

Magneto Orbit Decay Analysis Using STK's Lifetime Tool

Assumptions

- Drag coefficient $C_d = 2.2$ (suggested value by STK)
- $Cr = 1$ for total absorption of solar radiation pressure, $Cr = 1.33$ for specular reflection of SRP
- Mass ranging from 1.15 – 1.26 kg
- Area exposed to sun would be same as cross-sectional area since spacecraft will likely be tumbling and therefore constantly changing orientation with respect to sun (so assume greatest cross-sectional area exposed to sun for worst case, at any given moment)
- Solar Flux File was updated in STK using Data Update Utility (not sure if that actually updated it or changed the values, but the steps were taken)

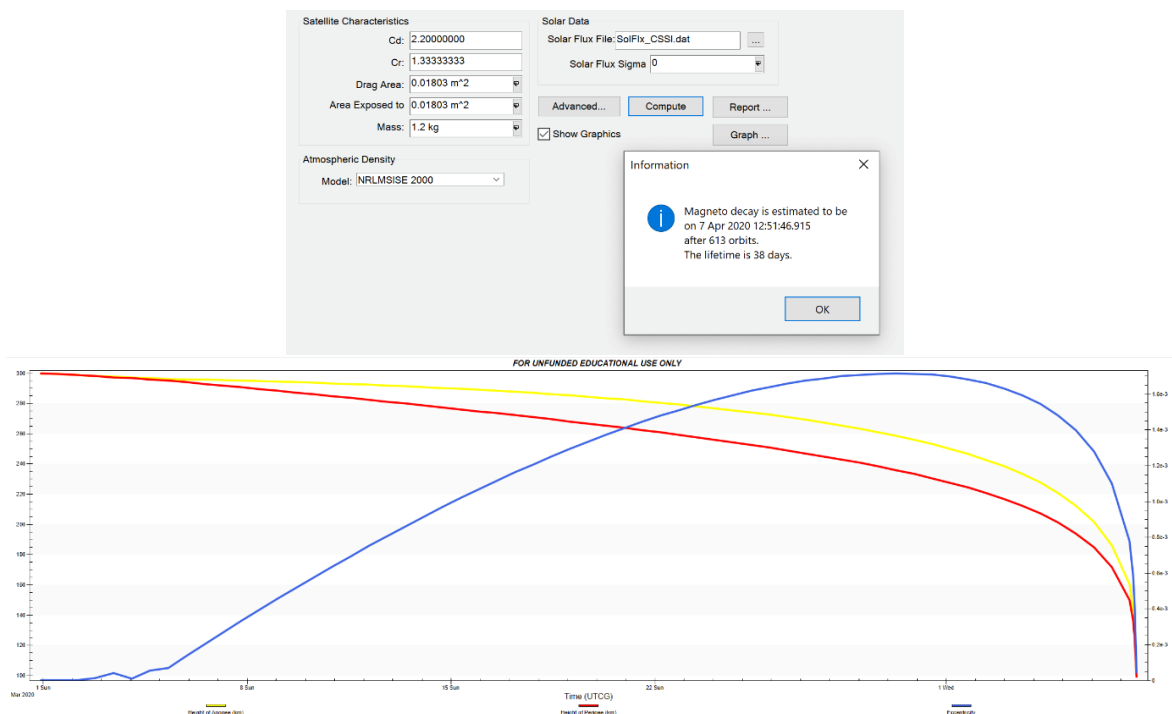
Orbit epoch and simulation start time: 29 Feb 2020 20:00:00.000

Orbit parameters:

Orbit Epoch:	29 Feb 2020 20:00:00.000 UTCG	Apoqee Altitude	300 km
Coord Epoch:	29 Feb 2020 20:00:00.000 UTCG	Periqee Altitude	300 km
Coord Type:	Classical	Inclination	97 deg
Coord System:	TrueOfDate	Argument of Perigee	0 deg
Prop Specific:	Special Options...	RAAN	343 deg
		True Anomaly	36 deg

Various Scenarios

Varying Solar Flux Sigma



Satellite Characteristics

Cd: 2.20000000

Cr: 1.33333000

Drag Area: 0.01803 m²

Area Exposed to: 0.01803 m²

Mass: 1.2 kg

Atmospheric Density

Model: NRLMSISE 2000

Solar Data

Solar Flux File: SoFix_CSGI.dat

Solar Flux Sigma: 1

Advanced...

