February 5, 1981

SECY-81-95

# RULEMAKING ISSUE
(Affirmation)

For: The Commissioners

From: William J. Dircks
Executive Director for Operations

Subject: NRC TRANSPORTATION RULEMAKING PROCEEDING

Purpose: To summarize actions and responses under the NRC Transportation Rulemaking Proceeding and to recommend that it be closed.

Issue: Should the Commission endorse the staff view that no immediate changes to the NRC's transportation regulations are needed, and close the transportation rulemaking proceeding by publishing the Federal Register notice contained in Enclosure "A"?

Discussion:

1. Background

The Commission issued an advance notice of rulemaking proceeding in 1975, stating its intention to reevaluate its regulations governing the air transportation of radioactive material and asking for public comments on selected issues. The staff issued a "Draft Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes, NUREG-0034, in 1976 and a "Final Environmental Statement," NUREG-0170, on the same subject in 1977. Public comments were requested on both occasions. The environmental statement included consideration of other transport modes because of the requirement to consider alternatives contained in the National Environmental Policy Act of 1969. Closure of the proceeding, scheduled for 1978, was held in abeyance pending the completion of considerations related to the Department of Transportation's (DOT) rulemaking proceeding on the highway routing of radioactive material. In response to publication, in January 1980, of DOT's proposed rule on

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this subject, the NRC provided comments to DOT in November 1980, as described in SECY 80-305. It is the staff's view that the transportation rulemaking proceeding should now be closed and attention focused on several aspects of transportation identified in the course of the proceeding as needing further study. These studies, which are discussed in Enclosure "G", include an environmental assessment of transporting radioactive material through urban areas, a transport worker exposure study, emergency response guidance for transportation accidents involving radioactive material, a study to examine mode-dependent packaging standards, and an examination of controlling the physical/chemical form of transported radioactive material to reduce the possible consequences of severe accidents. A chronology of the rulemaking proceeding, including conclusions of the Final Environmental Statement (FES) cited above and the staff response to public comments, is detailed in Enclosure "B".

2. Finding of Adequacy

Based on the FES, the NRC staff has determined that the environmental impacts of normal transportation of radioactive material and the risks attendant to accidents involving radioactive material shipments are sufficiently small to allow continued shipments by all modes. Because transportation conducted under present regulations provides adequate safety to the public, the staff concludes that no immediate changes to the regulations are needed to improve safety.

Three changes to the transportation regulations are currently being proposed that are either not related to safety or are Congressionally mandated. One change would improve compatibility of the regulations with those of the IAEA. Another change would improve transportation safeguards for shipments of special nuclear material of moderate strategic significance in transit at the same time. The final change implements the Congressional mandate to notify Governors of nuclear waste shipmerts in their State. These changes are described in Enclosure "C."

The staff believes a Commission finding that present regulations are adequate is important to eliminate industry uncertainty concerning changes to the NRC transportation regulations that may occur as a result of the proceeding. Although the FES evaluates the environmental impact of actual transportation as opposed to the hypothetical impact possible if all shipments were in minimal compliance with the regulations, the staff believes it is an adequate basis for judging the acceptablity of the regulations and recommends the Commission make this finding of adequacy.

3. Closing the proceeding

The purpose of the proceeding was to review NRC's regulations and procedures concerning the transportation of radioactive materials with a view to the possible amendment of its regulations in 10 CFR Parts 71 and 73. Particular emphasis was placed on evaluating the adequacy of packaging. Regulatory responsibility for packaging is shared between the NRC and the DOT. As outlined in a memorandum of understanding, the NRC is primarily concerned with the packaging of fissile and larger quantities of radioactive material while the DOT is primarily concerned with the packaging of smaller quantities and of low specific activity material.

The staff believes an adequate review has been completed. Public participation in the proceeding was aggressively sought. Public comments were requested on certain issues at the time the original notice, announcing the reevaluation, was published. The FES was widely distributed to Federal and State agencies, to industry and environmental organizations, and to individuals who requested copies. Public comments on the FES were requested. The FES was also reviewed in two public meetings held by the NRC's Advisory Committee on Reactor Safeguards. Public response was moderate with 125 letters of comment in all phases of the proceeding and only limited attendance, less than 50 participants, at the two public meetings. A detailed breakdown of the public comments is given in the chronology of the proceeding, Enclosure "B".

A paper containing an analysis of the safety record of radioactive material transport is given in Enclosure "D". The analysis was performed by Sandia National Laboratories using data supplied by the NRC and the DOT. The paper was presented at an international symposium, "Packaging and Transportation of Radioactive Material (PATRAM) 80." The analysis indicates that a total of 659 accidents and incidents involving radioactve material have been reported to either the DOT or the NRC in the period 1971 through June 1980. Of this total, only 31 events involved a release of radioactive material. Of these 31 events, only 5 events involved a transportation accident. The other 26 events were handling accidents. None of these events, in which radioactive material was released, resulted in a serious radiological effect on people or the environment.

Based on the results of the review, consideration of the comments, and the safety record of radioactive material transport (Enclosure "D"), the staff has concluded that the NRC's present transportation safety regulations are adequate

to provide a reasonable degree of public safety. The staff believes the broad consideration of the proceeding should now be terminated and attention focused on the more narrow issues of the follow-on studies described in Enclosure "G".

4. Related Activities

Since the notice of rulemaking proceeding in 1975, the Commission has taken several actions to improve safety and safeguards aspects of the transportation of radioactive material. Some of these actions involved changes to the regulations after issuance of the FES. At the time the FES was issued, the staff believed that no immediate changes to the regulations were necessary. Those changes made since issuance of the FES were due to considerations outside of the rulemaking proceeding. These rule changes, along with other activities related to the rulemaking proceeding, are discussed in Enclosure "C".

5. Summary

The staff's reevaluation of its transportation regulations disclosed no major deficiencies and supports both a determination that present regulations are adequate and a decision to close the rulemaking proceeding. Several follow-on studies will be conducted to identify cost-effective methods of further reducing the already low risk of radioactive material transport.

Closure of the transportation proceeding involves no new resource requirements.

Recommendation: That the Commission:

1. Approve issuance of the Federal Register Notice in Enclosure "A", setting forth the position that present NRC transportation regulations are adequate to provide a reasonable degree of safety for the public, and that no immediate changes in the regulations are needed to improve safety, but that several follow-on studies will be undertaken to determine whether regulatory revisions would be cost-effective in further reducing transportation impacts.

2. Note:

a. The appropriate Congressional Committees will be notified of this action. Draft letters are in Enclosure "E".

b. A public announcement such as Enclosure "F" will be issued when the Commission's notice is filed with the Office of the Federal Register.

William J. Dircks
Executive Director for Operations

Enclosures:
"A" - Federal Register Notice
"B" - Chronology of the Rulemaking Proceeding
Appendices to Enclosure "B"
1 - Public Comments on June 1975 Advance Notice of Rulemaking Proceeding - Staff Responses
2 - Commission Memo - June 28, 1977
3 - Notice of Issuance of NUREG-0170
4 - Public Comments After Issuance of FES - Staff Responses
"C" - Related Activities
"D" - Transportation Safety Record
"E" - Draft Congressional Letters
"F" - Public Announcement
"G" - Follow-on Studies

Commissioners' comments or consent should be provided directly to the Office of the Secretary by c.o.b. Tuesday, February 24, 1981.

Commission Staff Office comments, if any, should be submitted to the Commissioners NLT Tuesday, February 17, 1981, with an information copy to the Office of the Secretary. If the paper is of such a nature that it requires additional time for analytical review and comment, the Commissioners and the Secretariat should be apprised of when comments may be expected.

This paper is tentatively scheduled for affirmation at an open meeting during the week of March 9, 1981. Please refer to the appropriate Weekly Commission Schedule, when published, for a specific date and time.

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ENCLOSURE A

NUCLEAR REGULATORY COMMISSION

10 CFR Parts 71 and 73

RADIOACTIVE MATERIAL

Packaging and Transportation by Air

AGENCY: U.S. Nuclear Regulatory Commission

ACTION: Withdrawal of Advance Notice of Rulemaking

SUMMARY: The Nuclear Regulatory Commission has reevaluated its transportation regulations concerning the air transportation of radioactive materials, including packaging. The intention to reevaluate these regulations was announced on June 2, 1975 (40 FR 23768). Public comments were requested for early consideration in the proceeding. Public comments were also solicited when a draft environmental statement was issued in 1976, and again when the final environmental statement was issued in 1977. The environmental statement included an examination of the transportation of radioactive material by all modes of transport. Considering the information developed and received and the safety record associated with the transportation of radioactive material, the NRC has determined that the present regulations provide a reasonable degree of safety and that no immediate changes in the regulations are needed to improve safety. However, several follow-on studies will be undertaken by the Commission to determine whether regulatory revisions would be cost-effective in reducing transportation impacts. Having made the determination that no immediate

changes to its regulations are needed to improve safety, the NRC is closing the rulemaking proceeding and focusing its efforts on the follow-on studies.

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SUPPLEMENTARY INFORMATION: The Nuclear Regulatory Commission (NRC) announced on June 2, 1975 that it was reevaluating its then existing transportation regulations, originally issued by the Atomic Energy Commission, concerning the air transportation of radioactive materials, including packaging, with a view to the possible amendment of its regulations in 10 CFR Part 71, "Packaging of Radioactive Material for Transport and Transportation of Radioactive Material Under Certain Conditions," and Part 73, "Physical Protection of Plants and Materials." The NRC invited public comments on specific issues related to that reevaluation, established an interim position that air transportation of special nuclear material could continue during the rulemaking proceeding, and noted that the NRC staff would prepare a generic environmental impact statement (EIS) on the subject. The public comments submitted in response to the June 1975 notice were useful in providing an indication of public concerns which needed to be addressed in developing the EIS. The EIS also included consideration of other transport modes because of the requirement to consider alternatives contained in the National Environmental Policy Act of

1969. A total of 69 letters of comment were received in response to the announcement, 26 of them dealing with the interim position taken on air transportation of special nuclear material. These comments and the NRC staff's analysis of them are vailable in the NRC Public Document Room at 1717 H Street NW., Washington, D.C.

In a FEDERAL REGISTER notice published February 9, 1976, (41 FR 5627) the NRC affirmed its interim position that special nuclear material could continue to be shipped by air, but recognized that air shipment of plutonium had been foreclosed by Public Law 94-79. This law prohibited the NRC from licensing any plutonium air shipments (except certain medical devices) until "a safe container has been developed and tested which will not rupture under crash and blast-testing equivalent to the crash and explosion of a high-flying aircraft." In August 1978, NRC certified to Congress that such a package had been developed and tested. By NRC order dated September 1, 1978, plutonium air shipments in that package were authorized.

