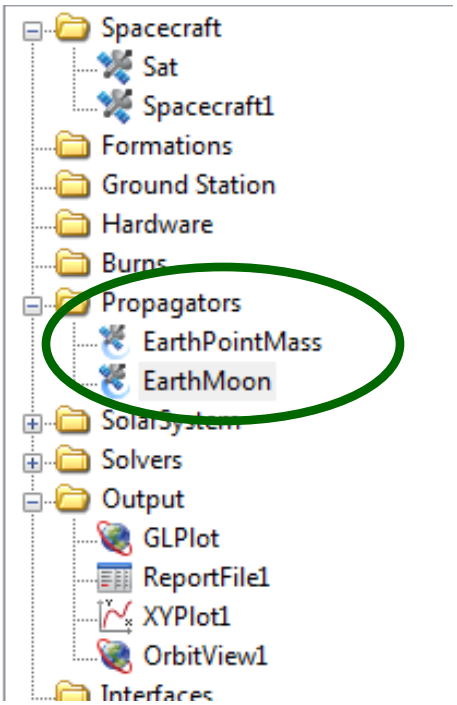
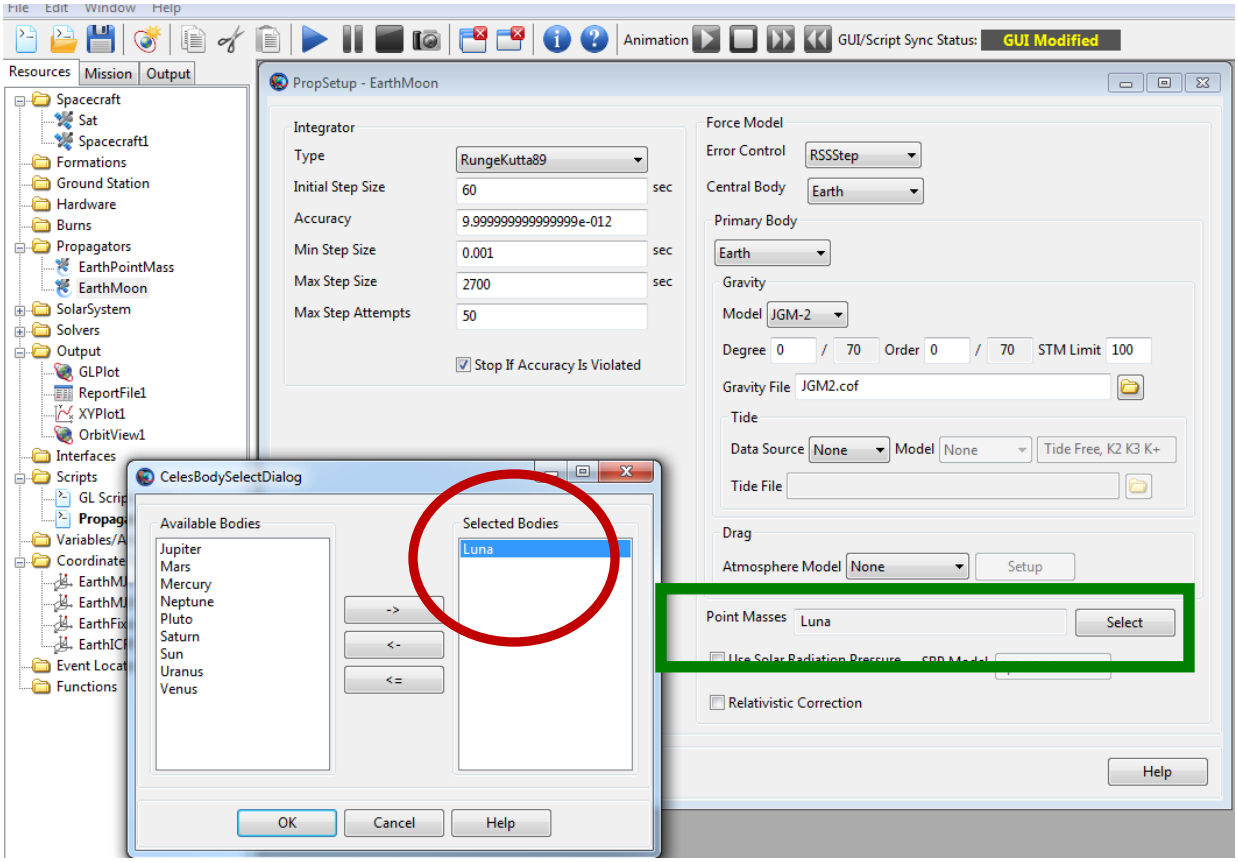
Build New Propagators in GMAT with Different Fore Models

