

EDWARD J. MARKEY  
7TH DISTRICT, MASSACHUSETTS

COMMITTEES  
ENERGY AND COMMERCE  
CHAIRMAN  
SUBCOMMITTEE ON  
COMMUNICATIONS AND  
FINANCE  
NATURAL RESOURCES  
COMMISSION ON SECURITY AND  
COOPERATION IN EUROPE

Congress of the United States  
House of Representatives  
Washington, DC 20515-2107

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2133 RAYBURN HOUSE OFFICE BUILDING  
WASHINGTON, DC 20515-2107  
(202) 225-2836

DISTRICT OFFICES  
5 HIGH STREET, SUITE 101  
MEDFORD, MA 02155  
(617) 398-2900  
188 CONCORD STREET, SUITE 102  
FRAMINGHAM, MA 01701  
(508) 875-2900

August 24, 1994

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The Honorable Hazel R. O'Leary  
Secretary  
U.S. Department of Energy  
1000 Independence Avenue, S.W.,  
Washington, D.C. 20585

Dear Secretary O'Leary:

Thank you for your coordinating efforts, on behalf of the Clinton Administration and its Human Radiation Interagency Working Group, to disclose all records regarding questionable exposures of human populations to ionizing radiation. As I have previously noted, the release of files related to human radiation experiments, including the documents released in connection with your Openness press conference on June 27, 1994, represents a tangible result of your leadership, and I commend your actions.

However, I wish to bring to your attention material in the Department's collection of Human Radiation Records, on the Atomic Energy Commission's (AEC) ill-fated project to develop a nuclear-powered rocket. Previous information, including material released at an October 1992 House subcommittee hearing, revealed that on several occasions between 1955 and 1972, tests of the nuclear-powered rocket routinely spewed radioactive material over the Nevada desert. Documents in the Department's collection now provide additional information. The history of the Atomic Energy Commission's nuclear-powered rocket program is already one of unrestrained radioactive *hubris*. This arrogance was apparently compounded by features that should qualify as human radiation experiments: An intentional reactor accident in Nevada in 1965 produced a radioactive cloud that was tracked over Los Angeles to the Pacific Ocean. In addition, during at least one test in 1960, aircraft were flown through the radioactive effluent from the rocket engine, and doses to aircrews were measured. As the Department of Energy continues its review of archival material, I recommend that operations of the nuclear rocket program be evaluated as potential human radiation experiments.

Moreover, the Defense Department and NASA have recently revived the nuclear-powered rocket concept for their own purposes, and DOE facilities are expected to conduct the testing of this concept. I am confident that your Openness Initiative will extend to any future Department activities on this project,

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and I recommend that any testing proceed only after a full discussion of radiation protection measures and expected doses to workers and the general population from such tests.

At its public meeting at the end of July, the presidential Advisory Committee on Human Radiation Experiments released a memo from its staff, dated July 17, 1994, describing activities being considered as human radiation experiments under two categories (Attachment 1). "Intentional releases" involve the deliberate release of radioactive substances into the environment. Examples of such releases were identified by the General Accounting Office, in response to requests from Senator John Glenn. "Experiments of opportunity" involve scientific studies of human biological effects that make use of opportunities created by other events including releases of radiation into the environment, atmospheric nuclear tests, or radiation accidents. As a potential example of these experiments, the staff memo refers to operations where Air Force pilots flew through clouds from U.S atomic weapons tests, designated a human experiment by the Department of Energy in the 1980s, and included in the report on human radiation experimentation that I released in October 1986. Elements of the nuclear-powered rocket program should qualify as human experiments under both of these categories.

Historical information on this program was released as a result of an October 1992 hearing of the Subcommittee on Investigations and Oversight, House Committee on Science, Space, and Technology, The Development of Nuclear Thermal Propulsion Technology for Use in Space (See Attachment 2 for excerpts). The principle of the nuclear-powered rocket is that hydrogen gas, heated to very high temperatures (thousands of degrees F) by a nuclear reactor, and forced through a rocket nozzle, would produce thrust for propulsion. However, the high temperatures and stress also had the effect of melting reactor fuel rods and releasing radioactive material. A report from Los Alamos laboratory noted that during 1955-1972, at least five tests of the nuclear rocket released radioactive material to the Nevada desert (Attachment 2, pp. 376ff).

In addition, one of the documents in the Department of Energy human radiation collection describes an intentional reactor accident during one Kiwi nuclear rocket test at the Nevada Test Site in January 1965 (DOE Document 708297, see Attachment 3 for excerpts). This report noted that even during "normal" operations of the nuclear reactor at 2000°C (3600°F), core materials broke and were ejected, producing a "Roman candle" effect and releasing radioactive material. The January 1965 reactor accident vaporized between 5 and 20 percent of the nuclear fuel. (Attachment 3, p. 1) This experiment was described as "a shower of incandescent sparks rarely seen in anything but a pyrotechnic display." (Ibid., p. 12).

