FNL25 RockSim Webinar

FNL Tech Team

Welcome, as you enter the Zoom please type in the chat:
Your Name & Your School

Note: This presentation will be recorded so team members not in attendance may be able to rewatch later

Webinar Overview

- RockSim Overview
  - Assumed you have a basic knowledge of RockSim
- RockSim Resources
  - To give you a basic knowledge of RockSim
- RockSim Rocket Files
  - How to get a RockSim file
- RockSim Load / Verify / Recovery / Mass Object / Motor / Flight data
  - Performance Requirements
- Common Errors

RockSim Overview

- From RockSim

RockSim is an easy-to-use computer program that allows you to design any size rocket then simulate its flight to see how high and fast it will fly! It allows you to virtually test your new model, even before you start buying components and building your design. You'll find out if it will be stable and safe to launch, as well as meet any payload capacity, speed or height criteria you might want. Instead of wasting money on incorrect components and numerous test motors, imagine how much money you'll save by doing all your test flights with just a few clicks of your mouse!

- First Nations Launch requires all teams to acquire and use **RockSim** for design, component and motor selection prior to parts procurements.
  - For consistency, all teams must use the same simulation program – RockSim.

RockSim Resources

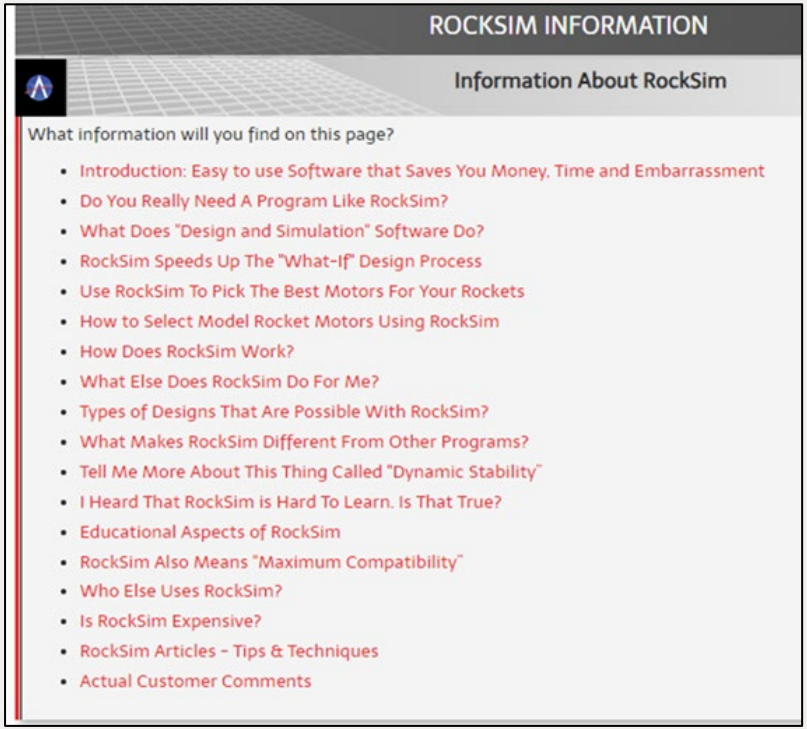
- FNL RockSim Resources
  - **Advisor Handbook** – Appendix D-3
    - Goals of Simulations / Simulation Parameters / Procurement
    - Additional Design Files (that are not in the RockSim Library)
    - Additional Motor Files (that are not in the RockSim Library)
  - **Rocket Instructional Videos** – FNL RockSim
    - Download / Install / Temp License (Award Number) / School License
    - User Interface Overview
    - RockSim Rocket Database / Motor Database
    - Parameters

https://spacegrant.carthage.edu/first-nations-launch/rocket-instructional-videoswebinars/

RockSim Resources

- Apogee Components Website
  - RockSim Overview – Various Topics
    - https://www.apogeerockets.com/RockSim/RockSim_Information
  - RockSim Video Tutorials – 35 Topics
    - https://www.apogeerockets.com/RockSim/RockSim_Video_Tutorials
  - Newsletter Articles – Over 100 Topics
    - https://www.apogeerockets.com/Peak-of-Flight?pof_list=topics&m=education&#RockSim
  - RockSim Program Guide
    - https://www.apogeerockets.com/downloads/PDFs/Rocksim.pdf

RockSim Resources

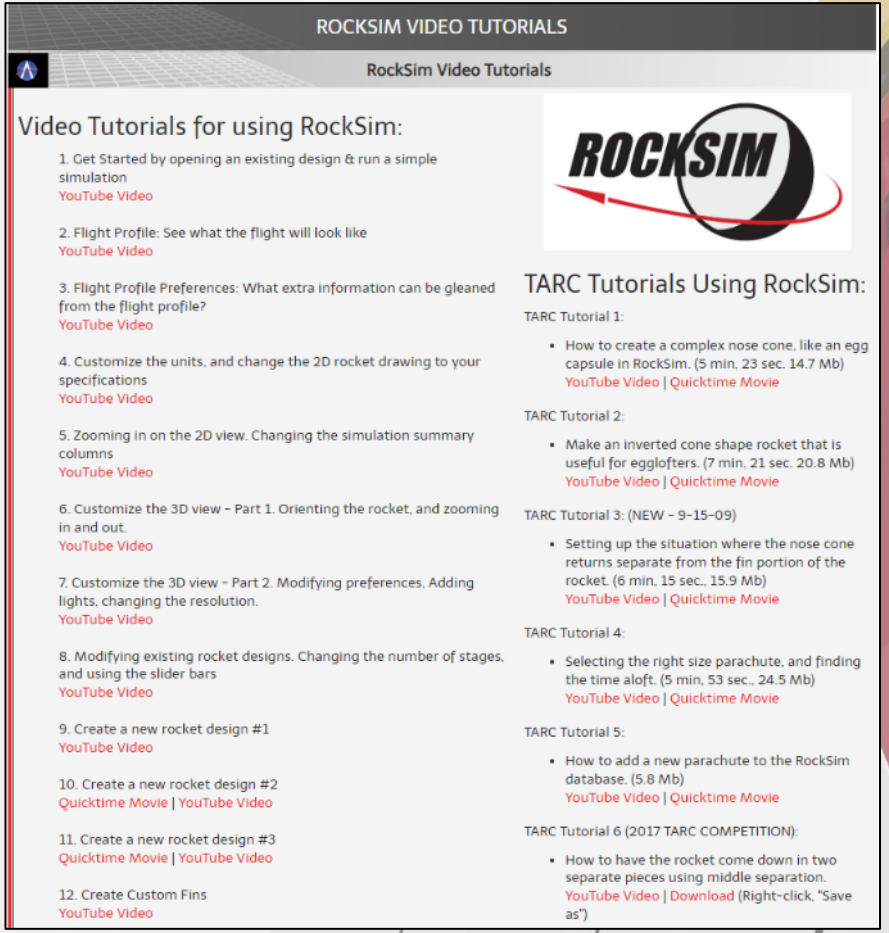


ROCKSIM INFORMATION

Information About RockSim

What information will you find on this page?

- Introduction: Easy to use Software that Saves You Money, Time and Embarrassment
- Do You Really Need A Program Like RockSim?
- What Does "Design and Simulation" Software Do?
- RockSim Speeds Up The "What-If" Design Process
- Use RockSim To Pick The Best Motors For Your Rockets
- How to Select Model Rocket Motors Using RockSim
- How Does RockSim Work?
- What Else Does RockSim Do For Me?
- Types of Designs That Are Possible With RockSim?
- What Makes RockSim Different From Other Programs?
- Tell Me More About This Thing Called "Dynamic Stability"
- I Heard That RockSim is Hard To Learn. Is That True?
- Educational Aspects of RockSim
- RockSim Also Means "Maximum Compatibility"
- Who Else Uses RockSim?
- Is RockSim Expensive?
- RockSim Articles - Tips & Techniques
- Actual Customer Comments



ROCKSIM VIDEO TUTORIALS

RockSim Video Tutorials

Video Tutorials for using RockSim:

1. Get Started by opening an existing design & run a simple simulation
YouTube Video

2. Flight Profile: See what the flight will look like
YouTube Video

3. Flight Profile Preferences: What extra information can be gleaned from the flight profile?
YouTube Video

4. Customize the units, and change the 2D rocket drawing to your specifications
YouTube Video

5. Zooming in on the 2D view. Changing the simulation summary columns
YouTube Video

6. Customize the 3D view - Part 1. Orienting the rocket, and zooming in and out.
YouTube Video

7. Customize the 3D view - Part 2. Modifying preferences, Adding lights, changing the resolution.
YouTube Video

8. Modifying existing rocket designs. Changing the number of stages, and using the slider bars
YouTube Video

9. Create a new rocket design #1
YouTube Video

10. Create a new rocket design #2
Quicktime Movie | YouTube Video

11. Create a new rocket design #3
Quicktime Movie | YouTube Video

12. Create Custom Fins
YouTube Video

TARC Tutorials Using RockSim:

TARC Tutorial 1:

- How to create a complex nose cone, like an egg capsule in RockSim. (5 min, 23 sec. 14.7 Mb)
YouTube Video | Quicktime Movie

TARC Tutorial 2:

- Make an inverted cone shape rocket that is useful for egglofters. (7 min, 21 sec. 20.8 Mb)
YouTube Video | Quicktime Movie

TARC Tutorial 3: (NEW - 9-15-09)

- Setting up the situation where the nose cone returns separate from the fin portion of the rocket. (6 min, 15 sec., 15.9 Mb)
YouTube Video | Quicktime Movie

TARC Tutorial 4:

- Selecting the right size parachute, and finding the time aloft. (5 min, 53 sec., 24.5 Mb)
YouTube Video | Quicktime Movie

TARC Tutorial 5:

- How to add a new parachute to the RockSim database. (5.8 Mb)
YouTube Video | Quicktime Movie

