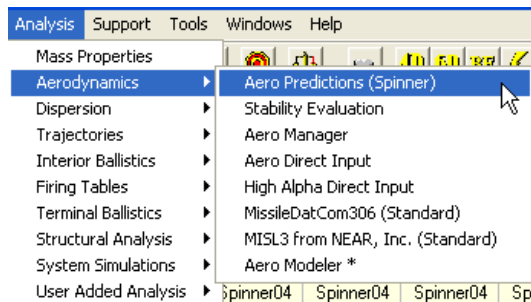# Adding Aero Test Data to Model

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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)

1st step is to open the PRODAS model and then go to the Aerodynamics – Aero Predictions option.

Within the Aero Predictor Interface open the Tabular Results which will give the user direct access to the aerodynamic coefficients.
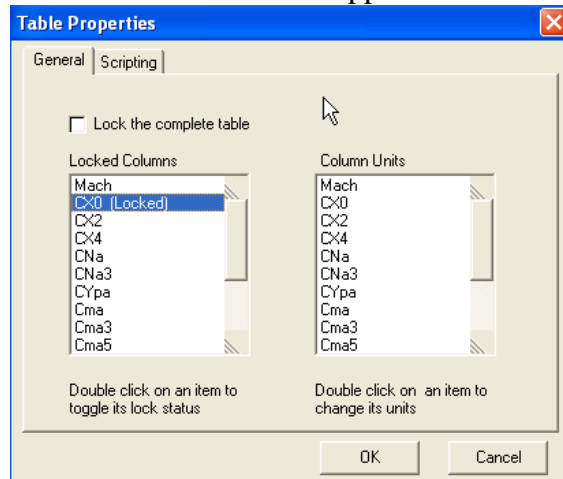
	Mach	CX0	CX2	CX4	CNa	CNa3	CYpa	Cma
Units								
Red=Lock	Spinner04	Spinner04	Spinner04	Spinner04	Spinner04	Spinner04	Spinner04	Spinner04
	0.010	0.2190	2.02	0.	2.270	0.0	-0.74	2.525
	0.400	0.2185	2.02	0.	2.283	0.0	-0.74	2.534
	0.600	0.2200	2.02	0.	2.273	0.0	-0.74	2.551
	0.700	0.2212	2.23	0.	2.263	0.0	-0.75	2.563
	0.750	0.2233	2.36	0.	2.253	0.0	-0.76	2.584
	0.800	0.2289	2.47	0.	2.257	0.0	-0.77	2.610
	0.850	0.2327	2.66	0.	2.266	0.0	-0.80	2.623

You will notice that the source for all of the coefficients is Spinner 04. The user now can either hand input or copy and paste the updated coefficients. The source label now has changed to USER to indicate that the coefficients have been modified by the user. After the coefficients have been updated it is highly recommended that the user at least lock the modified column.

Estimate Aerodynamics | Aero Model | Adv. User CG Shift | Formatted Results | Results Tables | Plotted Results |

Aero Table

	Mach	CX0	CX2	CX4	CNa	CNa3	CYpa	Cma
Units								
Red=Lock	Spinner04	User	Spinner04	Spinner04	Spinner04	Spinner04	Spinner04	Spinner04
	0.010	0.2200	2.02	0.	2.270	0.0	-0.74	2.525
	0.400	0.2200	2.02	0.	2.283	0.0	-0.74	2.534
	0.600	0.2200	2.02	0.	2.273	0.0	-0.74	2.551
	0.700	0.2200	2.23	0.	2.263	0.0	-0.75	2.563
	0.750	0.2200	2.36	0.	2.253	0.0	-0.76	2.584
	0.800	0.2200	2.47	0.	2.257	0.0	-0.77	2.610
	0.850	0.2350	2.66	0.	2.266	0.0	-0.80	2.623
	0.875	0.2425	2.78	0.	2.281	0.0	-0.81	2.670
	0.900	0.2500	2.87	0.	2.301	0.0	-0.83	2.737
	0.925	0.2750	3.10	0.	2.326	0.0	-0.94	2.843
	0.950	0.3000	3.29	0.	2.346	0.0	-1.07	2.921
	0.975	0.3475	3.53	0.	2.372	0.0	-0.95	2.936
	1.000	0.3050	3.75	0	2.393	0.0	-0.97	3.083

Note in this case the original prediction was quite accurate. To lock the column, double click on the "USER" label and a "lock" interface will pop up. The user just needs to double click on the desired coefficient to lock and a red lock status will appear on the table itself.

Table Properties

General | Scripting |

☐ Lock the complete table

Locked Columns

| Mach |
| CX0 (Locked) |
| CX2 |
| CX4 |
| CNa |
| CNa3 |
| CYpa |
| Cma |
| Cma3 |
| Cma5 |

Double click on an item to toggle its lock status

Column Units

| Mach |
| CX0 |
| CX2 |
| CX4 |
| CNa |
| CNa3 |
| CYpa |
| Cma |
| Cma3 |
| Cma5 |

Double click on an item to change its units

OK   Cancel

Aero Table

	Mach	CX0	CX2	CX4
Units				
Red=Lock	Spinner04	User	Spinner04	Spinner0
	0.010	0.2200	2.02	
	0.400	0.2200	2.02	
	0.600	0.2200	2.02	
	0.700	0.2200	2.23	
	0.750	0.2200	2.36	

It is important to lock the updated values so that they will not be inadvertently overwritten. Once the truth model is defined the user can then use this model to generate Fire Control, Firing Tables, Terminal Performance, Ballistic Match, and assess system performance such as probability of hit/kill. Aero coefficients can also be modified via the Aerodirect Input and Aero Manager interfaces. The Aero Manager interface also allows the user to visually compare the aero dynamic data from multiple sources.

For further information on truth modeling, updating aero coefficients of the Aero Manager please contact John Whyte at jwhyte@prodas.com or 802-865-3460 ext 13.