



MANUFACTURING TECHNOLOGY SUCCESS STORY

RF MetaFerrite Devices

PROBLEM / OBJECTIVE

Evolving Army systems, including communications, radar and electronic warfare, require ultra-thin wideband antennas to mitigate the physical projection the antenna makes from the platform. Many antennas are inherently narrowband because of impedance matching problems. This problem has plagued antenna design engineers for decades. A solution to this problem requires development of materials that are low-loss and have high permeabilities.

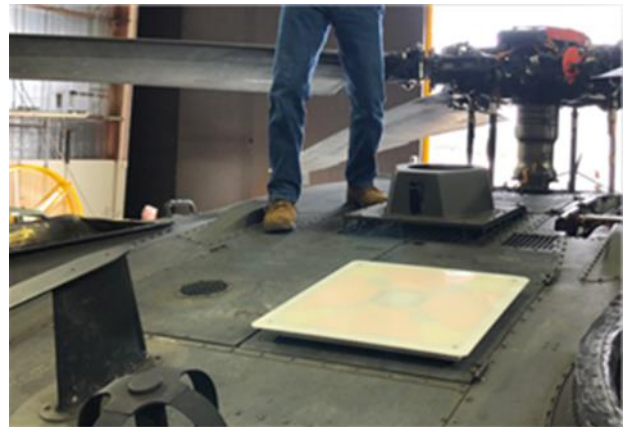
The objective of this ManTech project was to mature a manufacturing process to develop anisotropic materials with prescribed constitutive parameters. The materials will be used to manufacture wideband (2:1 bandwidth minimum) radio-frequency devices such as ultra-thin antennas. Current ultra-thin antennas cannot achieve this bandwidth without sacrificing efficiency.

ACCOMPLISHMENTS / PAYOFF

This project resulted in substantial process improvements for manufacturing high-performance MetaFerrite materials. Additionally, prototype radio-frequency antennas were manufactured for testing on rotary-wing aircraft and ground vehicles. The accomplishments include:

- Transitioned Metaferrite material manufacturing from a foreign source to a domestic supplier
- Produced material with 50 percent improved performance using 50 percent less material
- Produced 1" thick MetaFerrite antenna that covers both legacy TACSAT and MUOS bands
- Manufactured more than 500 antennas per year with current capability; upgradeable to more than 1000 per year
- Developed capability to regenerate poor performing material with magnetic realignment to improve production rates, reduce handling and inspections resulting in reduced cost

- Developed micro-inductor method of material characterization reducing material analysis
- Integrated MetaFerrite antenna technology with rotary wing and ground vehicle platforms.



Engineers prepare a MetaFerrite antenna prototype for integration and testing with a Black Hawk helicopter. (Photo credit: U.S. Army)

This ManTech project supports the Army's Network/C3I modernization priority. The project also informs the Future Vertical Lift and Next Generation Combat Vehicle modernization priorities by providing low-profile antennas for satellite-on-the-move communications, foliage penetration radars and numerous other communication applications. The low-profile of the antenna aperture eliminates drag for rotary-wing and other aircraft, and the reduced visible signature is important for advanced ground vehicles.

PARTICIPANTS

This project was executed by the U.S. Army Combat Capabilities Development Command – Army Research Laboratory in collaboration with industry partners.

CCDC Army Research Laboratory, Adelphi, Maryland

- Lockheed Martin, Baltimore, Maryland