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## An overview of spatial auditory displays

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Abstract Recent advances in technology have resulted in huge increases in the flow of information to human operators in complex operational environments. Most current interfaces present the information via visual displays, thus placing great demands on the visual information processing capacity of the operator. In an effort to lessen these demands, a great deal of research has been focused on the feasibility of interfaces that present information to other sensory systems. In particular, auditory displays have shown great promise, because the human auditory system is extremely effective as an early warning system, alerting operators to the presence of critical events, especially when they occur outside the visual field of view. However, auditory warnings and communication systems, as currently implemented in most existing operational systems, do not take advantage of the spatial auditory processing capabilities of humans. In other words, auditory displays do not fully exploit the ability of humans to determine the location of a sound source and monitor events at multiple locations simultaneously. Spatial audio (3-D audio) display technologies take advantage of the capabilities of the auditory system by recreating and presenting to an operator the spatial information that would naturally is available in a "real-world" listening environment. The 3-D audio displays are intuitive and impose few additional demands on the information processing capacity of the operator. Furthermore, research suggests that performance on many tasks is vastly improved with 3-D audio displays as compared to performance with standard single-channel audio systems. Thus, in many applied settings, 3-D audio displays have the potential to improve performance, enhance situation awareness, and reduce workload. The Air Force Research Laboratory has worked extensively on generating and testing spatial displays for complex operational environments. This talk will provide a brief overview of generating and applying such auditory displays. In addition, data from our laboratory will also be presented to highlight the utility of these displays to operators in complex environments.

**Keywords** Auditory system • Auditory displays • Human effectiveness

