



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MAR 03 1986

MEMORANDUM FOR: Chairman Palladino
Commissioner Roberts
Commissioner Asselstine
Commissioner Bernthal
Commissioner Zech

FROM: Victor Stello, Jr.
Acting Executive Director
for Operations

SUBJECT: NUCLEAR REGULATORY COMMISSION (NRC) INVOLVEMENT
IN SPACE MISSIONS USING RADIOACTIVE MATERIALS

Two scientific space probes utilizing plutonium power sources were scheduled to be launched aboard the shuttle in May and June of this year. Because of the recent shuttle accident, the National Aeronautics and Space Administration (NASA) has decided to postpone the two launches. The next window for these missions is in the Summer of 1987. By reconfiguring hardware, the missions could conceivably be launched in October 1986. The purpose of this memorandum is to remind the Commission of the extent to which NRC is involved in safety evaluation of these missions.

Background

The safety of space missions involving radioactive material is reviewed by the Interagency Nuclear Safety Review Panel (INSRP). The activities of INSRP are conducted under a Presidential Directive (PD-25). The panel is comprised of staff and consultants of NASA, the Department of Defense (DOD), and the Department of Energy (DOE). A typical panel includes 40-50 members who work part time on INSRP reviews. The panel has three co-chairmen, one from each parent agency.

The review is focused upon a series of Safety Analysis Reports (SAR) prepared by the DOE contractor selected to supply the power source. At the conclusion of the review, the panel prepares a Safety Evaluation Report (SER) which states their findings as to probable risks, possible safety problems, etc., of the proposed mission. The SER does not contain a recommendation as to whether the mission should or should not be conducted. The report is signed by the three co-chairmen and transmitted to the head of each of the three parent agencies.

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The report, together with other information, is used at senior levels within each parent agency to formulate a position with respect to whether the risk is acceptable relative to the scientific benefits to be gained. The head of each agency transmits his agency's position to the White House through the Office of Science and Technology Policy (OSTP). The President decides whether to authorize launch of the nuclear devices.

NRC INVOLVEMENT

In a letter dated December 7, 1977, the Director of the General Accounting Office (GAO) recommended to the Director of OSTP that NRC should participate in the nuclear safety evaluation of future space programs, including NRC reporting its conclusions to the President through OSTP. On January 5, 1978, Mr. Benjamin Huberman, Assistant Director of OSTP replied to GAO that NRC would participate in all relevant nuclear safety evaluation processes for space launches.

Subsequently, then Chairman Hendrie of the NRC requested the staff to outline possible ways in which the staff might deal with this responsibility. In response to this request, the staff met with NASA and submitted two papers to the Commission (SECY-79-220 and SECY-79-220A). The Commission's decision in this matter is described in memoranda from the Chairman and Secretary dated July 2, 1979 and October 30, 1979 (Enclosures 1 and 2). The General Counsel also prepared a legal analysis, dated September 13, 1979, which concluded that these activities were not subject to NRC licensing (Enclosure 3).

By letter dated December 5, 1979 (Enclosure 4), the staff informed INSRP that NRC would assign observers and outlined the conditions under which they would participate. In February 1983, the INSRP coordinator notified the staff of two planned missions and requested that NRC observers be appointed. Subsequently, three staff members from the Division of Fuel Cycle and Material Safety were assigned as INSRP observers.

Participation by NRC observers has been limited. In 1984, the staff attended a week long INSRP review meeting of the SAR. The staff also attended a meeting in 1985 where INSRP was briefed by DOE and NASA on the status of resolving outstanding issues and problems. In the INSRP review process, the detailed indepth analyses and evaluations are performed by several subpanels which meet separately. The staff has not participated in the activities of the subpanels.

Status

Two missions involving plutonium Radioisotope Thermoelectric Generators (RTG) were scheduled to be launched aboard the shuttle in May and June of this year. The Galileo Mission will send a probe to Jupiter while the Ulysses Mission will investigate the sun. Both missions utilize RTG's to power the instruments and electrical systems aboard the space craft. Each RTG contains approximately 9.2 kg of $^{238}\text{PuO}_2$ in the form of solid ceramic pellets. One RTG will be needed for the Ulysses mission while two RTG's will be used for the Galileo mission. In addition, the Galileo probe contains approximately 100 smaller plutonium sources used in Lightweight Radioactive Heater Units.

INSRP review of these missions has been proceeding over the past two years. The schedule for the FSAR was substantially delayed due to the need for DOE to conduct additional tests and perform additional evaluations. With the schedule slip, INSRP did not have sufficient time to conduct a formal review after the FSAR was completed and still maintain the schedule for submitting its results to the White House. Instead, the subpanels conducted their review and evaluation in parallel with final testing and preparation of the FSAR. At the time of the recent shuttle accident, INSRP was in the process of preparing the final draft of its Safety Evaluation Report for publication.

As a result of the shuttle accident, NASA has decided to postpone the missions scheduled for May and June. The next window for these launches will be in the Summer of 1987. However, by reconfiguring hardware, it is possible the missions could be launched aboard the shuttle in October of this year. INSRP has decided not to issue its report in final form at this time. In discussions with the INSRP coordinators, the staff understands that the report will be updated to consider whether its conclusions are affected by the recent Challenger accident.

The draft SER and portions of the FSAR are classified.

Discussion

In accordance with the Commission's instructions, the staff does not intend to take a position with respect to the safety aspects of space missions or the merit of the missions when compared to the risks. The NRC staff observers have technical competence in the areas of thermal and structural behavior of packages in defined environments and in health risk resulting from release of plutonium near the ground. Our limited participation in INSRP and lack of expertise in aerospace technology does not provide sufficient basis for a meaningful position on the safety of the mission.

The Commission should know that the RTG's are not designed to withstand all credible accidents. The potential consequences of plutonium release could be serious, particularly if the accident occurs near the ground.

The staff intends to inform the Commission of the INSRP analysis of nuclear risks associated with the launches and any disagreements it might have with that analysis. The staff does not know to what extent (if any) the White House, in determining whether to authorize launch, would seek NPC views on safety; particularly in view of the recent shuttle accident.

At present, only the Galileo and Ulysses missions are definitely planned; however, preliminary work is underway on a space reactor system in the event high power systems are needed in the 1990's.

Original signed by
Victor Stello

Victor Stello, Jr.
Acting Executive Director
for Operations

Enclosures: As stated

cc: SECY
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