Multi-Stage Ionic Thruster Mark II Advancing Multi-Stage Ionic Thrusters: Optimizing Design and Exploring Sustainable Applications

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This project aimed to improve the performance, efficiency, and strength of an ionic thruster, which uses corona discharge to create airflow. The goal was to enhance sealing, reduce air bleed with a permanently enclosed design using acrylic tubing, and ensure proper electrical insulation. Additionally, the project sought to test the thruster’s ability to move a small water vessel. The hypothesis was that improving the precision, sealing, and durability of the ionic thruster would increase its performance and efficiency. Adding neodymium magnets was expected to additionally boost speed. A single stage of the thruster consisted of an anode (positive) and cathode (negative), with optimized spacing to prevent arcing. Key improvements included enclosing the thruster stages with acrylic tubing to reduce air bleed, using rubber sealant to control corona discharge, and raising the thruster on an insulated base to avoid power loss. Neodymium magnets were placed around the thruster to guide the ions and increase performance. Tests measured airflow velocity with an areometer. Data was collected over multiple runs to find the average and top speeds. The results showed the single-stage thruster could consistently reach speeds up to 1.10 m/s. Magnets helped increase the velocity to 1.30 m/s, and the thruster showed the ability to move a lightweight boat across water. These findings highlight the potential for ionic thrusters as efficient, low-noise propulsion systems with applications in marine and aerospace technologies and emphasize the importance of precision engineering in maximizing performance.

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