INTERIM REPORT

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June 27, 1979

Mr. Donald E. Solberg
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and Environmental Research
US Nuclear Regulatory Commission
Washington, DC 20555

Dear Don:

SUBJECT: R673 MONTHLY PROGRESS LETTER FOR MAY 1979 - ACCIDENT-INDUCED FLOW AND MATERIAL TRANSPORT IN NUCLEAR FACILITIES

We received authorization to begin work on this project on May 1, 1979. Our activities this past month are discussed below

We have divided our investigations of fire-induced flow into two catagories: propagating and nonpropagating. Calculation of the flow dynamics associated with a propagating flame front introduces many complications that we do not have to consider for stationary fires. Therefore, our initial program emphasis will be placed on nonpropagating fires to identify significant parameters that must be included in the analytical model. The most promising articles reviewed are those outlining full-scale fire experiments at Lawrence Livermore Laboratory (LLL). We plan to explore the LLL experiments in greater detail within the next three months.

Our literature review of relevant material transport information indicates that we should take a diverse approach to modeling particulate movement. We are reviewing techniques that emphasize the calculation of individual particle trajectories, tracking of particulate clouds, or interparticle dynamics such as agglomeration, coagulation, or condensation. We hope to outline the significant parameters, conditions of importance, and associated mathematical description for each transport process.

As in the case of material transport, there appears to be more than one way to proceed in developing a surface model. One approach involves the use of semiempirical mass flux equations based on similitude studies of the important variables and supporting experimental data to determine unknown coefficients. We suggested this method in our NFS plant analysis. A different task would involve developing the equations of motion (conservation of momentum) for individual particles and calculating their trajectories off the surface as the threshold lift was reached or exceeded. The latter method may turn out to be the most viable for the case of lightly loaded surfaces. Besides nuclear safety, health physics, aerosol science, soil science, and space science, we are looking carefully at another body of literature, namely, multiphase flow phenomena. These reviews will lead to an experimental plan for laboratory simulation of incipient material motion, entrainment, and total material flux.

On May 31, 1979, J. Glissmeyer and P. Owzarski from Battelle Pacific Northwest Laboratory (PNL) visited us. This meeting provided us with an opportunity to become more familiar with their program. We discussed PNL/LASL interface requirements and several analytical techniques that we are considering to model material transport.

Sincerely,

William S. Gregory

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