Compute

Report ...

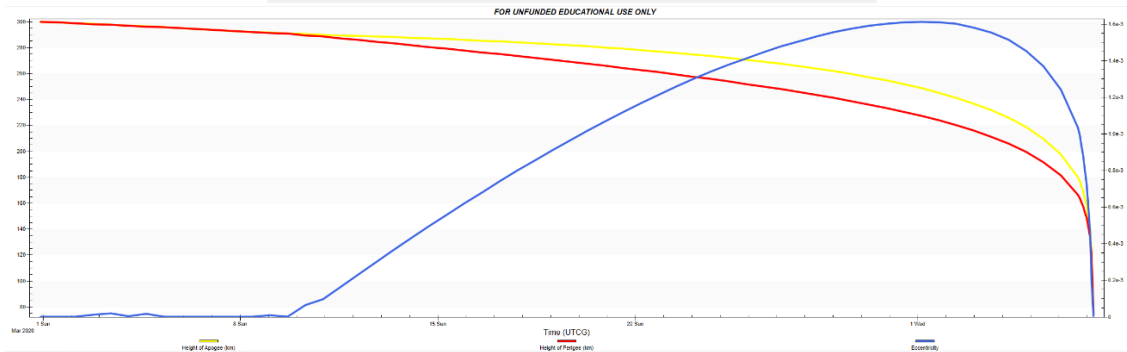
Show Graphics

Graph ...

Information

Magneto decay is estimated to be on 7 Apr 2020 02:24:10.360 after 606 orbits. The lifetime is 37 days.

OK



Satellite Characteristics

Cd: 2.20000000

Cr: 1.33333000

Drag Area: 0.01803 m²

Area Exposed to: 0.01803 m²

Mass: 1.2 kg

Atmospheric Density

Model: NRLMSISE 2000

Solar Data

Solar Flux File: SoFix_CSGI.dat

Solar Flux Sigma: 2

Advanced...

Compute

Report ...

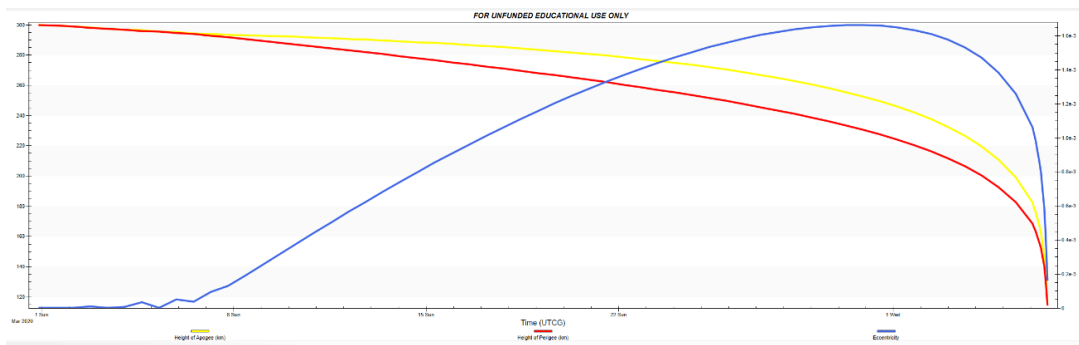
Show Graphics

Graph ...

Information

Magneto decay is estimated to be on 6 Apr 2020 14:26:50.344 after 598 orbits. The lifetime is 37 days.