TARC Tutorial 6 (2017 TARC COMPETITION):

- How to have the rocket come down in two separate pieces using middle separation.
YouTube Video | Download (Right-click, "Save as")

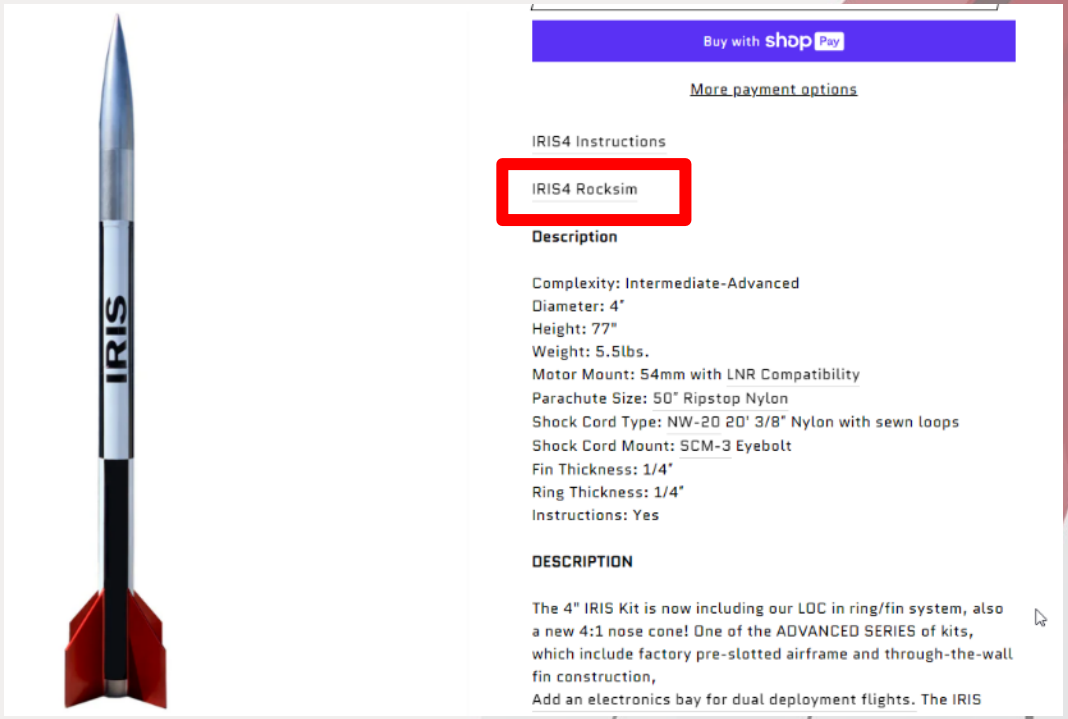
RockSim Rocket File

RockSim Rocket Files

- There are 2 methods to beginning your simulations;
  - (Preferred) Download the basic rocket file, of the kit you selected
    - Researching kits - most manufacturers provide a basic RockSim file
    - If no file, you can search the internet for a basic RockSim file
      - https://www.rocketreviews.com/rocksim-library.html
    - Note: this file should be inspected to verify it reflects what you expect
    - Note: this file will likely be very basic, and need improvements
  - Build the kit components from scratch in RockSim
    - This works if you have the components on-hand and can measure dimensions

