Assessing the Accuracy of a Rocket’s Trajectory Through Space

Since the goal of a rocket is to arrive at a particular destination point at a particular moment in time, understanding the trajectory the rocket will follow is an essential aspect of rocket design. Whether you are launching a satellite into space or lighting up the night sky with fireworks, an accurate trajectory is crucial in assuring the projectile is on target. Unfortunately, making sure a rocket adheres to its calculated path can be difficult, since atmospheric conditions such as wind and rain can dramatically change the rocket’s path.

The Challenge

To explore the impact of changing atmospheric conditions on the trajectory of a rocket.

The engineer uses MapleSim to:

- Create a realistic model of the rocket in MapleSim. The model is divided into separate subsystems, each of which is responsible for a particular aspect of the rocket
- Incorporate a random variable into the model to simulate the effect that environment conditions have on drag
- Perform a Monte Carlo simulation to understand the effects of changes in atmospheric conditions. The results are used to estimate the bounds of the trajectory

Creating a detailed model that takes into account specifications of the rocket as well as environmental conditions allows the engineer to investigate the design parameters and determine the effect atmospheric conditions have on the trajectory. With the results from the Monte Carlo simulation, the rocket manufacturer determines the probable bounds of the rocket’s trajectory and then uses this information to create comprehensive operating guidelines for customers.