The NRC issued a Draft Environmental Statement, "Transportation of Radioactive Material by Air and Other Modes" (NUREG-0034), in March 1976. After consideration of the 28 letters of comment received from the public and from Federal, State and local agencies, a final statement on that subject was prepared. That final statement contained the 28 public comments on the draft statement and the NRC staff's analysis of them. Before issuance, the final statement was extensively reviewed within the NRC, and was reviewed twice in public meetings (February 1977 in Atlanta, GA; November 1977 in Chicago, IL) by the NRC's Advisory Committee on Reactor Safeguards.

The Final Environmental Statement (FES), "Transportation of Radioactive Material By Air and Other Modes" (NUREG-0170), was issued in December 1977. It included a cover sheet requesting comments from persons with views on the content or conclusions of the final environmental statement which might be helpful to the NRC in considering the disposition of the rulemaking proceeding announced on June 2, 1975. NUREG-0170 analyzes the impacts of the normal transportation of radioactive material, the impacts of transportation accidents, and deliberate misuse of radioactive material in transportation. These analyses are based on the numbers and characteristics of real shipment as identified in a 1975 survey of shippers, the results of which were detailed in "Survey of Radioactive Material Shipments in the United States," BNWL-1972, dated April 1976. NUREG-0170 shows that the environmental impact from normal transportation of radioactive material is small, adding about one latent cancer fatality per year to the existing total of approximately 300,000. The impact from transportation accidents is shown to be only a small fraction of the normal impact, and the risk from deliberate misuse is qualitatively shown to be "sufficiently small to constitute no major adverse impact on the environment."

Of the eleven letters offering post-issuance comments, five supported NUREG-0170 as an adequate representation of transportation impacts. Three of the letters criticized the scope of the report (two, too limited; one, too broad), and three said that consideration of alternatives was inadequate. One commenter noted that the report purports to be neither an EIS for NRC licensing actions nor an EIS for actions of DOE, DOT, FAA or the State

Department with respect to transport of radioactive material. Finally, three commenters were critical of specific portions of the impact analysis in NUREG-0170.

With respect to the NRC's action on the rulemaking proceeding, two commenters suggested that we implement the concept of "as low as reasonably achievable" in transportation, and two suggested that we have a strong enforcement program to assure adequate implementation of the transportation requirements. Four commenters suggested closing the proceeding, and one suggested that the NRC consider the urban environment, carrier aspects of transportation, and military shipments in deciding on any follow-on action. Single suggestions were received to educate transport workers, require consignees to identify themselves, to eliminate any exposures to the general public above background, to prohibit high-level waste shipments by air, and to improve the safeguards physical protection requirements.

The public comments submitted in response to the June 1975 notice were useful in expressing public attitudes which needed to be addressed in the environmental statement. The public comments after issuance of the FES did not claim, except in two cases, any large deficiencies in either the FES or in the current transportation requirements. In no case did the latter public comments present convincing or supporting evidence of any significant deficiency in transportation requirements.

Closure of this transportation rulemaking proceeding had been scheduled for 1978, but was held in abeyance pending the completion of considerations related to the Department of Transportation's (DOT)

rulemaking proceeding on the highway routing of radioactive material. In November 1980, the NRC provided comments to DOT in response to publication, in January 1980, of DOT's proposed rule on this subject (45 FR 7140). The NRC advice was to require routing of shipments so as to minimize total annual health impacts, including nonradiological impacts. Now that these routing considerations are complete, closure of the transportation proceeding can be accomplished.

Based on the analysis developed in the rulemaking proceeding, on the public comments received, on the safety record, and on other information, the NRC has concluded that present regulations are adequate to protect the public against unreasonable risk from the transport of radioactive materials. However, prudence dictates that regulatory policy concerning transportation of radioactive materials be subject to close and continuing review. In its continuing review, the NRC distinguishes between safety matters and safeguards matters. Safety deals with protection against adverse consequences from accidents or natural causes while safeguards deals with protection against deliberate, malevolent acts by man. Concerning safety regulation, several studies are in progress or contemplated. The object of the studies is to find cost-effective measures to further reduce public dose. The study subjects include environmental effects of transportation in urban areas, transport worker doses, physical and chemical forms of materials being shipped, and package test standards for extreme accidents in each transport mode. A draft technical assessment of the environmental effects of transporting radioactive material through an urban area has been

issued by Sandia National Laboratories under contract to the NRC. Its availability to the public was announced in the Federal Register on September 17, 1980 (45 FR 61838). This assessment will form the basis of the NRC's Environmental Impact Statement on this subject that is scheduled to be issued in 1981. Additionally, a proposed rule change, announced on August 17, 1979 (44 FR 48234), would improve compatiblity of the transportation regulations with those of the International Atomic Energy Agency. In connection with safeguards regulation, follow-on studies on sabotage of spent fuel shipments and transportation of high level waste are in progress or contemplated. A proposed rule change, announced on January 14, 1980 (45 FR 2657) and modified on February 21, 1980 (45 FR 11503), would strengthen transportation safeguards by eliminating multiple, simultaneous shipments of special nuclear material of moderate strategic significance. As the regulatory process proceeds, these studies and proposed rules may result in the issuance of new regulations.

In a separate regulatory action, the NRC issued on December 9, 1980, (45 FR 81058) a proposed regulation as a first step in carrying out the Congressional mandate in Public Law 96-295 to notify the governor of a state concerning shipments of radioactive waste within or through the state. In another separate action, the NRC, in cooperation with the Federal Emergency Management Agency and other federal agencies, is currently developing guidance material to be used by state agencies in developing emergency response plans for transportation accidents involving radioactive material.

Since the purpose of the rulemaking proceeding announced on June 2, 1975 has been completed, i.e., present transportation regulations have been adequately reassessed, that rulemaking proceeding is now closed.

Persons who wish to view the public comments received under the rulemaking proceeding or the staff's analyses of these comments at the NRC Public Document Room at 1717 H Street NW., Washington, D.C., should refer to Docket Number PR 71, 73 (40 FR 23768).

Authority: Secs. 53, 161b and i; Pub. L. 83-703, as amended; 68 Stat. 930, 948 (42 U.S.C. 2073, 2201(b) and (i)); Sec. 201; Pub. L. 93-438, as amended; 88 Stat. 1242, as amended (42 U.S.C. 5841).

Dated at Washington, D.C. this _____ day of _____, 1981.

For The Nuclear Regulatory Commission.

_____

Samuel J. Chilk
Secretary of the Commission

ENCLOSURE B

CHRONOLOGY OF THE TRANSPORTATION

RULEMAKING PROCEEDING

On May 15, 1975 the Commission approved a Notice of Rulemaking Proceeding (SECY-75-221) on the Packaging and Transportation of Radioactive Material by Air. In this notice, the Commission indicated that the then existing NRC air transportation regulations were being reevaluated, invited public comments on specific issues related to that reevaluation, established an interim position that air transportation of special nuclear material could continue during the rulemaking proceeding, and noted that the NRC staff would prepare a generic environmental impact statement on the subject.

A total of 69 letters of comment were received in response to this Notice, 26 of them dealing with the interim position taken on air transportation of special nuclear material. The Commission's notice and the staff's summary and analysis of the comments are included in Appendix 1 to this enclosure.

In a FEDERAL REGISTER Notice published February 9, 1976, the Commission affirmed its interim position that special nuclear material could continue to be shipped by air, but recognized that air shipment of plutonium had been temporarily foreclosed by Public Law 94-79 (Scheuer amendment).

The staff issued a Draft Environmental Statement, "Transportation of Radioactive Material by Air and Other Modes" (NUREG-0034), in March 1976. After consideration of the 28 letters of comment received from the public and from Federal, State and local agencies, the staff completed a Final Environmental Statement (FES) in February 1977. The Commission chose to review the document

prior to issuance. Commission comments, contained in memorandum dated April 21, 1977, requested a review of the contemplated follow-on action plan subsequent to the issuance of the FES. The follow-on action plan provided for inclusion of an opportunity for public comments after the FES was issued. The plan also provided for inclusion of a Commission decision on the adequacy of then existing transportation requirements, on continuing staff actions, and on closing the Transportation Rulemaking Proceeding.

The Commission instructed the staff (memorandum dated June 28, 1977 - Appendix 2 to this enclosure) to thoroughly edit the FES and ask ACRS to review it again before issuance. The ACRS review was completed in November 1977, and the FES (NUREG-0170) was issued in December 1977. The FES indicates that the environmental impact from normal transport is small, adding one latent cancer fatality per year to the existing total of approximately 300,000 and that the impact from transportation accidents is only a small fraction of the normal impact. However, even though the probability is low, the consequences of a major release of certain radionuclides in a densely populated area could be severe, with one early fatality expected from radiological causes, and as many as 150 latent cancer fatalities over a 30-year period. In addition, up to 60 persons would be expected to suffer some lung injury.

The FES was widely distributed to Federal and State agencies, to industry and environmental organizations, and to individuals who requested copies. Distribution exceeded the initial printing of 2,300 copies. An issuance notice included with each copy (Appendix 3 to this enclosure) invited public comments for consideration by the Commission in deciding on the disposition of the Transportation Rulemaking Proceeding. A total of eleven letters of comment were received from Federal and State agencies and from the nuclear industry. These

comments are included in Appendix 4 to this enclosure, as is the staff's analysis of those comments. In addition, there were eight State responses offering no comments.

Of the eleven letters offering post-issuance comments, five supported NUREG-0170 as an adequate representation of transportation impacts. Three of the letters criticized the scope of the report (two, too limited; one, too broad), and three said that consideration of alternatives was inadequate. One commenter noted that the report purports to be neither an EIS for NRC licensing actions nor an EIS for actions of DOE, DOT, FAA or the State Department with respect to transport of radioactive material. Finally, three commenters were critical of specific portions of the impact analysis in NUREG-0170.

With respect to the NRC's action on the Rulemaking Proceeding, two commenters suggested that we implement the concept of "as low as reasonably achievable" in transportation, and two suggested that we have a strong enforcement program to assure adequate implementation of the transportation requirements. Four commenters suggested closing the proceeding, and one suggested that the NRC consider the urban environment, carrier aspects of transportation, and military shipments in deciding on any follow-on action. Single suggestions were received to educate transport workers, require consignees to identify themselves, to eliminate any exposures to the general public above background, to prohibit high level waste shipments by air, and to improve the safeguards physical protection requirements.

The public comments submitted in response to the June 1975 notice were useful in expressing public attitudes which needed to be addressed in the environmental statement. The public comments after issuance of the FES did not claim, except in two cases, any large deficiencies in either the

FES or in the current transportation requirements. In no case did the latter public comments present convincing or supporting evidence of any large deficiency in transportation requirements.