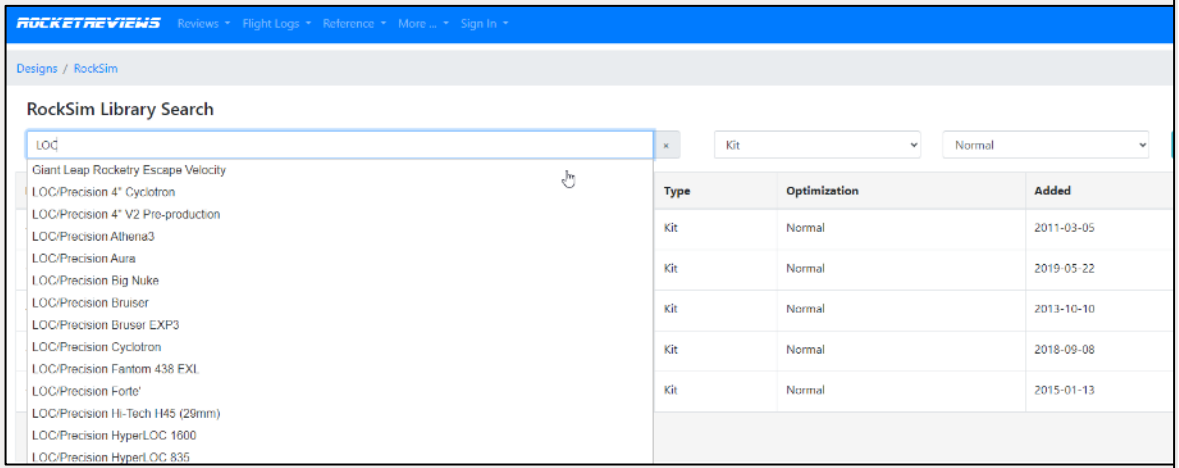
RockSim Rocket Files

Example of a vendor website – link for the RockSim file highlighted



RockSim Rocket Files

Example of RockSim User Library –
link for the RockSim file highlighted

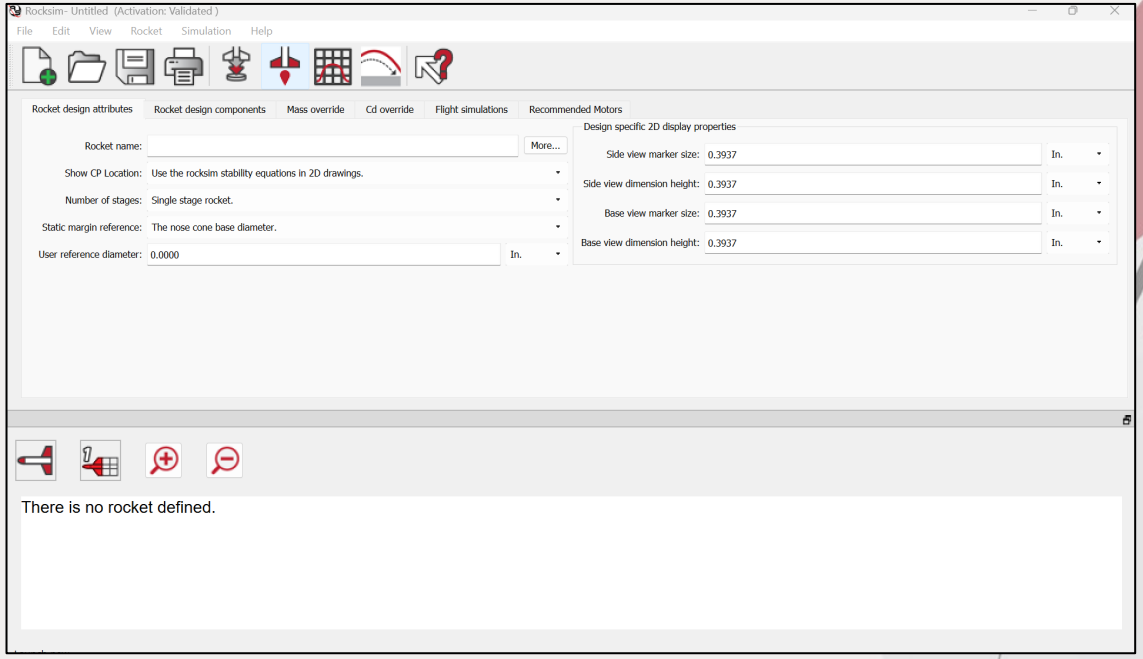


https://www.rocketreviews.com/rocksim-library.html

Running Simulations

RockSim Rockets – Load File

- You have your .rkt file -> Open RockSim -> Load the File



RockSim Rockets – Load File

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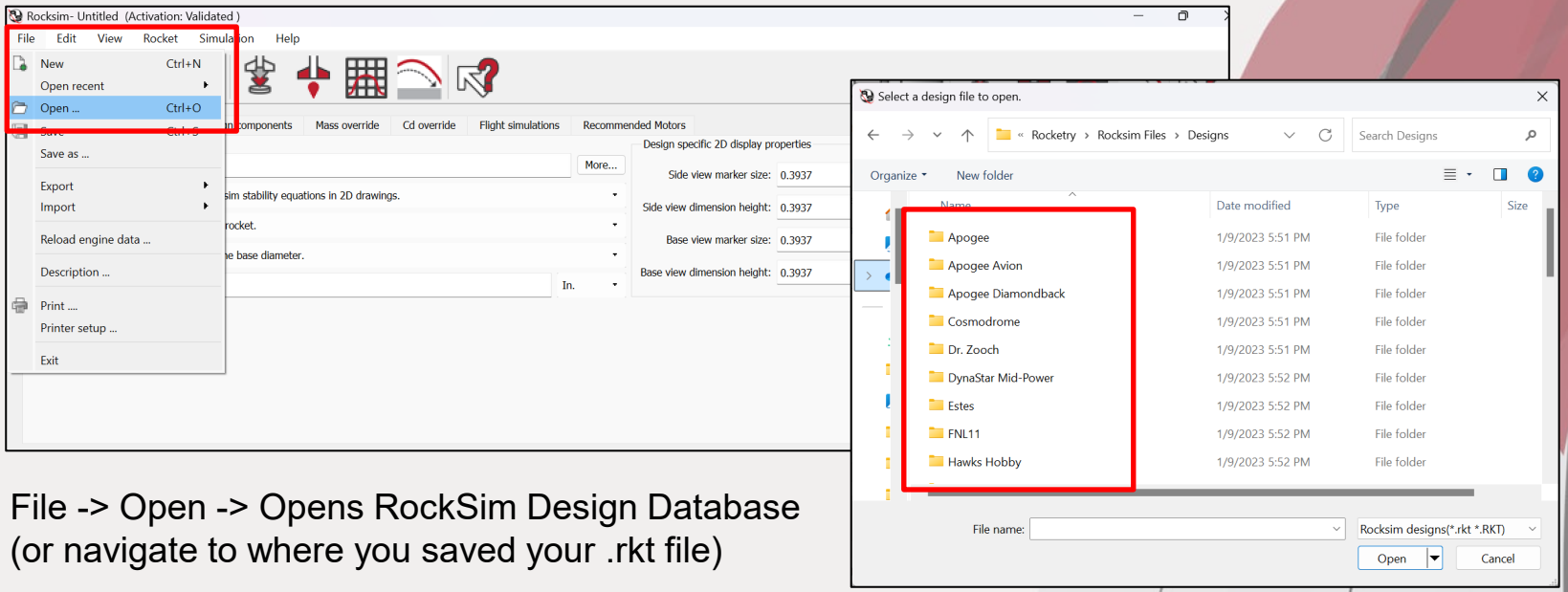
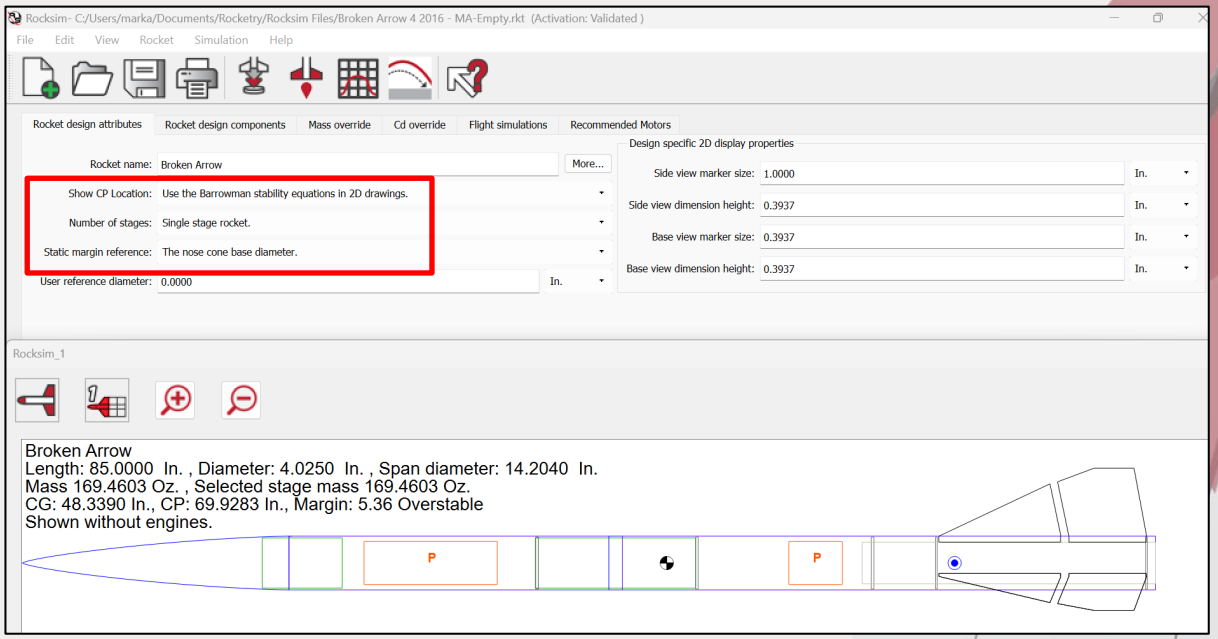


File -> Open -> Opens RockSim Design Database
(or navigate to where you saved your .rkt file)

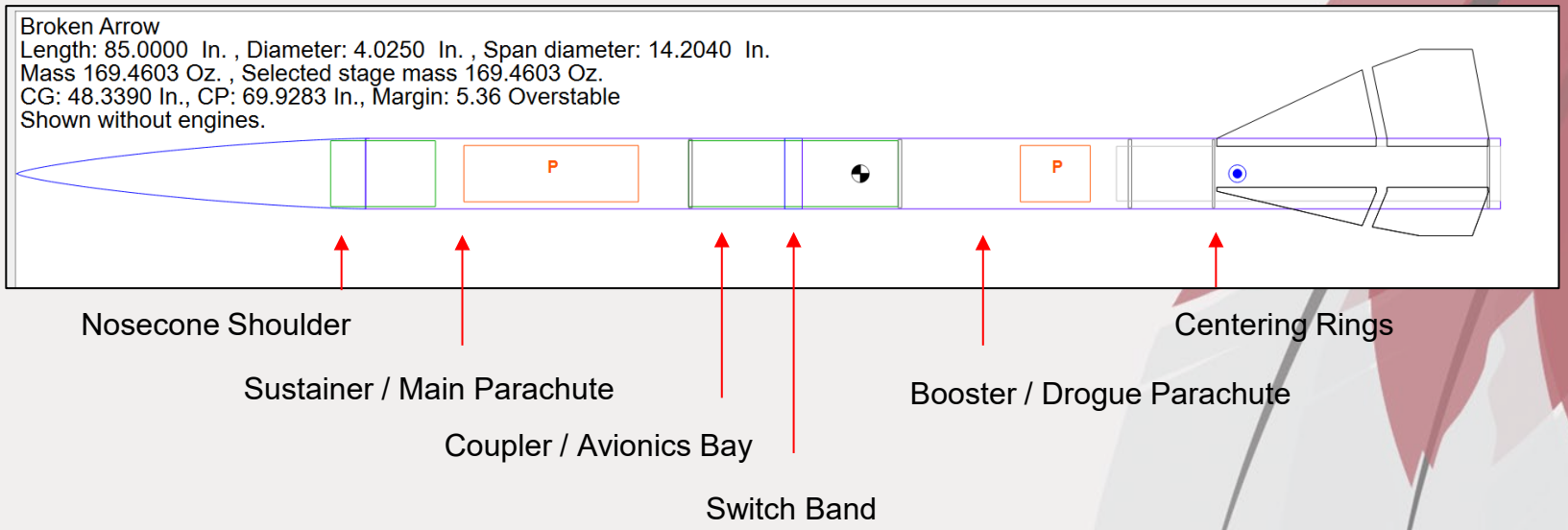
RockSim Rockets – Load File

- You have your .rkt file -> Open RockSim -> Load the File



RockSim Rockets - Verify

- Verify the loaded Rocket (file) accurately represents what you expect



RockSim Rockets - Verify

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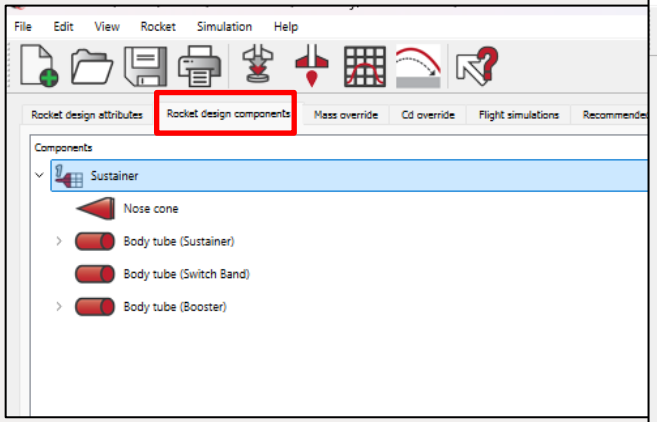
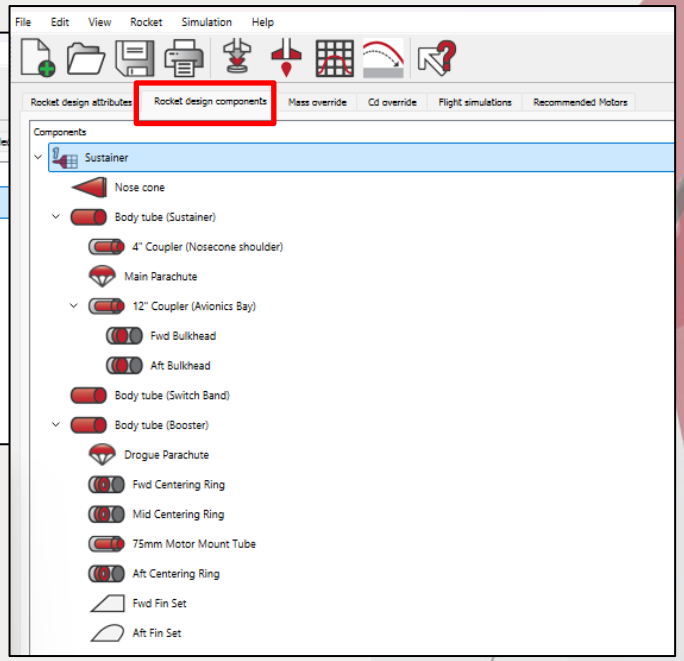




