

THE IMPACT OF GIVING WARFIGHTERS A VOICE IN EARLY TECHNOLOGY DEVELOPMENT

In-ear Wearable Device At Chemical And Biological Operational Analysis (cboa) Events

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Background: Land, Sea, Air, and Space defense forces need an integrated capability to accurately assess, predict, and improve warfighter health, fitness, and readiness and to optimize human performance. There is an increasing need to develop the operational capability to monitor warfighter's physical and psychological health to prevent performance deterioration, assess readiness, and identify and mitigate the impact of the intentional or accidental use of chemical and biological threats.

Defense Threat Reduction Agency's (DTRA) Medical Diagnostics Division (RD-CBA)/ Joint Science and Technology Office (JSTO) is investing in the development of a minimally invasive, lightweight, wearable sensor technology that can provide early indication of physical impairment because of a CB threat exposure. Government and academic partners are collaborating in the "CB10787 In-Ear Wearable Device (EWD) for predicting warfighter readiness" program to build and test a customizable EWD that can detect the onset of changes in a Warfighter's health state. The EWD will capture autonomic and bio-chemical (ABC) signatures such as heart rate, blood oxygen level (SpO2), and body temperature. Algorithms for physiological monitoring and adverse event sensing will be programmed onto the EWD and integrated with data storage and analysis to provide remote monitoring capability via ATAK compliant wireless data transmission.

Methods: Human Subject Research (HSR) activities are currently underway in government laboratories to test and evaluate EWD performance and to help develop the device for its intended use. To better understand warfighter needs, to optimize the applicability and utility of the technology, and to incorporate user feedback in the early phase of technology development, the developers participated in the Chemical and Biological Operational Analysis events (CBOA 2021 Concept Tent and CBOA 2022 Early User Assessment).

Objectives: The objectives of participation in CBOA were 1) to introduce the technology to users in the developmental phase and gauge the interest in the technology, 2) to collect feedback from the users on the user interface of the system and 3) to assess if the EWD preformed un-obstructive physiological sensing and data collection.

Results: The developers were able to successfully achieve their objectives. The EWD were custom made and fitted to each users, trainings were easily completed and fit-form-function feedback registered after the "real world- like" scenario. Specific suggestions from users included refinement of the EWD design for comfort, ease of use, and non-interfering with mission execution, communication, and situational awareness.

Conclusions: Feedbacks from users and reviewers along with data collected and observed software/hardware deficiencies have positively affected the development of EWD technology to augment operational endurance, assist warfighters and decision makers by furnishing a product to better-suited warfighter requirements at the point of need and that is capable of providing actionable health and readiness information.

The EWD is designed to be integrated with the Attenuating Custom Communications Earpiece System or ACCES, manufactured by Westone for US Air Force. The EWD allows for better correlation of physiological response to external stressors while decreasing effects from environmental interferences. The EWD offers defense forces pre-symptomatic warning capability to thwart warfighter deterioration, apply remedying actions, and enhance readiness.

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