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## Contract Program or Project Title:

Analysis of Hypothetical Accidents Resulting in Core Meltdown  
Subject of this Document:

Analysis of Hypothetical Accidents Resulting in Core Meltdown

## Type of Document:

Monthly Progress Report for March, 1980

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Office of Nuclear Regulatory Research

This document was prepared primarily for preliminary or internal use. It has not received full review and approval. Since there may be substantive changes, this document should not be considered final.

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Washington, D. C. 20555

INTERIM REPORT  
NRC Research and Technical  
Assistance Report

PROGRAM: Reactor Safety Study Follow-on Program Subtask      FIN#: A4067

CONTRACTOR: Battelle's Columbus Laboratories

BUDGET PERIOD: (mm/yy-mm/yy) 10/79-9/80

PAS PROGRAM MANAGER: J. Curry

BUDGET AMOUNT: (Thousands) 95.1\*

CONTRACTOR PROGRAM MANAGER: R. S. Denning

PHONE: FTS-976-7510

PRINCIPAL INVESTIGATOR(S): P. Cybulskis

PHONE: FTS-976-7509

**PROGRAM OBJECTIVES:**

Investigate the effects of LWR plant design variations on the risks associated with reactor meltdown accidents. Specifically, determine the effects of plant design variations on the probability and nature of the radionuclide source term released during key meltdown accident sequences.

**ACTIVITIES DURING March, 1980**

A series of MARCH analyses dealing with hydrogen generation under a variety of meltdown accident conditions in the B&W PWR design were completed. It is expected that this will complete the detailed analyses to be performed on this design; analyses, evaluation, and documentation will continue.

BCL participated in the EPRI workshops on Hydrogen and Containment in Palo Alto, California on March 24-25, 1980.

**MAJOR MILESTONES:**

MILESTONE DESCRIPTION	SCHEDULED/ACTUAL START	SCHEDULED COMPLETION	ACTUAL/PROJECTED COMPLETION
1. Complete Analyses of B&W Design	4/78	3/80	4/80
2. Complete Analyses of GE Mark III Plant	9/78	4/80	
3. Complete Analyses of CE Design	8/78	5/80	
4. Evaluation & Documentation		7/80	