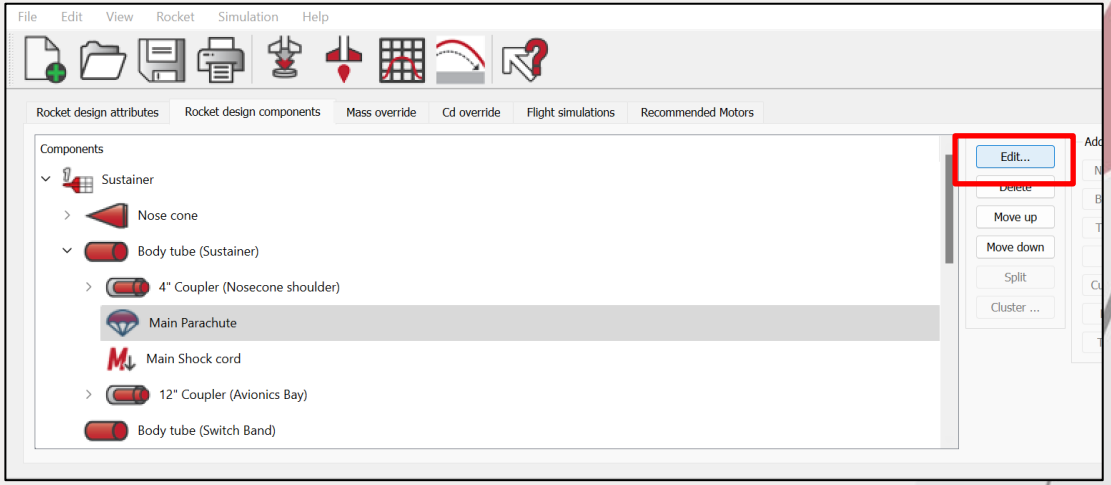
Note: Sequential Order

Note: Naming Convention

Note: Grouping Parts

RockSim Rockets - Recovery

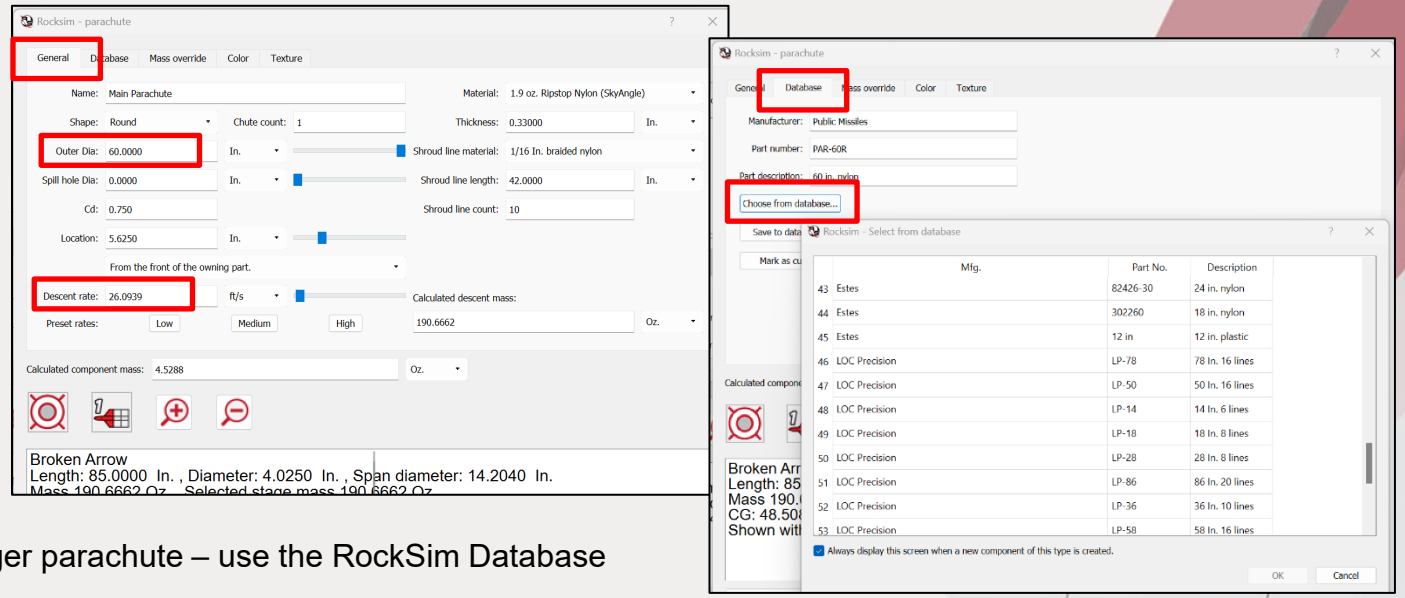
- You will need to replace the existing Parachutes in the model
  - Your Parachute selections will need to satisfy the descent Requirements
  - You need two Parachutes (a Drogue and a Main) – example shows Main only



RockSim Rockets - Recovery

- You will need to replace the existing Parachutes in the model
  - Your Parachute selections will need to satisfy the descent Requirements

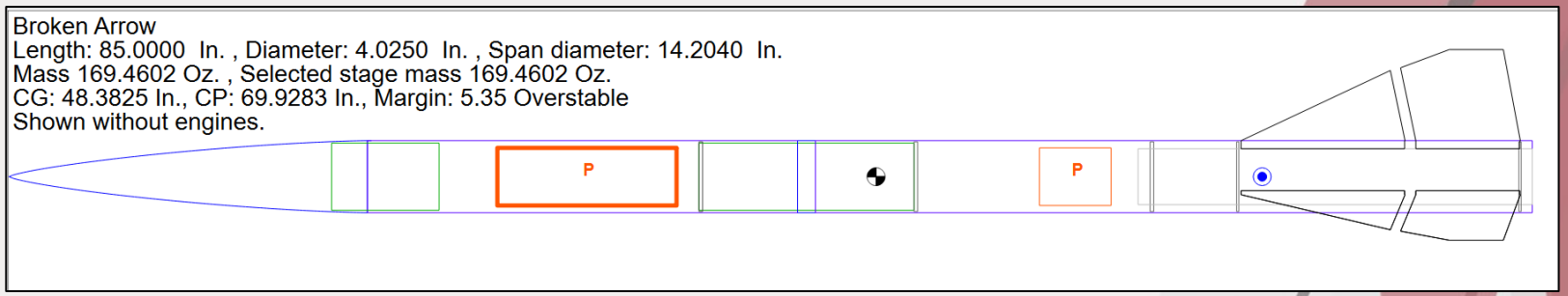
Rate Exceeds Requirements



So, select a larger parachute – use the RockSim Database

RockSim Rockets - Recovery

- You will need to replace the existing Parachutes in the model
  - Your Parachute selections will need to satisfy the descent Requirements

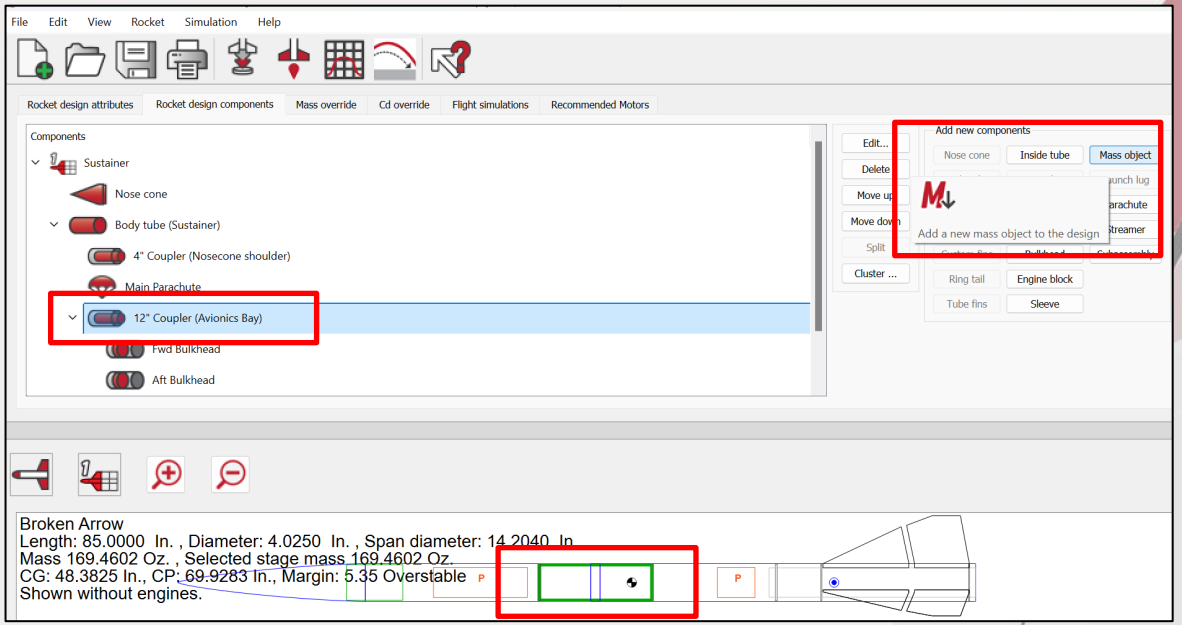


Note: The rectangle represents the volume that your parachute selection is expected to occupy. Ensure your parachute will fit in the airframe! Check the specs!

Note: The position of the parachutes are aft in their respective tubes– this is where they will sit when the rocket is vertical – this affects the CG, so position accordingly!

