Simulation for LEO CubeSat using MatLAB Programming

* The first phase of the program defines variables and sets up simple equations describing the following:
  + Initial Orbital Velocity of the Satellite
  + Energy of the Satellite (sum of the kinetic energy and gravitational energy)
  + Period of the Satellite
  + Mass of Particles hitting the satellite per second
  + Satellite Distance
* The following assumptions are made to solve the previous equations:
  + Change in time ~ 0.001s; This number is equivalent to one millisecond and is a reasonable change in time to use for an impulse equation.
  + The density of particles found at 250 km is ~5.94 \* 10-8
  + The number of particles found at 250 km is ~1.7 \* 1015
  + Sampling rate of 100
* In Phase II of the Program the interactive interface asks the user what type of nose cone is being used on the LEO Satellite.
  + If selection “1” is made the user is working without a nose cone. The angle alpha, set angle between the nose cone and the x-axis, is 90 degrees.
  + If selection “2” is made the user is working with a double wedge nose cone. The angle alpha is 30 degrees.
  + If selection “3” is made the user is working with a half cylinder. The angle alpha is 0 degrees and will be revisited later.
* The third phases moves forward in calculating the orbit life of the previously selected satellite nose cone.
  + For each condition above the program randomly generates a number from normal distribution that represents beta, the angle between the incoming particle and the x-axis.
  + From the angle beta and a randomly generated particle velocity of 1150 (found by BCC group), the x and y components of the particle velocity are found.
  + Theta is found as the sum of angle alpha and beta.
  + The angle Phi is equal to 2PI minus theta.
  + The rotational matrix of Phi is found.
  + The product of the rotational matrix of Phi and the initial velocity of the particle equals the final velocity of the particle.
  + Using the conservation of momentum and the impulse equation the force from impulse on the particle is found. That same force is then used to find the change in velocity of the satellite.
  + The final velocity of the satellite is found as the initial satellite velocity minus the change in velocity.
  + The total force is found as the initial force plus the force from this collision.
  + These calculations occur in a while loop for values where *i* (time value) is less than the period of the satellite divided by the sampling rate.
  + As the calculations progress the collisions increase and the total force increases. The value of *i* eventually reaches some value where the time is equal to the period divided by the sampling ratio. At this point the total force and change in velocity are known for the set distance.
* Once the while loop is exhausted and *i* is equal to the period of the satellite divided by the sampling rate the lifespan of the satellite is calculated. The second while loop calculates how many iterations of the first loop (increasing force) it will take to make the satellite re-enter the Earth’s orbit (Radial distance is greater than re-entry of 100 km)
  + After every interval the decreasing energy, radius and velocity of the satellite are recalculated.
  + The time is accumulating while the previous values are decreasing.
  + Eventually the Radius will be less than 100 km and the CubeSat will re-enter the Earth’s orbit. At this point the loop will stop and the resulting time will be the lifespan of the satellite in seconds.