In SECY-77-92A, the follow-on action plan now calls for a Commission decision on the adequacy of existing transportation regulations to allow continued shipment of radioactive materials by all modes while protecting the public from an unreasonable health and safety risk. The plan also includes Commission consideration of public comments received (Appendix 1 to this enclosure) in response to the original Notice of Rulemaking Proceeding in 1975, the analysis and conclusions in the FES (NUREG-0170) and the public response to it (Appendix 4 to this enclosure), and the safety record for the transportation of radioactive material as discussed in Enclosure "D" to this Commission Paper.

Closure of the proceeding had been scheduled for 1978, but was held in abeyance pending the completion of considerations related to the DOT's rulemaking proceeding on the highway routing of radioactive material. NRC provided comments to DOT, as described in SECY 80-305, in response to publication of DOT's proposed rule on this subject. Now that these routing considerations have been completed, closure of the NRC proceeding can be accomplished.

APPENDIX 1 TO ENCLOSURE "B"

PUBLIC COMMENTS ON JUNE 1975 ADVANCE NOTICE OF

RULEMAKING PROCEEDING - STAFF RESPONSES

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## NUCLEAR REGULATORY COMMISSION

[10 CFR Parts 71 and 73]

### RADIOACTIVE MATERIAL

Packaging and Transportation by Air

Following its organization under the Energy Reorganization Act of 1974 (Public Law 93-438), the Nuclear Regulatory Commission (NRC) has stated its intention of reviewing those of its regulations and procedures pertaining to the licensing and regulation of nuclear facilities and materials which were originally promulgated by the Atomic Energy Commission, with a view to considering what changes should be made. As part of that effort, the NRC is initiating a rule making proceeding concerning the air transportation of radioactive materials, including packaging, with a view to the possible amendment of its regulations in 10 CFR Parts 71 and 73, adopted pursuant to the Atomic Energy Act of 1954, as amended. The NRC considers the reevaluation of these particular regulations to be especially timely in view of concerns that have been recently expressed by public officials and others as to the safety and security of air shipment of plutonium and other special nuclear materials through highly populated metropolitan areas.

The Department of Transportation (DOT) has overlapping jurisdiction over

safety in packaging and transportation by air of radioactive materials under the Transportation of Explosives and Other Dangerous Materials Act (18 U.S.C. 831–835) and the Transportation Safety Act of 1974 (Pub. L. 93–633, 88 Stat. 2156), and the Federal Aviation Administration has similar overlapping jurisdiction under the Federal Aviation Act of 1958 (49 U.S.C. 1421–1430, 1472(b)). It is expected that the expertise of these agencies will be utilized in the subject rule making proceeding.

*Background of present regulations.* Following a prohibition against shipment of radioactive material by mail in 1936 to protect unexposed film, safety regulations for shipping radioactive material were adopted by the Interstate Commerce Commission in 1948. Those regulations were based on a report of a National Academy of Sciences–National Research Council Subcommittee on Transportation of Radioactive Material. The basic principles reflected in those regulations were reviewed and adopted, with minor modifications and some elaboration, by the International Atomic Energy Agency (IAEA) in 1961 and reflected in recommended International Standards for the Safe Transport of Radioactive Material. In 1964, on the basis of shipping experience up to that date and an analysis of transportation accidents prepared by the United Kingdom Atomic Energy Authority, the IAEA issued revised transport regulations incorporating specific accident damage test standards which were incorporated into the NRC (then AEC) and DOT (then within the jurisdiction of the ICC) regulations by 1968. Except for changes in the regulations to deal with specific problems (e.g., leak testing of packages containing liquids, prompt pickup and monitoring of packages, restrictions on shipments of plutonium on passenger aircraft, opening and closing procedures), the safety regulations have remained essentially the same since that time.

The safety standards for transportation, as set forth in NRC's regulation in 10 CFR Part 71 and DOT regulations in 49 CFR Parts 170–178, are based on two main considerations: (1) Protection of the public from external radiation and (2) assurance that the contents are unlikely to be released during either normal or accident conditions of transport or, if the container is not designed to withstand accidents, that its contents are so limited in quantity as to preclude a significant radiation safety problem if released. These safety standards are applicable to packages used in all models of transport and were developed with the objective of providing an acceptable level of safety for transport of radioactive material by any mode.[1] With respect to air shipments, it was considered that, taking into account the high integrity of the packaging[2] and the low accident probability for air transportation (no more than one accident per 100 million miles, the risk of an air accident resulting in a release of radioactive material from a package was small.

[1] In contrast to the safety standards described above, NRC's requirements for the physical protection (security) of strategic quantities of special nuclear material, including plutonium, in 10 CFR Part 73, are specific as to the mode of transport.

[2] Container designs required to meet accident conditions are evaluated under current regulations against the following accident test conditions in sequence: 30-foot free drop of the container in the most damaging position onto a flat, essentially unyielding surface, 40-inch drop onto a steel bar to test the ability to withstand puncture, 30-minute fire test at 1475° F and 3-foot water immersion test for eight hours. The puncture test and the drop test are engineering qualification tests. The test conditions were chosen to provide reproducible laboratory conditions representative of severe transportation accident environments. For example, a 30-foot drop onto an unyielding surface produces impact or shock loads which are more severe than drops of several thousand feet onto targets such as land, water, or even city streets which would tend to yield when struck by the package. Because of the conservatism of most designs, packages, when subjected to tests involving free fall from much greater heights than 30-feet, have either remained undamaged or continued to contain their contents. For example, a number of packages which pass the NRC qualification tests have also been tested under extra severe conditions such as a 250-foot free fall onto an essentially unyielding surface. Packages currently approved for bulk shipment of plutonium oxide and nitrate will survive such test conditions. These extra severe tests provide added assurance that containers, in much the same manner as aircraft flight recorders, could survive severe air accidents. A description of these tests is set forth in SC–DR–72 0507 (Sept. 1972), "Special Tests for Plutonium Shipping Containers 6M, SP5795, and L–10", a copy of which is available for public inspection at the Commission's Public Document Room, 1717 H Street NW., Washington, D.C.

[3] A Type B package is required for quantities in excess of a few millicuries and up to 20,000–50,000 curies, depending upon the radionuclide. Such packages are required to be designed to withstand accident conditions as well as normal conditions of transport.

NRC packaging standards are applicable to shipments by NRC licensees, while DOT regulations are applicable to transportation of radioactive material by land in interstate and foreign commerce on civil aircraft, and on water. DOT regulations in Title 49 of the Code of Federal Regulations and FAA regulations in 14 CFR Part 103 cover labeling and conditions for shipment and carriage as well as certain packaging. NRC regulations exempt carriers from their application in view of the controls exercised over carriers by DOT and its component parts, including FAA.

For the purpose of developing and implementing consistent, comprehensive and effective regulations for the safe transport of radioactive material and to avoid duplication, the DOT (then ICC) and the AEC (NRC's predecessor) entered into a Memorandum of Understanding in 1966 which was superseded by a revised Memorandum of Understanding signed on March 22, 1973. Under the revised memorandum, the AEC (now NRC) develops performance standards for package designs and reviews package designs for Type B[3] fissile and large quantity packages. The DOT develops safety standards governing handling and storage of all radioactive material packages while in possession of a common, contract or private carrier, as well as standards for Type A packages.[4] DOT requires AEC (now NRC) approval prior to use of all Type B, fissile and large quantity package designs. DOT is the National Competent Authority with respect to foreign shipments under the IAEA transport standards. IAEA Certificates of Competent Authority are issued by DOT with technical assistance provided by NRC as requested.

*Re-evaluation of present regulations.* Consistent with the considerations expressed in the first paragraph of this notice, the NRC has decided that its regulations governing air transportation of radioactive material, including packaging, should be re-evaluated from the standpoint of radiological health safety and prevention of diversion and sabotage as well. In connection with this re-evaluation, the NRC has instructed its staff to commence preparation of a generic environmental impact statement on the air transportation of radioactive materials, including packaging and related ground transportation. The statement will be directed at air transportation. However other transportation modes—land and water transport—will be considered in light of the requirement of the National Environmental Policy Act of 1969 (NEPA) that the relative costs and benefits of alternatives to certain proposed Federal actions be fully considered. It is anticipated that the draft generic environmental impact statement will be available by the time that any proposed changes to the regulations eventuating from this rule making proceeding are published for comment in the FEDERAL REGISTER. While the generic impact statement is in preparation, impact statements or impact appraisals for individual NRC licensing actions related to the transportation of radioactive materials, such as import licenses for significant quantities of plutonium and other special nuclear material, will be prepared as required by NEPA and 10 CFR Part 51.

In order to aid the NRC in this re-evaluation of existing regulations pertaining to radioactive material transported by air, interested persons are invited to submit information, comments and suggestions with respect to those aspects of the above-referenced NRC regulations. The NRC is particularly interested in receiving views on the following:

1. Whether radioactive materials should continue to be transported by air, considering the need for, and the benefits derived from such transportation, the risks to public health and safety and the common defense and security associated with such transportation, and the relative risks and benefits of other modes of transport.

[4] A Type A package is required for less than Type B quantities of radioactive material and is required to be designed to withstand normal conditions of transport only.



Enclosure "B"

2. Assuming a justifiable need for air transportation of radioactive materials, to what extent should safety requirements be based on:
(a) Accident probabilities;
(b) Packaging;
(c) Procedural controls;
(d) Combinations of the above?

3. What is the relative risk of transport of radioactive material by air compared to other modes of transport, and to other hazards faced by the public which may or may not be the subject of regulation?

4. Are improvements in applicable regulations necessary, and if so, what improvements should be considered?

Documentation supporting the views expressed by interested persons would be helpful to the NRC in re-evaluation of its regulations relating to air transportation of radioactive materials and consideration of possible changes to such regulations.

It should be noted that there are some related issues which will be, or are presently, the subject of consideration in other rule making proceedings and, therefore, will not be included in this proceeding. They are:

1. Physical security protection requirements for strategic quantities of special nuclear material that would apply to all modes of transport (39 FR 40036).

2. Requirements for advance notice of shipments of strategic quantities of special nuclear material (40 FR 15098).

3. Quality assurance requirements for packages for all special nuclear material (38 FR 35190).

4. Radiation levels from radioactive material transported in passenger aircraft.

If it subsequently appears that additional issues should more properly be treated in a separate proceeding, or proceedings, appropriate notices to that effect will be published in the FEDERAL REGISTER.

Interested persons should send comments and suggestions, with supporting documentation, to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Section by August 1, 1975. Copies of comments received may be examined in the NRC Public Document Room at 1717 H Street NW., Washington, D.C.