RockSim Rockets – Challenge ‘Mass Object’

- You will need to add a Mass Object for the Challenge Electronics



RockSim Rockets – Challenge ‘Mass Object’

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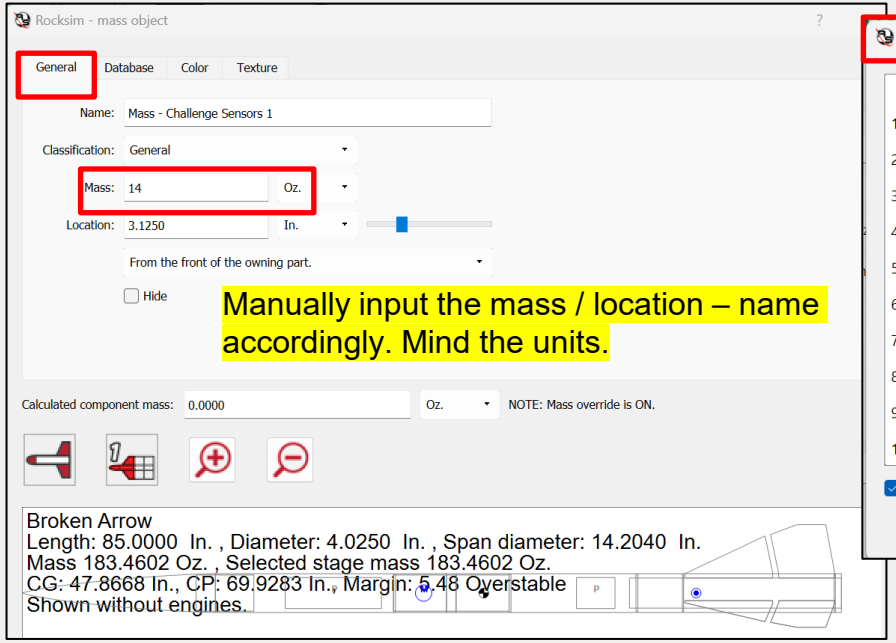
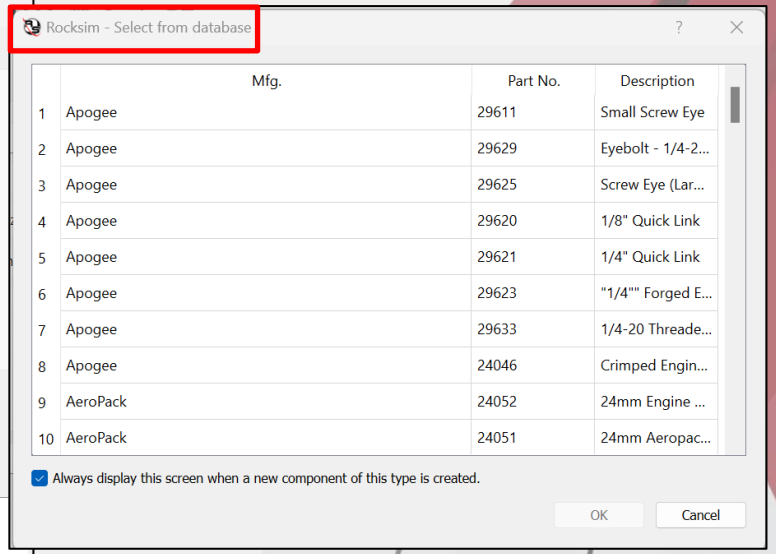
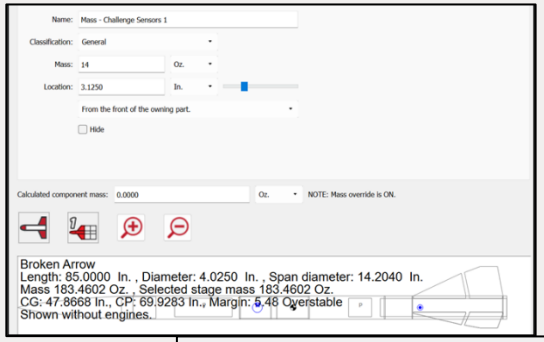




Database box may pop up – close this, not needed now.

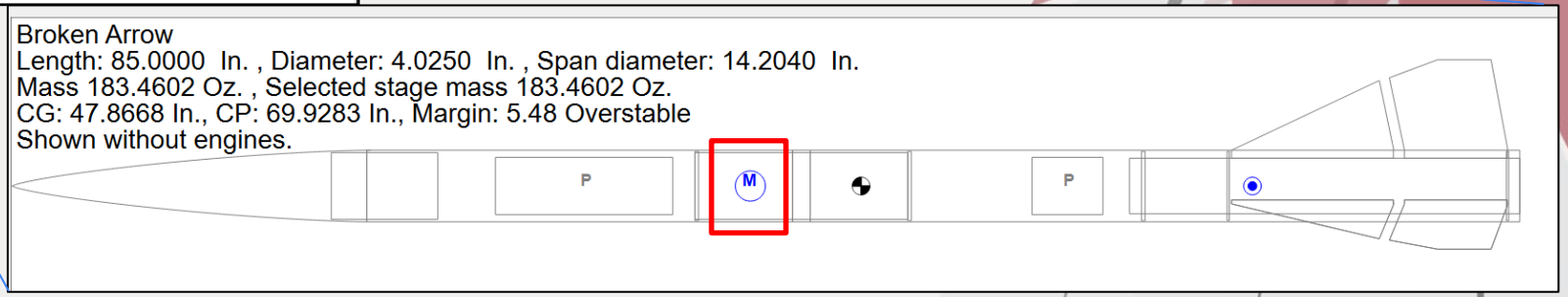
RockSim Rockets – Challenge ‘Mass Object’

- You will need to add a Mass Object for the Challenge Electronics



Note the part is added as a ‘M’ object, at the location shown.

You will need to repeat this for all your Challenge components.

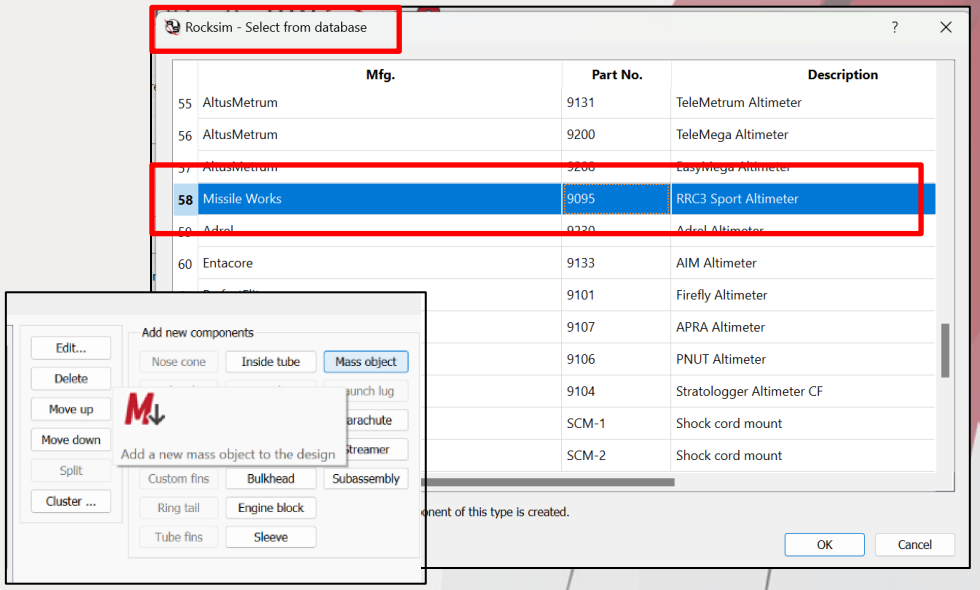


RockSim Rockets – General ‘Mass Object’

- You will also need to add a Mass Object for the General Components.

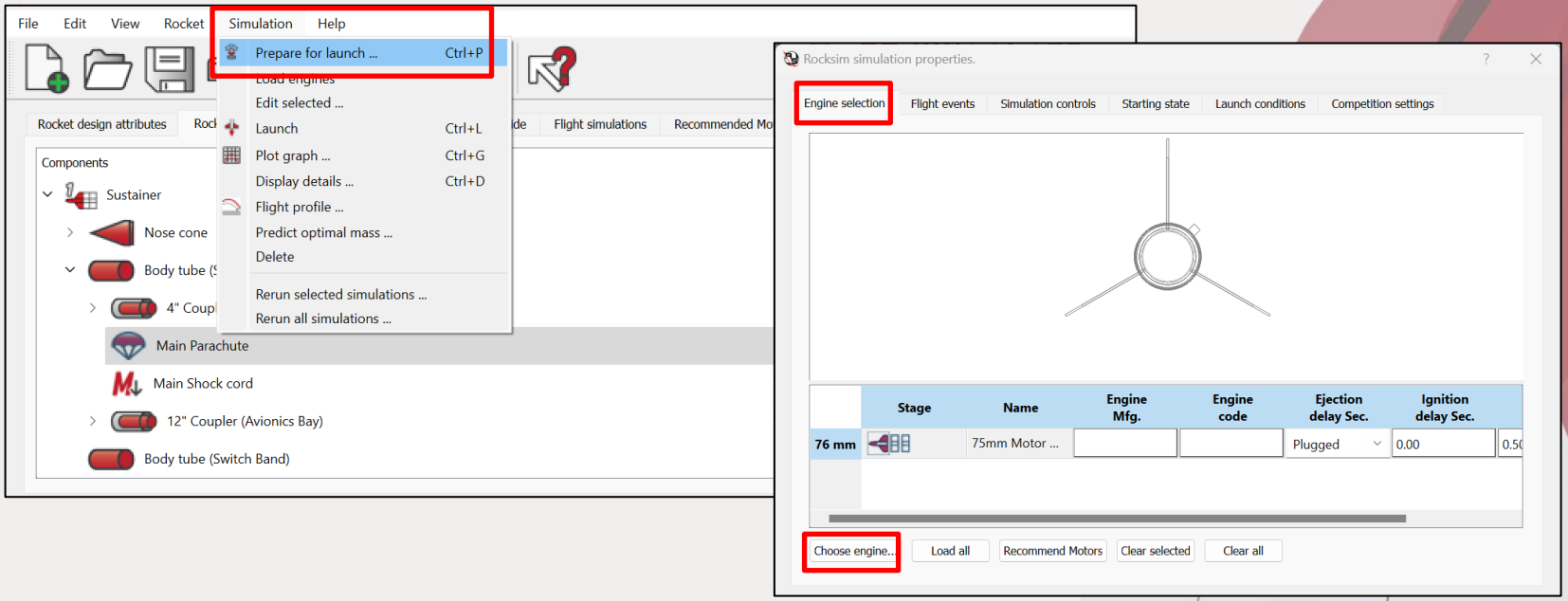
Add New Component -> Mass Object -> Database dialog box is convenient for adding mass of standard items – altimeters, eyebolts, threaded rods, etc.