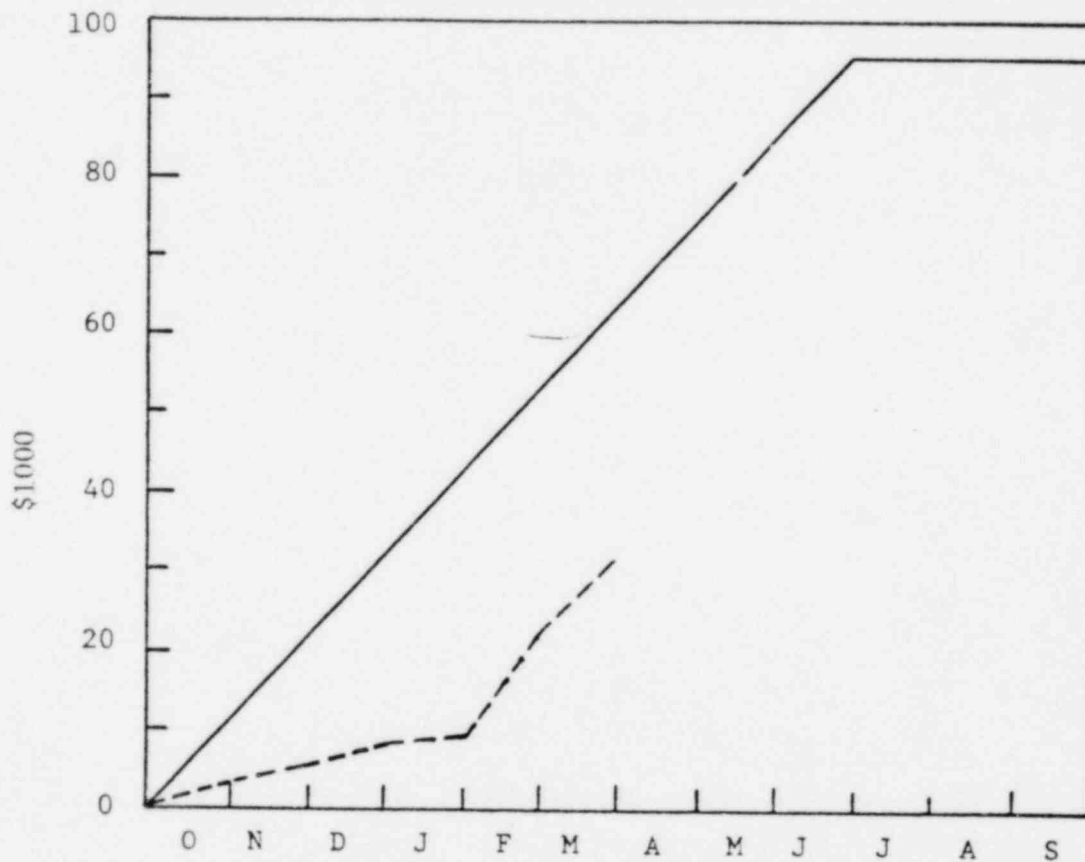
**MANAGEMENT AND TECHNICAL ISSUES/POTENTIAL SCHEDULE OR FUNDING PROBLEMS:**

NRC Research and Technical Assistance Report

\* Includes \$18,099 carryover from FY'79.

EXPENDITURES

PROGRAM: REACTOR SAFETY STUDY FOLLOW-ON PROGRAM



RESOURCES EXPENDED:

	March, 1980	CUMULATIVE
DOLLARS	9.4	31.2 (33%)
MAN-MONTHS	1.2	3.9

PROGRAM: PROBABILISTIC UNCERTAINTY ANALYSIS SUBTASK FIN#: A4067

CONTRACTOR: Battelle's Columbus Laboratories

BUDGET PERIOD: (mm/yy-mm/yy)10/70-9/80

PAS PROGRAM MANAGER: J. A. Murphy

BUDGET AMOUNT: (Thousands) 155.4\*

CONTRACTOR PROGRAM MANAGER: R. S. Denning

PHONE: FTS-976-7510

PRINCIPAL INVESTIGATOR(S): P. Baybutt

PHONE: FTS-976-7499

#### PROGRAM OBJECTIVES:

- Perform probabilistic uncertainty analyses for PWR and BWR accident sequences.
- Evaluate the uncertainty analysis methodology and develop decision criteria.
- Assess the feasibility of developing response surfaces for the MARCH and CORRAL codes.

#### ACTIVITIES DURING March, 1980

The accident sequence S<sub>2</sub>D was selected for the fourth uncertainty analysis. It will include the effects of containment sprays. A base case input deck for MARCH was prepared and shake-down runs started. The full analyses will be performed during April.

Work on the evaluation of response surfaces as code simulators was begun. In order to aid in this analysis, a Monte Carlo simulation of the TMLB-6 sequence was performed using the response surface. Best-estimate input distributions were developed for the design variables. These distributions were sampled and used to make release fraction predictions. The set of release fractions was then used to define the response output distribution. These results compared favorably to the results of the variance analysis when the 5th and 95th percentile values were compared to the mean plus or minus two standard deviations.

Work also proceeded on the documentation of research which has been performed.

