation dose and cabin environmental quality parameters such as air quality, ventilation, temperature and humidity. A second purpose is to compare collected radiation data with the predicted data generated by a FAA computer model.

The third study is a human-factor assessment, which is being completed this year. The purpose is to look at ergonomic and behavioral data to support the larger epidemiologic studies. The fourth study, begun in 1996, is a reproductive assessment study of female flight attendants. Researchers will administer a questionnaire to 3,500 flight attendants and 3,500 teachers (a control group). Results are anticipated in three years.

Results from all studies will be provided to companies, unions and other interested parties, and will be published in scientific journals. Regarding exposure, the data will provide information to the ASHRAE committees that look at air quality, most especially the Aviation Subcommittee of TC 9.3.

The fifth and final project is an ovulatory function study that is in the planning phase. Biological samples will be collected from flight attendants every day, and then certain hormones will be analyzed to see if there is any change that could indicate an effect on reproductive health.

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NIOSH is part of the Centers for Disease Control and Prevention (CDC), and is the federal agency responsible for conducting research and making recommendations for the prevention of work-related illnesses and injuries. NIOSH is charged with identifying the causes of work-related diseases and injuries, and the potential hazards of new work technologies and practices. Further information about those studies can be obtained from Dr. Waters at NIOSH at 513-841-4458.

Federal Aviation Administration

Shortly before the Society's winter meeting in Philadelphia, the Federal Aviation Administration (FAA) finalized a regulation that revised standards for maximum allowable carbon dioxide (CO2) concentration in aircraft cabins (see the Federal Register, vol. 61, no. 232, pp. 63952-56). The new standards set the maximum allowable CO2 concentration at 0.5% by volume, sea-level equivalent (down from the previous level of 3 percent).

Over a decade ago, the U.S. Congress directed the Department of Transportation to commission the National Academy of Sciences (NAS) to conduct an independent study on the cabin air quality in airplanes. The NAS conducted the study and submitted recommendations in a 1986 report. The FAA's revised standards are the result of those recommendations.

The NAS report noted that the then-standard 3 percent maximum was much higher than the limits adopted by the air-conditioning industry for buildings and other types of interior environments.

For example, *ASHRAE Standard 62-1989* recommends an outside air ventilation rate of 15 cubic feet per minute (7.1 L/s) for vehicles. This equates to a CO2 limit of 1,000 parts per million (ppm), or 0.1 percent, if the occupants have a low level of physical activity. The FAA used the ASHRAE standard as a basis for its revised regulations, taking into account certain other factors and revising its rule accordingly. ■