After comments have been received and considered, the NRC will publish its views as to NRC rules pertaining to air transportation of radioactive material in the FEDERAL REGISTER. When the aforementioned draft environmental impact statement is prepared, notice of its availability will be published in the FEDERAL REGISTER and opportunity for public comment afforded pursuant to NRC regulations implementing the National Environmental Policy Act of 1969 (10 CFR Part 51). In addition, background information on the subject of regulation of transportation of radioactive materials has been placed in the NRC Public Document Room at 1717 H Street NW., and at its local public document rooms throughout the nation. Copies of such background information are available upon request in writing to the Office of Standards Development, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

*Interim evaluation.* Recently there have been several requests that air shipments of plutonium and other special nuclear materials (and related ground transportation of special nuclear materials incidental thereto) be suspended pending reexamination of presently applicable regulations. In assessing the appropriateness of such action at this time, the NRC has considered the following:

1. In more than 25 years of shipping special nuclear material, including plutonium, in civilian aircraft, there have been no air accidents involving the material.

2. The experience in shipping thousands of packages per year of all forms of radioactive materials by all modes of transport under existing NRC, DOT, and FAA regulations has been very favorable.

3. The requests that have been received do not set forth any significant new information which would indicate that present package or security requirements are inadequate.

4. In view of the physical security measures now required by 10 CFR Part 73, the protection provided against severe accidents by the high integrity packaging required by NRC, DOT, and FAA regulations (summarized supra), the consistency of these requirements with international standards, the low accident probability (supra), and the favorable experience to date, the risk involved in the transportation of radioactive material under currently effective regulations is believed to be small.

Accordingly, it is presently the view of the NRC, subject to consideration of comments to be received, that its currently effective regulations can continue to be applicable during the period in which this rule making proceeding is in progress. More particularly, in light of present information as to the safety and security of air shipments of radioactive material, the Commission sees no sound basis, for the reasons stated above, for requiring the suspension of such shipments.

Notwithstanding the foregoing, in view of the concerns expressed and the fact that requests have been received for the suspension of air shipments of plutonium and other special nuclear materials, comments are specifically invited on the matter of whether suspension or other limitations on the air transportation of plutonium and other special nuclear materials are justified during the period that the subject rule making proceeding is being conducted. Views on this particular matter, together with the supporting basis for these views, should be submitted to the Secretary of the Commission, U.S. Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Section by July 2, 1975. The NRC will decide, after evaluating the views and comments received, whether a different course should be pursued during the pendency of this rule making proceeding and publish its conclusions in the FEDERAL REGISTER. Currently effective regulations will continue to be applied until a decision on this matter is made.

As indicated above, related specific issues will be, or are presently, the subject of consideration in other rule making proceedings, and the NRC will continue to take appropriate action, as justified by the circumstances, to assure that the risk associated with the transportation of radioactive materials remains small.

Dated at Washington, D.C. this 29th day of May 1975.

For the Nuclear Regulatory Commission.

SAMUEL J. CHILK,
*Secretary of the Commission.*

[FR Doc.75-14519 Filed 5-30-75;8:45 am]



Enclosure "B"

APPENDIX 1 TO ENCLOSURE "B"

PUBLIC COMMENTS ON JUNE 1975 ADVANCE NOTICE

OF RULEMAKING PROCEEDING - STAFF RESPONSES

Comment 1: Hittman Nuclear Battery Corporation

Packaging requirement of a Type B container affords trivial protection above that given by the inherent encapsulation of pacemakers.

Staff Response: Exceptions to package standards for special form materials are being considered.

Comment 2: Irene L. Munday

a. Three tablespoons of plutonium could give lung cancer to 9 billion people.

b. Nothing less than a 100 percent guarantee of safety is sufficient.

Staff Response:

a. The lethal dose of reactor grade plutonium to an average individual has been estimated under the assumption of uniform distribution throughout the entire lung mass by several authors as follows:

| | |
|---|---|
| Cohen | 37.8μg |
| NRC-NAS(BEIR) | 8.0μg |
| Gofman-Tamplin | 2.0μg |

One gram of Pu would thus cause death by lung cancer to a population between 2 and 38 million people if it were carefully administered to each individual in the population such that a uniform distribution of Pu in one lung mass of each individual could be achieved. Assuming a tablespoon holds four grams, between 0.024 and 0.45 billion people would be

affected if and only if all of the material in 3 tablespoons is distributed correctly. Conditions of careful administrations are necessary to effect the awesome lethality of Pu in Munday's letter (although it would be difficult to find nine billion people to kill even in today's crowded population environment).

b. A 100 percent guarantee of safety cannot be provided in any situation. Smaller guarantees are commonly accepted in dangerous situations.

Comment 3: General Electric Company, Vallecitos Nuclear Center

Noting that FAA and NRC safety regulations have recently been updated, the Nuclear Energy Division recommends that air transportion of plutonium continue under the current regulations.

Staff Response: This comment is addressed to the NRC interim position, which was answered in a public notice (41 FR 5627, February 9, 1976). The interim position is that no sound basis exists for suspending air shipments of SNM, noting that the question for plutonium has been foreclosed by Public Law 94-79.

Comment 4: USERDA, W. A. Brobst, Chief, Transportation Branch

The ERDA concurs with the NRC that no sound basis exists for suspension of air shipments of SNM during the public rulemaking proceeding.

Staff Response: See Comment 3.

Comment 5: Society of Nuclear Medicine

Appendices A, B, C, D and E of the comment are identical to similarly identified appendices of Comment 6 below. The Society summarizes:

a. Over 9 million patient studies projected for the year depend upon air transport of radioactive materials.

b. Medical benefits to such a large segment of the population outweigh the risks to the general public.

c. The Society of Nuclear Medicine has agreed to changes in regulations on air transport of radioactive materials for medical use.

Staff Response: These arguments were considered in the environmental impact statement. NRC rulemaking in the present instance would not address the exclusion of radiopharmaceuticals from air transport.

Comment 6: American College of Nuclear Physicians

a. Radioactive materials for medical use should be allowed air transportation for the following reasons:

   1) Speed is essential.

   2) Benefits to a sizeable population sample far exceed the risks of air transport.

   3) Demonstrated safety record indicates that the current packaging and procedural controls are quite adequate.

b. Cost impact is levied on patient if radionuclides are not transported by air.

c. Radiopharmaceuticals should be redesignated to a lower hazard rating on the Hazardous Materials List.

SUMMARY OF APPENDICES

Appendix A - Briner Testimony Before Senate Commerce Committee June 13, 1974

One out of 3.4 patients in the 63 percent of hospitals with more than 100 beds having nuclear medicine is examined with radionuclides.

Appendix B - Soc. Nucl. Med. meeting paper by Lester Rogers, AEC, June 11, 1974

Accident record of past 25 years shows 350 reportable accidents in all modes of transportation of radioactive materials. Two recent incidents involved a leaky container and an improper packaging procedure. The AEC (now NRC) has instituted quality assurance requirements for packaging.

Appendix C - Soc. Nucl. Med. meeting paper by Chet Holifield (D-Calif) June 12, 1974

A distinction should be made between short-lived radiopharmaceuticals which could lead to a nuisance and long-lived radiation sources which could lead to serious harm in accidents. Pocket dosimeters should be used to check the passenger compartment before takeoff.

Appendix D - Letters to Congress

Air Line Pilots Association embargo on radiopharmaceuticals on passenger airplanes is opposed.

Appendix E - Letters from Congress

Legislation on air transport of hazardous materials would allow radionuclides for medical use and research on passenger planes.

Appendix F - Briner statement to Hazardous Materials Regulation Board, February 10, 1975

Air Line Pilots Association wants ban on passenger plane carriage of most hazardous materials (HM), limit on cargo plane carriage of HM, flight crew briefing, prohibition on hazardous and non-hazardous cargo mixing, personnel training and licensing of shippers.

Appendix G - Briner and Goodrich comments on Carriage of Radioactive Materials Notice 75-2, 40 FR 24, 4 Feb 1975

Concerned with transport index, loading, dose rate, personnel training, labeling, licensing of shippers, inspection, and penalties in air transport of radioactive materials.

Briner and Goodrich comments on report of JCAE Special Panel on Transportation, 17 September 1974

Shipping cost is significant fraction of cost to patient. Restricting markets to closest suppliers is anti-free enterprise. Rescheduling examinations is impractical. A large amount of negative evidence exists for effect below doses of 1 rad and dose rates of 15 rad/yr. Equating hazard with half-life overlooks lack of external hazard or short residence time in body.

Briner and Goodrich comments on EPA report on Air Transport, December 1974

Transportation costs are a significant fraction of total patient costs.

Staff Response to Comments and Appendices

These arguments were considered in the environmental impact statement. The rule changes recommended in Appendices F and G have been considered in proposed

rulemaking by DOT. No substantive information is included to assist the current rulemaking proceeding of NRC.

Comment 7: Burns Security Systems, Inc.

Establish retention schedule for records and reports required by 10 CFR Part 73.

Staff Response: This comment lies outside the scope of this rulemaking proceeding, since it does not apply to safety or safeguards standards but instead is an administrative requirement.

Comment 8: Minnesota Pollution Control Agency

a. Air transport is justifiable only for radionuclides whose half-lives are less than several air transit times or for a medical emergency. Convenience and flexibility do not justify air transport.

b. Unique risks arise from air transport:

   (1) Crashes near population centers.

   (2) Toxicity of $PuO_2$ is great. Type B containers fail at aircraft impact velocities. Conclude that all transport of SNM should be prohibited on public safety grounds.

c. More opportunities exist for aircraft sabotage than for other modes.

d. Theft and diversion vulnerability due to aircraft speed and range is greater than for other modes. Prohibit SNM shipment on diversion vulnerability.

e. Potential accident situations have not been addressed.

Staff Response:

a. Air transport of radioactive materials is justifiable if the resulting benefits outweigh the risks involved. The reliability of air transport must be considered in determining the benefits. Usually public acceptance of a process is tied to a demonstration of the safety of a process and air transport of radioactive materials is such a process.

b. The environmental statement evaluates the risks with respect to both crashes near population centers and toxicity of plutonium. While the risks of air transport may be unique and the consequence of severe accidents may be significant to a few nearby individuals, the risks to public health and safety are not severe.

c. Not true for cargo air transport. A system of surveillance and control could be devised to effectively limit sabotage.

d. The vulnerability of a shipment of SNM to theft or diversion is related to the effectiveness of the safeguards program instituted to reduce the vulnerability. A physical protection system can be devised that would prevent a successful theft or diversion attempt on air cargo shipments of formula quantities of strategic SNM. In the recently upgraded safeguards regulations, the level of threat that needs to be considered by licensees in preparing their physical protection system for these shipments has been expanded. The rule includes, in the threat, a conspiracy between individuals having access to or knowledge of the transport facilities or activities or who may have items that could facilitate theft. In addition, the rule requires two armed escorts to accompany the shipment.

e. The environmental statement does address potential accident situations and highly unlikely worst consequence situations in particular, namely aircraft and other vehicle crashes in high population density areas, release of plutonium from packages on board, and dispersal of the released material.

