EFFECTS OF NOCTURNAL AIRCRAFT NOISE ON SLEEP: ACOUSTICAL SETUP AND RESULTS OF DLR LABORATORY AND FIELD STUDIES

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OBJECTIVES The DLR-Institute of Aerospace Medicine investigated the influence of nocturnal aircraft noise on sleep, mood and performance in laboratory and field studies from 1999 until 2003. Both studies required challenging acoustical solutions. This is especially true for the field studies, which were conducted at the all-night open airport Cologne.

METHODS Calibrated class-one noise level meters were used to record aircraft noise events (ANE) indoors at residents living near airports. In the laboratory, each sleeping cabin was calibrated before between 4 and 128 ANEs with $L_{AS,max}$ between 45 and 80 dB were played back using an acoustic workstation. In the field, three class-one noise level meters were used to record ANEs indoors and outdoors simultaneously with electrophysiological signals (polysomnography, EKG, plethysmography, respiration).

RESULTS Considerable differences between laboratory and field conditions were observed: In the laboratory, up to 128 aircraft noise events were applied at regular intervals. Depending on the air traffic volume, the direction of starts and landings and the location of the investigated home, the aviation related occurrences of noise was between 0 and 80 events per night and clustered at particular time intervals during the night. The damping characteristic of the house depended on window position and varied between 11 and 30 dB(A).

DISCUSSION When investigating the effects of aircraft noise on sleep, it is necessary to provide event correlated data of acoustic signals and sleep disturbances. Then these data can be judged with respect to the acoustic situation inside and outside the bedroom.