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## STUDYING THE EFFECT OF REUSABILITY ON THE PERFORMANCE OF AN LPE

### Abstract

In recent years, the New-Space era has motivated the space-industry-based companies to find a way to somehow cut the cost of launching payload to space. One of the frequent ways is reusability. The objective of this research is to establish a platform for performance analysis of liquid propellant engines (LPE) and to find a way to quantitatively evaluate how reusability will affect the performance of engine. For this purpose, the governing equations for engine major components are derived and as a case study, the space shuttle main engine, as one of the world's most complicated reusable engines, has been selected. A total of over 35 elements has been taken into account and using more than 100 linear/non-linear mathematic equations, engine's steady state model has been established in MATLAB SIMULINK software. The platform is then used for sensitivity analysis of engine, regarding four key parameters that are most important for the reusability of LPE. In this case, two similar engines are considered with the same input conditions; but one is going to be reusable and the other, expandable. The simulation results show that the reusable LPE will have at least 5-12