You will need to add all these components as you eventually make all component selections.



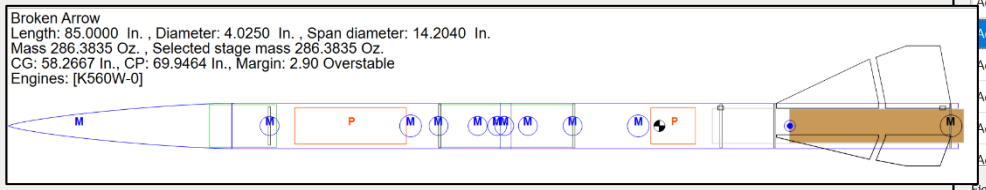
RockSim Rockets – Prepare For Launch ‘Motor’

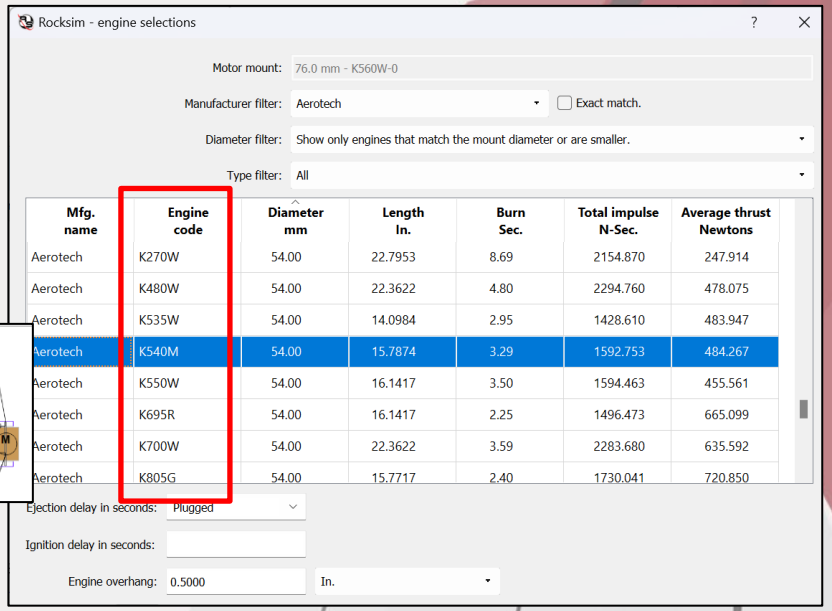
- You will Prepare for Launch -> Select / Load a Motor



RockSim Rockets – Prepare For Launch ‘Motor’

- You will need to select / load a Motor
  - Handbook Appendix A-1 has Challenge Motors
  - This year they are in the RockSim Database
  - If Motor not found in Database
    - You can import a motor (see Resources)

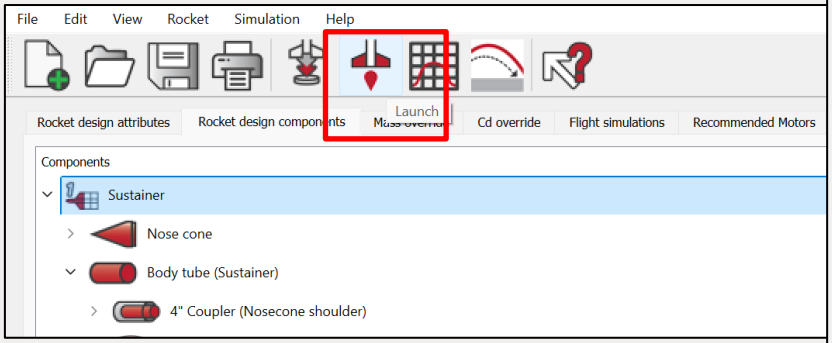


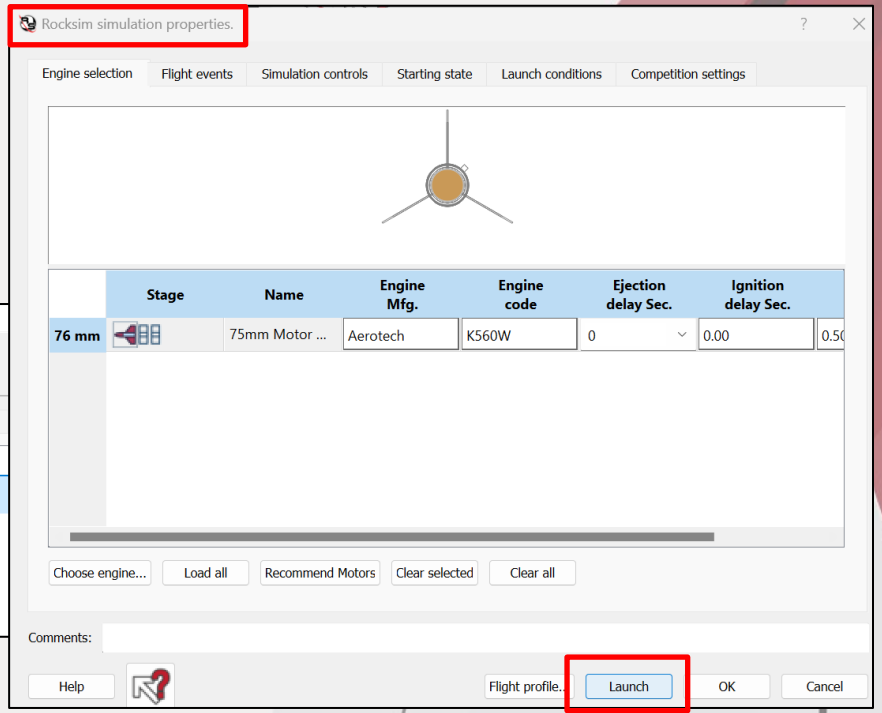


You can find complete motor data at – https://www.thrustcurve.org/

RockSim Rockets – Launch

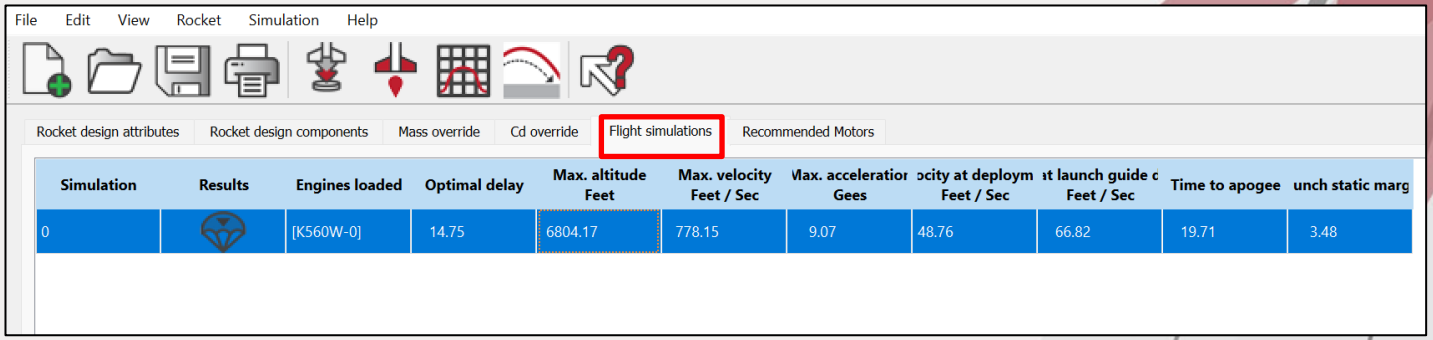
- Run the simulations!
  - Multiple ways to run





RockSim Rockets – Flight Data Requirements

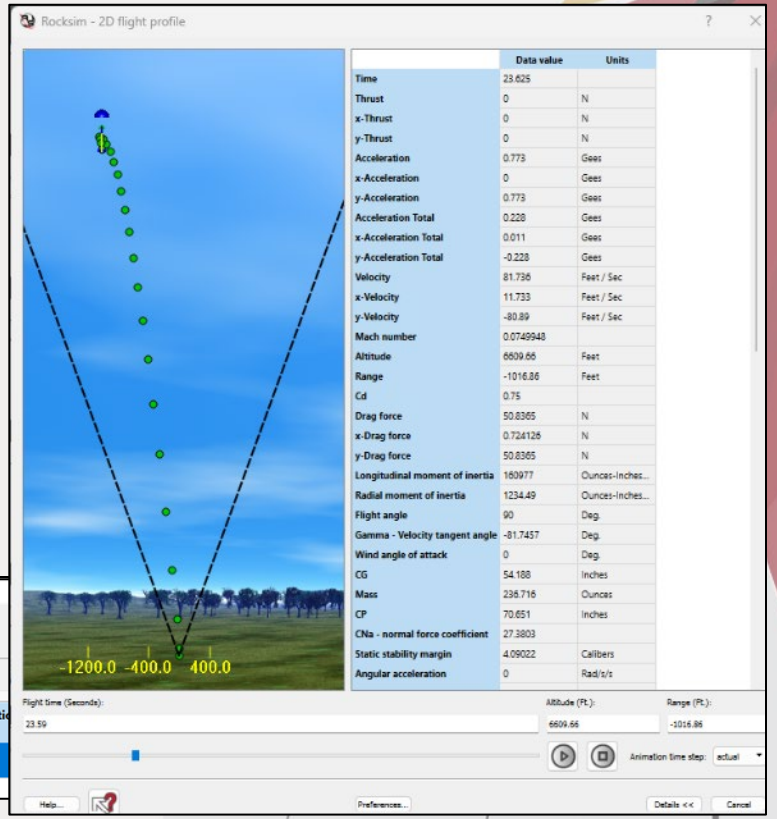
- Examine simulation Data – ensure you meet performance Requirements!
  - Max Altitude
  - Static Margin
  - Rail Exit Velocity
  - Thrust to Weight Ratio
  - Descent Rate - Main
  - Descent Rate - Drogue
  - Other FlySheet Data

