Modeling & Simulation

TriVector's M&S experts are widely known for their diverse M&S capabilities and *experience*; and for developing innovative M&S solutions to our customers' critical requirements. At TriVector, we provide our customers with superior M&S *performance* and exceptional *value*!

Our People

- *99% Employee Satisfaction*
- *95% Employee Retention*
- *57% Advanced Degrees*
- *32% Subject Matter Experts*

Our Customers

- *U.S Army: AMRDEC (ED, S3I)*
- *MDA: Ground Based Mid-Course Defense*
- *NASA: MSFC (SLS)*
- *Commercial Industry*

Modeling & Simulation Processes & Procedures

- *Model Based Systems Engineering*
- *Vehicle Architecture Concept Model Development*
- *Command and Data Handling/Software Timing*
- *Software Verification, Validation & Accreditation*
- *Building Damper Modeling*

Our Modeling & Simulation Tools

- *MATLAB – SIMULINK, MAVERIC, SPENVIS*
- *MDSIM, Piranha, STRIDE*
- *IBM Rhapsody, Magic Draw, JAVA, Others*

Exploring and Validating System Solutions… Delivering System Confidence

NASA Human Landing System (HLS) Model-Based System Engineering

The Human Landing System (HLS) is the final mode of transportation that will take astronauts to the lunar surface in the Artemis lunar exploration program and serve as living quarters for crew for up to a week at a time during transit. TriVector is responsible for the development and maintenance of the system architecture model needed to conduct requirements development and validation, system analysis, and functional design assessment and validation. In addition, we are assisting in the larger Model Based Systems Engineering (MBSE) efforts by ensuring that the modeling tools (such as MagicDraw/Cameo and Doors Next Generation) are set up and used in a way to facilitate the integration of date between models.

U.S. Army AMRDEC STRIDE Tool Development

For the AMRDEC's rapid prototyping missile simulation model development, TriVector's engineers created and implemented a set of algorithms to predict solid rocket motor thrust profiles based on motor case properties and propellant grain geometry. Additionally, our algorithms predicted mass properties of the solid rocket throughout the flight profile, enabling more accurate trajectory analysis and simulation. TriVector directly leveraged experience gained from work we performed for the Stratolaunch launch vehicle development effort to provide this tool set. As a result, the AMRDEC STRIDE simulation model was successfully tested against commercially available data regarding medium and large-sized solid rocket thrust profiles.

NASA Space Launch System (SLS) Control System and Flight Analysis

TriVector supports the NASA Guidance, Navigation, and Controls organization in analyzing the unique SLS control system. Our experts verify the flex models, select the models' appropriate modal content, and analyze time and frequency domain data from multiple sources. Our analysis results are input directly into NASA's high fidelity, 6-DOF, flight control simulation software, MAVERIC, to evaluate performance. TriVector also derived a model to fully visualize the bending modes of rocket-type vehicle bodies during flight. NASA uses this visualization program to better understand and demonstrate the SLS flex behavior. TriVector's analyses continue to advance SLS program success.

Ground Based Mid-Course Defense Piranha M&S Validation

GMD's Piranha software suite is a medium fidelity tool for simulating and analyzing the entire midcourse timeline. Piranha's models and algorithms are real world system approximations and require validation. TriVector's task is to validate Piranha against GMDSIM, a hi-fidelity simulation previously validated against flight testing. We gathered GMDSIM performance parameters and acceptance criteria from its validation documentation and mapped these to their Piranha counterparts. We created a JAVA-based validation package, within Piranha, to perform the collection, analysis, and validation of Piranha parameters and algorithms. TriVector's validation package will provide confidence in Piranha's simulation and analysis results.

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