

Announcing the Release of PRODAS Version 3.6

As times change, so do the tools we use to do our work. As Arrow Tech gets deeper and deeper into the world of guided projectiles, one tool keeps coming up again and again. MATLAB/Simulink is the tool of choice for system simulation of guided projectile systems.

I am very pleased to announce the new module that blends the depth and ease of use of PRODAS with the flexibility of MATLAB/Simulink. Use PRODAS to build your model and predict aerodynamics. Then launch the MATLAB/Simulink Trajectory module to build a Simulink project with your guidance algorithms. Run the simulation and use PRODAS to display cross plots or even watch the projectile fly in the 3D Visualizer.

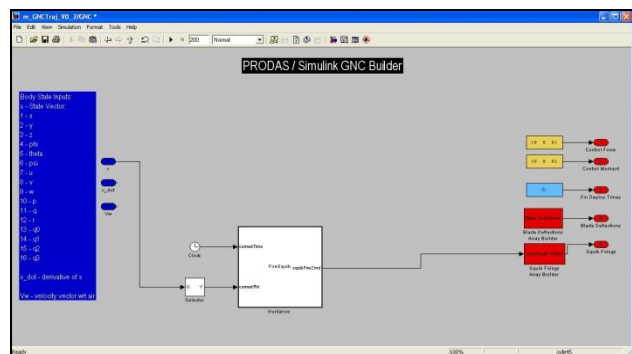
This model then becomes the basis for your hardware in the loop (HIL) system and even for the embedded processor that flies in the projectile. Guided system simulation has never been easier. Call for your evaluation today.

Mark Steinhoff
VP Software Products
Arrow Tech Associates

MATLAB/Simulink Trajectory Module



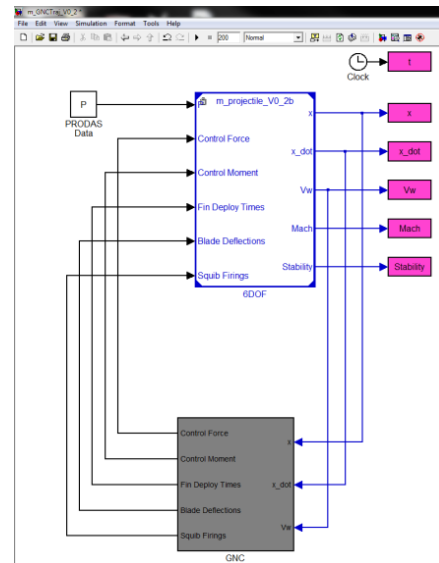
PRODAS is known for its seamless integration of analysis and simulation software tools from various disciplines in a graphical environment with a simple user interface. Now PRODAS has taken a dramatic leap forward by integrating with MATLAB® and Simulink®. The MATLAB® world is massive with general purpose programming and scientific computation and toolbox and blockset extensions for specific applications. With the integration of this powerful capability into PRODAS, a new paradigm of rapid and reliable system simulation for smart munitions is made possible.



MATLAB/Simulink Trajectory Module features

• Modeling in Simulink®

- *PRODAS Blockset* – Leverage the highly validated PRODAS 6+DOF trajectory block as the starting point for your simulation. Use lower-level blocks to build your own trajectory module such as aerodynamics, mass properties, rocket motor, squibs, and more. Customize any PRODAS block to meet your specific modeling needs.



- *100% Compatibility with All Simulink® Blocksets* – Use any of your licensed Math Works products to build your simulation. The integration with PRODAS does not place any restrictions on what you can do with MATLAB® and Simulink®.

- *Design Your Guidance, Navigation, and Control (GNC) System* – Use the PRODAS blockset, the Aerospace blockset, and your own custom blocks to design the GNC system. The default template provides an empty GNC subsystem with all the connections to the 6+DOF to enable close-loop control.

• System Simulation

- *Add Subsystem Models* – Drop-in subsystems modeled in Simulink® such as sensors, actuators, or physical devices.

