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Experimental Parametric Study of Factors Affecting the Negative Corona Plasma Propulsion System

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A B S T R A C T

Corona plasma propulsion (electro-aerodynamics) is an innovative method for generating thrust using strong electric fields to create ionic flow in a neutral gas. These systems, due to their elimination of fossil fuel dependency, simple design without moving parts, and low-noise operation, have emerged as a promising option for aerospace applications. This emerging propulsion technology holds significant potential for both aerospace and industrial applications. In this study, the key factors affecting the efficiency of corona plasma propulsion were experimentally investigated. Additionally, environmental factors such as temperature and humidity impacting the corona propulsion system were examined. The objective was to identify the key factors influencing efficiency (effectiveness coefficient) based on variables including applied voltage up to 34 kV, current intensity up to 0.6 mA, electrode spacing ranging from 2 cm to 5 cm, emitter electrodes made of copper, stainless steel, and steel, the number of electrodes ranging from 2 to 10, temperatures between 21°C and 26°C, humidity from 0.1 to 0.24, and structural characteristics. The results indicate that, in addition to key influential factors such as applied voltage and current, electrode material, and spacing, environmental factors like temperature and humidity also significantly affect efficiency (effectiveness coefficient).

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