Computing Thermal Effects of Cavitation in Cryogenic Liquids

A computer program implements a numerical model of thermal effects of cavitation in cryogenic fluids. The model and program were developed for use in designing and predicting the performances of turbopumps for cryogenic fluids. Prior numerical models used for this purpose do not account for either the variability of properties of cryogenic fluids or the thermal effects (especially, evaporative cooling) involved in cavitation. It is important to account for both because in a cryogenic fluid, the thermal effects of cavitation are substantial, and the cavitation characteristics are altered by coupling between the variable fluid properties and the phase changes involved in cavitation. The present model accounts for both thermal effects and variability of properties by incorporating a generalized representation of the properties of cryogenic fluids into a generalized compressible-fluid formulation for a cavitation pump. The model has been extensively validated for liquid nitrogen and liquid hydrogen. Using the available data on the properties of these fluids, the model has been shown to predict accurate temperature-depression values.

This program was written by Ashvin Hosangadi, Vineet Ahuja, and Sanford M. Dash of Combustion Research and Flow Technology, Inc., for Marshall Space Flight Center. For further information, contact Ashvin Hosangadi at hosangad@craft-tech.com. MFS-32140

Control Program for an Optical-Calibration Robot

A computer program provides semi-automatic control of a moveable robot used to perform optical calibration of videocamera-based optoelectronic sensor systems that will be used to guide automated rendezvous maneuvers of spacecraft. The function of the robot is to move a target and hold it at specified positions. With the help of limit switches, the software first centers or finds the target. Then the target is moved to a starting position. Thereafter, with the help of an intuitive graphical user interface, an operator types in coordinates of specified positions, and the software responds by commanding the robot to move the target to the positions. The software has capabilities for correcting errors and for recording data from the guidance-sensor system being calibrated. The software can also command that the target be moved in a predetermined sequence of motions between specified positions and can be run in an advanced control mode in which, among other things, the target can be moved beyond the limits set by the limit switches.

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SQL-RAMS

SQL-RAMS (where “SQL” signifies Structured Query Language and “RAMS” signifies Rocketdyne Automated Management System) is a succes-