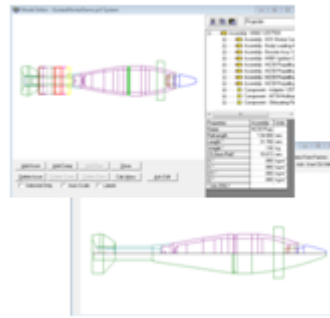
- *Trade Studies* – From the PRODAS GUI, setup and perform trade studies on any existing state variable or parameter or define your own. Use nominal values, ranges, or tables. Vary multiple states and parameters at once. The run matrix is created and executed automatically, and the results are collected for you.



- *Monte Carlo Analysis* – Add random errors to any existing state variable or parameter or define your own. Perform Monte Carlo runs to determine dispersion and guided performance. Define error tables and number of runs. Compute statistics and investigate outliers.

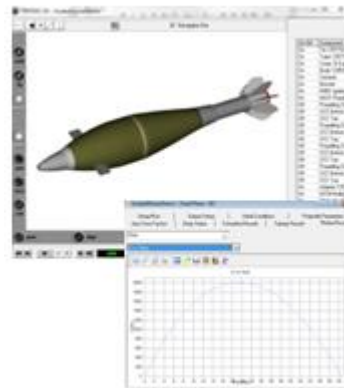
- **PRODAS Integration**

- *Aero and Mass Property Predictions* – Use the aero prediction capabilities in PRODAS along with mass properties in the concept development phases of your program. Replace predicted data with test data as it becomes available.



- *Supporting Modules* – Use PRODAS to provide all the necessary supporting models including MET, rocket motor, squibs, and more.
- *Validate Your Model* – Compare results to the basic PRODAS 4DOF and 6DOF trajectory modules for verification and validation of any custom Simulink® trajectory model.

- *Visualize Results* – Use plots and the 3D Visualizer to analyze your simulation results. Basic plots such as position, velocity, attitude, spin rate, angle of attack, and more are available. Look at the stability properties throughout the trajectory. Watch the motion of a realistic 3D model as you play-back the trajectory.



- **Concept to Production and More**

- *HIL* – Use Simulink® to target your simulation to a real-time Hardware-In-the-Loop (HIL) system and maintain compatibility with the PC simulation.



- *Code Generation* – Leverage Simulink®’s auto code generation tools to create embedded software from your GNC algorithm blocks.

- *Fire Control* – Use the simulation in test environments for fire control.



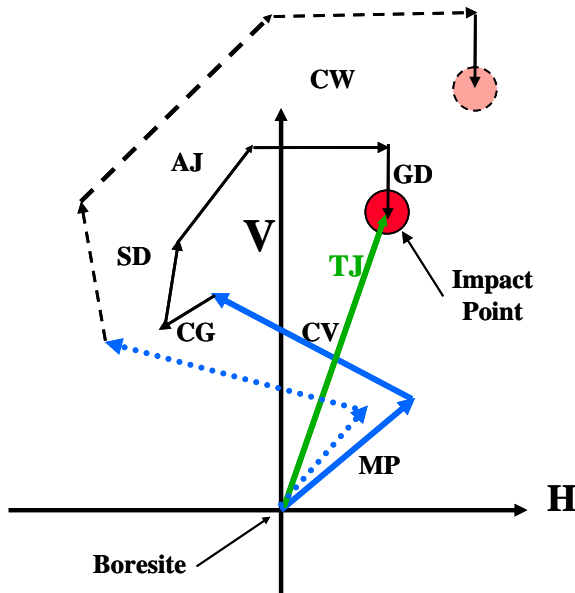
Trial versions are available. Call for details.

White Papers

We have added a couple of white papers to our site that we thought you might be interested in. *The following sections include a brief abstract and link to the new white paper page of our website..*

Using PRODAS 6DOF Trajectory Simulation to Estimate Dispersion

We frequently receive requests to estimate dispersion of a projectile at specific ranges based on a defined error budget. A typical error budget for two shots is shown in