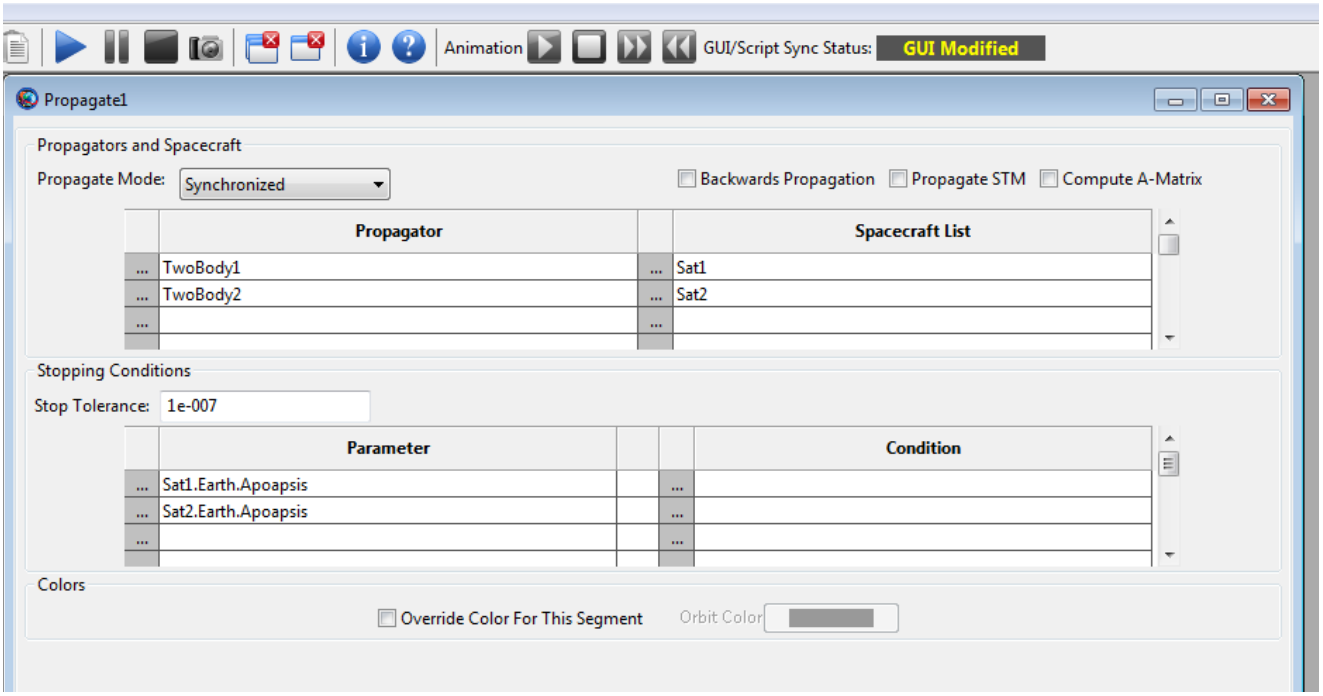
To understand the impact of a particular gravity field or force, or to use a different central body, it might be useful to build an additional propagator that adds or subtracts the force of interest. Consider an Earth orbit. To better appreciate the impact of the *n*-body model, create an additional propagator that includes the Moon and the Sun as additional gravitational influences in the problem.