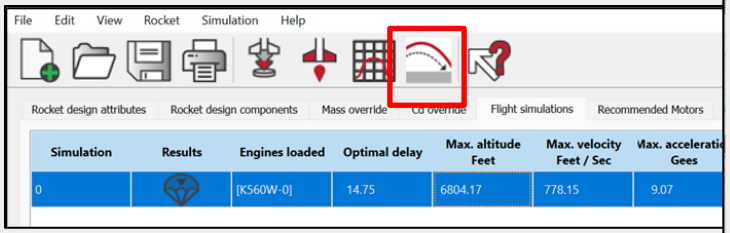


These columns are selectable to about 20 parameters

RockSim Rockets – Flight Data

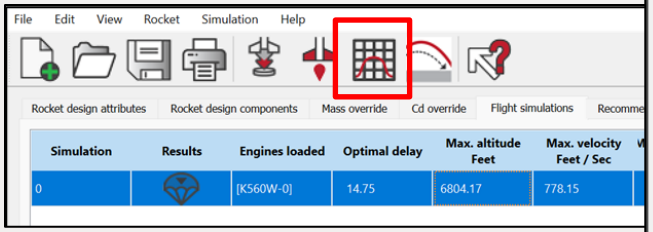
- Flight Profile Data
  - Visual of the simulated flight profile
  - Various data at all points in time of the flight
  - Profile can help ensure parachutes are configured (deploy) properly
  - Profile can help ensure drift is within Requirements

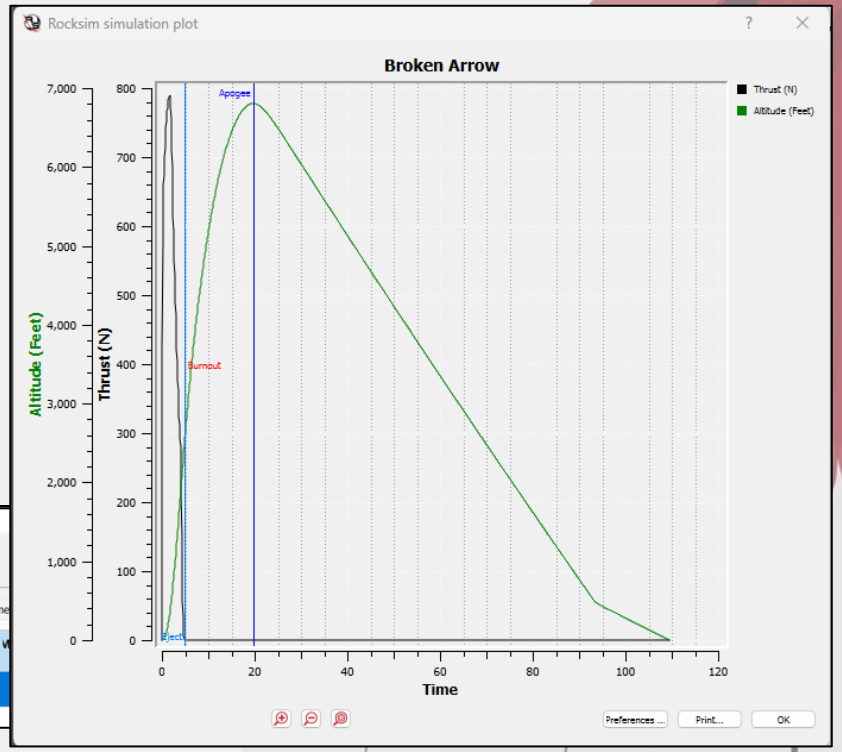




RockSim Rockets – Flight Data

- Plotting Data
  - Useful in Reports
  - Plot any parameter versus time
    - Thrust curve for example
  - Plot single or multiple parameters
  - Can zoom axis for more detail





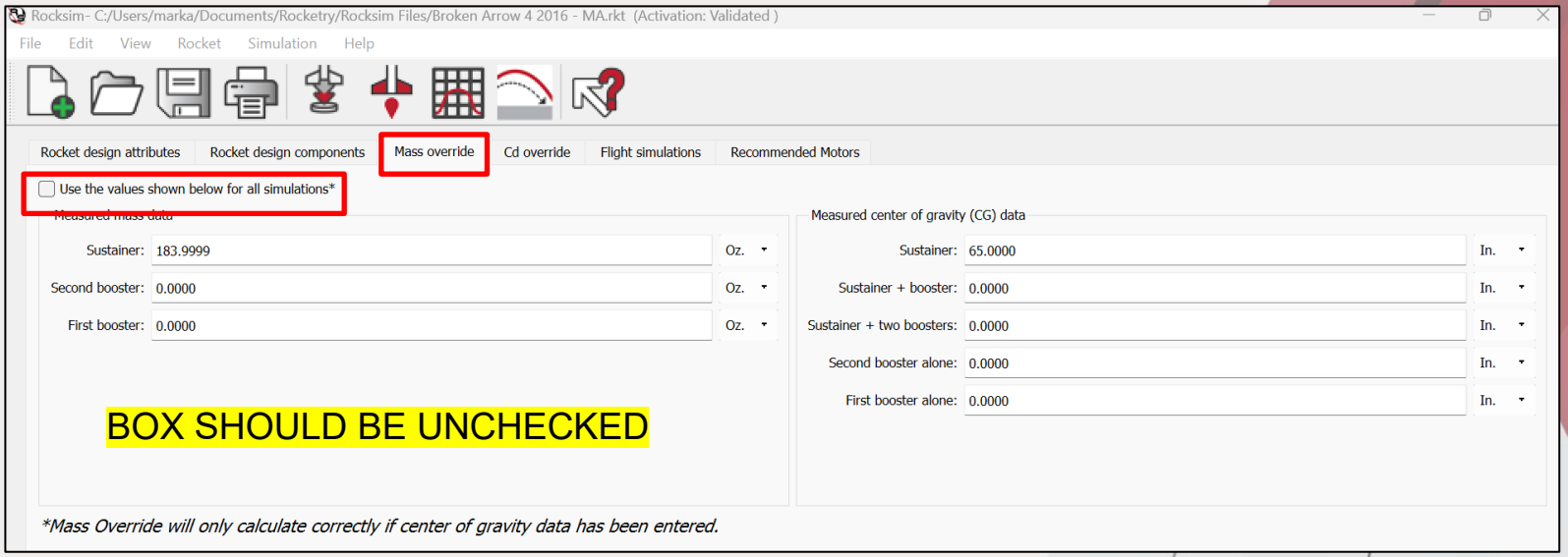
Common Errors

RockSim Rockets – Common Errors

- Ensure Vehicle Mass Override is OFF (and do not use)
- Ensure Cd Override is ON (and do not use)
- Ensure all Drag is accounted for (Rail Buttons, Surface Finish)
- Ensure Parachutes are configured to deploy properly
- Ensure Launch Guide length is configured properly
- Ensure all Mass Objects are accounted for

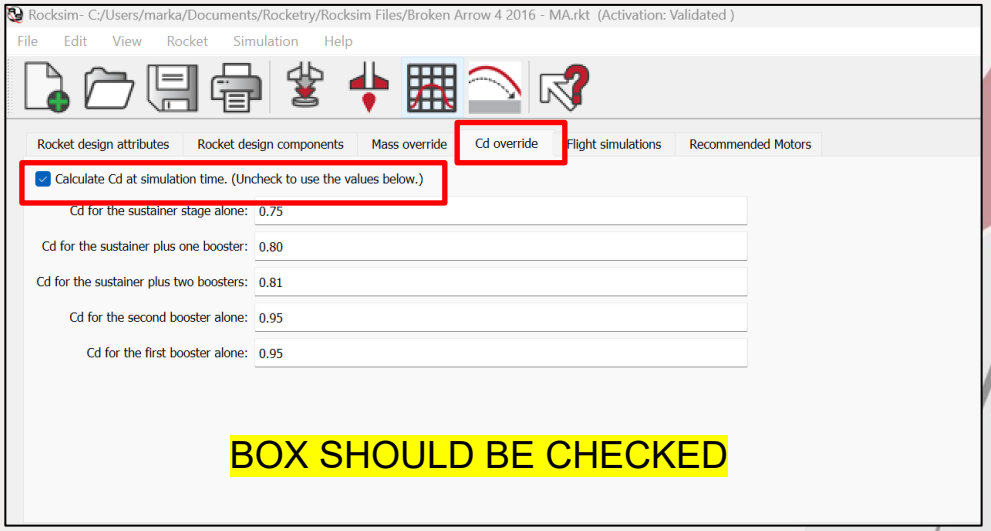
RockSim Rockets – Common Errors

- Ensure Vehicle Mass Override is OFF (and do not use)
  - If adding components (mass) does not change altitude – check this setting



RockSim Rockets – Common Errors

- Ensure Cd Override is ON (and do not change)
  - If changing (adding) drag does not change altitude, check this setting



RockSim Rockets – Common Errors

- Ensure all Drag is accounted for - Rail Buttons
  - If making drag adjustments does not change altitude, see Cd Override slide

