INTERIM REPORT

NRC Research and Technical Assistance Report

NRC Research and Technical Assistance Report

Accession No._____

Contract Program or Project Title: Thermal Hydraulic LMFBR Safety Experiments

Subject of this Document: March Monthly Highlight Letter

Type of Document: Monthly Highlight Letter

Author(s): Theodore Ginsberg
Department of Nuclear Energy
Brookhaven National Laboratory
Upton, New York 11973

Date of Document: March 1981

Responsible NRC Individual and NRC Office or Division: Dr. Melvin Silberberg
Division of Reactor Safety Research
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

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.

Brookhaven National Laboratory
Upton, New York 11973
Associated Universities, Inc.
for the
U.S. Department of Energy

NRC Research and Technical Assistance Report

Prepared for
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
Under Interagency Agreement DE-AC02-76CH00016
FIN No. A-3024

NRC Research and Technical Assistance Report

NRC Research and Technical Assistance Report

Monthly Highlights

for

March 1981*

Thermal Hydraulic LMFBR Safety Experiments
FIN No. A-3024

NRC Research and Technical Assistance Report

Theodore Ginsberg, Group Leader
Experimental Modeling Group
Department of Nuclear Energy
BROOKHAVEN NATIONAL LABORATORY
Upton, New York 11973

NRC Research and Technical Assistance Report

* Work carried out under the auspices of the United States Nuclear Regulatory Commission.

1. Thermal Hydraulic Reactor Safety Experiments

1.1 Heat Transfer in Core-Concrete Interactions (G. A. Greene)

Interfacial mixing studies of immiscible liquid layers with gas agitation continued.

Additional average void fraction measurements by gas injection into adiabatic multifluid layers were performed.

The apparatus for heat transfer studies has been completed. The instrumentation rake has been installed. The first series of experiments on interfacial heat transfer between immiscible liquid layers with gas agitation have begun. One liquid layer (lower) is internally heated.

1.2 LWR Steam Spike Phenomenology (T. Ginsberg)

Preliminary steam spike simulation experiments have been initiated. Initial tests are being conducted with 3 mm diameter stainless steel spheres, heated to 500°F. Five kilogram quantities of steel are dropped into columns of water, preheated to approximately 185-190°F. The quantity of water is a variable, ranging from 4 kg(equivalent to a 0.5 m high column of water) to 12 kg (1.5 m column of water). These experiments are being used to debug the experimental apparatus, as well as to provide preliminary data to evaluate analytical models of the interaction.

1.3 HCDA Bubble Energetics: Role of Taylor Instabilities

Calculations have been performed using the multiphase bubble model for Taylor instability at the bubble liquid sodium interface during HCDA bubble expansion. The model applies separate equations for the vapor phase and for the heavy liquid/solid phase of the expanding bubble. The phases are coupled in the momentum equations by interfacial drag.

The calculation results indicate:

(i) Interfacial drag reduces the growth rate of interfacial disturbances.

(ii) The heavy-phase component composition in the bubble affects the "cut-off wavenumber" beyond which disturbances will not grow.

(iii) There exists a bubble void fraction below which interfacial disturbances will not grow. This conclusion supports earlier intuitive predictions based upon the original Taylor theory.

Distribution Thermal Hydraulic LMFBR Development Program

BNL RSP Division Heads
BNL RSP Group Leaders
BNL RSP Personnel

J. Boudreau, LASL
I. Catton, University of California
J. C. Chen, Lehigh University
R. T. Curtis, NRC
W. Gammill, NRC (2)
D. T. Eggen, Northwestern University
H. H. Hummel, ANL (2)
W. Y. Kato, BNL
M. S. Kazimi, MIT
H. J. Kouts, BNL
A. Reynolds, University of Virginia
M. Silberberg, NRC
M. Stevenson, LASL
J. C. Walker, Sandia Laboratory
R. W. Wright, NRC

U.S. NRC Division of Technical Information and Control