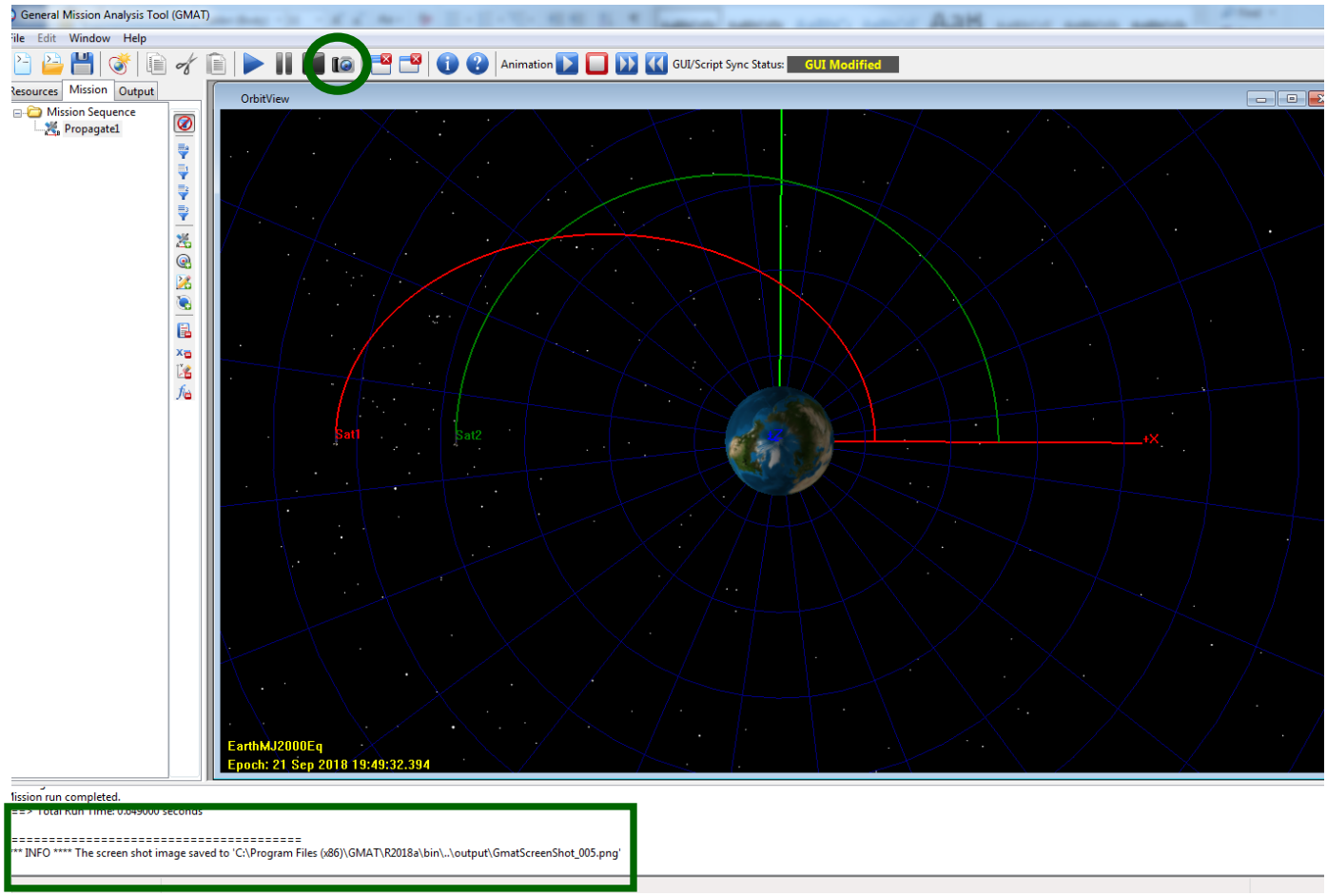
Add a propagator and label it EarthMoon. In the propagator window, simply find the menu for 'Point Masses' and select the additional point masses beyond the Central Body.