OK



$Cr = 1.0$ (perfect absorptance)

Satellite Characteristics

Cd: 2.20000000

Cr: 1.00000000

Drag Area: 0.01803 m²

Area Exposed to: 0.01803 m²

Mass: 1.2 kg

Atmospheric Density

Model: NRLMISE 2000

Solar Data

Solar Flux File: SoFix_CSSI.dat

Solar Flux Sigma: 2

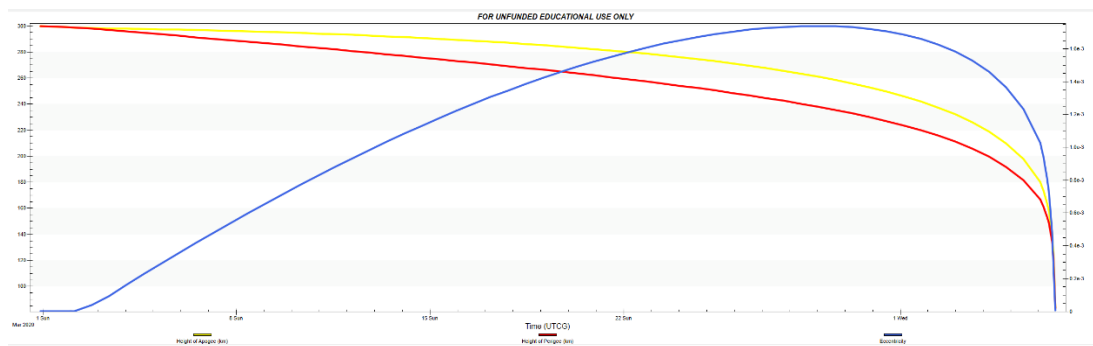
Advanced... Compute Report ...

Show Graphics Graph ...

Information

Magneto decay is estimated to be on 6 Apr 2020 14:27:13.823 after 598 orbits. The lifetime is 37 days.

OK



Varying Masses

Satellite Characteristics

Cd: 2.20000000

Cr: 1.33333333

Drag Area: 0.01803 m²

Area Exposed to: 0.01803 m²

Mass: 1.15 kg

Atmospheric Density

Model: NRLMISE 2000

Solar Data

Solar Flux File: SoFix_CSSI.dat

Solar Flux Sigma: 2

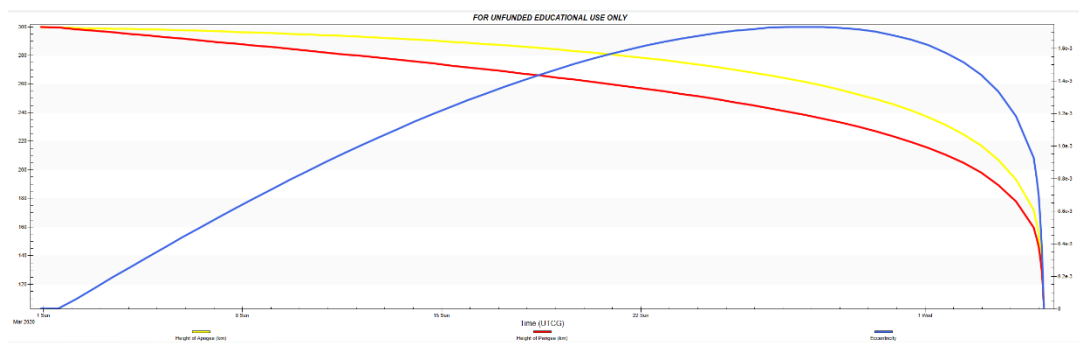
Advanced... Compute Report ...

Show Graphics Graph ...

Information

Magneto decay is estimated to be on 5 Apr 2020 04:01:25.195 after 575 orbits. The lifetime is 35 days.

