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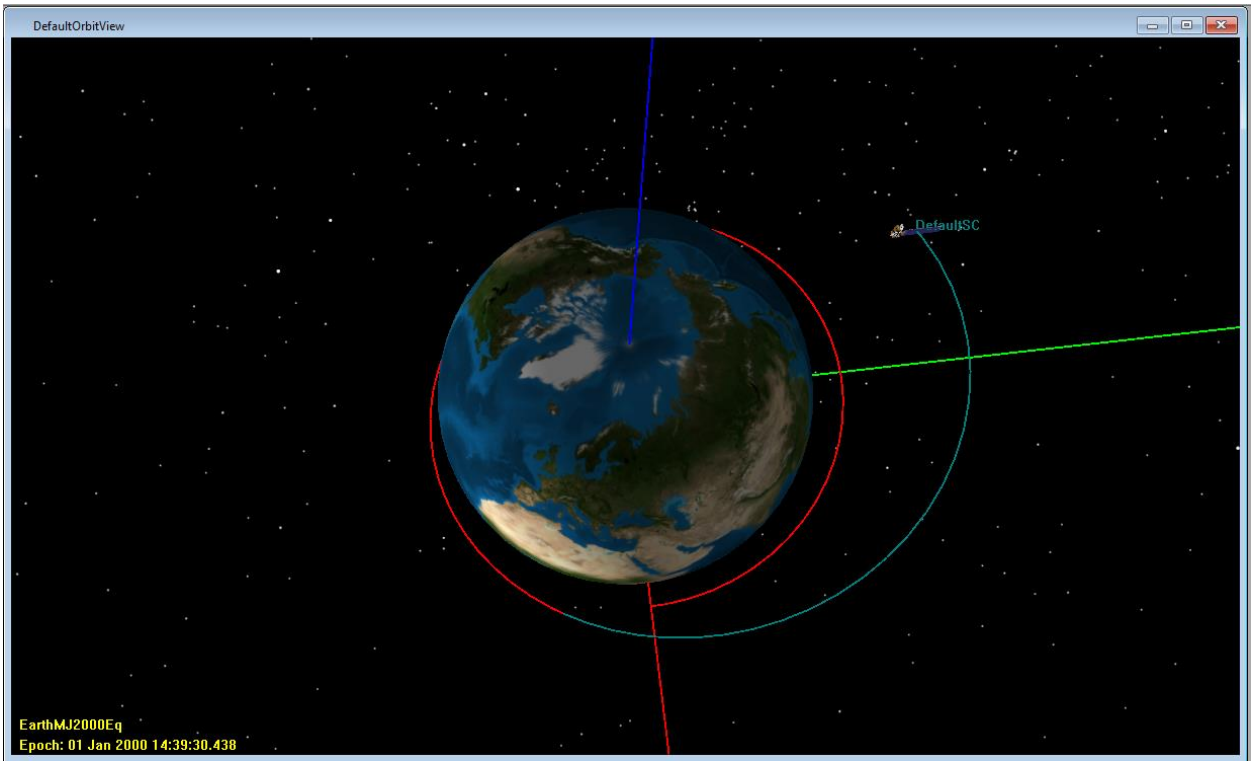
ASEN 6008
Lab 2 – Intro Part 2
2/8/2017

Target Finite Burn to Raise Apogee

1. Screen capture of simulated orbit



2. Command Summary

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

        Propagate Command: Prop BurnDuration
        Spacecraft       : DefaultSC
        Coordinate System: EarthMJ2000Eq

        Time System   Gregorian                    Modified Julian
        ------------------------------------------------------------------
        UTC Epoch:    01 Jan 2000 13:32:43.922     21545.0643972480
        TAI Epoch:    01 Jan 2000 13:33:15.922     21545.0647676184
        TT  Epoch:    01 Jan 2000 13:33:48.106     21545.0651401184
        TDB Epoch:    01 Jan 2000 13:33:48.106     21545.0651401175

