



MSIAC Success Story

Enhancing Global Positioning System (GPS) Integrity for the US Coast Guard

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Customer:	The United States Coast Guard (USCG) Command, Control, and Communications Engineering Center (C3CEN)
Challenge:	To keep our waterways safe, the United States Coast Guard (USCG) emplaces and maintains Federal Aids to Navigation (AtoN). The USCG relies on very accurate navigation enabled by GPS to position AtoNs correctly. In the continental United States, the Differential Global Positioning System (DGPS) provides the needed accuracy, but DGPS coverage is unavailable in remote areas such as parts of Alaska and the Pacific Rim. To ensure accuracy in these remote areas, the USCG needed to find a new system capable of operating in these remote regions and then guarantee its integrity.
Approach:	The USCG initially identified and deployed a dual frequency Commercial Off The Shelf (COTS) GPS as a potential solution. This COTS product incorporates Receiver Autonomous Integrity Monitoring (RAIM) to indicate correct functioning. However, the USCG needed extensive testing to ensure this device was capable of handling real operational conditions while meeting performance standards in both accuracy and integrity. Rather than commencing a very expensive and lengthy project that would require extensive use of availability-constrained ships, and that could only test in a limited set of situations, the USCG asked the MSIAC to develop tests relying on simulation. MSIAC Subject Matter Experts (SME) created a unique approach based on their depth of experience in both testing and simulation. Using a USCG-provided Radio Frequency simulator, the MSIAC replicated both static and dynamic conditions for the remote areas in question and then stimulated the COTS GPS to analyze its performance. The MSIAC determined that the GPS accuracy and integrity, even under the worst-case operational conditions, was sufficient for USCG positioning of AtoNs. The MSIAC also identified improvements in the receiver that will be corrected for increased operational effectiveness.
Value:	Based on simulation, the MSIAC provided a timely, effective, and cost-effective assessment supporting the USCG's decision to deploy their COTS GPS receiver. The simulation also identified important improvements to the technology. The scenarios and test methodology developed by the MSIAC set a precedent in performance tests for maritime GPS receivers and can now be reused by other governmental agencies for improving future effectiveness while reducing costs and schedule.