

Los Alamos National Laboratory Los Alamos New Mexico 87545

Safety Assessment

OATE N REPLY REFER TO MAIL STOP TELEPHONE

February 28, 1983 Q-6-772 (R673) K557 (505) 667-6231 FTS 843-6231

Mr. S. Bernstein Office of Nuclear Regulatory Research US Nuclear Regulatory Commission 5650 Nicholson Lane Rockville, MD 20852

Dear Steve:

SUBJECT: R673 MONTHLY STATUS REPORT FOR JANUARY 1983--INVESTIGATION OF ACCIDENT-INDUCED FLOW AND MATERIAL TRANSPORT IN NUCLEAR FACILITIES

The monthly status report for January 1983 is enclosed. Please call if you have questions or need clarification.

Sincerely,

12:22%

R. A. Martin

Belli inthe

W. S. Gregory

RAM/WSG: tmg

Enc: As cited above

Cys w/enc: P. C. Owczarski/J. Mishima, PNL M. Simon-TOV/ORNL J. H. Scott, ES/NP, MS F671 J. F. Jackson/M. G. Stevenson, Q-DO, MC R. A. Haarman, Q-6, MS K557 Q-6 Fluid/Thermal Section CRMO (2), MS A150 Q-6 File

An Equal Opportunity Employer/Operated by University of California

8303160175 830228 PDR RES 8303160175 PDR

## PROGRAM STATUS REPORT

Investigation of Accident-Induced Flow and Material Transport TITLE: in Nuclear Facilities R673 PROJECT NO: FIN NO: A7029 Los Alamos National Laboratory CONTRACTOR: MONTH COVERED: January 1983 BUDGET STATUS: Annual Budget \$437.6 k (includes FY 1982 carryover of \$37.6 k) Monthly Spending : \$ 32.7 k

Cumulative Spending: \$ 134.8 k Funds Remaining : \$ 302.8 k

#### PROGRAM DESCRIPTION I...

The objective of this research is to develop the capability to predict accident-induced flow and material transport within a fuel-cycle facility. We will develop techniques and conduct experiments to provide supportive data for the transport of internal accident releases throughout a facility. The program will be limited to providing source-term characterization at a plant's atmospheric boundary. The primary pathway to the atmosphere is a facility's ventilation system, and techniques developed in this investigation will be designed for, but not limited to, ventilation system pathways. An accident analysis computer code for fire will be developed this fiscal year. We will perform tasks in both the analytical and experimental areas to support this program deliverable. We will provide the necessary support to outline fire accident analysis methods and provide examples for an accident analysis user's handbook.

### II. HIGHLIGHTS/SIGNIFICANT MONTHLY ACTIVITIES

#### Compartment Fire Model Assessment Α.

The main activity in compartment fire model assessment this month was preparing the data report for the FY 1981 Lawrence Livermore National Laboratory (LLNL) fire tests. This report will be delivered to the NRC on February 8, 1983. Validating the test data took much more time and effort than originally planned. In retrospect, we should have been more aware of the validation problem. (A. Tewarson from Factory Mutual needed 3 yr to validate his test apparatus.) T. DeRis from Factory Mutual and T. Quintiere from the NBS currently are building intermediate-scale relese-rate ovens (8 ft high with a 1 ft<sup>2</sup> burn area) for under-ventilated fires. They both expect the tests and validation time to significantly exceed the cost and time of construction. Validating the full-scale LLNL test facility results within 18 months compares well with this.

We have requested approval to extend a consulting agreement to H. E. Mitler from Harvard University to work with us on evaluating the Harvard fire code for possible integration with FIRAC. We hope that this agreement will be effective by March 14, 1983.

