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Presenter/author	Title	Abstract
Caretti, D. M. **Grove**, C. M. **Cohen**, K. S. *U.S. Army Edgewood Chemical & Biological Center* *5183 Blackhawk Rd.* *APG, MD 21010-5424* *USA*	**Respirator Design Tools for the Next Millennium**	The bulk of major system design decisions occur while the system is still in the conceptual stage of development. This is also the case when designing new military respirators. By utilizing established computer-based modeling and simulation tools, designers of major systems are able to gauge the impacts of these early decisions in a cost-effective manner. Unfortunately, when it comes to respirator design, computer-based modeling and simulation tools that could support early design decisions are essentially non-existent. This limitation requires respirators to be designed and fabricated from scratch to support product development, prototyping, field testing, re-design, manufacturing, and distribution. Obviously, the precision of these methods is less than adequate and the entire process is extremely expensive and time consuming. Therefore, efforts have been initiated to develop a computer-based expert design system that will guide respirator design into the next millennium. This system will integrate several design analysis tools to assess and optimize the effects of various component designs on the overall function of the system before concept models are produced. To that end, three individual respirator design tools are currently being developed for the expert design system. For future computer aided design (Cad) needs Pro-Engineer software is being set up to permit parametric modeling of respirator components and face pieces. A Respirator Encumbrance Model (REM) has been developed to assess and optimize the effects of respirator component designs on human performance of different physical tasks. Finally, modeling of the interface between the respirator seal and the human face is under way to assess and optimize facepiece and suspension designs without compromising respirator comfort or fit. Other design tools envisioned for the expert design system include modules that will assess interfaces with operational equipment such as sighting devices and determine airflow characteristics within a respirator's facepiece. In the end, the development and validation of the expert design system or any of its individual components will significantly improve the military respirator design process by supporting early design decisions through modeling and simulation based on the primary factors of respirator design.