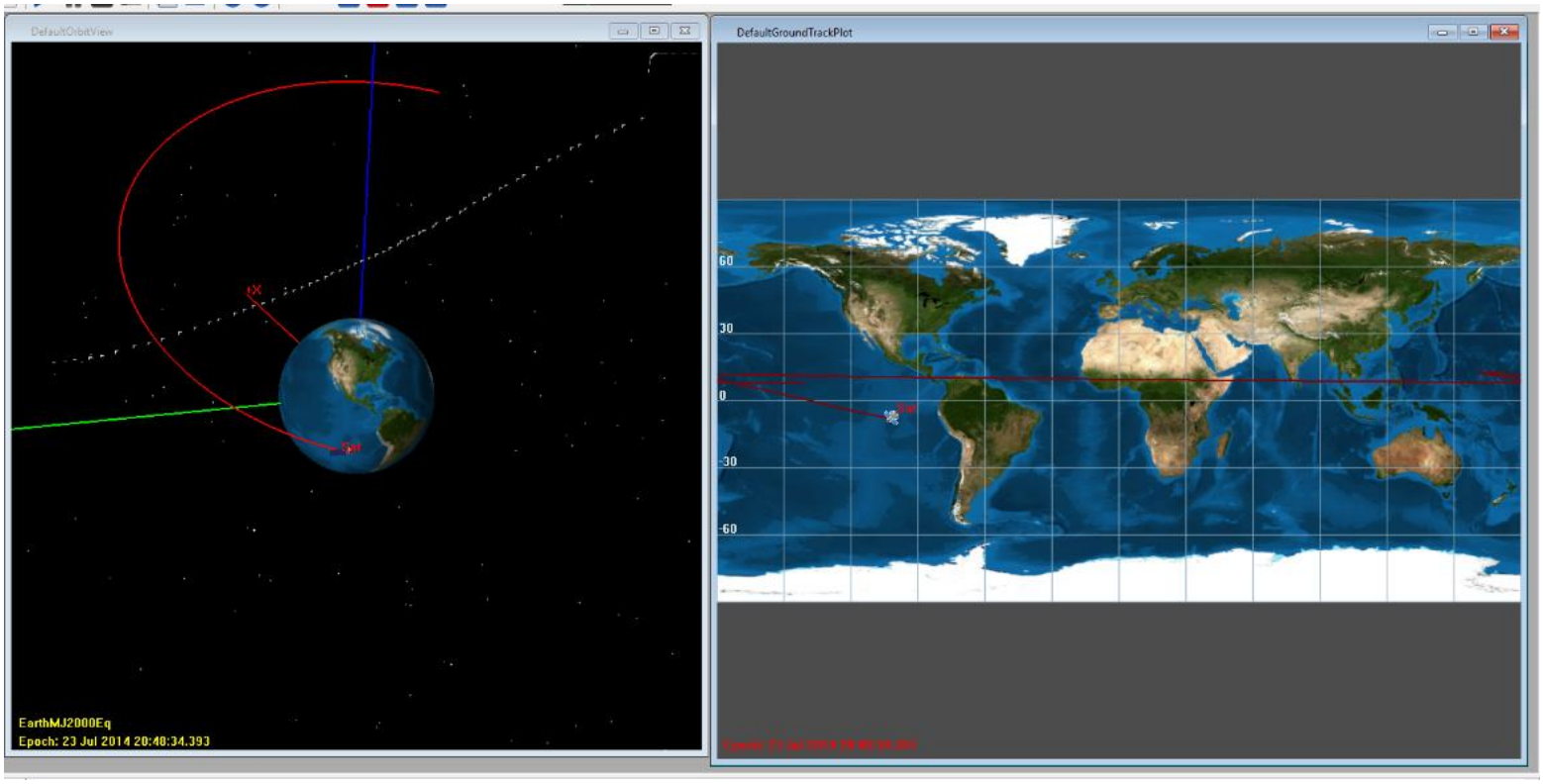
Russell Bjella
ASEN 6008 – Lab 1 Intro
1 February 2017

A. Simulating an orbit

1. (and (2)) 3D and ground track views below, periapsis is indicated by the position of "Sat" on the right-hand side of the image.