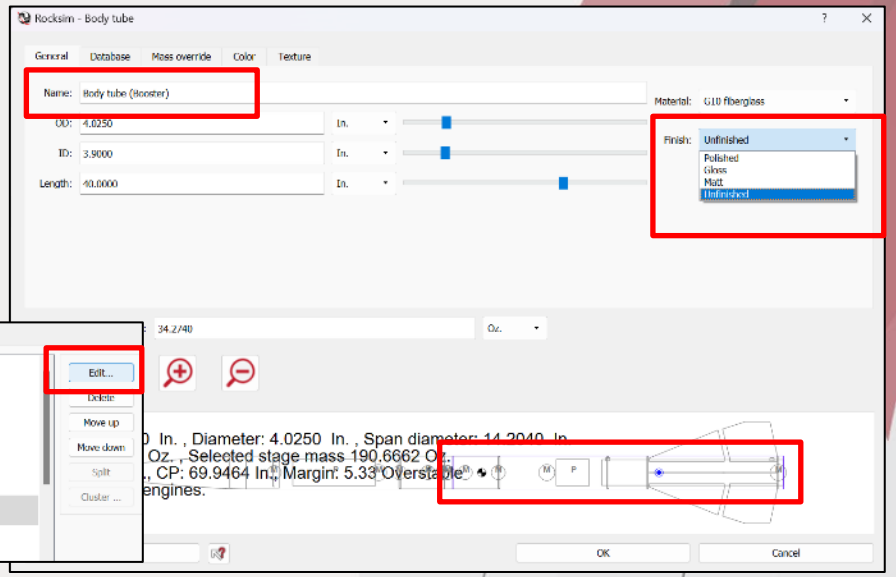
Any surface protuberance should be modeled

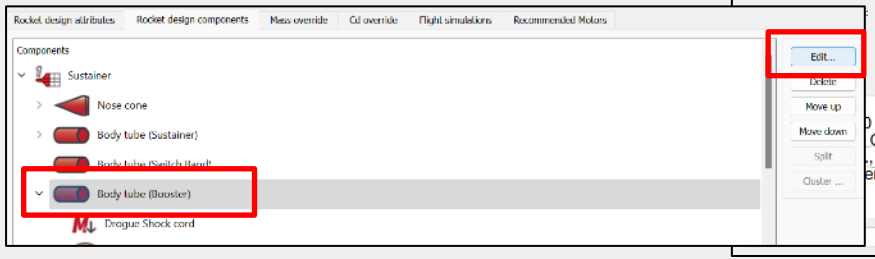
RockSim Rockets – Common Errors

- Ensure all Drag is accounted for - Surface Finish
  - If making drag adjustments does not change altitude, see Cd Override slide

Select the finish that most appropriately represents your rocket.

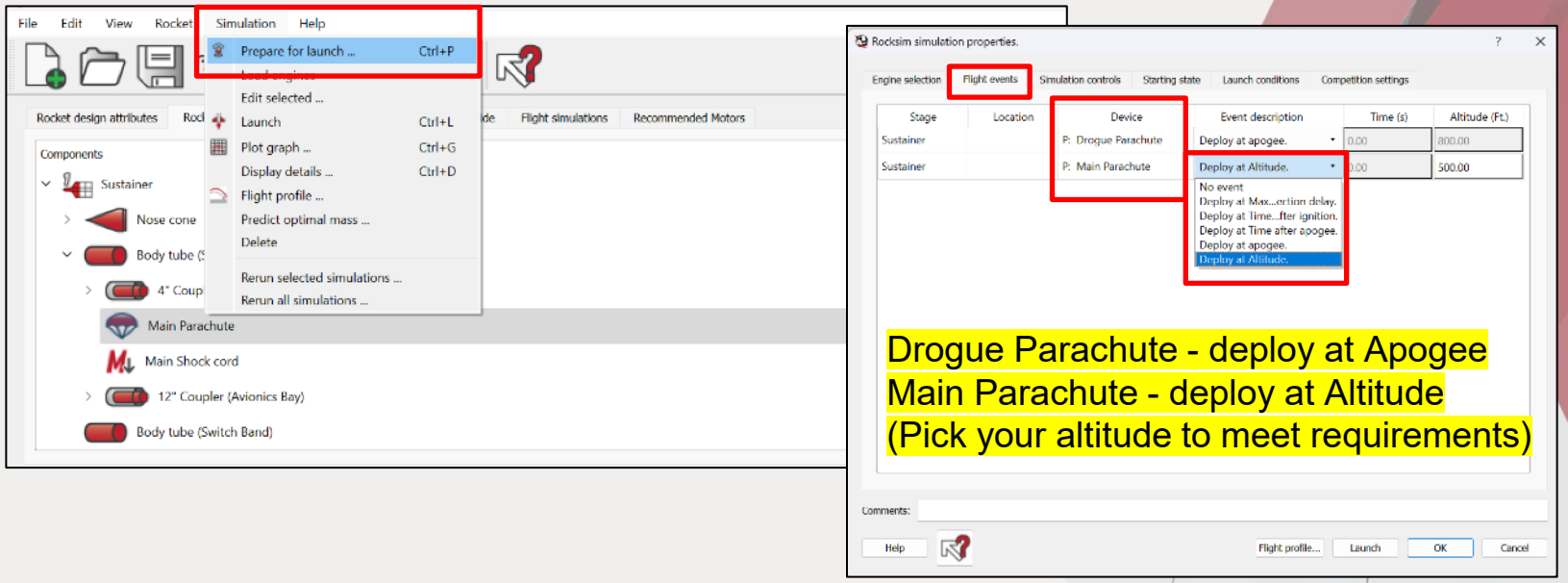
Adjust the finish to see the effects on altitude – all body tubes, fins, nosecone.





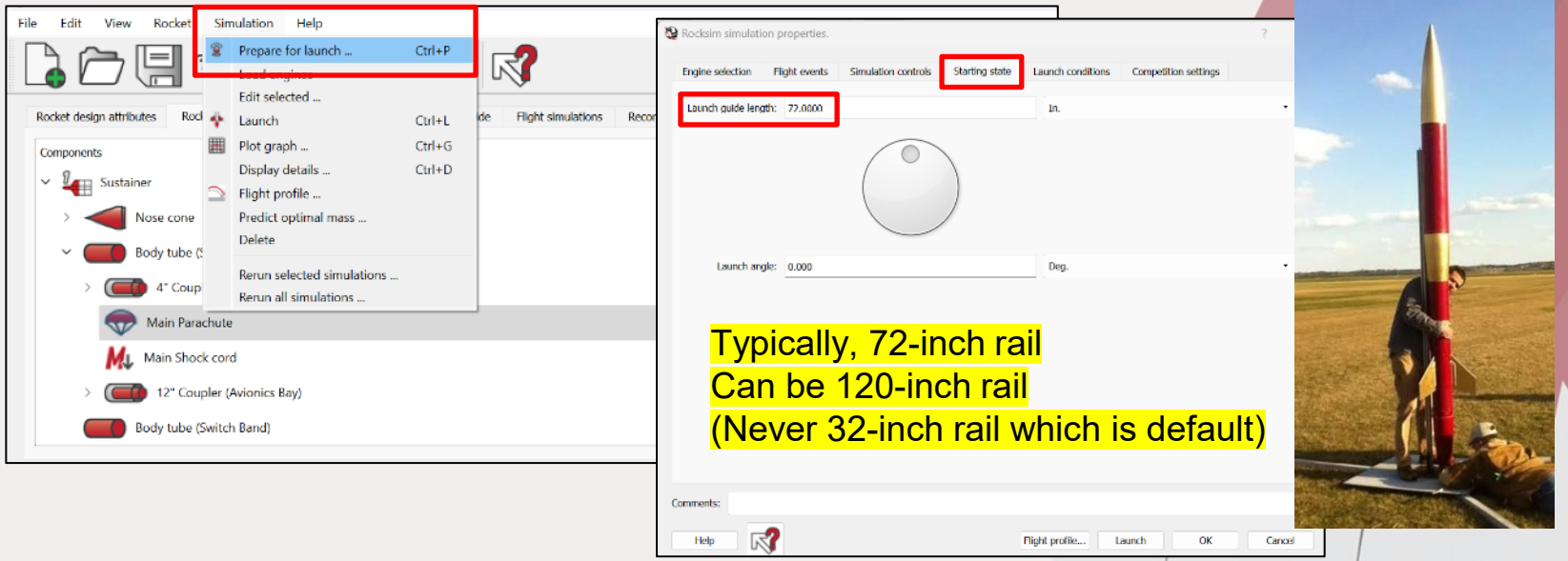
RockSim Rockets – Common Errors

- Ensure Parachutes are configured to deploy properly
  - Improperly configured, they deploy too early (false apogee) or not at all



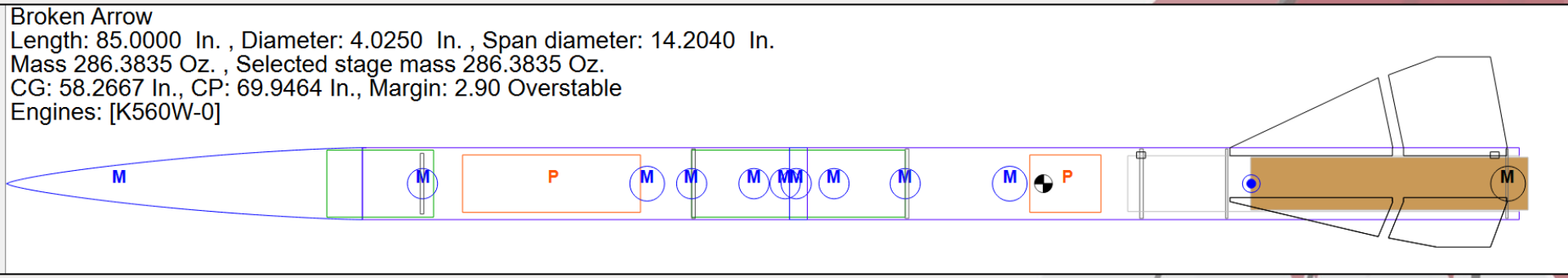
RockSim Rockets – Common Errors

- Ensure Launch Guide length is configured properly
  - If your rail exit velocity (launch guide departure) is too low, check this setting



RockSim Rockets – Common Errors

- Ensure all Mass Objects are accounted for by CDR
  - If add mass after motor selection, your apogee will change / not meet target altitude
  - Note all individual components (bolts, batteries etc.) are accounted for in simulation



Questions?