Comment 9: Center for Law and Social Policy

a. Air transport of Pu carries two risks:

(1) Crash in populated area requires containment of Pu.

(2) Hijacking, sabotage, and theft of Pu must be prevented.

b. No need for speed exists with Pu transport. No inconvenience is introduced on banning air shipments of Pu.

c. Extreme toxicity of Pu is well-documented. A microgram causes cancer in animals. Release of significant quantity of Pu into the atmosphere could have deadly effects.

Staff Response:

a. This qualitative assessment of the risks inherent in air transport is accurate for any hazardous material. These risks are considered in the environmental impact statement.

b. It is true that for plutonium, the speed of air transport is not necessary in terms of the half-life of the material. Use of the air mode for plutonium shipments may still be desirable because of economics, schedule reliability, or security. These shipments should be allowed since a physical protection system can be devised to provide the necessary safeguards.

c. Agreed. Several authors have studied the quantitative description of the effects. The environmental impact statement evaluates with the most recent information the health effects of possible but improbable plutonium releases in urban areas.

Comment 10: New York Atomic Energy Council

a. Not aware of any study showing that present packaging requirements are adequate to protect the public.

b. Must consider consequences of package failure.

c. Must consider alternative transport modes besides air.

d. Recommend suspension of air shipment of Pu, SNM in interim except for small quantities in non-dispersible form (e.g., cardiac pacemakers, sealed sources, etc.).

Datum

New York electric utilities generally rely on land transportation for delivery of fuel and transport of wastes. Therefore, suspension of Pu air transport would not adversely affect New York energy supply.

Staff Response:

a. The environmental statement documents several studies, including package testing, of packaging adequacy.

b&c. The environmental statement includes a determination of the consequences of package failure and examines other transport modes as an alternative for shipment by air.

d. Requiring Pu to be in special form is a worthy consideration. However, it's bound to be costly. Pu powder could be locked in a compound or encapsulated to meet the requirements. Extra processing before and after trips would be required, but outer containment requirements on packagings could be relaxed.

Comment 11: British Embassy

Datum

UKAEA, Brit. Nucl. Fuels Ltd., and Radiochemical Centre Ltd. have had considerable experience in safe packaging and transportation of radioactive materials by air, including Pu and SNM under IAEA Regulations.

Comments

a. IAEA Regulations are adequate.

b. NRC Regulations are adequate.

c. Urge NRC to continue approving air transport of Pu.

d. Risk studies are under way in UK and other member states of IAEA.

Staff Response:

a.b.c. As part of the process of reevaluating its transportation regulations, the NRC will examine the transport regulations of the IAEA. Air transport of plutonium will continue to be allowed during the reevaluation if it is packaged in accordance with current requirements.

d. These studies may be helpful to the rulemaking proceeding.

Comment 12: State of New York, Department of Law

Draws conclusions from NY vs NRC et al. affidavits:

a. Present containers are inadequate for air crashes.

b. Air crashes are far more severe in impact and complexity than are surface mode accidents.

c. Dispersal of SNM is a distinct possibility, and could result in deaths of millions of citizens.

d. Air safeguards are notably inferior to those of other transport options; the U.S. military has superior safeguards capability to transport SNM by surface modes than does commercial air transport; use military bases as transport nodes.

Staff Response:

a. This contention depends on the material being carried. For plutonium, shipments are now required to be made in packages that can withstand severe aircraft crashes. For special nuclear materials other than plutonium,

the NRC has tentatively concluded that no sound basis exists for suspending air shipments (41 FR 5627, February 9, 1976). For other radioactive materials, the environmental impact statement indicates the risk to be substantially less than for plutonium.

b. Questionable. Impact may be obviously different for head on collisions, but the puncture mode can be ignored for air accidents, according to a recent study, (SLA-74-0001) and is quite complex for surface accidents. Fire is probably present in less than half of all air crashes, and water immersion applies to both air and surface accidents. No doubt that accidents are complex phenomena.

c. The possibility is remote, not distinct. SNM is hazardous, but is difficult to disperse for such catastrophic results. Preventive actions preclude such results.

d. Commercial cargo air transport as distinguished from passenger air transport is not believed to be especially vulnerable to terrorism, under the current system. A successful hijacking of an air cargo shipment of SNM is highly improbable. Recent amendments to NRC safeguards regulations (10 CFR 73) increase the level of protection given to air cargo shipments of formula quantities of strategic SNM. Applicable safeguards improvements contained in these amendments include, among others, expanding the level of threat that must be considered in developing a physical protection system and requiring that two armed escorts accompany these air shipments. In addition, safeguard requirements have also been adopted for shipments containing less than a formula quantity of strategic SNM.

The use of paramilitary forces for surface transportation safeguards has been found unnecessary in another NRC study (Security Agency Study, NUREG-0015).

Comment 13: Citizen Action for the Environment

a. Against air transport of SNM.

b. Problems associated with air transport of Pu are immense and potentially insoluble.

c. Numerous risks far outweigh any possible economic benefits.

d. Pu is substance of unprecedented toxicity.

e. Relation between package tests and actual plane crash or trucking accident is a little hard to see.

f. Abandon Pu recycle.

g. Develop renewable energy resources.

Staff Response: Most of these comments are subjective feelings. Comments f and g are outside the scope of the current review.

Comments

h. Diversion or sabotage of plutonium in transport is a disastrous problem.

i. Over 124 people knew some significant details of a shipment of plutonium from Brussels, Belgium, to Cheswick, Pa.

Staff Response: We recognize that the threat of theft or sabotage of plutonium during transport is a serious problem. We do believe this threat can be managed and be made an acceptable risk.

Comment 14: Governor of New York

Suspend air transport of Pu in New York until safety is improved.

Staff Response: No sound basis for suspension of air shipments of SNM exists. For plutonium, shipments are now required to be made in packages that can withstand severe aircraft crashes.

Comment 15: Environmental Protection Agency

a. Examine potential consequences in Pu air transport accident release in highly populated urban area.

b. Consider alternative airports for Pu air transport to reduce risk until the risk assessment is completed.

Staff Response:

a. The environmental impact statement includes such consequences in its risk assessment. In addition, NRC is supporting research at Sandia Labs on package integrity.

b. Plutonium air shipments are now required to be made in packages that can withstand severe aircraft crashes. This action will substantially reduce the risks associated with plutonium air transport.

Comment 16: Exxon Nuclear Company, Inc.

Conceivably, air shipments of some radioactive materials, properly controlled and packaged, could result in the least adverse impact on health, safety and safeguards.

Staff Response: We agree that the inherent remoteness from population during the air operation phase of air transportation of radioactive material limits the number of persons receiving radiation and reduces the vulnerability of SNM to theft or sabotage. We also believe that measures of control over the ground operation phases of air transportation of SNM by cargo aircraft reduces

the overall vulnerability to theft or sabotage of SNM to an acceptable level within reasonable costs.

Comment 17: National Resources Defense Council, Inc.

a. Quotes Conway report that risk of air transport of Pu is sufficient to restrict transportation to surface modes.

b. Quotes Resnikoff affidavit that 2,000-46,000 lung cancers could develop from 2.8 percent release under possible meteorological conditions and 100,000 under less probable conditions.

c. Since Pu half-life is 24,500 yr, air speed is not required.

Staff Response:

a. This point is being investigated in the environmental impact statement.

b. Resnikoff's analysis contains conservative assumptions that render its valuations too high. The worst case analysis in the environmental impact statement indicates that the radiological health effects would be no early fatalities and 70-150 latent cancer fatalities. This is for a severe crash in a high population density urban area of an aircraft carrying plutonium in packages of current designs.

c. Requirements for air transportation are not based on half life alone, but may also include emergencies, unforeseen circumstances, economics, schedule reliability, and security.

Comment 18: Kansas Dept. Health and Environment

a. Speed of air transport appears to reduce handling time and allow greater quantity deliveries of small half-life nuclides.

b. Air transport allows smaller quantities to be shipped economically.

c. Air transport appears necessary and beneficial.

d. Safety requirements should be based on thorough study of accident probabilities, packaging standards, and procedural controls.

e. Air risks do not appear significantly greater than surface risks.

f. Current regulations appear adequate if adequately disseminated and enforced.

g. These comments are based on the department's experience, which does not include experience with SNM or high level radioactive wastes.

Staff Response: These comments will be considered in the rulemaking proceeding.

Comment 19: Univ. Cincinnati, College of Medicine

a. Any limitation in transport will increase health hazards.

b. Increase in transportation costs increases medical costs.

c. Air transport of radioactive materials carries smaller risks than does surface transport.

d. Concern is over air shipment of industrial nuclides.

Staff Response: These points are discussed in the environmental impact statement.

Comment 20: Environmental Defense Fund

a. Suspend air transport of SNM.

b. Superior alternative transport technologies exist.

c. Maximum security conditions (secrecy) are incompatible with the need for alerting post incident reaction forces such as civil defense, aviation authority, and law enforcement officials.

d. Investigate air shipments between remote military installations.

e. Consider surface transport of SNM only.

f. Ordinary decision rules such as benefit-cost analysis are not applicable to this problem in uncertainty.

g. Public is more risk averse than federal agencies or private firms.

Staff Response:

a. No sound basis for such suspension exists (see 41 FR 5627, February 9, 1976).

b. This point is considered in the environmental impact statement.

c. We have recognized the dilemma of limiting knowledge of SNM movements to those individuals who have a proper role to play in its safeguarding. To involve state police more formally would increase the number of personnel having specific route and other movement information, but such an increase may be acceptable. The 1980 NRC Appropriations Authorization Act (Pub. L. 96-295) provides for the NRC to issue regulations to prohibit unauthorized disclosure of sensitive safeguards information.

d. The Posse Comitatus Act, 18 USC 1385, prohibits the use of Armed Forces for civil law enforcement, which would include protection of private property, unless expressly authorized by the Constitution or by statutes. None of the present authorizations would permit the use of Armed Forces personnel except in emergencies caused by civil disorder, calamity, or disturbance, or when State authority has broken down or there is armed insurrection. Even if this legal impediment did not exist, there is no need or justification for using military forces and equipment to protect against the postulated threat. The physical protection deemed necessary to defeat this threat can and is being provided by the private sector.

e. This point is considered in the environmental impact statement.

f. Disagree. We believe that benefits of alternative transport modes can be evaluated in terms of risk and cost.

g. This is a subjective opinion and is difficult to verify. The concept of "acceptable risk" is being examined with regard to transportation regulations.