Weather requirements for the reactor accident were winds from the northeast, which blew the radioactive cloud toward Death Valley. Individuals in the track of the cloud were given film badges, and a ground-based monitoring system extended out to 50 miles from the test point. In addition, aircraft tracked the radioactive cloud over the Los Angeles area, until it reached the Pacific Ocean. (Ibid., p. 2). A few days after the reactor explosion, increased radioactivity in routine air samples was observed in Barstow, San Bernardino, Los Angeles, and San Diego (Ibid., p. 58).

The radioactivity released by the 1965 experiment was limited by the fact that the reactor had not previously been operated. The estimated highest dose beyond the test site was 5.7 millirad whole body radiation. This is below present limits established by the Environmental Protection Agency for annual exposure to a member of the general public from commercial atomic power operations, at approximately 25 millirad whole body radiation (40 CFR 190). It is gratifying to learn that estimated doses from the 1965 reactor accident were relatively low. However, an intentional reactor accident releasing a radioactive cloud should not be considered prudent public policy. In addition, the 1965 radioactive cloud extended over a longer distance and exposed considerably more people than some operations already being considered as human experiments. For example, the Advisory Committee on Human Radiation Experiments has been instructed to examine a radioactive release from Los Alamos in 1950 that was tracked 70 miles away (Attachment 1, p. 2). The intentional reactor accident in 1965 produced a cloud that traveled more than 200 miles to the Los Angeles area.

Other documents describe a second feature associated with nuclear rocket testing that may qualify as a human experiment. A December 1960 report from Los Alamos Laboratory (DOE Document 708159, see Attachment 4 for excerpts) noted that it had been "common practice" since 1950 to send aircraft through clouds from atomic tests (Ibid., p. 335). As noted above, these operations are being considered as potential "experiments of opportunity" by the Advisory Committee. This precedent apparently led to a similar experiment with B-57 aircrews who were sent through the radioactive exhaust from one of the Kiwi nuclear rocket tests. It appears that such tests were conducted with the rocket exhaust pointing toward the sky, presumably to avoid accidental launch of the rocket assembly. The 1960 Los Alamos report omitted "actual dose" values as classified information (Ibid., p. 337). In another part of the report, a reading in air near the nuclear rocket was reported as 990,000 roentgen/hr (Ibid., p. 340). The actual doses to aircrews would depend on parameters such as distance from the rocket nozzle, time spent within the exhaust cloud, and shielding around the crew. Depending on conditions, it does seem plausible that doses to aircrews could approach or exceed 5 roentgen, the approximate limit for annual occupational

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exposure today. Material submitted for the record in the 1992 hearings describes other tests where planes passed through nuclear rocket effluent, at altitudes as low as 1000 feet (Attachment 2, p. 381).

The Department of Energy has not yet designated operations of the nuclear-powered rocket program as human experiments. However, I recognize that the Department's program on human radiation records is an ongoing effort, including review, redaction, release, and analysis of documents. Moreover, members of my staff have reviewed only a small portion of the Los Alamos collection of released documents. As the Department continues its efforts, I recommend that the documents described here and any other documents on the nuclear-powered rocket be evaluated for whether these tests qualify as human radiation experiments under the categories described above.

The sad history of the nuclear-powered rocket program may also have ramifications for future Department operations. As you probably know, the October 1992 hearings before the House Subcommittee on Investigations and Oversight developed because the nuclear-powered rocket concept was revived by the Air Force and NASA. The project surfaced under the code name TIMBERWIND as part of the Star Wars program, but when nuclear rockets were deemed unsuitable for ballistic missile defense, the project was transferred to the Air Force. Both the Air Force and NASA made commitments during the October 1992 hearings that nuclear-powered rockets would not be launched from the ground, but terrestrial testing would be performed at Department of Energy facilities. Reactor tests would be conducted at Brookhaven laboratory, and field tests would be conducted at Sandia laboratory, with possible contributions from the Idaho laboratory. I am confident that your Openness Initiative extends to any field operations of the Department, and I recommend that any testing of nuclear rocket components proceed only after full public discussion of radiation protection measures and the anticipated doses to workers and members of the general public.

I am pleased to acknowledge that your Openness Initiative and other programs have produced results not previously seen from the Department of Energy. I wish to reiterate my commendations for your leadership and your efforts to provide full disclosure of improper activities that may have been conducted during the history of government atomic energy programs.

Sincerely,



Edward J. Markey  
Member of Congress

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Attachments:

1. Memo of Advisory Committee Staff, 7/19/94
2. Excerpts from October 1992 Hearing, Subcommittee on Investigations and Oversight
3. Excerpts from DOE Document 708297
4. Excerpts from DOE Document 708159

cc (w/ Attachments):

The Honorable John Glenn, Chairman  
Senate Committee on Governmental Affairs

The Honorable George E. Brown, Jr., Chairman  
House Committee on Science, Space, and Technology

The Honorable Philip R. Sharp, Chairman  
House Subcommittee on Energy and Power

Dr. Ruth R. Faden, Chair  
Advisory Committee on Human Radiation Experimentation