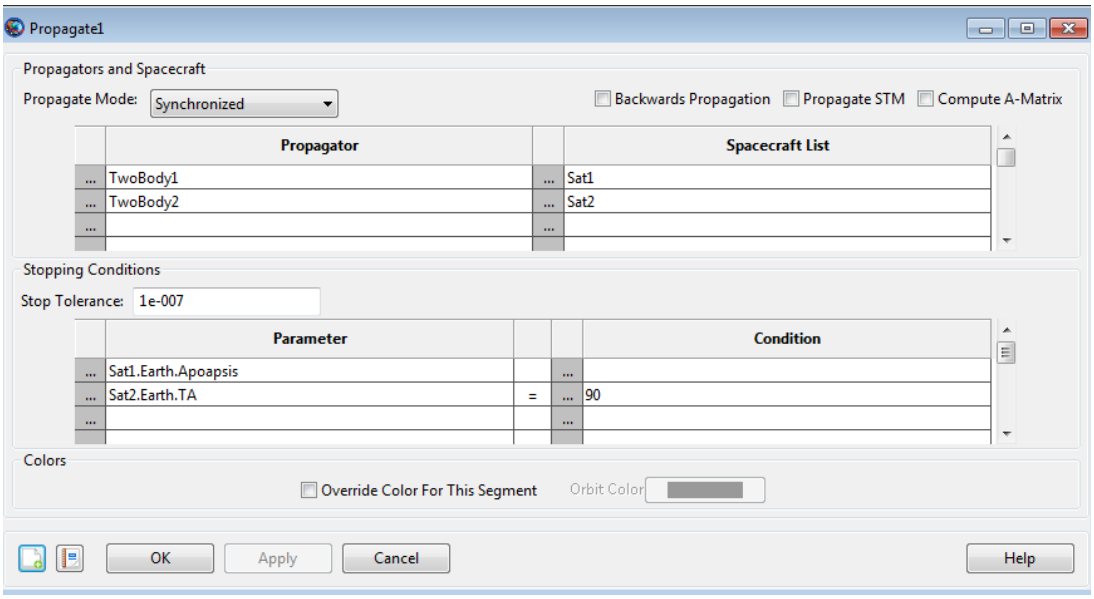
The Moon (or Luna) has been added to this propagator

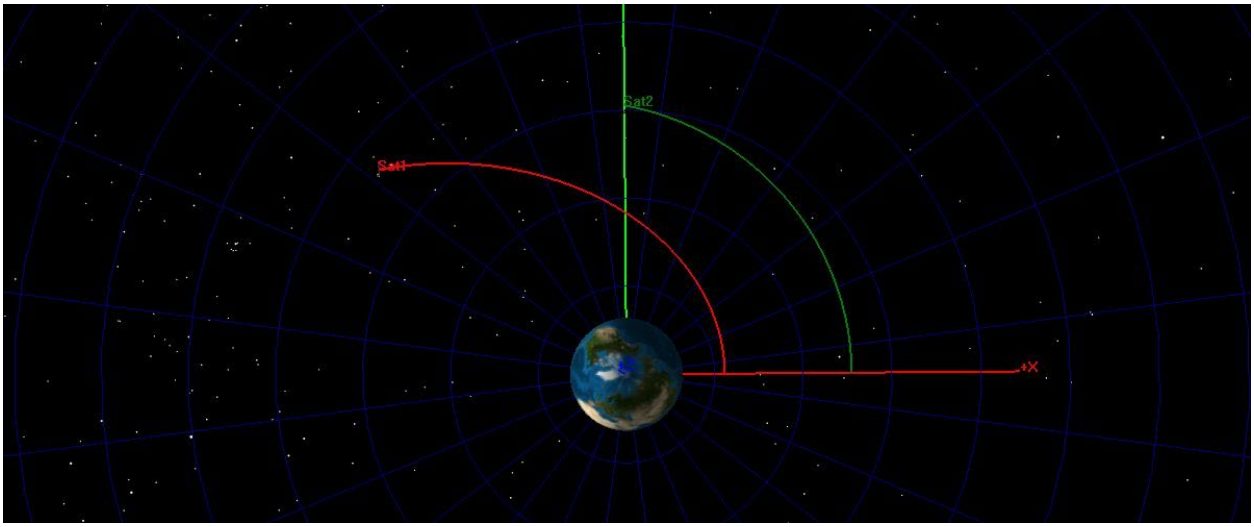


The results appears in the image. If you find it easier for GAMT to store your image, click on the camera. GMAT will store the image. It will also inform you at the bottom exactly where you can find the figure.

