



CEROS Project Description

Project: *Combined Optical Acoustic Tracking System (COATS)*¹

Contractor: Lockheed Martin Orincon Defense, Kailua HI

Summary: The effectiveness of current periscope systems suffers due a limited field of view and challenges associated with own ship’s motion, weather, lighting, and atmospheric conditions. The greatest need for improvements in both legacy and new systems is in assisting operators to detect and track multiple targets under varying conditions. Littoral operations can require extended periods at periscope depth yet periscope systems have not been significantly upgraded to enhance their capabilities to meet the added demands. This contract demonstrated technologies for stabilizing the images, enhancing lowlight and obscured images, and created a single “stitched” 360 degree view that drastically improved the operator’s ability to maintain tactical control. Optical tracking techniques for automatic target detection and bearing measurement were to allow for automatic data fusion with other sensors.

Description: The overall goal of the COATS program was to identify operational needs and constraints of United States submarine periscope systems and identify technologies to meet those needs. To achieve this goal, development activities focused on synergy with the AN/BYG-1 combat system. However, AN/BYG-1 still treats the periscope as a stand-alone

sensor. Moreover, preliminary findings showed that no work was being performed to enhance the raw video signal emanating from the periscope. COATS provided the capability to enhance raw video from the periscope and to integrate it with other sensors. COATS allowed the operator to correlate visual contacts with all sensors and add tools to do visual classification and tracking. Figure 1 shows the COATS-AN/BYG-1 integration vision.

Effectiveness of current periscope systems suffer due a limited field of view and challenges associated with own ship’s motion, weather, lighting, and atmospheric conditions. The BYG-1 brings periscope data into a system where its information can be correlated manually with other sensors and the optical data can be viewed at operator’s consoles. COATS was intended to

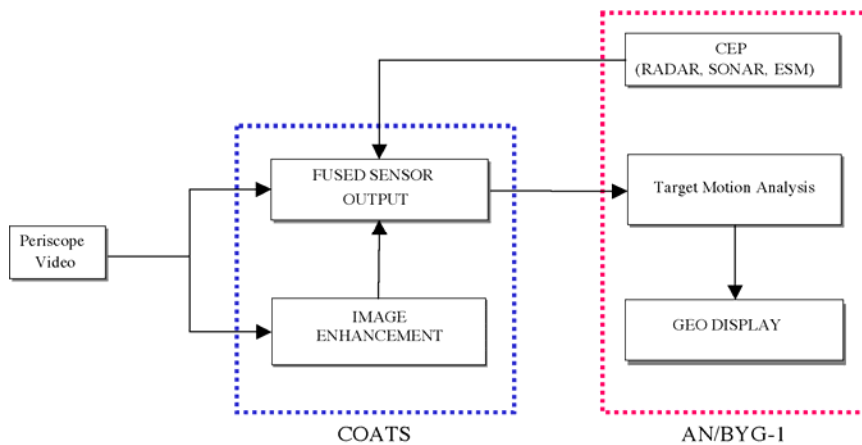


Figure 1. COATS AN/BYG-1 block diagram

¹ CEROS FY03 contract 50986, successfully completed in June 2004.

explore the coupling of current acoustic sensor processing with to-be-developed periscope image processing and automated visual tracking capabilities. This multi-modal (acoustic and visual) contact processing and tracking system was viewed as a relatively low-risk method to enhance littoral contact scene management and hence, detection avoidance and safety of ship.

The greatest need for improvements in both legacy and new systems is in assisting operators to detect and track multiple targets under varying conditions. To accomplish this meant first stabilizing the images to allow for further processing. Several methods were employed to enhance lowlight and obscured images as shown in Figure 2. The stabilized and enhanced images enabled the development of a single "stitched" 360 degree view (Figure 3) that drastically improved the operator's ability to maintain tactical control. Optical tracking techniques were developed which allowed for automatic target detection and bearing measurements and for automatic data fusion with other sensors.

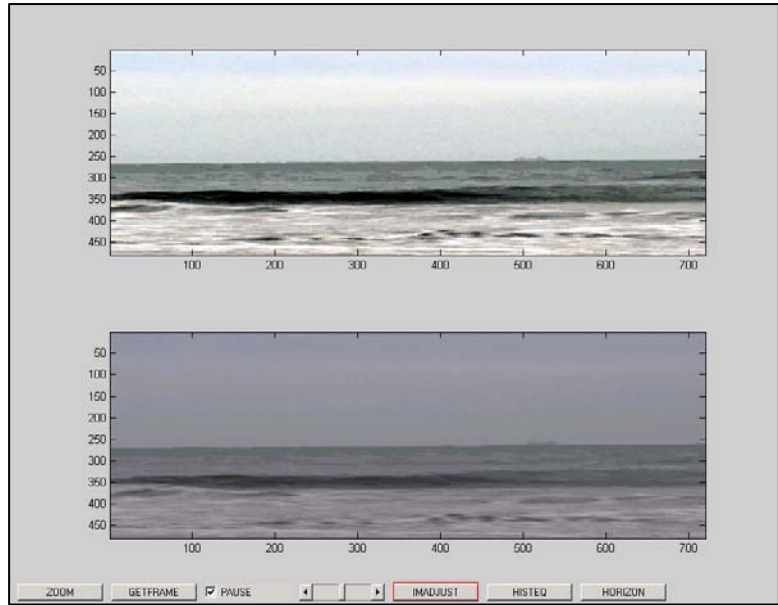


Figure 2. Scaling Enhancement



Figure 3. Stitched image (above) with contrast enhancement (below)

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