

# System Analysis of the Kuwait Suborbital Rocket ( KSR )

## Liquid Rocket Propellant Engine

This document states the specifications of the 10KM KSR Rocket Engine. The analysis was done through MATLAB by Eng. Sulieman AlFuhaid.

### KSR 10 KM ROCKET:

- **Drag Coefficient:** 0.7
- **Cross Sectional Area (m<sup>2</sup>):** 0.007854
- **Thrust (N):** 735.3395
- **Nozzle Exit Velocity (m/s):** 2579.2991
- **Burn Time (s):** 19.27
- **Time to Apogee (s):** 44.1313
- **Oxidizer Mass Flow Rate (kg/s):** 0.21838
- **Fuel Mass Flow Rate (kg/s):** 0.066712
- **Total Mass (kg):** 10.0128
- **Payload Mass (kg):** 0.85655
- **Propellant Mass (kg):** 5.4937
- **Rocket Length (m):** 1
- **Rocket Diameter (m):** 0.1
- **Nozzle Throat Radius (m):** 0.005
- **Chamber Pressure (kpa):** 6000
- **Actual Altitude (m):** 11944.7605
- **Drag Free Altitude (m):** 192246.2901

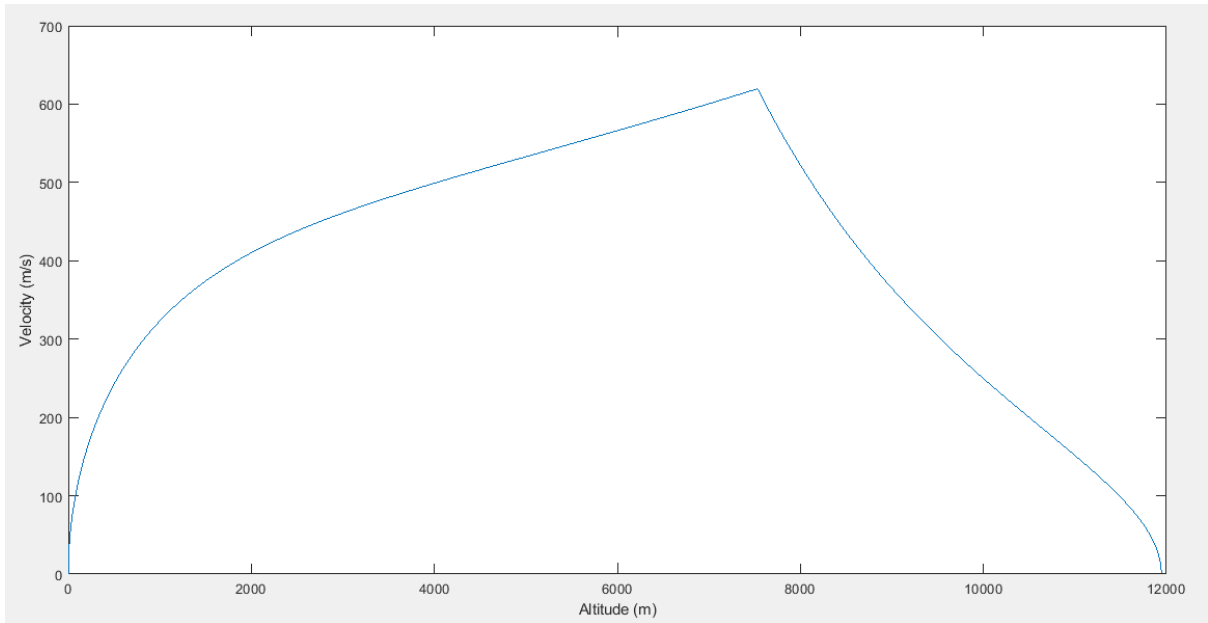


Figure 1: Velocity vs Altitude

This graph shows the velocity of the KSR 10KM Rocket, at various altitudes starting from sea level 0KM and reaching max velocity 600 m/s at approximately 7.9KM, with max height and 0 m/s at 120KM.