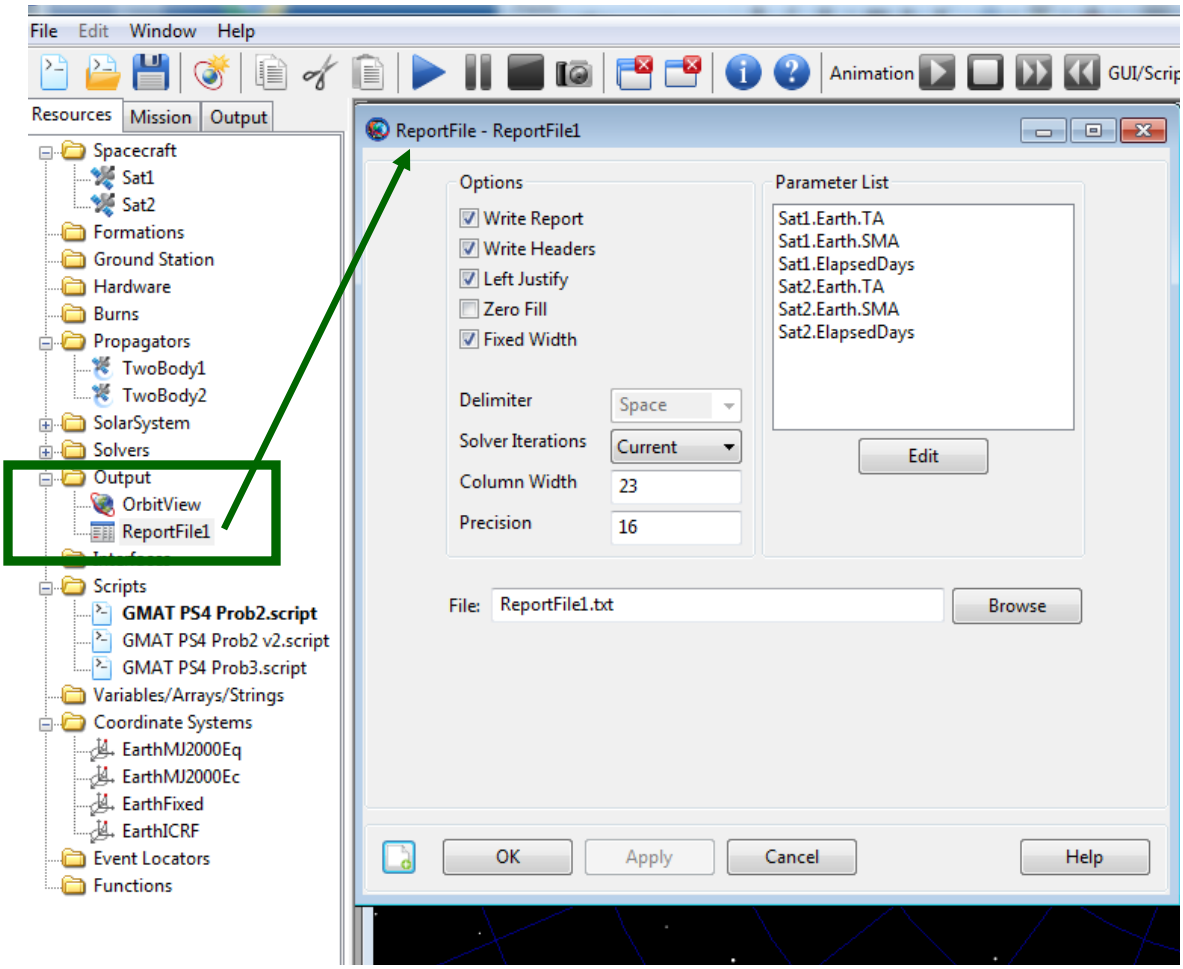


If you use a single propagator in the Mission Sequence and propagate the two spacecraft to different locations, the propagators will stop at whatever conditions occurs first. For example, in the following Mission sequence Propagate1, the two spacecraft are synchronized but two different stopping conditions are noted (which will occur at two different times). You will see the screen shot on the next page where Sat2 has reached its TA = 90 deg before Sat 1 reaches apoapsis so the propagator has stopped.

