

External post-doctoral study position offer
Engineering science applied to space transport system

Subject title : Identification and characterisation of temperature fields measurement methods inside a cavitating cryogenic fluid

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CNES Structure : DLA/SDT/EPM

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Keywords : Fluid mechanics, instrumentation, thermodynamic, two-phase flows, turbulence, hydraulic machines

Subject :

Identification and characterisation of temperature fields measurement methods inside a cavitating cryogenic fluid

Context:

This post-doctoral study is part of the thermodynamic characterization of cavitation phenomenon inside spatial turbo pumps inducers. The main concept is to measure the temperature variations associated to phase change inside cavitation zones, precisely the cooling effect linked to the vaporisation of the fluid. Through these measurements, the main goal is to understand and quantify this effect in order to develop and validate physical models (law, correlations, tables, etc.) which will be used to increase the accuracy of numerical simulations. This knowledge is very important when designing turbo pumps.

Objectives:

The main task will be the identification and characterisation of unsteady and local temperature measurement means inside a cavitating cryogenic fluid. This goal will be using preliminary work currently done at Laboratoire de Mécanique de Lille (France) in order to study temperature fluctuations inside cavitating flows. Nowadays, these studies only concern water and a few measurement methods (Infrared thermography, cold wire, etc.). The current post-doctoral offer will allow the continuation of these studies for cryogenic fluids, like nitrogen and hydrogen.

On top of temperature measurement, measures of others important variables such as pressure, void fraction and velocities will also be needed.

Two-year planning:

-Bibliographic study about temperature measurement (local, unsteady, cavitating, etc.)

-Development and validations of one or several small test benches permitting to study cavitation flow inside liquid nitrogen.

-Analyse of the results

-Use and modification, if needed for nitrogen, of pressure, void fraction and velocity measurement methods used for water.

-Feasibility study about using liquid hydrogen