

Transition

Topic Number:
AF121c-123

Topic Title:
Microwave Mapping
Transparency Sensor
System (MM-TSS)

Contract Number:
FA-8650-13-C-5014

SBIR Company Name:
Roswell, GA

Technical Project Office:
AFRL Materials
and Manufacturing
Directorate, Wright-
Patterson, AFB, OH

Published:
March 2015

An example of a U.S. Air Force supported Small Business Innovative 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.



Figure 1: Microwave Mapping Transparency Sensor System (MM-TSS) Development System, showing pair of innovative broadband RF spot probes on robotic arms. (Courtesy Photo)

Safety and cost savings are highly observable to Georgia small business

Aircraft transparency systems such as canopies incorporate conductive layers that provide electromagnetic interference shielding. These conductive layers require inspection during manufacturing and throughout the life of the aircraft to ensure proper electrical performance is achieved and maintained. Increased capability of inspection of the aircraft part before delivery will result in increased confidence, increased mission capability and reduced maintenance man-hours per flight hours.

- The Microwave Mapping Transparency Sensor System (MM-TSS), developed by Compass Technology Group, LLC, helps ensure mission-effectiveness, survivability and the safety of our U.S. and ally airmen.
- The MM-TSS inspects and provides full-canopy quality assurance (QA) in the F-35 aircraft production, reducing labor costs and helping keep the F-35 program on schedule.
- By detecting defects early in the manufacturing process, the MM-TSS will save the taxpayer millions of dollars in avoided costly canopy replacements, mission down-time, and maintenance man-hours.

Air Force Requirement

Currently a field inspection capability to assess transparency performance and accurately characterize defects, damages, and repairs does not exist. This results in unknown transparency performance and increases removal and replacement rate, increasing program cost and maintenance. Aircraft transparency systems (canopies, windows, etc.) incorporate shielding layers that require inspection during manufacturing and throughout the life of the aircraft to ensure proper electrical performance is achieved and maintained. Current manufacturing inspections are conducted manually, are labor intensive, and do not cover 100% of the transparency surface.

SBIR Technology

Compass Technology Group (CTG), a Georgia based small business has successfully developed a potentially game-changing technology. Working under an Air Force Small Business Innovation Research (SBIR) award, CTG developed and demonstrated a new concept in microwave nondestructive evaluation (NDE) for transparent conductive canopy coating testing.

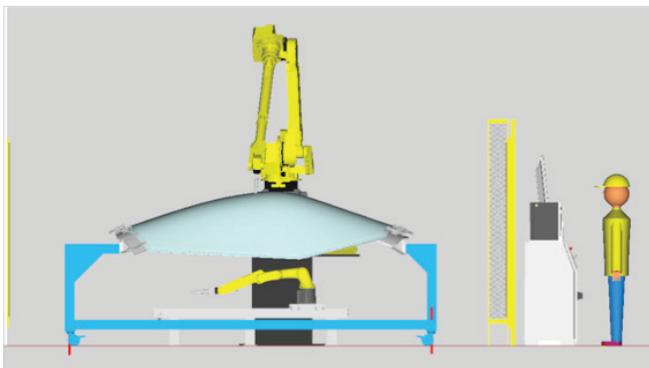


Figure 2: Rendering of installed MM-TSS at canopy manufacturing facility, showing canopy on cart, two robotic arms each with innovative, broadband RF spot probes, and operator in front of electrical cabinet and HMI. MM-TSS provides full canopy scanning at a significant labor reduction and measurement accuracy improvement.

The Microwave Mapping Transparency Sensor System (MM-TSS) is a manufacturing facility based QA tool for ascertaining and verifying that the electrical characteristics of a production canopy meet government specifications. This system specifically addresses the need for high-fidelity

measurements of defects and manufacturing variations in aircraft windows in both factory and in-service environments. The system consists of a pair of innovative, broadband RF spot probes installed on the ends of two robotic arms along with advanced RF processing and human-machine interface (HMI) software and tools.

Transition Impact

The MM-TSS consists of a unique wide-band microwave probe technology combined with robotic automation that significantly improves measurement accuracy over the current baseline approach where single frequency band horn antennas are manually operated. More importantly, it achieves a full mapping of the canopy RF performance while simultaneously reducing the labor costs associated with RF quality assurance measurement by a factor of three. The MM-TSS is scheduled for delivery to the aircraft canopy manufacturing facility in December 2014 and will undergo extensive testing. It is anticipated that successful test results will drive system buy-in and ultimately drive a specification change by replacing the current baseline approach with the MM-TSS.

CTG is also extending the MM-TSS technology with additional RF analysis tools and an enhanced HMI to provide extended performance data. Data archiving is also being developed with the system to track a canopy's performance over its whole life cycle, which will then inform and support new canopy coating development as well as maintenance actions. Additionally, the MM-TSS will support the anticipated strip / recoat mission to reduce maintenance costs of the canopies thereby reducing long-term maintenance costs of the aircraft. A portable field-variant is also under development for use in the flight-line environment.

Company Impact

Based on the successful demonstrations to date, a quote has been requested for a second system to be installed at another canopy manufacturing facility. Furthermore, there has already been significant interest by various aircraft integrators and component manufacturers in the robotically automated RF probe technology. Additional demonstrations are now in the planning stages for applying the MM-TSS to other specialty aircraft components and materials.

Because of its accelerated development, this SBIR project has resulted in the recent addition of three full-time employees to this small, woman-owned-business. In addition to the delivery and anticipated sale of a second system of the MM-TSS, CTG has received several purchase orders and contracts for innovative sensor and measurement equipment totaling to date revenue over \$370,000.



U.S. AIR FORCE

SBIR/STTR

Air Force SBIR Program
AFRL/SB
1864 4th Street
Wright-Patterson AFB OH 45433

Air Force SBIR/STTR Program Manager: David Sikora
Website: www.afsbirsttr.com
Comm: (800) 222-0336
Fax: (937) 255-2219
e-mail: info@afsbirsttr.com