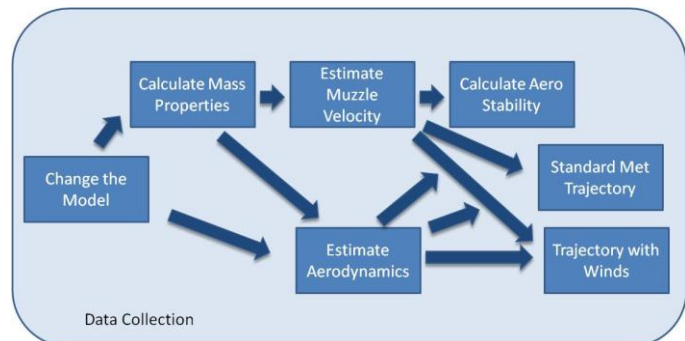
- MP = Muzzle Pointing**
- CV = Cross Velocity**
- CW = Cross Wind**
- CG = Projectile CG Cross Velocity**
- SD = Sabot Discard**
- AJ = Aero Jump**
- GD = Gravity Drop**
- TJ = Total Jump Vector**

Figure 1: Error Budget Example

For direct fire applications versus a vertically oriented target, it is quite simple to use the fixed plane 6 DoF trajectory simulation in PRODAS to generate a series of sensitivity factors as a function of range, multiply by each of the appropriate sized error system factors, and add the components up in a root-sum-square fashion to estimate the total dispersion of the system at any range desired. [More...](#)

Changing your Model with Macro Code

Sometimes we are asked to perform complex trade-offs; for example determine the optimum length of a projectile for a given mission realizing length will effect mass and propellant volume which in turn will effect launch velocity. And the basic shape will determine the drag as well. Long and heavy is good for flight, but not so good for launch.



Now there is a way you can use the PRODAS macro script to actually make changes to your model, run a number of test cases and evaluate the results.

The following paper, “Automated Projectile Design Software” was presented at the 2010 NDIA Guns and Ammo conference in Dallas. [More...](#)

