



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

January 15, 1993

The Honorable Bob Graham, Chairman  
Subcommittee on Nuclear Regulation  
Committee on Environment and Public Works  
United States Senate  
Washington, D.C. 20510

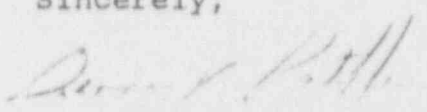
Dear Mr. Chairman:

Enclosed is a copy of the Abstract and Executive Summary from the report "Feasibility Studies for the Controlled, Cruise-Altitude Drop, and Aircraft Crash Tests" for the Plutonium Air Transport Certification Program.

In Phase One of the Nuclear Regulatory Commission program for certifying plutonium air transport packages in accordance with Public Law 100-203, draft criteria for the specified tests (Cruise-Altitude Package Drop Test, Aircraft Crash Test, and Controlled Test) were developed by Lawrence Livermore National Laboratory for the NRC. At the conclusion of this effort, Phase One was extended to perform feasibility studies for conducting the tests. This report describes the results of the studies.

If I can be of further assistance, please contact me.

Sincerely,

  
Dennis K. Rathbun, Director  
Office of Congressional Affairs

Enclosure:  
As Stated

cc: The Honorable Alan K. Simpson

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

January 15, 1993

The Honorable Richard H. Lehman, Chairman  
Subcommittee on Energy and Mineral Resources  
Committee on Natural Resources  
United States House of Representatives  
Washington, D.C. 20515

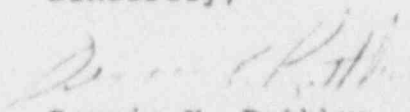
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Dennis K. Rathbun, Director  
Office of Congressional Affairs

Enclosure:  
As Stated

cc: The Honorable Barbara Vucanovich



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

January 15, 1993

The Honorable Philip Sharp, Chairman  
Subcommittee on Energy and Power  
Committee on Energy and Commerce  
United States House of Representatives  
Washington, D.C. 20515

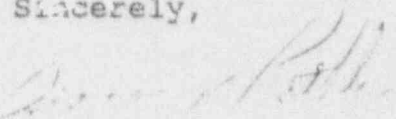
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Dennis K. Fathbun, Director  
Office of Congressional Affairs

Enclosure:  
As Stated

cc: The Honorable Michael Bilirakis



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

January 15, 1993

The Honorable Frank Murkowski  
United States Senate  
Washington, D.C. 20510


Dear Senator Murkowski:

Enclosed is a copy of the Abstract and Executive Summary from the report "Feasibility Studies for the Controlled, Cruise-Altitude Drop, and Aircraft Crash Tests" for the Plutonium Air Transport Certification Program.

In Phase One of the Nuclear Regulatory Commission program for certifying plutonium air transport packages in accordance with Public Law 100-203, draft criteria for the specified tests (Cruise-Altitude Package Drop Test, Aircraft Crash Test, and Controlled Test) were developed by Lawrence Livermore National Laboratory for the NRC. At the conclusion of this effort, Phase One was extended to perform feasibility studies for conducting the tests. This report describes the results of the studies.

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Dennis K. Rathbun, Director  
Office of Congressional Affairs

Enclosure:  
As Stated





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

January 15, 1993

The Honorable Ted Stevens  
United States Senate  
Washington, D.C. 20510

Dear Senator Stevens:

Enclosed is a copy of the Abstract and Executive Summary from the report "Feasibility Studies for the Controlled, Cruise-Altitude Drop, and Aircraft Crash Tests" for the Plutonium Air Transport Certification Program.

In Phase One of the Nuclear Regulatory Commission program for certifying plutonium air transport packages in accordance with Public Law 100-203, draft criteria for the specified tests (Cruise-Altitude Package Drop Test, Aircraft Crash Test, and Controlled Test) were developed by Lawrence Livermore National Laboratory for the NRC. At the conclusion of this effort, Phase One was extended to perform feasibility studies for conducting the tests. This report describes the results of the studies.

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Sincerely,

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Dennis K. Rathbun, Director  
Office of Congressional Affairs

Enclosure:  
As Stated



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

January 15, 1993

The Honorable Don Young  
United States House of Representatives  
Washington, D.C. 20515

Dear Congressman Young:

Enclosed is a copy of the Abstract and Executive Summary from the report "Feasibility Studies for the Controlled, Cruise-Altitude Drop, and Aircraft Crash Tests" for the Plutonium Air Transport Certification Program.

In Phase One of the Nuclear Regulatory Commission program for certifying plutonium air transport packages in accordance with Public Law 100-203, draft criteria for the specified tests (Cruise-Altitude Package Drop Test, Aircraft Crash Test, and Controlled Test) were developed by Lawrence Livermore National Laboratory for the NRC. At the conclusion of this effort, Phase One was extended to perform feasibility studies for conducting the tests. This report describes the results of the studies.

