# Department of the Navy SBIR/STTR Transition Program

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Topic # N12A-T004

Comprehensive Bonded Joint Analysis Method

M4 Engineering, Inc.

## WHO

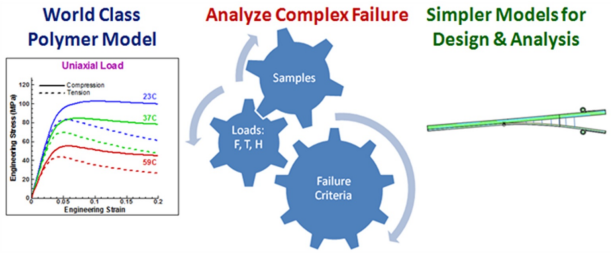
**SYSCOM:** NAVAIR

**Sponsoring Program:** PMA-208 Navy Aerial Targets & Decoys

**Transition Target:**

**TPOC:**
(760) 939-3638

**Other transition opportunities:** Air Force. Commercial primes including Boeing, Lockheed Martin, Raytheon, Orbital ATK. Electronics manufacturers.




## WHAT

**Operational Need and Improvement:** Because of weight/cost benefits, bonded joints are becoming much more common in fielded and proposed systems. Streamlined approaches for introducing new/better adhesives and bonded joint designs for optimal reliability in operational environments will provide programmatic time and budget advantages.

**Specifications Required:**

**Technology Developed:** An analysis software tool that combines advanced surrogate models for bonded joint response which is based upon a world-class polymer model originally developed by Sandia National Laboratories.[1] This tool interfaces directly with industry standard analysis tools and can be adopted quickly.

**Warfighter Value:** Faster introduction of new material systems through reduced testing and better analysis. Higher confidence in operational reliability and robustness will account for the complete range of mechanical loads and directly incorporate operational environments (temperature, moisture and their histories) in the structural analysis.

*[1]Sandia National Laboratories is a multi-program laboratory operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin company, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.*

## WHEN

**Contract Number:** N68335-14-C-0100 **Ending on:** April 29, 2016

| Milestone | Risk Level | Measure of Success | Ending TRL | Date |
|---|---|---|---|---|
| Surrogate Bond Modeling Demo | N/A | Predicts bond response for representative mechanical & environmental loads | 3 | January 2014 |
| Prototype Software Tool | Med | Analysis deck driven software tool that captures bond response over a wide range of mechanical & environmental loads | 4 | April 2016 |
| NAVAIR Evaluation of Prototype | Med | Application in relevant scenario by Navy | 5 | |
| Integrated GUI | Med | Commercial customers can rapidly apply technology | 5 | |

## HOW

**Projected Business Model:** M4 Engineering will commercialize the software tool via licensing. Both term-limited and non-expiring options will be offered. Direct sales to the government and its primes will be sought, as appropriate.

**Company Objectives:** During the Forum for SBIR/STTR Transition, M4 Engineering will develop additional customer interest outside of PMA-208. Throughout the remainder of Phase II, M4 will pursue additional government resources for further technology development. M4 will lay the foundation for a comprehensive bond modeling tool well suited for design and analysis activities, especially following integration with M4's optimization and uncertainty quantification framework. Additionally, M4 will continue to expand its commercial analysis business in the US aerospace industry.

**Potential Commercial Applications:** The advanced bond modeling tool will enable commercial aerospace firms to develop and incorporate improved bonded joint designs, new and refined adhesive materials, and bonded patch repairs more rapidly.

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