#### MAJOR MILESTONES:

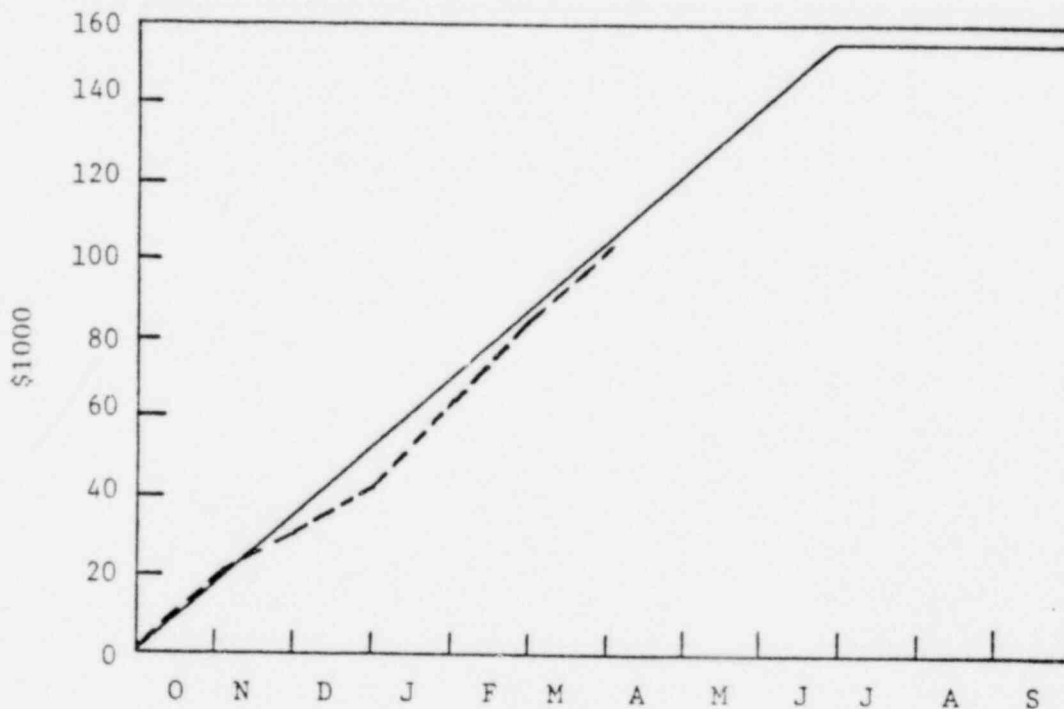
MILESTONE DESCRIPTION	SCHEDULED/ACTUAL START	SCHEDULED COMPLETION	ACTUAL/PROJECTED COMPLETION
1. Methodology/Application Topical Reports	----	10/31/79	10/31/79
2. Task Completion	----	5/31/80	5/31/80
3.			

#### MANAGEMENT AND TECHNICAL ISSUES/POTENTIAL SCHEDULE OR FUNDING PROBLEMS:

\* Carryover from FY'79.

EXPENDITURES

PROGRAM: PROBABILISTIC UNCERTAINTY ANALYSIS PROGRAM



RESOURCES EXPENDED:

	MARCH, 1980	CUMULATIVE
DOLLARS	18.4 K	102.5 (66%)
MAN-MONTHS	2.6	13.5

PROGRAM: ANALYSIS OF THERMAL-HYDRAULIC BEHAVIOR

FIN#: A4067

CONTRACTOR: Battelle's Columbus Laboratories

BUDGET PERIOD: (mm/yy-mm/yy) 10.79-9/80

PAS PROGRAM MANAGER: J. Curry

BUDGET AMOUNT: (Thousands) 81.9\*

CONTRACTOR PROGRAM MANAGER: R. S. Denning

PHONE: FTS-976-7510

PRINCIPAL INVESTIGATOR(S): P. Cybulskis

PHONE: FTS-976-7509

PROGRAM OBJECTIVES:

1. Test each of the modules in the MARCH code.
2. Standardize programming and units.
3. Document the MARCH code.
4. Verify against available data and compare with similar codes.

ACTIVITIES DURING March, 1980

With the concurrence of PAS, the interim version of MARCH was provided to a number of outside organizations.

Efforts related to MARCH documentation were continued.

MAJOR MILESTONES:

MILESTONE DESCRIPTION	SCHEDULED/ACTUAL START	SCHEDULED COMPLETION	ACTUAL/PROJECTED COMPLETION
1. MARCH Testing/ User's Guide	4/79 - 5/79	12/79	1/80
2. MARCH Verification	10/79	9/80	
3. MARCH Documentation	5/79	9/80	