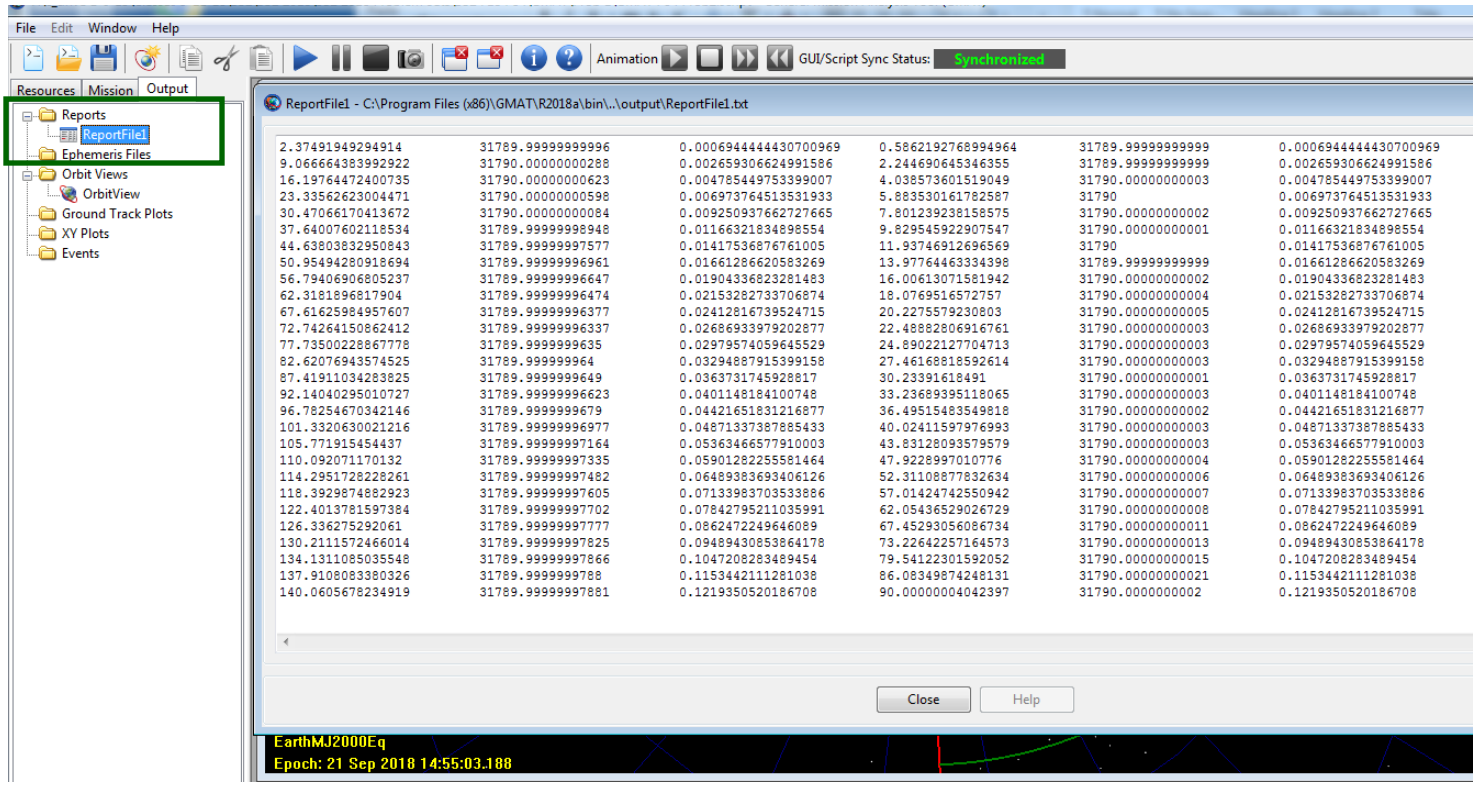




To verify, you can add a report to the output as seen n the next screenshot. Clicking the Edit button under the ‘Parameter List’, we added True Anomaly, Semi-Major Axis, and Elapsed Days for each spacecraft.