        Cartesian State                      Keplerian State
        -------------------------            -------------------------------
        X  =   6765.4740003992 km            SMA  =   9582.2027904178 km
        Y  =  -3226.2851425451 km            ECC  =   0.2544968636324
        Z  =   811.36637400990 km            INC  =   12.858041327042 deg
        VX =   4.2174973212297 km/sec        RAAN =   306.19509708325 deg
        VY =   6.6013719522497 km/sec        AOP  =   346.76780471375 deg
        VZ =   1.6667355846354 km/sec        TA   =   42.153515224846 deg
                                             MA   =   25.131809702841 deg
                                             EA   =   33.093451885464 deg
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        Spherical State                         Other Orbit Data
        -------------------------               --------------------------------
        RMAG =   7539.1557659966 km             Mean Motion        =
   6.730864552e-004 deg/sec
        RA   =  -25.495305420499 deg            Orbit Energy       =  -
   20.798998425425 km^2/s^2
        DEC  =   6.1781556710573 deg            C3                 =  -
   41.597996850849 km^2/s^2
        VMAG =   8.0089576609955 km/s           Semilatus Rectum   =
   8961.5764171723 km
        AZI  =   78.701502515314 deg            Angular Momentum   =
   59766.950034453 km^2/s
        VFPA =   81.823250646688 deg            Beta Angle         =  -
   17.178837499115 deg
        RAV  =   57.426225591113 deg            Periapsis Altitude =
   765.42593356647 km
        DECV =   12.011553510837 deg            VelPeriapsis       =
   8.3665471203734 km/s
                                                VelApoapsis        =
   4.9719431746884 km/s
                                                Orbit Period       =
   9334.8859698851 s

        Planetodetic Properties
        ---------------------------
        LST       =   334.50491426315 deg
        MHA       =   303.70858391173 deg
        Latitude  =   6.2124107997115 deg
        Longitude =   30.796330351418 deg
        Altitude  =   1161.2680670690 km

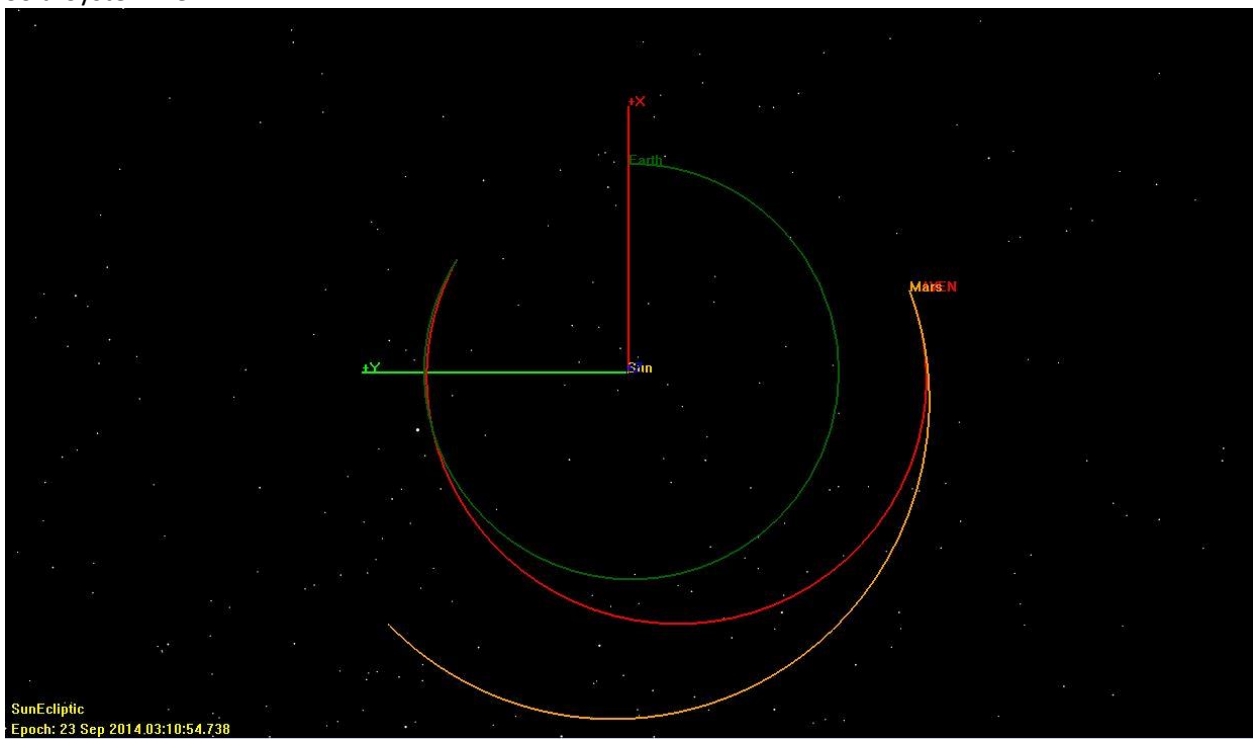

        Spacecraft Properties
        ------------------------------
        Cd                     =   2.200000
        Drag area              =   15.00000 m^2
        Cr                     =   1.800000
        Reflective (SRP) area =   1.000000 m^2
        Dry mass               =   850.00000000000 kg
        Total mass             =   1193.7699073421 kg