# B. Material Depletion/Modification

We have completed preliminary full-scale measurements of smoke transport and deposition in ventilation system ductwork and will deliver a rough-draft report to the NRC on February 8, 1983. This study is part of an effort to obtain experimental data in support of the fire accident analysis computer code FIRAC. To help assess the accuracy of the aerosol depletion model in FIRAC, we conducted the current depletion/modification experiments. The tests were performed under realistic conditions using real combustion products in full-sized ducts at typical airflow rates. We burned polystyrene, the most smoky fuel typically found in fuel cycle plants, at under-ventilated (oxygen-lean) conditions to product a combustion aerosol. Aerosol mass deposition and arrosol size and concentration measurements were performed. A mass balance of smoke generated upstream, deposited in a duct, and collected on a downstream high-efficiency particulate air filter was consistent to within about 20%. We found that as much as about 25% of the polystyrene smoke mass generated at the entrance of a 15.2-m (50-ft) duct is deposited on the duct walls. Our experimental results will be compared with the theoretical equations currently being used in FIRAC.

## III. PROGRAM DEVELOPMENT VARIANCE (Fig. 1)

At this time there is no variance from the program development plan. This month the following topical reports were put in draft form.

- · Data Report on FY 1981 LLNL Tests
- FY 1982 Filter Plugging Experiments
- Material Depletion/Modification

Two letter reports were written that outline our criteria to be used in selecting fire compartment models and cur plans for assessment of FIRAC. The FIRAC assessment plan was given to you in rough-draft form so that we may incorporate your input at an early stage.

N. Alvares (LLNL) plans to send K. Foote to Los Alamos on March 7, 1983, to discuss the results of the FY 1982 LLNL tests. He will bring a digital tape of the results so that we can plot the results with our graphics package. In addition, the consulting agreement with H. Mitler may not go into effect until March 14, 1983. These two situations have led us to ask you for a 1-month extension for the fire model assessment report and the Harvard code assessment report. As we discussed on the telephone on February 15, 1983, we will vary the program development schedule to reflect this change.

### IV. BUDGET VARIANCE (Fig. 2)

We have reduced our underspending by \$15.2 k this month. The consulting agreement with H. Mitler will partially make up the difference between the planned and actual spending.

