PROJECT NO. 1

THEORY OF ELECTROHYDRODYNAMICS

The complex nature of the forces involved in the electrohydrodynamic phenomena warrant a careful, theoretical investigation and mathematical analysis by physicists qualified in this special field. The benefits of such academic studies extend to every application of Electrohydrodynamics and makes it possible to understand the results of engineering tests which might otherwise become costly and time-consuming. The theoretical investigation, as herein proposed, is of prime importance.

PHASE I

A review of the literature on all phenomena bearing upon Electrohydrodynamics and useful in understanding its various manifestations. This includes the study of electrohydrodynamic devices in an effort to understand more fully the basic principles. This investigation includes definitive laboratory experiments where needed.

Proposed Contractor: Stevens Institute of Technology
Hoboken, New Jersey
Length of Contract: 9 months

Estimated Cost: $17,000

PHASE II

A continuation of the work started in Phase I directed specifically toward the solution of engineering problems which arise in connection with the various electrohydrodynamic devices under current development.

Length of Contract: One Year

Estimated Cost: Unknown
(To be government supported)

PROJECT NO. 2

LIFT AND PROPULSION

Section A AERO-MARINE VEHICLE

Development of the aero-marine vehicle utilizing electrohydrodynamic drive in combination with liquid propellent, flame-jet electric generator.

PHASE I

Preliminary evaluation and engineering development of previously tested, 3-foot tri-arcuate ballistic electrode adapted for lift and propulsion.

Proposed Contractor: Cornell Aeronautical Institute
Buffalo, New York
Estimated Cost: $22,500
Length of Contract: 6 months

PHASE II

Design and construction of 10-foot scale model prototype, without power supply, for static thrust measurements up to 600 kilovolts. Studies are to be made of various electrode materials, including inflatable electrodes.

Length of Contract: 6 months
Estimated Cost: $25,000

PHASE III

Testing of 10-foot scale model prototype with integral flame-jet generator for static thrust measurements. Preliminary design of 70-foot vehicle.

Length of Contract: 6 months
Estimated Cost: $125,000

PHASE IV

Final design and construction of complete 70-foot sub-orbital vehicle for manned flight.

Length of Contract: Unknown
Estimated Cost: Unknown
(To be government supported)

PROJECT NO. 3

LIFT AND PROPULSION (Continued)

Section B SPACE PROPULSION

Development of ambient-ion drive for space vehicles. Design of electrodes and high vacuum testing.

PHASE I

Evaluation of previous high vacuum tests with both arcuate and torpedo configurations, in vacuum chamber to 10^{-9} mm. Hg.

Proposed Contractor: National Research Corp. Cambridge, Mass
Length of Contract: 6 months
Estimated Cost: $25,000

PHASE II

Continuation of high vacuum tests with larger electrodes in space simulation chamber up to 10^{-9} mm. Hg. (altitude equivalent 125 miles)

Length of Contract: 6 months
Estimated Cost: $40,000

PHASE III

Extrapolation and interpretation of engineering data for coordination with the conclusions of Cornell Aeronautical Institute (Project 2, Phase III).

Length of Contract: 6 months
Estimated Cost: $40,000
(To be government supported)

PHASE IV

Collaboration with Cornell Aeronautical Institute (Project No. 2, Phase IV) in connection with construction of 70-foot working prototype, including cabin pressurization, equipment placement and flame-jet operation in high vacuum.

PROJECT NO. 4

ELECTROKINETIC HIGH VOLTAGE GENERATOR

This is an application of electrohydrodynamic principles for the conversion of kinetic energy into electrical energy. It is a method for generating high voltage from a moving gas stream, and appears to have its principal practical application when utilizing a flame jet. In this embodiment, the thermo-kinetic energy of the rapidly moving flame is converted into electricity at high voltage, and the output can be directly applied to the propulsion of space vehicles. Quite apart from its application in space propulsion, the flame-jet generator has interesting possibilities in municipal and industrial power generation. Pulsed generators, operating at the standard 60 cycles, may conceivably replace the conventional generators employing steam turbines. This is especially attractive in areas where petroleum or natural gas is plentiful. Since the generator contains no moving parts, such installations may have marked advantages over existing electric generating plants. Smaller forms of electrokinetic generators may serve as flow-meters in fuel lines and the like, having certain advantages over present methods for measuring flow.

PHASE I

Evaluation of present patent claims and the performance of tests to show operability, including the construction of a 100 kilowatt, 600,000 volt D.C. flame-jet generator, powered by liquid fuel.

Proposed Contractor: Southwest Research Institute
San Antonio, Texas
Length of Contract: 9 months.

Estimated Cost: $25,000

PHASE II

Continuation of tests to include the construction of a light weight, miniaturized unit to generate 600.000 volts for use in connection with Cornell, Project 2, Phase III.

Length of Contract: 9 months

Estimated Cost: Unknown
(To be government supported)

PHASE III

Extrapolation and interpretation of engineering data leading to the powering of the 70-foot prototype to be designed and built under Cornell, Project 2, Phase IV.

PROJECT NO. 5

PLASMA TURBINE

This device may be described as the simplest form of electric motor, utilizing electro-hydrodynamic principles to generate torque. In operation, a high-density ion plasma is accelerated by means of a shaped electric field and projected into a bladed turbine wheel, causing rotation at high velocity. A speed reducer may then be applied to increase the torque. Such a turbine can be constructed of very light materials and, therefore, may have its principal usefulness in satellites and space vehicles. The turbine may be applicable to many functions in space, such as the movement of control vanes or other mechanical parts.

PHASE I

Evaluation of existing laboratory models and improvement of engineering design to meet requirements in space applications. The construction of a small demonstration model including the necessary testing to obtain performance data in various vacuum ranges.

Proposed Contractor: Texas Research Associates
Austin, Texas
Length of Contract: 9 months

Estimated Cost: $22,500

PHASE II

Engineering studies leading to the design of (at least) two larger turbine operating models, including performance data.

Length of Contract: 9 months

Estimated Cost: $15,000

PHASE III

Collaboration with Cornell Project No. 2, Phase III in the design and construction of the gyroscopic petticoat stabilizer for 10-foot vehicle model.

Length of Contract: Unknown

Estimated Cost: Unknown
(To be government supported)

PHASE IV

Collaboration with Cornell Project No. 2, Phase IV for design and construction of the gyroscopic petticoat stabilizer for 70-foot vehicle prototype, including torque generators for landing-gear retraction and for other mechanically operated parts.

Length of Contract: Unknown

Estimated Cost: Unknown
(To be government supported)