Comment 21: Maine Attorney General

a. Suspend air transport of SNM during proposed rulemaking proceeding.

b. Air transport of Pu has been commonplace.

c. Recent tests show that SNM containers could be damaged in air crashes.

d. It is quite possible for an SNM container to be punctured and for the contents to be released in an air accident.

e. Cites experts that the most minute quantities of $PuO_2$ could result in over 100,000 deaths.

f. SNM is attractive to terrorists and saboteurs.

g. Details of a shipment are known by hundreds of people.

h. Air transport of SNM is in violation of NEPA.

Staff Response:

a. No sound basis exists for such a suspension (see 41 FR 5627, February 9, 1976).

b. The NRC has determined that 30 domestic air shipments and 7 export air shipments of Pu were made by licensees in 1974 (Affidavits by Joseph V. Catania and G. Wayne Kerr, New York vs NRC et al.). This amount of traffic hardly makes the air shipment of Pu commonplace.

c. Plutonium air shipments are now required to be made in packages that can withstand severe aircraft crashes.

d. This sequence of events has to be considered as credible, but it is remotely possible, not quite possible.

e. Although the experts referred to are not identified, a calculation with a similar result was submitted in the New York vs NRC et al. case. This calculation contains conservative factors which yield a result that is too large. The environmental impact statement's worst case analysis indicates that the radiological health effects of a severe crash of aircraft carrying plutonium in pre-crash-resistant packages in an urban area of high population density would be no early fatalities and 70-150 latent cancer fatalities. Air shipments of plutonium are now required to be made in packages that can withstand severe air crashes so that the consequences of an air accident would be less than indicated.

f. SNM is escorted by guards when it is shipped in strategic quantities. Such shipments are also provided with other safeguards measures. These precautions are taken to inhibit unauthorized use or theft by terrorists and saboteurs.

g. A trial concept for rulemaking now under consideration seeks to require personnel clearances for security escorts of SNM shipments. In this way, the number of people with need to know the details of the shipment ought to be minimized, and the probability of information leaks ought to be

reduced. The 1980 NRC Appropriations Authorization Act (Pub. L. 96-295) provides for the NRC to issue regulations to prohibit unauthorized disclosure of sensitive safeguards information.

h. An environmental impact statement has been written.

Comment 22: Westinghouse Electric Corporation Power Systems

a. Supports NRC on no sound basis to change status quo.

b. Decision to suspend air transport of SNM without appropriate notice would violate due process.

Staff Response: Opportunity for hearing is required for suspension; hence no violation of due process will occur. See Comment 3.

Comment 23: L.V. Gossick Affidavit in New York vs NRC et al.

a. SNM is used extensively at home and abroad for power, medicine, research, industry.

b. Use, handling, transport of SNM is regulated.

c. No reason is evident to suspend air transport of SNM.

(1) No air accidents involving SNM have occurred in past 25 years.

(2) Risk of exposure is believed to be small, because of

(a) High integrity packaging.

(b) Physical security measures required.

d. The NRC is reviewing new and existing import or export licenses for significant quantities of SNM. A significant quantity of SNM is defined as one kilogram of Pu, one kilogram of U-233, or the mass of uranium multiplied by the square of its enrichment in the U-235 isotope, expressed as a weight fraction between 0 and 1. In contrast, a strategic quantity of SNM for which safeguards are required is 2 kilograms of Pu, 2 kilograms of U-233, or 5 kilograms of U-235 in uranium of 20 or more weight percent enrichment.

Staff Response: These comments are incorporated into the environmental impact statement.

Comment 24: C. Sheldon

Despite the "very low probability of serious air accidents," if there is an accident, 15 million New Yorkers could get lung cancer. Please ban these flights.

Staff Response: See Comment 21.e.

Comment 25: General Atomic Company

If air transport (of SNM) is further restricted, the less reliable schedules which characterize other modes of transportation will reduce the effectiveness of the safeguards system for monitoring movements and for assuring that shipments are promptly picked up by consignees at their destinations.

Staff Response: The NRC announced its tentative conclusion that no sound basis exists to suspend air shipments of SNM. The results of the reevaluation of the NRC's transportation regulations support this conclusion.

Comment 26: Johns Hopkins Hospital, and

Comment 27: The Soci[illegible] for Pediatric Research

a. Requests NRC to keep in mind the need to not disrupt medical diagnoses, treatment and research.

b. Most shipment of radioactive material have small quantities, low levels of radiation, and short half-lives.

Staff Response: These comments have been incorporated into the environmental impact statement.

Comment 28: Attorney General of Massachusetts

Suspend air transport of SNM during the rulemaking proceeding.

Staff Response: See Comment 3.

Comment 29: Chicago Bridge and Iron Company

a. Industrial radioactive sources in air transport do not pose a threat to the safety of passenger aircraft operations as do combustible, flammable, explosive or corrosive materials in air transport.

b. Exposure to individuals is less in air transport than in surface mode transport because the transit time is smaller.

Staff Response: These comments have been incorporated in the environmental impact statement.

Comment 30: Nuclear Associates, Inc.

a. Tritium air transport should be prohibited because of substantial release if packaging is inadequate.

b. Tritium and beta-emitters are long-lived so transportation speed is not obligatory.

c. Detection of spillage is difficult since no adequate field survey instruments exist.

d. Transportation companies and airlines should "spot-check" material for leakage.

Staff Response:

a-c. Increased attention to containment of liquids may be a valid requirement.

d. Inspection and "spot-checking" of packages for spillage would be a DOT regulatory responsibility.

Comment 31: University of Arkansas

a. Safety requirements for radioactive materials should be based on packaging requirements.

b. Monitoring of a shipment prior to acceptance by the air carrier with a "charge" for this function could improve airline passenger protection.

Staff Response:

a. Packaging of radioactive material in forms not susceptible to escape if the container is breached may be a means of enhancing safety and acceptance of air shipments.

b. If such a fee practice is established, it should be done by the FAA.

Comment 32: Health Industry Manufacturers Association

a. Most radioactive material shipped by air has between 1 and 50 microcuries activity.

b. The NRC should adopt FAA rules by reference rather than issue more conflicting, overlapping regulations.

Staff Response:

a. This comment has been incorporated into the environmental impact statement.

b. The NRC and the DOT, of which the FAA is a part, do have an overlapping authority to regulate safety of transportation of radioactive materials. The NRC and the DOT have entered into a revised (1979) Memorandum of Understanding to avoid conflict and duplication of regulations. The NRC has incorporated by reference certain DOT regulations.

Comment 33: American College of Radiology

Testimony previously given to the House Commerce Committee by Dr. J. L. Quinn on April 25, 1974 was reproduced.

a. Nuclear medicine is desirable to American health care.

b. Development of short-lived radionuclides has improved nuclear medicine.

c. Scheduled passenger flights offer the only national network capable of meeting the needs of patients for these radionuclides across the country.

Staff Response: These statements are considered in the rulemaking proceeding.

Comment 34: No comment was docketed under this number.

Comment 35: Department of Health, Education, and Welfare, Bureau of Radiological Health

a. General features of radiological health considerations for air transport of radioactive materials are reviewed.

b. Package and storage requirements to provide assurance of proper radiation levels should be simplified rather than be changed to increase regulatory activity or carrier personnel training. This recommendation is based on cost effectiveness.

c. Federal inspection programs are mandatory. The failure to do such studies and periodic reevaluations has brought on the present controversy.

Staff Response:

a. These considerations are examined in the environmental statement.

b. DOT has completed its rule making proceeding involving the air transport of radioactive materials and has amended its regulations in Parts 173 and 175 of 49 CFR.

c. A survey of radioactive materials packages in the present day transportation system is presently being conducted. The NRC does have a strong inspection program, as do the agreement states. The public and the idea of cost effectiveness appear to better served by individual licensing inspections than by requiring regular industry-wide surveys.

Comment 36: Minnesota Pollution Control Agency

a. Proposed rulemaking should include consideration of radiation levels on passenger planes; need and alternatives for air transport of medical isotopes; air transport criteria based on atomic number, half-life, shipping distance, total transit time, and total actual flight time, range of package stresses in air accidents; consequences of air accidents; frequency of shipment inspections; prohibition of air transport of SNM except for national security shipments in military aircrafts between military airfields; and provisions for decontamination, federal support for local enforcement, and package requirements for armor and corrosion resistance.

b. The important transit time is from consignor portal to consignee portal. Air transport is reasonable only if flight time dominates the total transit time.

c. Half-lives of industrial and research isotopes can be considered greater than 1 or 2 months. A table summarizing half-lives for medical isotopes is submitted. A lower limit of 15 days for air transportable half-life is recommended. Air transport of some actinides would be allowed by this criterion, even though their health effects are unknown.

d. Relevant subjects to consider for safety requirements are probability of perilous conditions leading to accidents; correlation of accident severity with package damage and dispersal of contents, size of exposed population, and probability as well as consequences of accidental spills.

Staff Response:

a. All these subjects are considered in the environmental impact statement.

b. Air transport is used to reduce the total transit time which would be incurred by some other mode. More often than not, the flight time is a small part of the total transit time.

c. Several other factors beside half-life should determine whether air transport of radioactive materials should be permitted. These include emergencies, unforeseen circumstances, schedule reliability, and security.

d. Agreed, but these factors cannot be well controlled.

SUPPLEMENTARY COMMENTS

Cargo in air transport should be able to withstand ground impact at free fall velocities, crush and impact from airplane components, shrapnel impacts, corrosive agents, fires in the neighborhood of 1800-2000°F, and should be able to float. Current containment vessel designs appear to underestimate the magnitude of these threats.

Staff Response: The environmental impact statement examines the environmental impacts and associated risks of aircraft accidents involving radioactive material. Characteristics of air mode accidents were considered in the development of packaging standards to be applied to packages used for the air transport of plutonium. A testing program was conducted at Sandia Laboratories that examined the response of plutonium packages to air mode accident environments.

Comment 37: TVA Office of Agricultural and Chemical Development

a. Information was given on usual shipping practice at TVA.

b. The shipper should be required to monitor packages in the presence of a shipping agent, since many airports are not equipped with monitoring devices.

c. A label for easy identification of materials to be used in research, medical diagnosis, or medical treatment should be devised.

d. Speed and lack of disruption for transportation of radionuclides is needed.