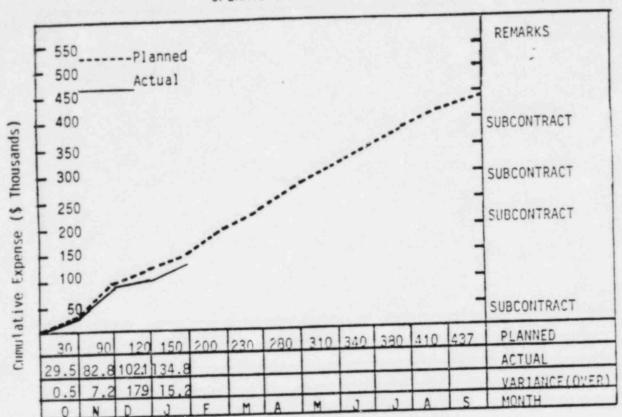


Fig. 2. OPERATING COSTS IN THOUSANDS

FIG. 1 FY 1983 PROGRAM DEVELOPMENT SCHEDULE

ELI	IVERABLES AND MAJOR SCHEDULED/UNSCHEDULED SUPPORTING TASKS	FY 1983 ONDJFMAMJJAS	FY 1984 1st Qtr
	DELIVERABLES 1. Accident Analysis Handbook (AAH)	이 같이 있는 것이 같은 것이 같이 같이 했다.	
	a) Chapter 5	٥	
	<ul> <li>b) Accident Scenario Analysis</li> <li>2. Computer Codes</li> </ul>		
	a) Fire Analysis Computer Code (FIRAC)	<u> </u>	
	3. Topical Reports		
	a) Data Report on FY 1981 LLNL Tests 5) Data Report on FY 1982 LLNL Tests	• • •	
	<ul> <li>c) Fire Compartment Model Assessment</li> </ul>	• • •	
	<ul> <li>d) Filter Plugging Preliminary Expts</li> <li>e) FY 1982 Filter Plugging Data Report</li> </ul>	•	
	f) Literature Review	•	
	g) Material Transport Modeling	• ^	
	<ul> <li>h) Entrainment Experiments</li> <li>i) Material Depletion/Modification Data</li> </ul>	• · · · ·	
	j) FIRAC Assessment	\$	
	<ol> <li>Code User Manuals         <ul> <li>a) FIRAC User Manual</li> </ul> </li> </ol>		
	5. Letter Reports	<u>11</u>	
	a) Recommendation of Fire Compartment Model		
	<ul> <li>b) Recommendations Resulting from Harvard Code Assessment</li> </ul>	_ <del>6</del> 6	
	c) Plan for Assessment of FIRAC		
	<ul> <li>d) Experimental Plan for FY 1983 LLNL Tests</li> <li>e) Conceptual Design of Fire Test Facility at NMSU</li> </ul>		
	<li>f) Operational Status of Fire Test Facility</li>		
	SUPPORTING TASKS (SCHEDULED)		
	1. Analytical	$\nabla$	
	<ul> <li>a) Compartment Fire Model Assessment</li> <li>b) Harvard Code Assessment</li> </ul>		
	c) FIRAC Code Improvement	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
	<ul> <li>Interactive Fire Compartment Model</li> </ul>		
	<ul> <li>Alternative Input Methods</li> <li>Turbulent Deposition</li> </ul>		
	<ul> <li>Room Material Deposition</li> </ul>		
	<ul> <li>Radioactive Source Term Integration</li> <li>Consideration of FY 81 Comments</li> </ul>		
	d) FIRAC Assessment		
	<ul> <li>Sensitivity Studies for Radioactive Component</li> </ul>		
	<ul> <li>Sensitivity Studies for Event Controlling Parameters</li> </ul>	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
	<ul> <li>Experimental Data Comparison</li> </ul>		
	<ul> <li>e) FIRAC User Assistance</li> <li>f) Foreign Govenment Information Exchange</li> </ul>	Real of the second s	
	2. Experimental		
	a) Compartment Fire Experiments		
	<ul> <li>b) Fire Test Facility at NMSU</li> <li>Design</li> </ul>		
	• Construction		
	<ul> <li>Instrumentation</li> <li>Accident Analysis Handbook (AAH)</li> </ul>		
	a) Representative Facility Modification		
	<ul> <li>b) AAH Accident Scenario Analysis</li> </ul>	⊽	
	c) AAH Chapter 5 Development		
	SUPPORTING TASKS (UNSCHEDULED) 1. Compartment Fire Model Criteria		
LEGE	SEND		
	Informal Letter Report Informal Letter Report Complete		
1.23	Dinitial Draft Topical Report Initial Draft Topical Report Complete		
1.5	O Final Draft Topical Report     ● Final Draft Topical Report Complete       ▲ Draft Interim Report     ▲ Draft Interim Report Complete		
1.15	△ Draft Interim Report ▲ Draft Interim Report Complete  ♥ Intermediate Milestone ♥ Intermediate Milestone Complete		
	Scheduled Variation		
	Activity Line		
-			

1983

NRC Research and for Technical Assistance Rep

Accession No.

Contract Program or Project Title: Investigation of Accident-Induced Flow and

Material Transport in Nuclear Facilities

Subject of this Document: Progress reported for JANUARY 83

Type of Document: Informal monthly progress report

Author(s): R. A. Martin and W. S. Gregory

Date of Document: February 28, 1983

Responsible NRC Individual and NRC Office or Division

Steven Bernstein, Transportation and Materials Risk Branch, DPA/RES

Prepared by Los Alamos National Laboratory P.O. Box 1663 Los Alamos, New Mexico 87545

Prepared for U.S. Nuclear Regulatory Commission Washington, D.C. 20555

NRC FIN A7029

LETTER REPORT

Distribution

B Buchbinder, RES D Solberg, RES C Belote, RES S Bernstein, RES S McGuire, RES F Fisher, NMSS R Grill, RES J Quintiere, NBS L Rouse, NMSS J Ayer, NMSS T Clark, NMSS P Loysen, NMSS R Page, NMSS PDR