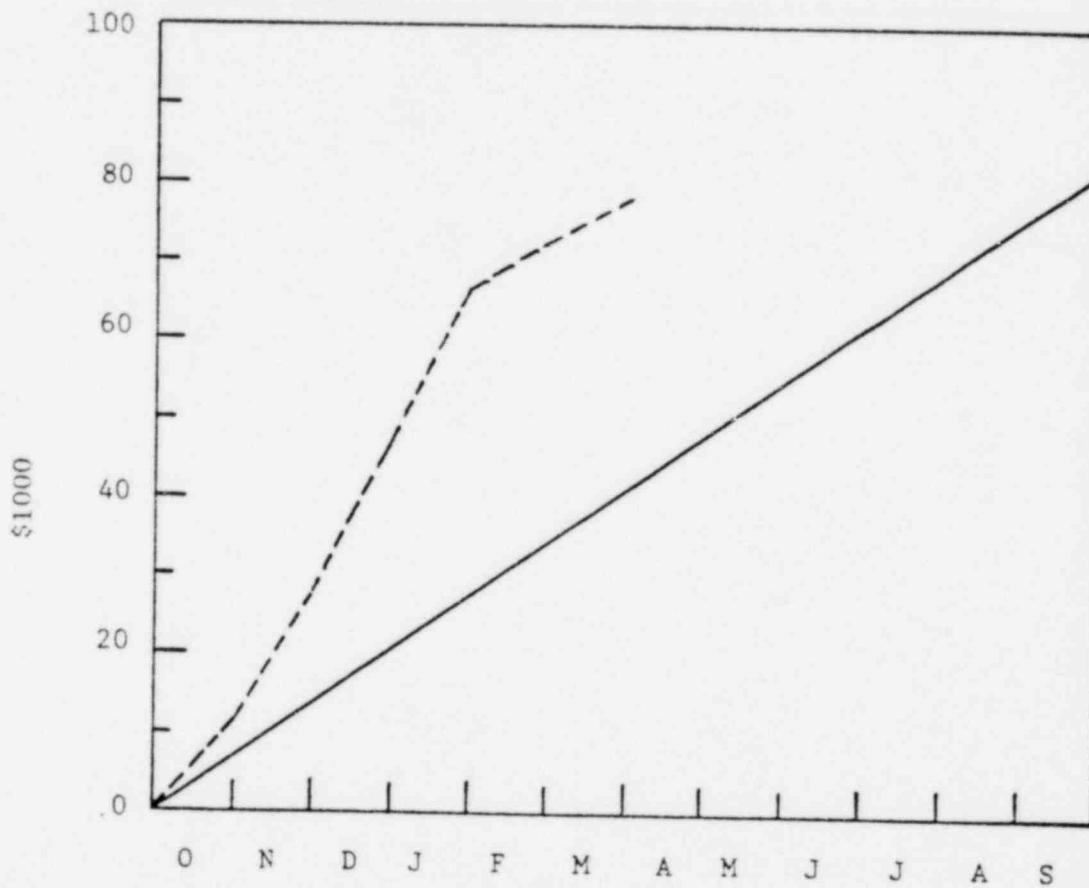
MANAGEMENT AND TECHNICAL ISSUES/POTENTIAL SCHEDULE OR FUNDING PROBLEMS:

The costs of final preparation of the MARCH User's Guide and testing of the released version of the code have been greater than anticipated. Within allocated budget, the amount of code intercomparison and verification possible will be minimal.

\* Includes carryover of \$31,918 from FY'79.

# EXPENDITURES

PROGRAM: ANALYSIS OF THERMAL-HYDRAULIC BEHAVIOR



RESOURCES EXPENDED:

	MARCH, 1980	CUMULATIVE
DOLLARS	4.2 K	78.3 (96%)
MAN-MONTHS	0.4	10.4

PROGRAM: ANALYSIS OF RADIONUCLIDE TRANSPORT SUBTASK

FIN#: A4067

CONTRACTOR: Battelle's Columbus Laboratories

BUDGET PERIOD: (mm/yy-mm/yy) 10/79-9/80

PAS PROGRAM MANAGER: J. A. Murphy

BUDGET AMOUNT: (Thousands) 100 K

CONTRACTOR PROGRAM MANAGER: R. S. Denning

PHONE: FTS-976-7510

PRINCIPAL INVESTIGATOR(S): P. Baybutt

PHONE: FTS-976-7499

PROGRAM OBJECTIVES:

- To revise the CORRAL code.
- To verify the revised code.
- To provide for the coupling of CORRAL with other codes.

ACTIVITIES DURING March, 1980

A writeup identifying and summarizing deficiencies in the present version of the CORRAL code was prepared. Models for radionuclide vapor attenuation by both natural removal processes and engineered safeguards were discussed in the write-up. These models are expected to be included in the upgraded version of CORRAL. A similar writeup will be developed for aerosol removal processes in April.

