Space exploration subsystem

Task-1 Submission Date: 16th January

Ben Tennyson and his partner Rook Blonko, are trapped on a planet in the null void whose population needs to be rescued and brought to a safe location. To accomplish this, Ben transforms into Juryrigg (a goblin-like alien that has a craving for building or destroying complex machinery) and builds a rocket large enough to evacuate the population of that planet. The rocket uses corrodium as the fuel since the planet appears to have rich deposits of it.

Mass of the rocket’s payload = 750,000 kg

Mass of corrodium available = 2,150,000 kg

Gravity on the planet = 9.81 m/s^2 (independent of height)

Drag coefficient in null void atmosphere = 0.6 Ns/m

Initial velocity of the rocket = 20m/s

Your task is to go through the given MATLAB code and fill the blank spaces in with appropriate expressions. The completed code will be able to tell you the range of the rocket for different initial angles including the maximum range considering thrust, drag, gravity and decreasing mass of the rocket. It will also show you the actual trajectory (x-y) of the rocket for various angles.

Using the completed code, answer the following questions

1. If the rocket uses standard propulsion engines (exit velocity of gas = 7,800m/s) and the mass flow rate is 1500kg/s, what would be the maximum range this rocket can attain and at what angle?
2. For the same standard propulsion engines, what should be the minimum mass flow rate for the rocket to escape the planet’s gravity when launched at 69 degrees?
3. If Ben were to use plasma thrusters instead (exit velocity of gas = 13,700m/s), how would the answer to the previous question be different?
4. Comment on how adding more or less fuel changes the performance of the rocket.