



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

AUG 30 2001

Purdue Research Foundation
Attn: Mr. Thomas B. Wright
Sponsored Program Services
1063 Hovde Hall
West Lafayette, IN 47907-1063

Dear Mr. Wright:

Subject: Modification No. 1 to Task Order No. 11
under Contract NRC-04-97-046

The purpose of this modification is to extend the period of performance of the subject task order at no additional cost to the Government through October 31, 2001. The effective date of this modification will be the date an official, authorized to bind your organization, executes three (3) copies of this document in the space provided and returns two (2) copies to the U.S. Nuclear Regulatory Commission, Attn: Ms. Amy Siller, Division of Contracts and Property Management, ADM/DCPM/CMB1, M/S T-7-I-2, Washington, DC 20555. You should retain the third copy for your records. As the period of performance for this task order expired on July 31, 2001, any costs incurred from July 31, 2001 through the date your official signs, will not be reimbursed by the Government.

Accordingly, Task Order No. 11 shall be in effect from April 1, 2001 through October 31, 2001, except for the time noted above, with a cost ceiling of \$66,919. The issuance of this modification does not amend any other terms and conditions of the subject task order, including the ceiling amount of \$66,919, nor the obligated amount of \$61,182. However, the enclosed Statement of Work reflects the revised estimated completion dates for task nos. 1, 2 and 3 under this effort.

A summary of obligations for the this task order, from award date through the date of this action, is given below:

FY01 Obligation Amount:	\$61,182
Total NRC Obligation Amount:	\$61,182

This modification does not obligate any FY01 funds.

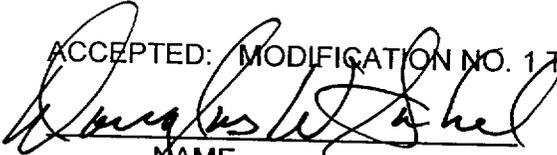
If you have any questions regarding this matter, please contact Ms. Siller, Contract Specialist, on (301) 415-6747.

Sincerely,

for 
Mary H. Mace, Contracting Officer
Contract Management Branch 1
Division of Contracts & Property Mgmt.
Office of Administration

Enclosure:
As stated

ACCEPTED: MODIFICATION NO. 1 TO TASK ORDER NO. 11



NAME
Douglas W. Sabel, Director
University Contracting Group

TITLE

AUG 30 2001

DATE

Modification (No. 1) to the Statement of Work for Task Order #11, "Multi-Phase CFD Enhancements for Nuclear Reactor Safety Analysis," under Contract #NRC-04-97-046, "Thermal-Hydraulic Research"

I. Background

The NRC uses thermal-hydraulic system codes such as TRAC and RELAP5 to study the flow phenomena associated with reactor safety issues. These system codes are not designed to model the details of multi-dimensional flow phenomena. In contrast, computational fluid dynamics (CFD) is a technique capable of analyzing multi-dimensional, single-phase flow phenomena in great detail. However, CFD is not considered a mature technology for predicting the multi-phase flow phenomena common in reactor safety analysis. As a result, CFD is used primarily to model multi-dimensional single-phase flow phenomena in limited regions of the reactor coolant system. Generally speaking, multi-phase CFD techniques have convergence problems and lack good physical models. Validation of these techniques is needed.

II. Objectives

The objectives of this task order are: (1) to develop a multi-dimensional, multi-phase CFD technique for reactor safety analysis, and (2) to demonstrate that the developed technique is robust, fast, and accurate.

III. Work Requirements (for the performance period of 4/1/01 - 10/31/01)

Several areas of effort are required. A basis for the selection of the CFD code should be outlined. A demonstration of the codes ability to outperform existing commercial multi-phase CFD codes is required. Model validation requirements should be considered and outlined. Finally, an outline for further development is needed which highlights suggested improvements and their benefits to the NRC for reactor safety analysis.

A code, developed specifically for multi-phase applications, will incorporate physical models applicable to nuclear safety analysis. The accuracy of the code and correlations should be demonstrated on a class of problems where experimental data are available. The code will be able to perform detailed multi-dimensional, multi-phase predictions of flow behavior in limited regions of the reactor coolant system. A code suitable for use at the NRC is needed.

Three are three tasks to be performed.

Task 1. Develop the Basis for Selecting a Multi-Phase CFD Code

A survey of the most common multi-phase solution algorithms should be made. A multi-phase CFD code should be identified that is superior to the commercial CFD codes with respect to robustness, speed, and accuracy. The benefits of this code should be demonstrated through a series of short term multi-phase test cases, which can be simulated by the selected CFD code and a commercial CFD code such as FLUENT. A description of the advantages of the new code should include fundamental features that make the tool superior to the existing techniques. If possible, accuracy should be demonstrated through comparisons with appropriate experimental data or correlations. Results should be delivered to the NRC manager as a letter report.

Estimated Level of Effort: 1 staff-month
Estimated Completion Date: August 31, 2001

Task 2. Develop Code Validation Requirements

This task develops code validation requirements against experimental data. Adequate data are needed for sufficient validation of the models. The existing multi-phase data should be identified along with any requirements for additional data. Specific requirements for the data such as sampling rate, measurement type, and measurement density should be outlined for each phenomena/flow regime under consideration. The code validation requirements should be delivered to the NRC as a letter report.

Estimated Level of Effort: 1 staff-month
Estimated Completion Date: August 31, 2001

Task 3. Outline Code Improvements and Benefits to the NRC

Code development plans should include code modifications to improve the accuracy, speed, and robustness as well as the ease of use. A plan for code improvements should be developed to address numerical improvements, physical model development, and user interface enhancements (including user guide). Limited examples of code improvements should be used to demonstrate the advantages for the NRC. The summary should be delivered to the NRC as a letter report.

Estimated Level of Effort: 1.5 staff-months
Estimated Completion Date: October 31, 2001

IV. Monthly Progress Report

In addition to the deliverables listed for each task, the contractor shall provide a monthly technical progress report by the 20th of the following month. The report summarizes activities of the month under this Task Order, which include the work performed during the period, milestone status, and anticipated and encountered problem areas.

V. Meetings and Travel

A one-day meeting is expected to take place at the NRC headquarters in Rockville, Maryland. The meeting will be attended by two people from this Task Order.