        Tank masses:
           ChemicalTank1:         343.76990734215 kg
```

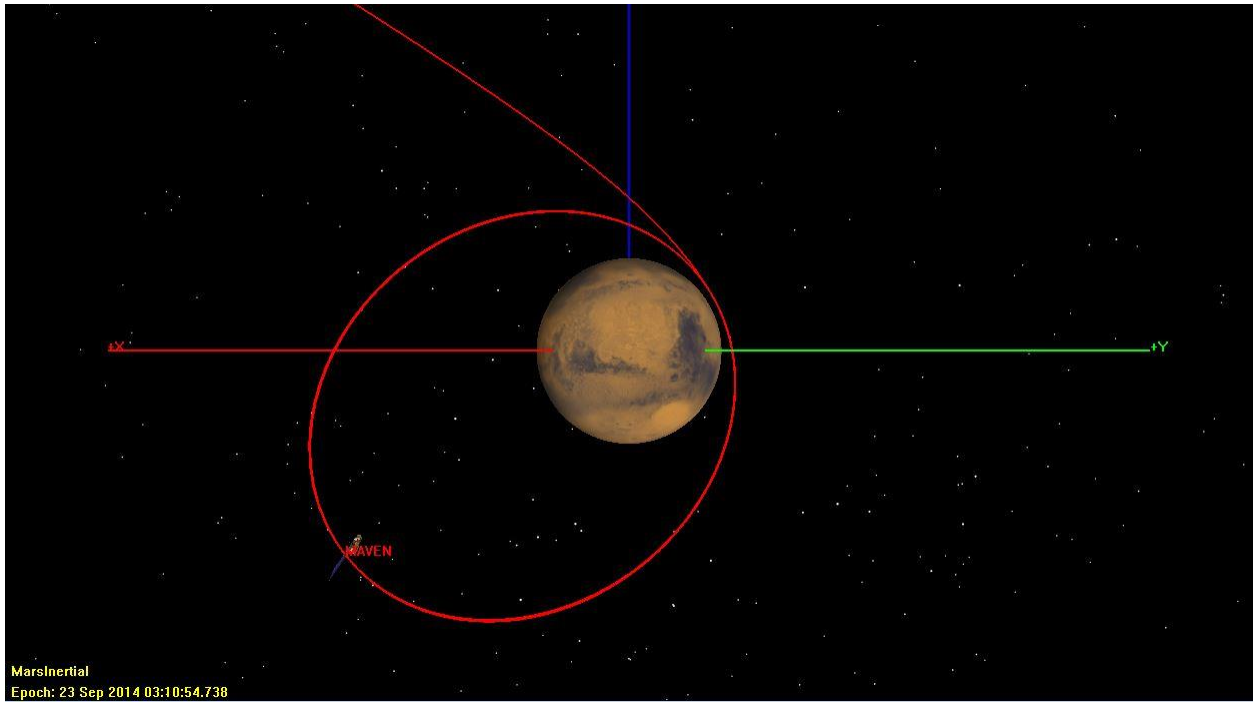
3. The DC1 required 13 iterations.
4. The final burn duration was 1213.19 seconds.
5. The DV of the finite burn was 885.84 m/s (0.88584 km/s). The theoretical DV for an impulsive burn at periapsis is 0.83589 km/s. If a finite burn was executed to this theoretical DV, the final apogee would be lower than the desired 12000 km due to cosine losses. This is why the value computed by GMAT is higher than the theoretical value.
6. Based on the initial and final propellant masses, the burn required 412.2301 kg of fuel.

Mars B-plane Targeting

1. The TCM delta-V is 0.0072436383880 km/s.
2. The MOI delta-V is 1.6034398477259 km/s and used 1076.0639629571 kg of propellant.
3. SolarSystemView



4. MarsView



5. Setting the Achieve goal to MAVEN.Mars.OrbitPeriod with a value of 180,000 seconds, the delta-V for MOI is 1.1282118468898 km/s. The semimajor axis is 32757.097856083 km.

6. The radius at apoapsis is 61563.468275708 km.