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SC-PR-65-682

CLASSIFIED SUPPLEMENT TO SANDIA CORPORATION AEROSPACE NUCLEAR SAFETY MONTHLY REPORT FOR NOVEMBER 1965 (Title Unclassified)

Prepared by

Aerospace Nuclear Safety Department 9310

ABSTRACT (U)

This supplement describes progress in classified work performed in Sandia Corporation's Aerospace Nuclear Safety Program during November 1965. Unclassified activity for this period is reported in SC-PR-65-624, Sandia Corporation Aerospace Nuclear Safety Report for November 1965.

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December 1965

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SUMMARY

This report summarizes Sandia participation in the SNAP-19/Nimbus B meetings which were held at AEC Headquarters on November 18, 1965.

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4. TASK IV -- SYSTEMS ANALYSIS AND SAFETY ASSESSMENT

4.1 SNAP-19/Nimbus B

Sandia representatives attended SNAP-19/Nimbus B meetings at AEC Headquarters on November 18, 1965. The purpose of the meetings was to gather up-to-date information from DBM and engineers relative to the assessment of the microsphere fuel form to be used in the SNAP-19.

The current SNAP-19 schedule was provided by R. T. Carpenter and is as follows:

a.	February 1966	First capsule fueled with sintered oxide delivered to Martin by Mound.
b.	May 1966	First two flight capsules to Martin.
c.	Late 1967, Early 1968	Nimbus B launch.

The current design approach for burnup of the generator and release of the microsphere fuel at high altitude was described by representatives of Martin. The design includes a single Haynes-25 capsule for each generator measuring 3 inches in diameter by 6.11 inches in length. The weight of the fueled capsule is about 7.25 pounds. Martin has estimated the fuel release altitudes from orbital re-entry to be between 211,000 and 193,000 feet, ignoring internal pressure effects. Considering internal pressure effects, they believe rupture will most likely occur at about 235,000 feet.

A summary of the characteristics of the fuel was presented by Mound representatives with all available data supporting the fuel form safety.

Sandia representatives presented the results of recent analysis of the re-entry behavior of the microsphere fuel form. The results of these studies were summarized as follows:

a. Melting and breakup of fuel particles can be avoided if release is accomplished at either high or low altitudes.

b. Melting of fuel particles alone is not expected to change the characteristics; verification experiments are planned.

c. Aerodynamic breakup of molten particles is expected to result in inhalable particles.

d. Vaporization of molten particles is expected but will not reduce the diameters to an inhalable size.

e. The altitude range of particle melting and breakup can be minimized by lowering the ballistic parameter of the generator and capsule.

f. The zone of fuel particle breakup can be reduced by decreasing the initial diameters of the fuel particles.

Based upon the analysis, the following three safety recommendations were presented:

a. A primary safety design objective should be the reduction of the probability of particle breakup.

b. A design for intact re-entry with trajectory shaping would minimize the probability of hazards and would allow a more confident behavior evaluation.

c. Minimizing the initial fuel particle diameter will enhance the safety of a design for high-altitude release.

Dr. Roy Thompson, Battelle-Northwest, and Dr. Wright Langham, Los Alamos, presented new data on the effects of single particles. Although Dr. Thompson has measured 30-micron diameter particles in the lung of a dog, it was the opinion of both Dr. Thompson and Dr. Langham that the PuO_2 microsphere fuel form, as manufactured, represents a nonhazardous fuel form.

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