Optimization of a CONUS Source of DNPD

PERIOD OF PERFORMANCE:
December FY2022 to December FY2024

PLATFORM:
AIM-120 Advanced Medium-Range Air-to-Air Missile (AMRAAM)

CENTER OF EXCELLENCE:
Energetics Manufacturing Technology Center (EMTC)

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STAKEHOLDER:
NAVAIR Air-to-Air Missiles Program (PMA-259)

A3002 — DNPD Optimized Scale-Up

Objective

Many Navy missile programs are encountering material obsolescence issues due to lack of a primary or secondary continental United States (CONUS) manufacturing source. A secondary CONUS source for critical materials becomes especially important during times of world conflict to ensure that these impacted programs experience no interruptions to their preparedness to defend the nation. N, N'-(di-2-naphthyl)-para-phenylenediamine (DNPD) is an antioxidant in the MG-844 propellant formulation used in the AIM-120 Advanced Medium-Range Air-to-Air Missile (AMRAAM) program. DNPD is one critical propellant component encountering obsolescence issues due to lack of a CONUS manufacturing source, and the current stockpile maintained by the AMRAAM program can only support two-to-three years of production at anticipated rates.

The objective of this Energetics Manufacturing Technology Center (EMTC) project is to optimize the DNPD manufacturing process at Naval Surface Warfare Center Indian Head Division (NSWC IHD). This will validate that NSWC IHD can produce DPND that meets customer material specification HS 6-0089A and can serve as a CONUS source of DNPD. Previous projects have developed and optimized a process for the synthesis and purification of DNPD that meets the required specifications; this project takes that knowledge and seeks to implement and optimize this process at a scale large enough to fulfill the AMRAAM program's estimated demand. Successful development and optimization of this capability would establish NSWC IHD as a qualified source for this critical propellant component.

Payoff

Successful completion of this project will establish a reliable CONUS source of DNPD product to support the Navy's AIM-120 AMRAAM program. DNPD is also a candidate for qualification in other propellant formulations and could be beneficial to other programs in the future.

Implementation

This project is a follow-on to A2720 — Development of a DNPD Manufacturing Process. The process that was developed during the previous effort will be scaled to a 50-gallon reactor in order to make quantities sufficient to meet the estimated demand. Some minor process design changes were made when scaling to the 50-gallon reactor, but none significant enough to change the predicted product quality.

The details of the optimized process will be outlined in an internal NSWC IHD technical report once three 50-gallon batches of DNPD that pass specification have been manufactured successfully.