NASA SBIR/STTR Technologies

Simulation Tool for Dielectric Barrier Discharge Plasma Actuators at Atmospheric and Sub-Atmospheric Pressures

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Identification Significance of Innovation

Identification:

✓ Simulation tool for dielectric barrier discharge (DBD) plasma actuator

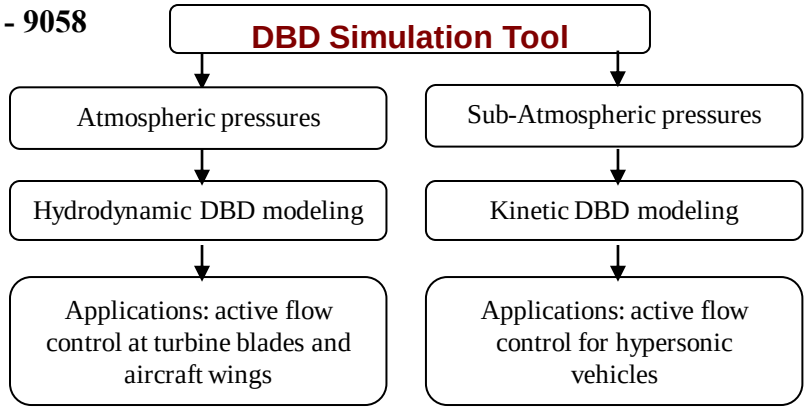
✓ Analyzes and predicts DBD operation at wide range of ambient gas pressures

Significance:

✓ Traditional DBD codes are limited to low-speed applications and have weak prediction capabilities

✓ Proposed tool allows DBD analysis/prediction for subsonic/hypersonic applications

Estimated TRL (1 – 9) at beginning and end of contract: 3 / 4



Technical Objectives

✓ Demonstrate VORPAL's capability of modeling DBD plasma actuator at low pressures (0.1 torr to 10 torr) using kinetic plasma modeling approach

✓ Demonstrate VORPAL's capability of modeling DBD plasma actuator at moderate to atmospheric pressures (10 torr to 1 atm) using hydrodynamic plasma modeling approach.

✓ Validate developed DBD simulation tool by comparison between simulation results and experimental data.

Work Plan

(1) Develop prototype DBD simulation tool for low pressures

(2) Develop prototype DBD simulation tool for moderate to atmospheric pressures

(3) Perform experimental study of the Pulses+Bias DBD configuration

(4) Validate developed prototypes by comparing simulation and experimental results

(5) Reporting

NASA Applications

✓ Active flow separation control at turbine blade

✓ Active flow separation control at fixed and rotary wing aircrafts

✓ Active flow control at hypersonic vehicles

Non-NASA Applications

✓ Lockheed Martin Aeronautics subsonic/hypersonic program

✓ Flow separation control at commercial airplanes and tiltrotor aircrafts

Firm Contacts

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NON-PROPRIETARY DATA