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MODIFICATION NO. 7 TO COOPERATIVE AGREEMENT NO. NRC-04-98-051

BETWEEN

UNIVERSITY OF CALIFORNIA AT SANTA BARBARA

AND THE

U.S. NUCLEAR REGULATORY COMMISSION

The purposes of this modification are to (a) correct an administrative error made in Modification No. 6, i.e., to increase the ceiling by \$199,930, from \$750,000 to \$949,930, in accordance with the cooperator's request to add two (2) new tasks dated March 30, 2000; (b) increase the ceiling by \$30,002, from \$949,930 to \$979,932, in accordance with the cooperator's request to add one (1) new task dated July 27, 2000; and (c) provide incremental funds in the amount of \$30,000, increasing the obligated amount from \$819,800 to \$849,800. Accordingly, the following changes are hereby made:

1. Block No. 9, Project Will Be Conducted Per Government's Proposal, is modified by adding the following statement to the existing statement:

"Project will be conducted per the Government's proposal dated 07/27/00 (attached) and Appendix A - Project Cooperative Agreement Provisions."

2. In Block No. 13, Accounting & Appropriation Data, the following is added to the information previously found there:

"APPN. NO: 31X0200.060
B&R NO: 06060401710
Job Code: F6366
BOC NO: 4110
Amount Obligated: \$ 30,000
RES ID NO: RES-C00-482

3. Block No. 15, NRC Obligation of Funds, is deleted in its entirety and replaced with the following:

This Cooperative Agreement Action	\$ <u>30,000.00</u>
Previous Obligation	\$ <u>819,800.00</u>
Total	\$ <u>849,800.00</u>

4. Block No. 16, Total Funding Agreement, is deleted in its entirety and replaced with the following:

NRC:	\$ <u>949,930.00</u>
Cooperator:	\$ <u>- 0 -</u>
Total:	\$ <u>949,930.00</u>

All other terms and conditions remain the same.

EXECUTED:

UNIVERSITY OF CALIFORNIA @
SANTA BARBARA

BY: *David J. Mayo*
NAME: David J. Mayo
TITLE: Assoc. Director, Sponsored Projects
DATE: 9/30/2000

UNITED STATES OF AMERICA
U.S. NUCLEAR REGULATORY
COMMISSION

BY: *Mary H. Mace*
NAME: Mary H. Mace
TITLE: Contracting Officer
DATE: 9-26-2000

Proposal – Investigation of Issues Related to Catastrophic Failure of a Pressurized Two Phase Fluid System

Background

Systems containing a two-phase fluid under pressure have the potential for failure similar to any system under pressure. However, the phenomena and consequences of such failures are dependent upon the fluid properties and stored energy in the system as well as the failure mode of the piping or vessels containing the fluid. The center at UCSB, through the IMuST program, has taken the lead to facilitate cooperation on the study of two-phase fluid phenomena. As a part of this program failure of two-phase fluid systems are of interest to assess their consequences. Accordingly, some exploratory work to investigate this area of two-phase fluids is proposed. This work is of interest to and will benefit all IMuST participants by identifying where consequences and likelihood warrant additional investigation and/or design requirements. Specific benefit to the NRC would be in support of risk-informed changes to the reactor regulations where the large break LOCA and pressurized thermal shock accidents involve catastrophic failure of two-phase systems and the consequences and likelihood are key input in assessing these accidents.

The Institute for Multifluid Science and Technology (IMuST) is a virtual institute established four years ago, for the purpose of “promoting the basic understanding of multifluid flows,” and for the special purpose of “pursuing the basic issues such as to have a significant impact in practice.” Currently, the institute counts about 130 members (including many from industry), has held three annual meetings following the founding meeting in March 1997, and has put into practice methodologies of operation in pursuit of its goals. The central strategic element of these methodologies is an effort to develop a large scale cooperative research plan, and to pursue it by a proposal to NSF’s Science and Technology Center (STC) or Engineering Research Center (ERC) programs.

Objective

The objective of this work is to perform a scoping study to identify the important phenomena, potential consequences and their likelihood following failure of a high pressure system containing a two phase fluid. The results of this scoping study will be useful to all IMuST participants concerned with the design, operation and safety of two-phase fluid systems by providing information applicable to prioritizing and planning additional work in this area

Work Scope and Deliverables

A postulated rupture of a vessel containing water under high pressure and temperature will be used as the example. Phenomena and consequences related to the vessel and its adjoining system shall be identified, and their magnitude and likelihood estimated. This shall include phenomena and consequences associated with vessel supports, adjoining piping and surrounding structures. A report shall be prepared describing the results of the scoping study. The work will be performed under the direction of Professor Theofanous and is estimated to take 2 months. A letter report will be prepared to document the results.