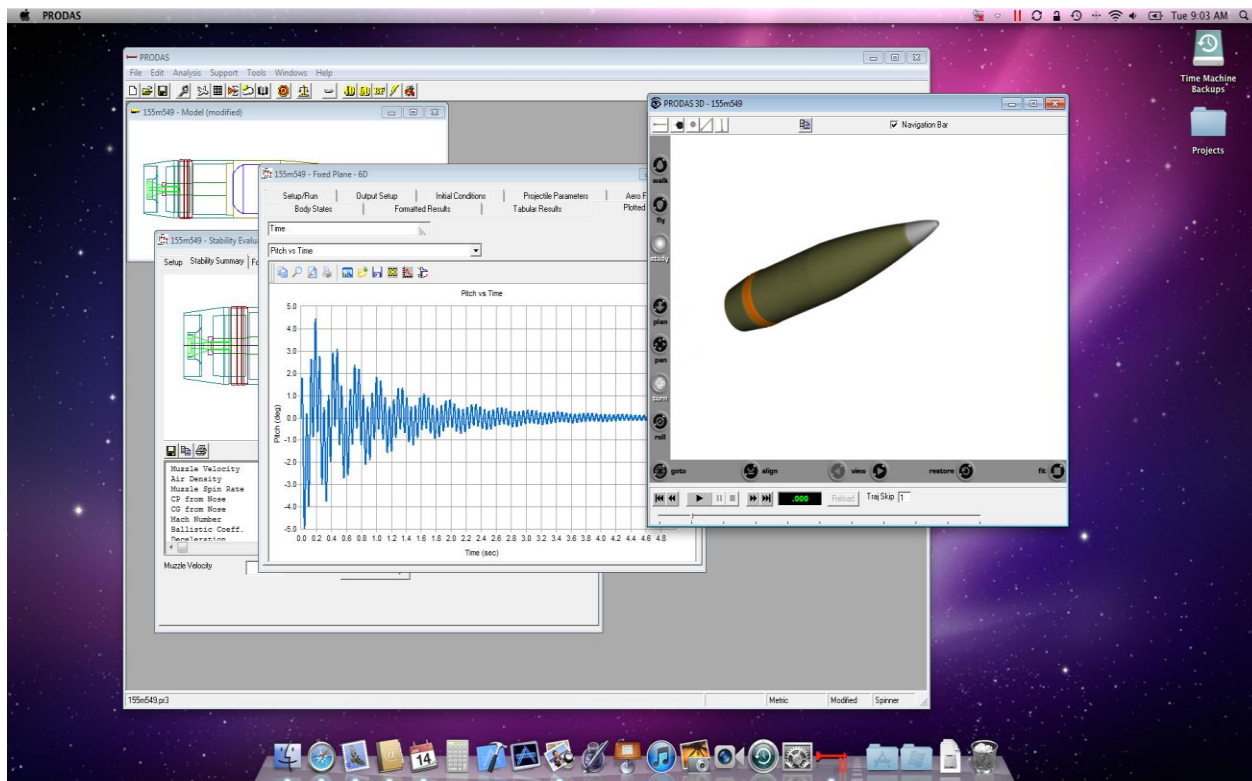
Adding Aero Test Data to Model

So what does “truth modeling” actually mean? A “truth model” is a model that completely recreates the performance of a projectile in the real world. During the design through production phase of projectile/ammunition the final goal should be a projectile truth model.

PRODAS has the capability to predict what the aerodynamic coefficients of a projectile shape based on several aero predictors such as Arrow Tech’s Finner and Spinner algorithms, NEAR’s MISL3, and interfaces for Missile DATCOM* and the AP98 series* (each with their strengths) but these may not match the real world performance for various reasons. To accurately determine the real world performance of a projectile it should be free flight tested and the aerodynamic data, originally predicted by PRODAS, should be derived from the test data itself. Free Flight test data can come from many sources such as Yaw Card, Wind Tunnel, Dfuze, Spark Range or Radar testing. PRODAS users have the capability to easily update the aero tables within PRODAS. Below is a quick example of updating the drag values of a PRODAS spin stabilized projectile with test data derived from radar data. (* requires prior ownership of the baseline algorithms) [More...](#)

PRODAS on Mac OS X

If you are a Mac user and want to run PRODAS, there is now a solution for you. PRODAS is available to Mac users through Parallels Desktop 6 or 7. Parallels provides the capability to run Windows within the Mac operating system. PRODAS has been tested with Parallels using both Windows 7 and XP and performs exactly as on a native Windows machine. All of the PRODAS modules can easily interact with other Mac applications through copy and paste with data, plots, and graphics. Contact Arrow Tech for any setup help, and start using PRODAS today on your Mac.



PRODAS on an iPad

Using the same Parallels software discussed above, with the addition of the Mobile Module, you can now run PRODAS on your iPad. It doesn't really run on the iPad, the iPad is acting as a window into your Mac. Still you control all of the functionality, including running trajectories and predicting aros in the palm of your hand. Great for meetings to answer that tough question definitively. Call if you would like more details.



New Courses

Arrow Tech engineers teach 10 to 20 classes a year all over the world. If you are thinking about a course to get the most out of your PRODAS investment, call soon so we can reserve a spot.

In addition to our traditional PRODAS training courses we now offer an **Advanced PRODAS User Course** which covers using the Initial Conditions Generator and macros to perform Guided System Effectiveness as well as other advanced tools such as the Projectile Tracing Tool, the Aero Manager, the suite of Structural Analysis modules and the Guided Projectile/Rocket modules.

For the ultimate in effective training, Arrow Tech offers the **Advanced PRODAS User Seminar**. This is a one on one training experience where you work with one of our engineers at our facility. Bring along your current projectile problem, and solve it with our help and take home the knowledge so you can do it alone the next time. This has become very popular for companies wanting to expand their guided projectile expertise. Of course we will sign a non-disclosure to protect your ideas and abide by all applicable ITAR regulations.

To discuss what training is best for you please contact John Whyte at 802-865-3460 ext. 13 or email jwhyte@prodas.com.

My Product Support has expired, how can I bring it up to date?

PRODAS product support is paid on an annual basis and covers all PRODAS Software on a per site basis. Per our published PRODAS Maintenance Agreement product support can be re-instated if there has been a lapse in coverage with defined penalties. To access the Maintenance Agreement terms click on the following link: [Maintenance Agreement](#)

For a quote to reinstate your product support please contact Lin White (lin@prodas.com) or John Whyte (jwhyte@prodas.com).

To remove your name from our mailing list, please [click here](#)

Questions, comments or to request the latest pricing information please email us at: info@prodas.com or call 802-865-3460

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