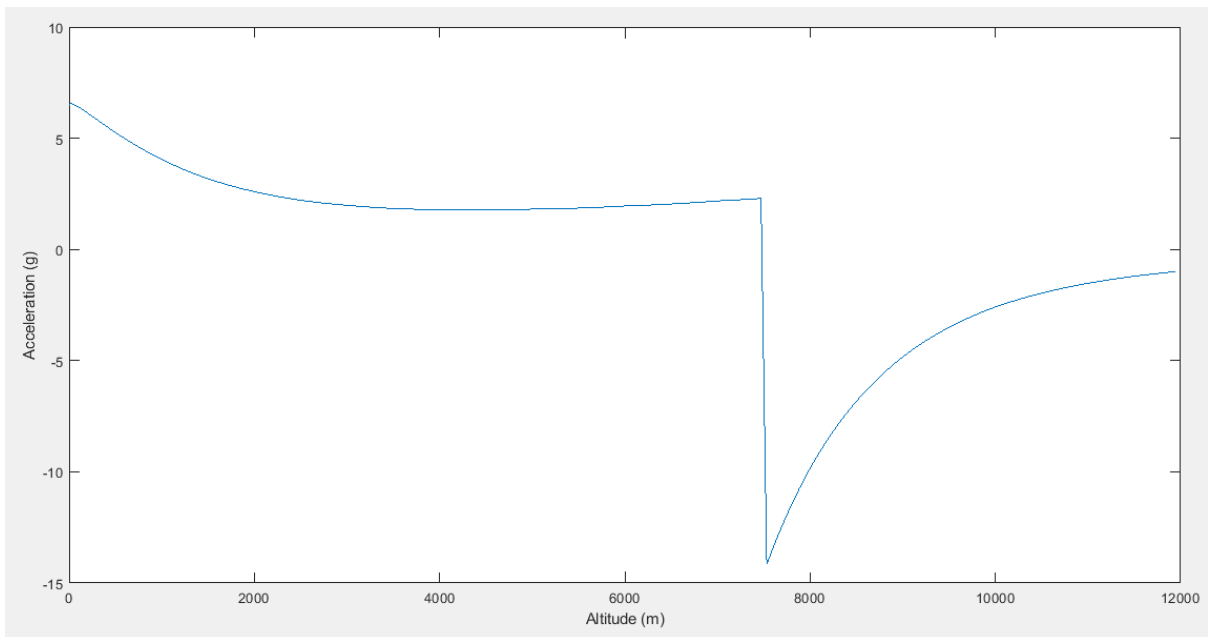


Figure 2: Acceleration vs Altitude

This graph shows the acceleration of the KSR 10KM Rocket, at various altitudes starting at 7g's at launch off and reaching approximately -2g's at apogee.

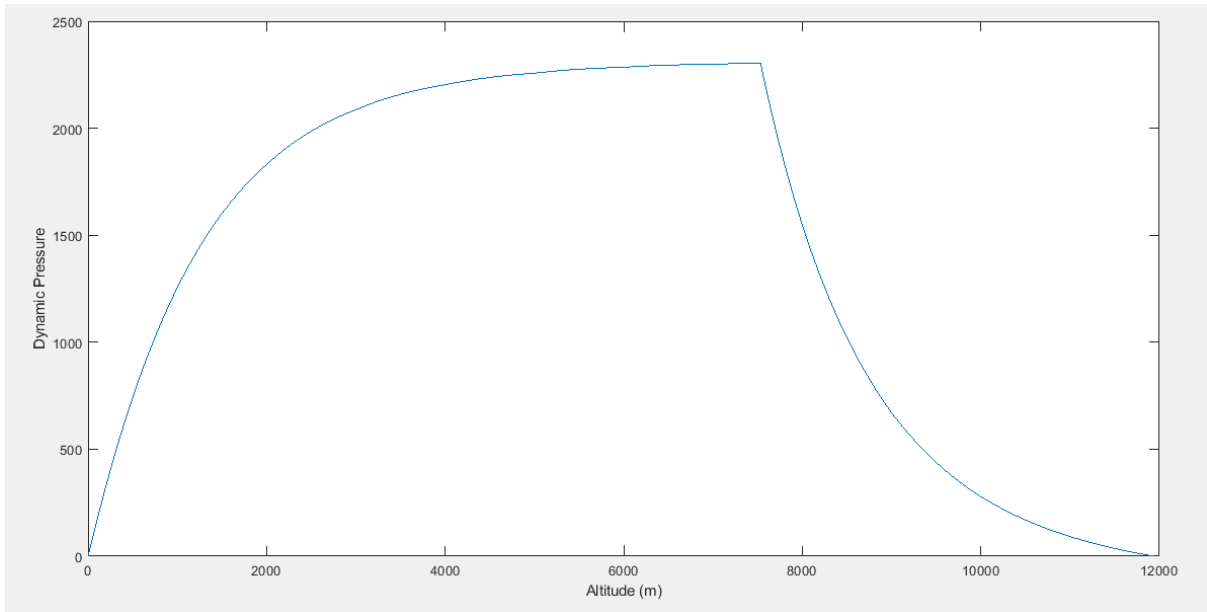


Figure 2: Dynamic Pressure vs Altitude

This graph shows the dynamic pressure of the KSR 10KM Rocket, at various altitudes starting at atmospheric pressure approximately 15 psi and reaching a maximum of 2250 psi at max velocity.

### Summary:

At launch off the values of velocity and dynamic pressure increase until the rocket reaches an altitude of approximately 7.9KM. At this point, the engine shuts off and the values start to decrease reaching a minimum at apogee 120KM.