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VARIATION OF A ROCKET'S ENGINE THRUST RELATIVE TO EXTERNAL PRESSURE

Abstract

In order to have rockets reach the maximum altitude possible it is very helpful to launch from a higher altitude. One way to accomplish this is to launch from a hovering platform which is elevated via a helium balloon (also known as rockoon). Although it is important to bear in mind that this creates an inconvenience; launching from such a high altitude implies low pressure and temperature at the time of ignition, this can greatly affect the engines performance. Therefore, the objective is to analyse the effects of the characteristic pressure and temperature from different altitudes on the rocket engines. Moreover, the thrust functions will be traced in the different conditions mentioned and compared to find the optimal altitude from which to launch the rocket. The experiment will take place in a vacuum chamber, using a pneumatic pump and valve it will be possible to sustain a specific pressure. Furthermore, if the vacuum chamber is set in a refrigerator or surrounded by ice it will also allow us to have control over the temperature. There are pressure and temperature sensors inside of the chamber to get reliable data from the experiment. The engine is set into the chamber and its thrust is measured, allowing to trace a function over time. We believe that the pressure will improve the merit figure of the rocket; although the decreased temperature may result in a worse combustion and a decrease of the merit figure which may even be greater than the gain due to the lower pressure. Finding the optimal altitude of a rockoon will be very helpful, since it will increase the time the rocket spends in microgravity (allowing for longer experiments) and increase the amount of data that will be measured while the rocket is in the air.