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Dennis K. Rathbun, Director  
Office of Congressional Affairs

Enclosure:  
As Stated

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Plutonium Air Transport Certification (PATC) Program

Phase One Extension Final Report

Feasibility Studies for the Controlled,  
Cruise-Altitude Drop,  
and Aircraft Crash Tests

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Manuscript completed: December, 1992

Prepared by:  
J.H. VanSant, T.F. Chen, and L.E. Fischer

Lawrence Livermore National Laboratory  
7000 East Avenue  
Livermore, CA 94550

Prepared for:  
Division of Safeguards and Transportation  
Office of Nuclear Material Safety and Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555  
NRC FIN No. L1056

## ABSTRACT

Section 5062 of Public Law 100-203 states that the Nuclear Regulatory Commission (NRC) shall certify to Congress the safety of containers used in the air transport of plutonium through U.S. airspace from a foreign nation to a foreign nation by requiring testing as follows: (1) an actual drop test from a maximum cruising altitude of a full-scale sample of such container with test materials, and (2) an actual crash test of a cargo aircraft fully loaded with full-scale samples of such container loaded with test materials unless the Commission determines, after consultation with an independent scientific review panel, that stresses on the container produced by other tests used in developing the container exceed the stresses that occur during a worst-case plutonium air shipment accident. Under Phase One of the NRC program for Public Law 100-203, draft criteria for performing the specified tests were developed and published in References 1 and 2 of this report. Phase One was extended to perform feasibility studies for conducting these tests. This report describes the results of the Phase One Extension activities. Facilities and organizations capable of conducting the tests are identified. Performance of a single test to satisfy the required cruise-altitude test and worst-case accident is discussed. Finally, the feasibility of conducting tests at a lower velocity on an unyielding surface rather than soft rock is explained.



## EXECUTIVE SUMMARY

Section 5062 of Public Law 100-203 states that the Nuclear Regulatory Commission (NRC) shall certify to Congress the safety of containers used to air transport plutonium through U.S. airspace from a foreign nation to a foreign nation. Specifically, the law states that the NRC shall require testing with full-scale samples of the plutonium container: (1) a drop test from the maximum cruising altitude of the cargo aircraft and (2) a crash test of a cargo aircraft fully loaded with sample containers, or other tests (also named Controlled Tests) that develop stresses in the container greater than would occur during the aircraft crash test. These requirements are in addition to those specified in Public Law 94-79.

In Phase One of the NRC program for certifying plutonium air transport (PAT) packages in accordance with Public Law 100-203, draft criteria for the specified tests (Cruise-Altitude Package Drop Test, Aircraft Crash Test, and Controlled Test) were developed by LLNL for the NRC. At the conclusion of this effort, Phase One was extended to perform feasibility studies for conducting the tests (a task defined as Phase One Extension). This report describes the results of the Phase One Extension studies.

The principal task in the Phase One Extension program is Controlled Test feasibility studies. Included are computer analyses of model PAT packages and physical benchmark tests with package models. The primary objectives of the studies are to validate the methodology developed in Phase One to determine impact velocities on yielding and unyielding materials for equivalent package response (i.e., 282 m/s impact on soft rock surface or equivalent velocity on unyielding surface). Also, two methods for conducting Controlled Tests to certify actual PAT packages are reviewed. Other tasks include a feasibility assessment of a single test satisfying both the Cruise-Altitude Package Drop Test and the Controlled Test requirements, and a status review of three technical issues pertaining to the Aircraft Crash Test: (1) alternative test aircraft, (2) flutter avoidance, and (3) flight control.

In the Controlled Test studies, only one energy absorbing material is considered. This material is grout, which is a specified mixture of sand and cement. Results of the studies indicate that a PAT container subjected to impacts on a yielding and an unyielding surface can experience equivalent maximum deceleration values. However, package deformation patterns resulting from impacts on two surfaces would not be equivalent due to interaction with impact surfaces of different properties. The test model used in the benchmark tests did not rupture when subjected to 282 m/s impacts on simulated soft rock and 157 m/s on steel plate. Benchmark test results were incorporated into material property models to improve the accuracy of analytical predictions of package response to impacts. Predicted decelerations and deformations nearly agree with test results, but additional improvements are needed, especially for impacts on yielding targets.

Review of rocket-sled and air-drop test methods reveals that these methods can feasibly be used to conduct PAT package Controlled Tests. Finally, it appears that the required Cruise-Altitude Drop Test can be conducted such that it could also be demonstrated to an independent review panel that stresses in a plutonium container would be greater than would occur in an actual Aircraft Crash Test.

CONGRESSIONAL CORRESPONDENCE SYSTEM  
DOCUMENT PREPARATION CHECKLIST

This checklist is to be submitted with each document (or group of Qs/As) sent for filing into the CCS.

1. BRIEF DESCRIPTION OF DOCUMENT(S) Ltr to Senator Graham
2. TYPE OF DOCUMENT ☒ Correspondence ☐ Hearings (Qs/As)
3. DOCUMENT CONTROL ☐ Sensitive (WRC Only) ☒ Non-sensitive
4. CONGRESSIONAL COMMITTEE and SUBCOMMITTEES (if applicable)  
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Congressional Committee  
\_\_\_\_\_  
Subcommittee
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(a) \_\_\_\_\_  
(b) \_\_\_\_\_  
(c) \_\_\_\_\_
6. SOURCE OF DOCUMENTS  
(a) \_\_\_\_\_ 5520 (document name) \_\_\_\_\_  
(b) ☒ Scan (c) \_\_\_\_\_ Attachments  
(d) \_\_\_\_\_ Rekey (e) \_\_\_\_\_ Other \_\_\_\_\_
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