Staff Response:

a,d. This information is considered in the environmental impact statement.

b,c. These comments are beyond the scope of this rulemaking proceeding since they do not involve regulations contained in Parts 71 or 73 of 10 CFR. With regard to comment b it should be noted that the lack of monitoring devices is equally true for other modal carriers. Requiring additional

monitoring above that required to determine the TI to be applied to the package label would increase occupational exposure without a significant reduction in exposure risk.

Comment 38: Los Alamos Scientific Laboratory

a. Review of more than 30 years intense involvement in nuclear programs shows radiological risks to be less than conventional industrial risks.

b. Nuclear electricity generation saved $100 million/yr in the Chicago area.

c. Complete risk-benefit analysis must include evaluation of industrial isotope use.

d. Current estimates are that 40 million patients per year utilize radiopharmaceuticals.

e. ALPA embargo has been a significant impediment to the research efforts of LASL.

f. Altering the regulations is not needed, but assurance of compliance should be strengthened; however simplification and stabilization of regulations is more important than increased enforcement of them.

Staff Response:

a-e. This information is considered in the environmental impact statement.

f. The regulations are being simplified by consolidating several separate regulations (for example, incorporation of FAA and Coast Guard regulations in 49 CFR and incorporation of 1973 IAEA regulations in both 49 CFR and 10 CFR Part 71). Hopefully, these changes will increase stability as well.

Comment 39: Commonwealth Edison

a. Regulations are adequate.

b. Retain the ability to ship by air irradiated or contaminated items or hardware. Such items present little hazard to the public but could be of significant benefit in repair or diagnostic purposes, especially in connection with the operation of nuclear power plants.

c. Review of regulations and possible revision of them is a desirable alternative to a ban of air transport.

Staff Response: This information is considered in the environmental impact statement.

Comment 40: New England Nuclear

Letter promising later delivery to NRC of bibliography of pertinent enclosure material.

Comment 41: Exxon Nuclear Company, Inc.

a. Evaluate cost-risk-benefit optimum of alternative transport modes for each general SNM form, type, and packaging.

b. Base licensing on package design and procedural controls.

c. Proposed rulemaking proceeding is assumed to determine relative risks, establish acceptable releases, and establish acceptable exposure limits.

d. The NRC should license standard packages on generic basis.

e. Define acceptable tests which an applicant can use to prove that a particular container is able to withstand an aircrash without exceeding the accident release limit.

f. Designate a Federal facility, such as Sandia Laboratories, to certify specification containers and special packages and to assure consistent test conditions.

g. Publish outline for shipping package license application.

h. Formalize review procedure for complex packages so as to eliminate uncertainty of procurement and testing before the applicant can be assured that the packaging can be licensed.

Staff Response:

a. This evaluation is carred out in the environmental impact statement.

b. The concept of licensing is to designate what (performance standards) is expected of a package, not how it should be achieved. This concept is internationally accepted and is consistent with government of free enterprise.

c. The rulemaking proceeding will determine the relative risks associated with radioactive materials transport. Risks arising from exposures that are within acceptable limits and exposures resulting from small releases of gasses and liquid coolant that are recognized as being unpreventable in certain accident situations are included in this determination.

d. Although the recommended procedure may expedite the licensing process, it would not result in any significant health or safety benefit.

e-f. As a result of the development of packaging standards to be used for the air transport of plutonium, test criteria and acceptance standards were established for air mode accidents. Requiring all tests to be performed at Sandia Laboratories seems to present an undesirable potential for restricting rather than for regulating safe commerce in radioactive materials.

g. A regulatory guide on package license applications has been issued.

h. Efforts to streamline the review procedures for a package license application are always subject to upgrading by suggestions from individuals. NRC management of this process is very formal now.

Comment 42: Technical Operations, Inc.

a. Radiography practice predominatly uses Ir-192, which has a half life of 75 days; thus 1 percent is lost each day. Such sources cannot be economically stockpiled. An average source is transported 2 or 3 times during its life, and thus would spend an appreciable fraction of its life in transit if it were required to be transported by surface.

b. Air freight business is much more tightly organized than the trucking business, including the following considerations:

(1) Rapid cargo handling on transhipment by air.

(2) Fewer transfers on long hauls by air.

(3) Frequent cargo breakdowns and delays by trucks.

(4) Frequent cargo misplacement with trucks.

(5) Air shipments more easily traced, better controlled.

(6) Air personnel better trained, less likely to mishandle packages.

c. It is almost impossible to contaminate surroundings with special form material.

d. Only one incident related to an air shipment has been reported in last 20 years; it did not involve injury and could have been preveted by compliance with regulations. Minor exposures have been reported from several incidents.

e. Radiographic materials are of such small quantity that they can not interfere with aircraft operation, even if unshielded.

f. Transportation regulation authority should be put solely in hands of Secretary of Transportation. We recommend also certification and inspection of shippers; provision of penalties for violations of regulations, including mislabeling of shipments; and monitoring by carriers.

g. Present regulations are adequate, but mechanisms for enforcement should be improved.

Staff Response:

a-e. These comments are considered in the environmental impact statement.

f. These recommendations are within the domain of DOT. These ideas are considered in ongoing rulemaking proceedings.

g. This observation is under consideration.

Comment 43: Department of Transportation (Materials Transportation Bureau)

Rulemaking should be confined to:

a. Adequacy of Type "B" package of SNM of high radiotoxicity.

b. Safeguards (physical protection) of SNM during air transport.

Staff Response:

a. Consideration is also required for Type B packages of materials other than SNM, for example radioteletherapy units.

b. Consideration is also required for aspects of safeguards other than physical protection of SNM; risk-benefit evaluation of international and domestic shipments, evaluation of sabotage potential, and evaluation of economic burden of safeguards requirements.

Comment 44: Air Transport Association of America

a. Packages for air transport must meet stringent safety requirements established by the federal government and must be marked for clear recognition by the freight forwarder and the carrier.

b. Consider accident probability, packaging, and procedural controls in combination. Also consider accident conditions.

c. Beef up regulation and enforcement.

d. Air transport risk pales in comparison to life's risks. Consider though:

(1) An airplane pilot's inability to stop and check out an irregularity.

(2) Captivity of passengers.

e. The shipper should be responsible for safety.

f. Limit air transport to RadWhite I, RadYellow II, and medical generators with transport index equal to 3 mrem/hr.

g. The seat level should be less than 1 mrem/hr.

h. Emphasize prompt pickup.

i. A RadWhite I package should be able to hold a 200 lb. top load. Increase other package requirements.

j. Air carriers are not able to and should not be required to monitor packages.

Staff Response: These comments are more properly addressed to the DOT than the NRC. The quantities apparently being discussed are those of Type A packages, which are in DOT's province. However, the comments are considered in the environmental impact statement.

Comment 45: New York Atomic Energy Council

a. Radioactive material must be transported by some means.

b. Decide need for air transport on whether benefit exceeds risk and on whether air transport risk is comparable to surface mode transport risk.

c. Average accident probability per mile may not be an appropriate measure, since risks occur near airports.

d. Verify proper packaging, limit package contents, and limit the number of packages in particular shipments.

e. For plutonium, require special form and design packages to withstand maximum credible accidents.

Staff Response: This information is considered in the environmental impact statement.

Comment 46: Galland et al. for Japan Air Lines

a. Continue air transport of radioactive materials.

b. No system exists to require shippers to have adequate facilities and personnel. Put quality assurance into shipper's licenses. Provide airlines with list of licensed shippers. Spot check licensed shippers.

c. License, check contract packers.

d. Requiring air carriers to monitor packaging is proper.

e. Train air carrier personnel in packaging documentation requirements, emergency handling of radioactive materials on ground, loading guidelines and all other training necessary for safe air transport.

f. Inform shippers of departure time after shipment is booked. Prohibit delivery to air terminal before 24 hours before plane departure.

g. Prohibit cargo mixing. Keep radioactive cargo accessible.

h. U.S. regulations should be consistent with IAEA regulations. Consolidate air, sea, and land transport regulations.

Staff Response: These comments are more appropriately addressed to the DOT rather than to the NRC.

Comment 47: ERDA

Comment 47a: Comments of W. Brobst, Division of Environmental Control Technology

a. Continue air transport of radioactive materials.

b. Environmental impact report should include cost-benefit relationships.

c. Continue air transport of Type A packages.

d. Continue air transport of Type B packages, but with justification.

e. Reexamine survivability of Type B packages in typical air crash (150 mph).

f. Air transport accident probability is less than that of surface transport.

g. The contamination problem near a city is the same for air and surface transport. Not a catastrophe in either case.

h. Consider package requirements to be more important than accident probabilities, which in turn are more important than procedural controls.

i. Increase fines and publicize them more widely. Suspend licenses for 30-90 days.

j. The risks of air transport of radioactive materials are comparable to those of surface transport of these materials.

k. Risks of air transport of radioactive materials are less than other risks of life.

l. Recent June 24, 1975 air crash in New York resulted in 110 deaths, some of which resulted from flammable liquid aboard.

m. Simplify the rules and improve perspective with respect to air carriage of other hazardous materials.

n. Weakest point of regulations is compliance.

Comment 47b: Comments of H. Rickover, Division of Naval Reactors (NR)

a. NR prohibits passenger air and cargo air shipment of radioactive material except in justified and approved emergency.

b. NR accepts Conway recommendations to restrict air transport of radioactive material.

Staff Response: These comments are considered in the environmental impact statement.

Comment 48: New England Nuclear Bibliography

Refer to Comment 40. Enclosures of most interest are summarized below. Enclosure 48w, Dr. J. L. Quinn's testimony before Congress on April 25, 1975, has been discussed under Comment 33.

Comment 48a: New England Nuclear

a. Parts 30-34 and 71 should be amended so that no licensee can offer a package of radioactive materials for shipment unless the licensee holds a specific shipper's license under a new paragraph of Part 71.

b. This new control over shippers should be made a national responsibility of the Nuclear Regulatory Commission. Inspection of licensees in Agreement States would be contracted to the Agreement State licensing and inspecting organization. The slowness of Agreement States to adopt desirable new NRC rules and the lack of homogeneity in their rules would require national enforcement of shipper's licenses.

c. It is still possible for a shipper to offer packages containing naturally-occurring or cyclotron-produced radioactive materials without a license from NRC. In some cases the packaging of these materials is not good. The NRC should work for a change in statutes to bring all radioactive material under its control.

Staff Response:

a,b. Exercising regulatory responsibility over the transport of radioactive material that is within the scope of Part 71 is accomplished through the issuance of general licensees and certificates of compliance approving

for use certain packaging. The use of other regulatory schemes has been considered. However, these other schemes often involve unnecessary work on the part of the Commission and its licensees, can cause delays in shipments and complicates regulatory requirements without adding to safety of shipments.

