

Transition

An example of a U.S. Air Force supported Small Business Innovation Research (SBIR) or Small Business Technology Transfer (STTR) technology that has transitioned into an Air Force, other DoD agency, or commercial industry system or subsystem.

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AF112-153

Topic Title:

Position Navigation and Time (PNT) Autonomous Negotiator Applying Cognitive Effects-Based Analysis (PANACEA)

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SBIR Company Name &

Location:

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Figure 1: PANACEA is capable of testing multiple GPS receivers simultaneously, fully illuminating their capabilities and vulnerabilities autonomously 24 hours a day, seven days a week. (Courtesy photo)

Ohio Small Business Locates Innovative Solution for GPS Receiver Testing

It should come as no surprise that the Air Force, the Department of Defense, as well as other government and commercial entities rely heavily on the accuracy of the Global Positioning System (GPS). The DoD operates in diverse environments where GPS access can be jammed or degraded and U.S. military operations are increasingly carried out in areas where GPS is denied, unreliable or not accessible. The availability of GPS to the warfighter is a huge strategic advantage—and a potential vulnerability.

In order to defend GPS receivers from the effects of jamming or other malicious signals, receiver manufacturers must design safeguards within each receiver's hardware and software. To ensure that any newly developed approach for GPS receiver protection actually works as intended, receivers equipped with new protection schemes must be individually tested using a series of rigorous test scenarios.

Air Force Requirement

An ongoing challenge for DoD and commercial users is the inability to fully comprehend the impacts of interference sources (intentional or unintentional) on their PNT equipment. Meeting this challenge requires a predictive approach based upon quantitative and qualitative analysis. A new solution is needed that can perform autonomous analysis on PNT systems to evaluate thousands of interference types and their effects on PNT systems/networks.

SBIR Technology

PreTalen Ltd, an Ohio- based small business partnered with the Air Force Small Business Innovation Research (SBIR) program to develop PANACEA, a software tool that supports test and evaluation with an accurate, repeatable and shareable method of conducting automated Global Navigation Satellite System (GNSS) receiver analysis against an array of requirement and threat scenarios. The tool's ability to automate testing and analysis reduces errors and increases efficiency during GNSS testing.

What separates PANACEA from conventional laboratory test assembly is that PANACEA can automatically test more than 30 receivers at the same time, simultaneously controlling the GPS signal simulator and multiple interference sources, and logging the position and timing outputs from all of the receivers. The same test plan that would be run individually for each receiver sequentially can now be run for all of the receivers at the same time reducing labor and decreasing cost.

The PANACEA system controls and collects data from a GPS signal simulator and an array of dissimilar GPS receivers. A set of "motions" describing the simulated position of a GPS receiver is generated. The GPS signal simulator generates signals corresponding with these motions, then bundles motion scenarios together into a test plan. The test plan is executed and GPS receivers generate positioning messages which are stored for analysis (Figure 2).

A battlefield scenario may reveal that a new threat signal had been observed by our armed forces. This threat could impact our operations due to inaccurate GPS data. If the threat signal were recorded for analysis, that same signal could be injected into PANACEA to determine to what extent receivers in munitions were affected by the threat signal. Engineers could build new protections for munitions receivers, and PANACEA could be used to test a large array of modified receivers against the threat and verify that it had been mitigated.

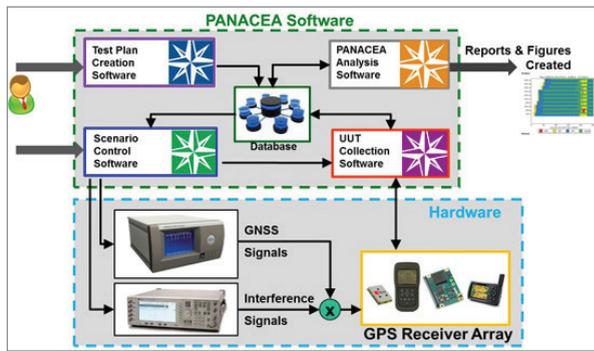


Figure 2: PANACEA uses an open architecture to employ the use of external controllers and simulators.

Transition Impact

Before PANACEA, testing of military GPS receivers required establishing a connection between the receiver and a GPS signal simulator, invoking logging software to record position outputs from the receiver, and using another software application to compare the logged results against the true positions generated by the simulator. Since each receiver had to be tested separately, the process was painstaking, labor intensive and prone to error.

PANACEA is the first closed-loop hardware GPS receiver test platform that can test independently manufactured receivers. PANACEA will simplify PNT system compliance and interference analysis and deliver significant cost savings for DoD and commercial sectors by reducing the operational risk of the PNT system.

The U.S. Army has adopted PANACEA as its principal test asset supporting the Army's PNT System of Systems Architecture (SoSA) testing of GPS receivers. "PANACEA has enabled our test engineers to conduct device characterization and performance testing across a vast number of simulated operational environments," said Kevin Coggins, program manager for PNT for the Army System of Systems Engineering and Integration (SOSEI) office. "PANACEA allows us to gather invaluable data that is being used to shape the Army's assured PNT program and the Army PNT SoSA.

Company Impact

"Developing PANACEA under this SBIR award puts PreTalen on the map," said Greg Gerten, PreTalen's chief technology officer. "We now have the opportunity to make significant contributions in the preservation of GPS signal integrity for both military and civilian users. GPS is an invaluable resource provided by the U.S. government, PANACEA likewise is an invaluable tool in uncovering the limitations of GPS receivers." PreTalen has recently stepped up production to meet increased demand. To learn more about this company, visit its website at <http://www.pretalen.com>.



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