3. Command Summary:

```
******  Changes made to the mission will not be reflected ******
******  in the data displayed until the mission is rerun  ******

        Propagate Command: Propagate1
        Spacecraft       : Sat
        Coordinate System: EarthMJ2000Eq

        Time System   Gregorian                    Modified Julian
        ------------------------------------------------------------------
        UTC Epoch:    23 Jul 2014 20:48:34.393     26862.3670647284
        TAI Epoch:    23 Jul 2014 20:49:09.393     26862.3674698210
        TT  Epoch:    23 Jul 2014 20:49:41.577     26862.3678423210
        TDB Epoch:    23 Jul 2014 20:49:41.576     26862.3678423151

        Cartesian State                      Keplerian State
        --------------------------           --------------------------------
```

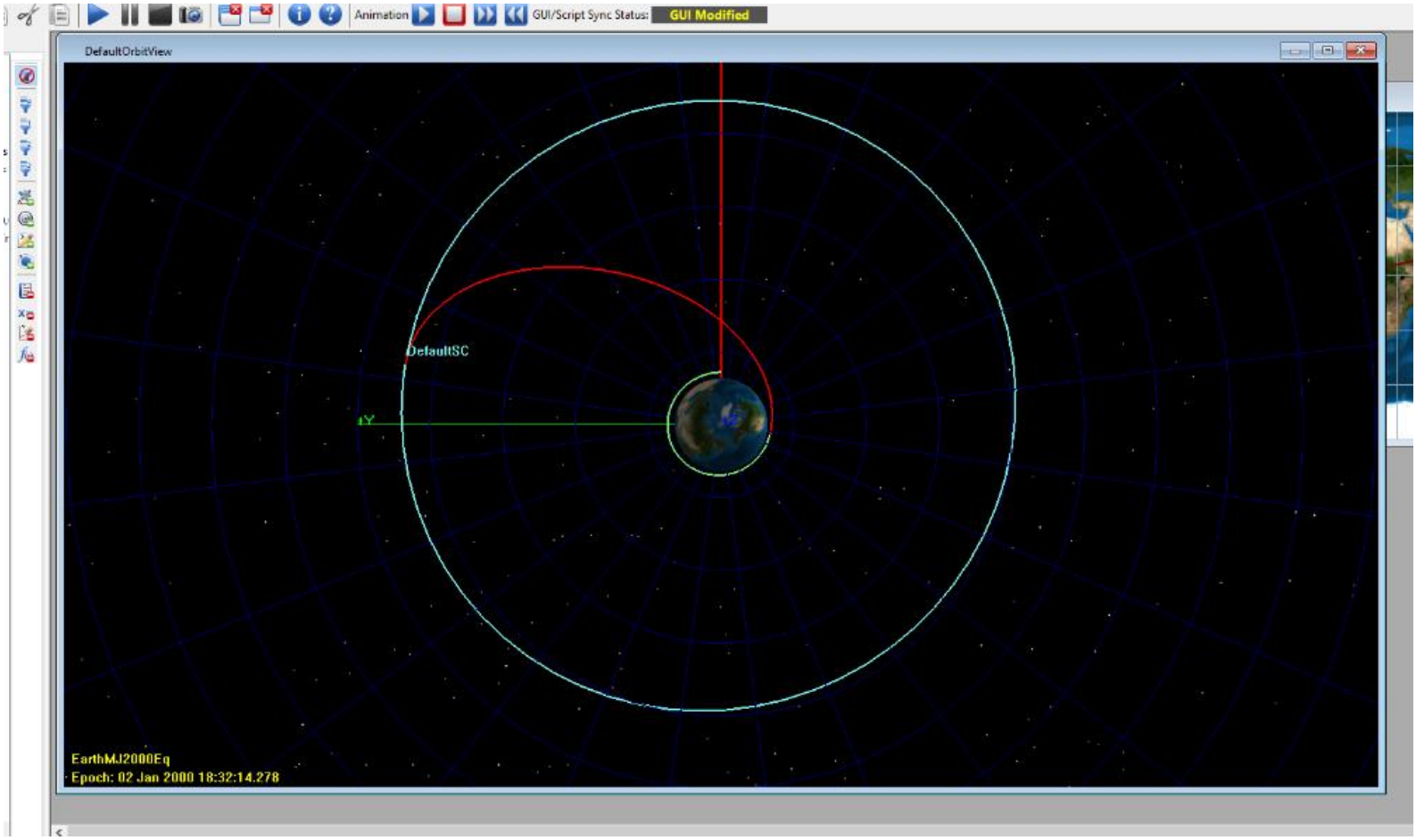
```
        X  =  -7466.6017206564 km            SMA  =   83938.555279821 km
        Y  =   4104.8939594891 km            ECC  =   0.8975373278076
        Z  =  -1170.2503328836 km            INC  =   12.430660360941 deg
        VX =  -4.2651116225787 km/sec        RAAN =   292.65758666753 deg
        VY =  -8.2039635778501 km/sec        AOP  =   219.20594194467 deg
        VZ =  -1.5642043869574 km/sec        TA   =   360.00000000000 deg
                                             MA   =   360.00000000000 deg
                                             EA   =   360.00000000000 deg

        Spherical State                      Other Orbit Data
        ---------------------------          --------------------------------
        RMAG =   8600.5686739409 km          Mean Motion        =  2.596131297e-005
deg/sec
        RA   =   151.19944062694 deg         Orbit Energy       =  -2.3743584826497
km^2/s^2
        DEC  =  -7.8203020255811 deg         C3                 =  -4.7487169652993
km^2/s^2
        VMAG =   9.3777892332854 km/s        Semilatus Rectum   =   16319.900099176
km
        AZI  =   99.692752055627 deg         Angular Momentum   =   80654.320310615
km^2/s
        VFPA =   90.000000035600 deg         Beta Angle         =   21.714871859344
deg
        RAV  =  -117.46921192606 deg         Periapsis Altitude =   2222.4323739409
km
        DECV =  -9.6017488421297 deg         VelPeriapsis       =   9.3777892332854
km/s
                                             VelApoapsis        =   0.5063791526093
km/s
                                             Orbit Period       =   242021.09174444 s

        Planetodetic Properties
        ---------------------------
        LST       =   151.38083007540 deg
        MHA       =   253.65146344970 deg
        Latitude  =  -7.9323313269337 deg
        Longitude =  -102.27063337430 deg
        Altitude  =   2222.8369807829 km


        Spacecraft Properties
        ------------------------------
        Cd                     =   2.200000
        Drag area              =   15.00000 m^2
        Cr                     =   1.800000
        Reflective (SRP) area  =   1.000000 m^2
        Dry mass               =   850.00000000000 kg
        Total mass             =   850.00000000000 kg
```

