First Quarterly Progress Report

on NSR 22-009-288

A STUDY OF FLUID DYNAMICS OF GASEOUS NUCLEAR ROCKETS

A comprehensive review of the state of knowledge of vortex flows and how such flows may or may not be used for fluid dynamic containment of a gaseous nuclear fuel has been initiated. The first step has been the compilation of the attached bibliography of articles concerned with confined vortex flows. This list includes the results of research sponsored by NASA, USAF, and private companies on various proposed concepts of fluid dynamic containment which involve vortex flow in one form or another. It also includes articles motivated by a wide variety of other problems which involve vortex flows bounded in some way by either a solid boundary or a closed streamline. A continuing search of the literature is being made for other pertinent references. If the reader knows of an article that has been overlooked this information would be appreciated. The next step of the study involves assimilation of the useful information from these articles.

A graduate student, William H. Newton, is working with experimental data available in the references to obtain some empirical correlations of various vortex parameters. Several different approaches are being used in this attempt. One approach is similar to that introduced by Keyes(1960). It involves determining the turbulent eddy viscosity that is needed to make experimentally obtained velocity profiles approximately agree with predictions based on laminar flow theory. The laminar flow theory chosen for use in this comparison is that by Rosenzweig, Lewellen and Ross (1964) which is quite similar to that of Anderson (1961). Another more straight-forward approach is to correlate the velocity ratio between the vortex periphery and center exhaust with variations in the experimentally prescribed parameters. No conclusions have yet been reached from this investigation, but a large amount of data has been retrieved from the literature to be used in determining the most appropriate correlations.

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