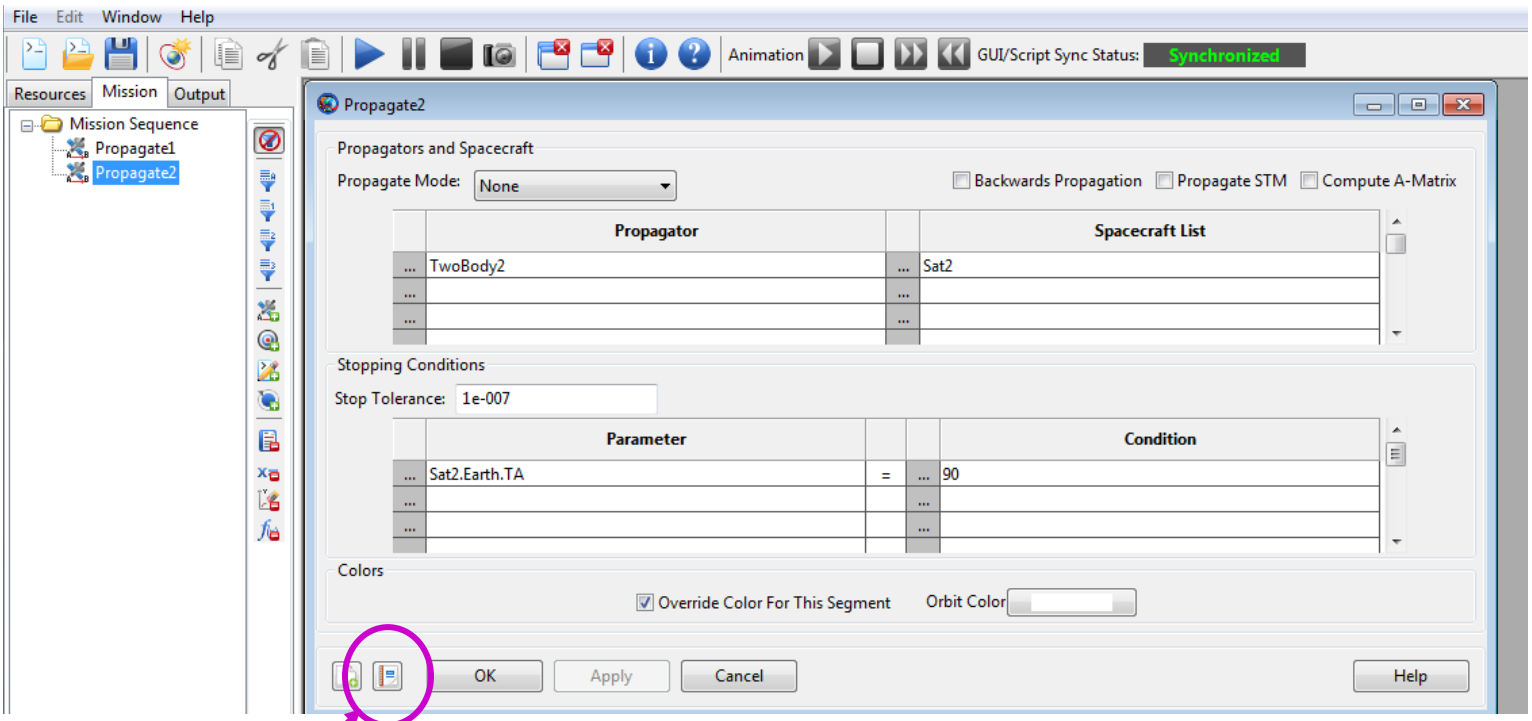
When you finish the propagation and check the Report Field under Output, you can, in fact, see the time when Sat2 arrives at TA = 90 deg; Sat 1 is located at TA = 140 deg.