4. It can be verified that the satellite is at periapsis at the stop condition by checking the true anomaly under “Keplerian State” in the command summary. The value above is 360 degrees, so the satellite is at periapsis at the end of the simulation.

B. Simple Orbit Transfer

1. The targeter took 7 iterations to converge.
2. TOI: 2.2402692107499 km/s
   GOI: 1.4406428582523 km/s

3. Transfer start time: 01 Jan 2000 13:12:30.729 UTC
   Transfer stop time: 01 Jan 2000 18:32:14.278
   Transfer duration: 319.725 minutes



4. Initial, transfer, and final orbit.

C. Finding eclipses and station contacts

1. Three eclipses were found.
2. Eclipse report

Spacecraft: DefaultSC

Start Time (UTC)	Stop Time (UTC)	Duration (s)	Occ Body	Type	Event Number	Total Duration (s)
01 Jan 2000 12:10:05.136	01 Jan 2000 12:10:15.516	10.379568336	Earth	Penumbra	1	2105.5343751
01 Jan 2000 12:10:15.516	01 Jan 2000 12:45:00.414	2084.8983078	Earth	Umbra	1	2105.5343751
01 Jan 2000 12:45:00.414	01 Jan 2000 12:45:10.670	10.256498947	Earth	Penumbra	1	2105.5343751

Number of individual events : 3

Number of total events : 1
Maximum duration (s) : 2105.5343751
Maximum duration at the 1st eclipse.

3. Two contacts were located for Hyderabad
4. Contact report

Target: DefaultSC

Observer: Hyderabad

Start Time (UTC)	Stop Time (UTC)	Duration (s)
01 Jan 2000 11:59:28.000	01 Jan 2000 12:05:58.248	390.24814353
01 Jan 2000 13:34:20.816	02 Jan 2000 18:32:14.157	104273.34070

Number of events : 2