OK



Satellite Characteristics

Cd: 2.20000000

Cr: 1.33333333

Drag Area: 0.01803 m²

Area Exposed to: 0.01803 m²

Mass: 1.26 kg

Atmospheric Density Model: NRLMSISE 2000

Solar Data

Solar Flux File: SolFix_CSSI.dat

Solar Flux Sigma: 2

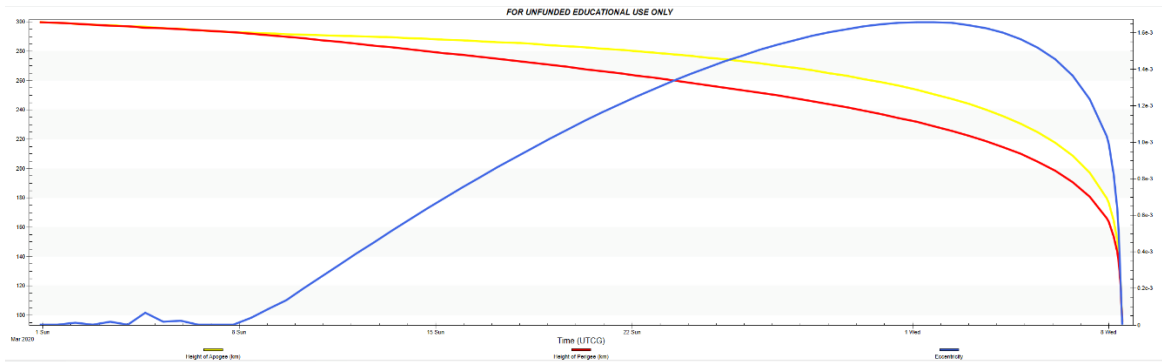
Advanced... Compute Report ...

Show Graphics Graph ...

Information

Magneto decay is estimated to be on 8 Apr 2020 11:21:41.977 after 628 orbits. The lifetime is 39 days.

OK



Varying Cross-Sectional Area & Mass

Satellite Characteristics

Cd: 2.20000000

Cr: 1.33333333

Drag Area: 0.01 m²

Area Exposed to: 0.01 m²

Mass: 1.15 kg

Atmospheric Density Model: NRLMSISE 2000

Solar Data

Solar Flux File: SolFix_CSSI.dat

Solar Flux Sigma: 2

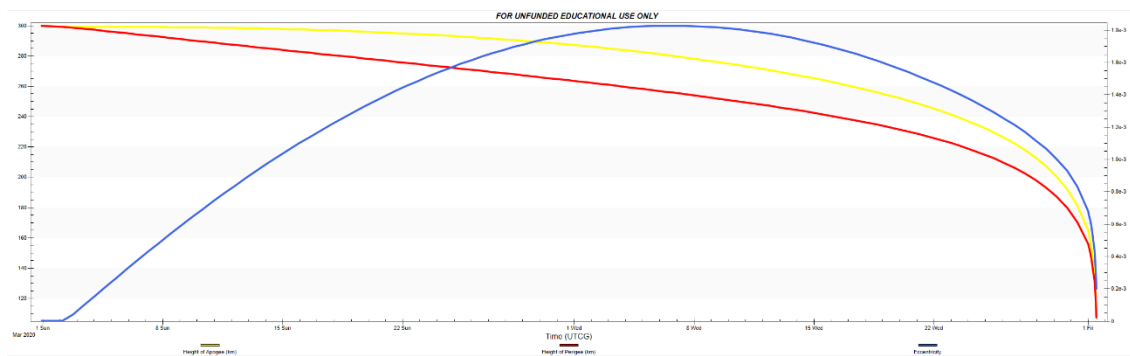
Advanced... Compute Report ...

Show Graphics Graph ...

Information

Magneto decay is estimated to be on 1 May 2020 11:21:35.396 after 997 orbits. The lifetime is 62 days.

OK



Satellite Characteristics

Cd: 2.20000000

Cr: 1.33333333

Drag Area: 0.01 m^2

Area Exposed to: 0.01 m^2

Mass: 1.2 kg

Atmospheric Density

Model: NRLMSISE 2000

Solar Data

Solar Flux File: SolFix_CSSl.dat

Solar Flux Sigma: 2

Advanced...

Compute

Report ...

☒ Show Graphics

Graph ...

Information

Magneto decay is estimated to be on 4 May 2020 08:04:43.805 after 1043 orbits. The lifetime is 65 days.

OK