Radionuclide source terms currently employed in CORRAL were reviewed in order to identify improvements in the way they are handled. German experimental data on fission product releases from simulated core melts were reviewed to help in this process.

Work was also begun this month on the development of an improved interface between the MARCH code and CORRAL. Improvements in this interface will result in efficiencies in running the code.

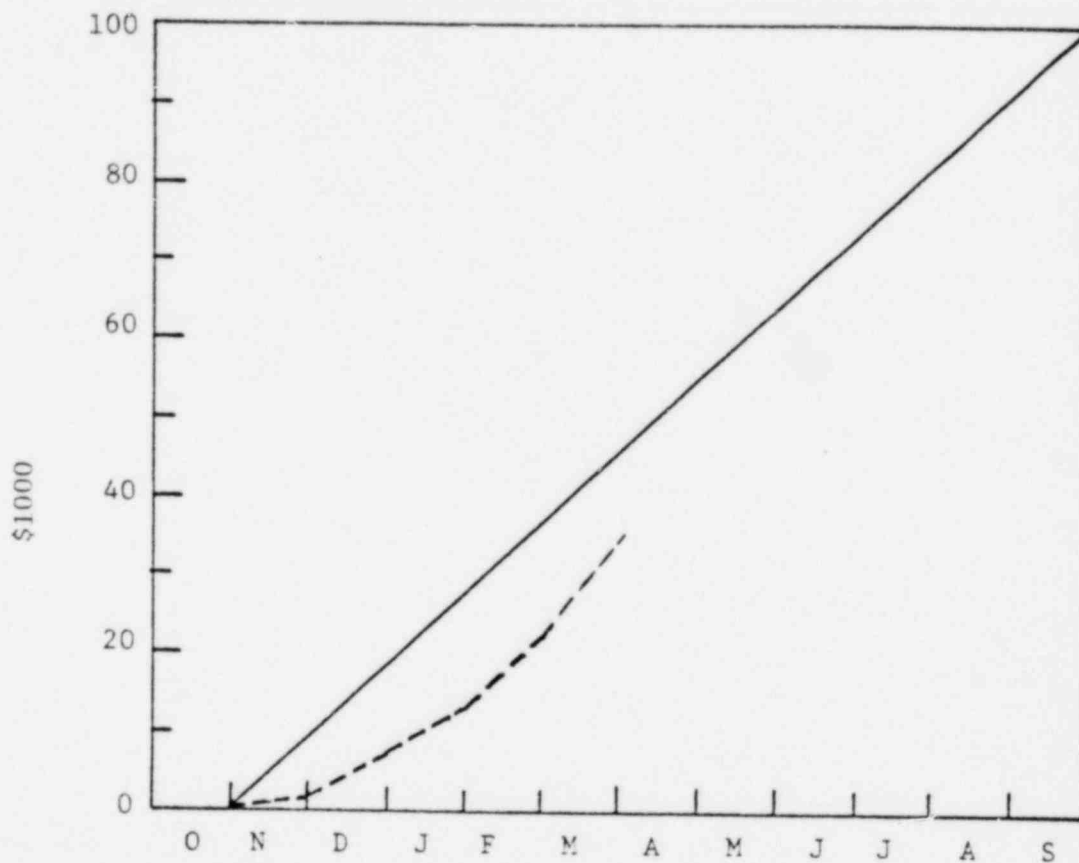
MAJOR MILESTONES:

MILESTONE DESCRIPTION	SCHEDULED/ACTUAL START	SCHEDULED COMPLETION	ACTUAL/PROJECTED COMPLETION
1. Specification of model improvements	10/1/79	2/29/80	2/29/80
2. Specification of new model requirements	12/1/79	6/30/80	
3. Identification of interface requirements	2/1/79	9/30/80	

MANAGEMENT AND TECHNICAL ISSUES/POTENTIAL SCHEDULE OR FUNDING PROBLEMS:



PROGRAM: ANALYSIS OF RADIONUCLIDE TRANSPORT



RESOURCES EXPENDED:

	MARCH, 1980	CUMULATIVE
DOLLARS	12.4 K	34.7 (35%)
MAN-MONTHS	0.8	2.3