

# Human systems integration of UAS into submarines

## PROGRAM DESCRIPTION

This project designed a concept of employment and associated user interface concepts. It also defined user roles and tasks for the use of unmanned aerial systems (UAS) from a submarine in support of over the horizon (OTH) missions. The project showcased a scientifically-principled human systems integration (HSI) approach to a complex, advanced development problem.

## OPERATIONAL GAP

Submarines are full-spectrum, integrated participants in complex littoral operations. Submarines need business processes, tools and displays to coordinate UAS handling with mission collaborators and to integrate UAS into the ship's own command and control to fully exploit UAS usage and products.

## VALUE TO THE WARFIGHTER

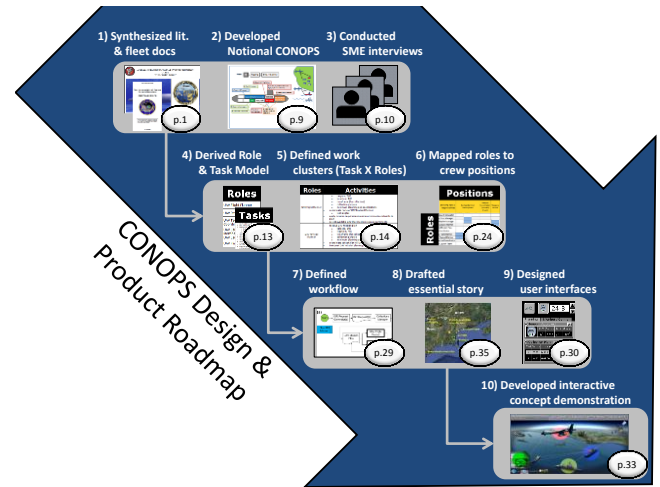
The systems engineering effort to integrate UAS into submarines is wasted unless it is woven into warfighters' task environments. Who does which UAS-related tasks, how, and with what tools and displays? PSE's coherent CONOPS for UAS-sub integration, that defined roles, tasks, workflow, and new user interface concepts, answers these questions to put warfighter needs first.

## APPROACH

With a task- and user-centered process, a domain, role and task model of a prescriptive employment concept for UAS-submarine operations was created. The latest applied cognitive science and human factors research was woven into new user interface design concepts, prototyped to provide the required UAS task support. Cognitive task analysis, and field observations and interviews at a Navy exercise where UAS were flown from submarines validated the CONOPS and concept prototype, which was then illustrated in an interactive movie format.

## IMPACT

The concept prototype is showcased in a testbay at the Naval Undersea Warfare Center, in Newport, RI (NUWC DIVNPT). The employment concept is guiding future Navy systems integration of UAS into submarine command and control systems. It both illustrates the potential future UAS capabilities and highlights the associated warfighter issues that must be addressed to achieve the future vision. Eighteen discrete user roles and 192 separate tasks were identified as necessary to conduct OTH missions with UAVs from submarines.



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