Department of the Navy SBIR/STTR Transition Program

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Topic # N101-034

Affordable Broadband Radome

Rock West Composites, Inc.

WHO

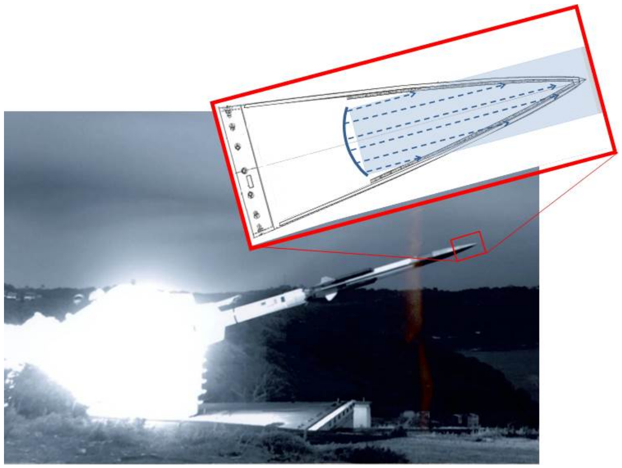
SYSCOM: NAVAIR

Sponsoring Program: PMA-208 Aerial Targets

Transition Target: GQM-163A

TPOC:
(805)620-8099

Other transition opportunities:
This radome technology can benefit any high speed missile or target that has a nose radome and requires broader bandwidth, and/or an increase of its usable scan volume. This technology could also be applied to fixed wing aircraft, UAVs, and ground or sea systems. This technology could provide the GQM-163 target with a highly survivable radome for High Diver and aggressive flight profile missions and improve radome transmission and AOI performance. The path could lead to broader X, Ku, and Ka-band frequency performance.



Courtesy of US Navy
http://www.navair.navy.mil/index.cfm?fuseaction=home.NAVAIRNewsStory&id=4970

WHAT

Operational Need and Improvement: High-speed missiles often require nose radomes that protect antennas for radars that need to communicate across a wide range of radio frequencies (RF). Typical ceramic radomes allow for high RF transmission only over narrow frequency bands. Further, radar cannot transmit effectively straight ahead (through its tip) due to the narrow cone angle for missile noses. At near-grazing angles of incidence (AOI); transmission efficiency drops dramatically and bandwidth is narrowed.

Specifications Required: High temperature radome with less than 2 decibel (dB) transmission loss over most of Ku-band; good performance at X band; very good transmission near-grazing AOI; fly at Mach 2.5 to 3 flight at low altitude and Mach 3.5 to 5 flight at med-high altitude; affordable; retro-fitable.

Technology Developed: Our innovation is a high temperature, non-structural, RF "tuning liner" that nests with the structural ceramic radome shell, but does not need to be adhered to the monolithic radome. This layer reduces RF transmission losses to less than 2 dB over angles of transmission of 0° (straight ahead) to 70°. This design also allows for looser tolerances on the thickness profile of the structural monolithic radomes and/or can be built as a retrofit to existing ceramic radomes.

Warfighter Value: Missiles and targets with radomes that can transmit over broader bandwidths and high AOI enable them to track and transmit straight ahead along their flight trajectory at longer ranges, or emit at broader or steeper angles. For targets this improves capabilities to emit at frequencies that better represent threat systems in X, Ku-, & Ka-bands, and permits aggressive high supersonic flight profiles.

WHEN

Contract Number: N68335-16-C-0162 **Ending on:** August 31, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
RF Transmission Test w/ Flight antenna	Med	Achieve RF transmission reqmts	TRL 5	September 2016
Final mechanical tests	Low	Survive shock and vibration tests	TRL 5	October 2016
Aerothermal Heating test @ Mach #	Low	Survive time at speed and temperature	TRL 6	February 2017
First Flight	Med	Meet flight safety & dimensional rqmts	TRL 6	November 2017

HOW

Projected Business Model: Rock West Composites will develop and manufacture the tuned dielectric layers and integrate them to the structural outer shell. We can contract with either the radome manufacturer for new radomes or directly to the government for retrofit applications. This fits in well with our current manufacturing capacity and RF testing capability even for modest rate production programs.

Company Objectives: Develop ceramic (and other) radomes with broader frequency ranges and/or able to transmit at higher angles of incidence. Enable looser tolerances on ceramic (monolithic) radomes shells. Our technology can tune "as-built" ceramic radomes to meet their transmission objectives by modifying the thickness of our tuning layer and/or its dielectric constant to bring the radome into compliance.

Potential Commercial Applications: Higher data rate antenna systems, such as those used for high definition video and/or in-flight entertainment systems, use more bandwidth and often need to transmit at higher frequencies. Conventional sandwich radomes can benefit from adding a tuning layer as well - especially if their geometry requires the RF energy to intersect the radome at glancing angles of incidence particularly when connecting to satellites near the horizon. This radome technology can benefit civil space hardware which often also includes antennas and radomes that must endure high temperature/ high Mach number flight.

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