

## Static Test Pad for Solid Rocket Motors

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**Abstract :** Static Test Pads are stationary mechanisms that hold a solid rocket motor, measuring the different parameters of its operation including thrust and temperature to better calibrate it for launch. This paper outlines a specific STP designed to test high powered rocket motors with a thrust upwards of 4000N and limited to 6500N. The design includes a specific portable mechanism with cost an integral part of the design process to make it accessible to small scale rocket developers with limited resources. Using curved surfaces and an ergonomic design, the STP has a delicately engineered façade/case with a focus on stability and axial calibration of thrust. This paper describes the design, operation and working of the STP and its widescale uses given the growing market of aviation enthusiasts. Simulations on the CAD model in Fusion 360 provided promising results with a safety factor of 2 established and stress limited along with the load coefficient A PCB was also designed as part of the test pad design process to help obtain results, with visual output and various virtual terminals to collect data of different parameters. The circuitry was simulated using 'proteus' and a special virtual interface with auditory commands was also created for accessibility and wide-scale implementation. Along with this description of the design, the paper also emphasizes the design principle behind the STP including a description of its vertical orientation to maximize thrust accuracy along with a stable base to prevent micromovements. Given the rise of students and professionals alike building high powered rockets, the STP described in this paper is an appropriate option, with limited cost, portability, accuracy, and versatility. There are two types of STP's vertical or horizontal, the one discussed in this paper is vertical to utilize the axial component of thrust.

**Keywords :** static test pad, rocket motor, thrust, load, circuit, avionics, drag

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