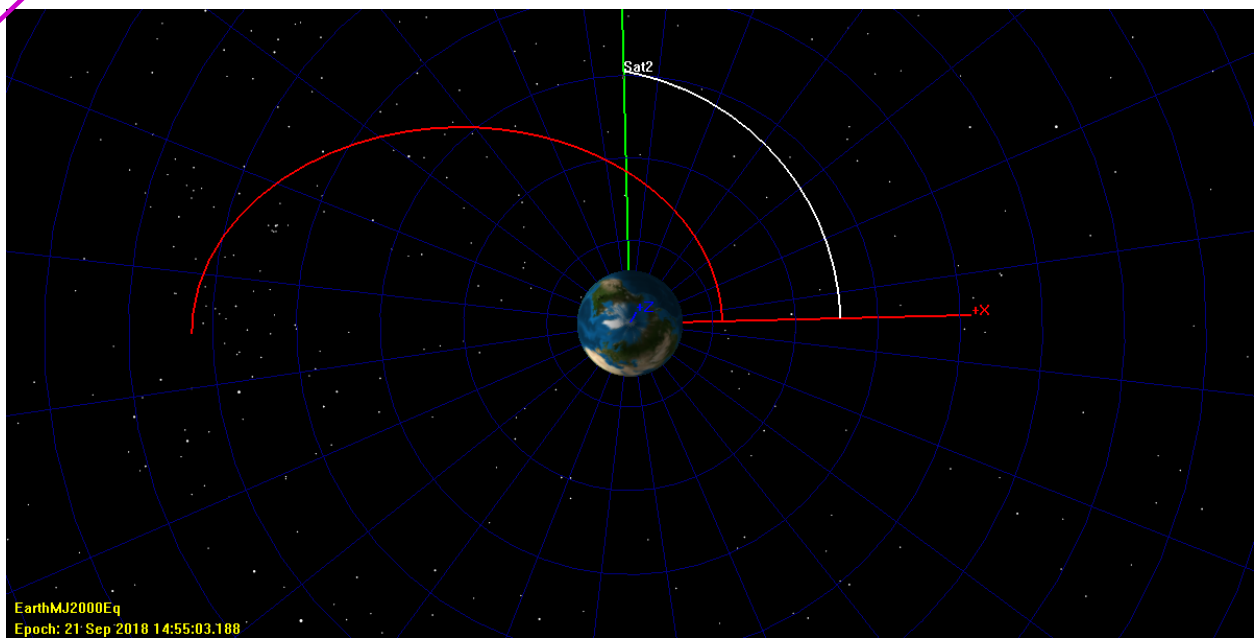
Multiple Propagators

All spacecraft propagated by the same Propagator are time synchronized during propagation. Time synchronization means that all spacecraft are propagated across the same time step. The 'synchronized' keyword tells GMAT to keep spacecraft propagated by different propagators synchronized in time during propagation. Time synchronization among multiple propagators is employs a single step for all spacecraft controlled by the first propagator (Propagate1 in the previous example), and then stepping all other propagators to that time. When the 'synchronized' keyword is omitted, spacecraft propagated by different propagators are not synchronized in time. In that case, each propagator takes steps determined by its step size control algorithm without regard to the other Propagators in the Propagate command.

However, you can also define two propagators. In the following screenshot, A second propagators is added in the Mission Sequence such that each spacecraft is listed separately in Propagate1 and Propagate2.



Then, you should see the following image. Note that the propagations will occur sequentially, not simultaneously.



Note this box in the Propagate window under the Mission Sequence. Click it and see what information is available!