Transport requirements are imposed upon Agreement State licensees thro[illegible] regulations of the DOT. Agreement States do not adopt NRC transportation regulations. The requirement for Agreement State licensees to use NRC approved packages for certain shipments is established in the DOT regulations.

c. This comment is beyond the scope of this rulemaking proceeding.

Comment 48b: Air Transport Association of America

a. Inadequate enforcement of present regulations exists.

b. Limit radioactive materials in air transport to short half-life medical or research isotopes.

c. Limit the TI and spacing of packages.

d. Establish central monitoring facilities at airports, licensed by the federal government.

e. DOT should review its regulations.

   (1) Prohibit air transport of radioactive materials on safety grounds.

   (2) Labeling, etc., requirements should be reviewed.

   (3) Shippers' education requirements should be reviewed.

f. Inspect shippers.

g. Penalize wrongdoers.

Staff Response: DOT has considered these comments in its rulemaking proceeding on the air transport of radioactive material and has amended its regulations in Parts 173 and 175 of 49 CFR.

Comment 48c: SNM Newsletter, Nov. 1974

Data

In 1961, 200,000 packages of radioactive materials traveled by air. In 1973, 600,000 packages went by air.

Comments

a. Limit TI to 3 or less.

b. Ban Radioactive Yellow III category packages from air transport except if the half life is less than 30 days.

c. Load Radioactive Yellow II and Radioactive Yellow III category packages on the floor of the cargo hold.

d. Establish dose rate limits of 2 mrem/hr at any air passenger seat and a limit of 1 mrem/hr on the average.

Staff Response: See staff response to Comment 48b.

Comment 48d: ALPA Embargo, Nov. 18, 1974

a. Ban hazardous materials from transport on passenger airplanes except:

   (1) Radiopharmaceuticals in Radioactive White I or Radioactive Yellow II category packages,

   (2) Dry ice, and

   (3) Magnetic materials packaged according to regulations.

b. Cargo is to be inaccessible to crew.

c. Crew is to be briefed on the hazardous materials included in the cargo.

d. Inspect the overpacks accepted for air transport.

e. Ban cargo with mixed categories of hazardous materials.

f. FAA should require minimum training for air crews.

g. Air carriers must accept only packages from licensed shippers.

h. Require air lines to monitor packages rather than rely on shipping papers describing them.

Staff Response: See staff response to comment 48b.

Comment 48e: H.J. Paas, Jr. AECIDO, "Maintaining Perspective... (on I-131 spill)..."

a. Deposition of I-131 was identified in 59 people.

b. The radiological incident is one of the least important and less frequent of man's hazards.

Staff Response: This information is considered in the environmental impact statement.

Comment 48i: Capt. J.A. Echols for ALPA, Sept. 22-27 1974

a. Lists 8 areas of concern in air transport of radioactive materials.

(1) Are limits on Radioactive Yellow III category packages low enough?

(2) Do cargo stowage plans on passenger aircraft allow enough separation of radioactive materials packages?

(3) Are loading personnel trained well enough?

(4) Are dose regulations as low as practicable?

(5) Do shipping agents engage in unsafe practices?

(6) Do differences exist between licensee controls and controls on packages within the transportation system?

(7) Are cargo handlers adequately protected?

(8) Are federal regulations adequately enforced?

b. Average cargo hold height: 75 in.(B747, L1011, DC10), 20 in. (Convair 24,340,580,600, YS-11), 45 in. (others).

c. Surveys have shown deviations from regulations to be more frequent than should be tolerated.

d. Survey of training programs shows crabbed approaches.

Staff Response: See staff response to comment 48b.

Comment 48v: Brantley, J.C.: "Industry's Role in Transportation of Radiopharmaceuticals," Soc. Nuc. Med. Ann. Mtg (June 12, 1974)

Data

Packages presently on passenger planes flow from 5 cities to 550 airports, thence to 1500 cities by surface, and thence to 3300 hospitals by surface. With cargo air transport, packages can flow from 5 cities to 40 airports by air, thence to 1500 cities by surface, thence to 3300 hospitals by surface. On weekends by cargo air transport, packages can flow from 5 cities to 20-25 airports.

Staff Response: These numbers are considered in the environmental impact statement.

Comment 49: State of New York Department of Law (Affidavits by Dr. John Gofman and Peter N. Skinner included)

a. Failure to file an adequate environmental impact statement requires that air transport of SNM must cease.

b. Commercial air transport of SNM, particularly under security conditions . . . at JFK in NYC and other major metropolitan airports, is far more vulnerable to terrorist diversion and attack than military surface transport.

In view of the . . . vulnerability to diversion and attack, air transport of SNM should be discontinued. This is particularly true for enriched U-235, U-233, plutonium in any form. [Refers to Skinner affidavit of New York vs NRC et al.]

c. Safety requirements should not be based on accident probabilities. Accidents should be considered likely events.

d. Specify package standards certifiable to JCAE for all forms of SNM. Explore possibility of requiring Pu to be shipped in bulk oxide form to reduce danger of dispersion.

e. Procedural control of SNM shipments is sporadic and ineffective. Shipments of SNM have been packaged in contravention of existing regulations and have been mishandled. As a result, leaks have occurred.

f. "Even if this hazard [of air transport of SNM] were not far greater than many others, there would be no justification for the Commission's failure to ground the transport of SNM."

g. Regulations should require that shipments of SNM be made by military surface transport, using military bases as points of shipment and interim storage.

Staff Response:

a. The NRC's interim position is that no sound basis exists to prohibit air transportation of SNM (41 FR 5627, February 9, 1976). An environmental impact statement has been written, issued for public comment and a final environmental statement has been issued.

b,g. The Posse Comitatus Act, 18 USC 1385, prohibits the use of Armed Forces for civil law enforcement, which would include protection of private property, unless expressly authorized by the Constitution or by statutes. None of the present authorizations would permit the use of Armed Forces personnel except in emergencies caused by civil disorder, calamity, or disturbance, or when State authority has been broken down or there is armed insurrection. Even if this legal impediment did not exist, there is no need or justification for using military forces and equipment to protect against the postulated threat. The physical protection considered necessary to defeat this threat can and is being provided by the private sector.

The Skinner affidavit calculates critical mass for various enrichments of U-235. Air transport of these amounts requires physical protection measures, since they exceed the minimum amount (5 kg) for which such protection is required.

c. Accident probabilities are used to determine the relative risks involved in certain transport activities. Safety requirements are then developed

based upon consideration of the relative risks involved and the costs and benefits resulting from the requirement.

d. This step is considered in the environment impact statement.

e. These declarations are not supported by the record.

f. This statement is a value judgment.

ARGUMENT OF GOFMAN AFFIDAVIT

a. The lung cancer dose, estimated from an absolute risk value of $2.54 \times 10^{-5}$/ year/man-rem, should be one fourth the BEIR estimate and one twentieth the Cohen estimate, if Pu is assumed to be uniformly distributed over the whole lung mass.

b. The lung mass at risk is that of the bronchi (about 1 gm in standard man), particularly the epithelium, not the pulmonary tissue (about 570 gm in standard man).

c. Cigarette smokers are about 10 times more at risk to lung cancer from inhalation of Pu than are nonsmokers.

d. The affidavit reports the number of lung cancer doses per pound of Pu in the economy. It argues that calculation of lung cancer doses per pound of all toxic chemicals is relevant.

e. The affidavit predicts an overkill factor of 4.5 for cigarette smoking occupational workers, a fatal lung cancer in one out of thirty nonsmoking occupational workers, 7 million lung cancer doses in the smoking USA public at large, and 60,000 lung cancer doses in the nonsmoking USA public at large over a 30 year period if everyone inhales and deposits the permissible lung burdens established for occupational workers and individuals in the public at large, respectively.

Staff Response:

a. The estimate may be valid, but only for the assumed conditions.

b. According to the BEIR report, "An important unresolved issue is the question of whether the radiation exposure to local areas is the critical datum or whether an effect extending over the entire respiratory epithelium is more likely to lead to cancer. This is important because lung cancers usually arise at bifurcations of the bronchial tree. Most analyses have concluded that the issue is basically a probabilistic one, in that a more widespread exposure is likely to subject more cells to the carcinomatous transformation." Gofman's argument that the relevant tissue is the epithelial layer of the bronchi has been analyzed in several recent publications (Snipes, Brooks, Cuddihy, and McClellan, Lovelace Foundation, LF-51 or UC-48 (September 1975); BEIR Ad Hoc Committee on Hot Particles, "Health Effects of Alpha-Emitting Particles in the Respiratory Tract, "EPA-520/4-76-013).

c. Gofman faults the model proposed by the ICRP Task Group on Lung Dynamics because of its reliance on the assumption of normally functioning cilia, which is an inaccurate description of cigarette smokers. His factor of 10 is not supported. The BEIR report declares the recent increase in lung cancer is not uniform all over the world nor is it correlated in all instances with cigarette smoking, but other less well defined environmental carcinogenic factors, such as air pollution and chemical agents, also evidently play a role.

d. No consideration by Gofman is tendered the differences between quantities of Pu that are transported or handled from those that are released, dispersed, inhaled, and actually deposited in the bronchial region. Gofman's calculations are based on the assumption of deposited Pu, however. The information conveyed by implication that the amount of Pu in the economy can be represented by an equivalent number of potential lung cancers is incomplete. Information must also be given on the distribution of the deposited material within the exposed population. Risk should properly be expressed in terms of the probability that a given amount of material will be deposited in the lung as well as the consequences of the deposition of that material. The concept of a lung cancer dose suggests that a threshold quantity of deposited material exists, below which no effect is achieved, and above which only a single effect is achieved, no matter how much material is deposited.

e. The lung cancer dose threshold suggestion is not taken consistently by Gofman. For example, he argues that for smoking occupational workers inhaling Pu-239, the lung cancer dose is 0.058 micrograms, resulting in

an overkill factor of 4.5, since the permissible lung burden is 0.26 micrograms. The threshold suggestion thus applies to smokers. However, he argues that for nonsmoking occupational workers inhaling Pu-239, the lung cancer dose is 7.3 micrograms, resulting in an expectation that one such worker out of thirty would develop fatal lung cancer at the permissible dose. If the threshold suggestion applied to nonsmokers, his expectation would be that no such worker would develop fatal lung cancer at the permissible dose. In other words, he confuses the probability and consequence factors of risk.

Gofman's predictions about the public at large do not follow from use of the threshold suggestion. If every individual inhaled the permissible lung burden of Pu-239, 0.0082 micrograms, for the public at large, no one would encounter a fatal lung cancer, since even by his calculations the lung cancer dose is a larger quantity for both smokers and nonsmokers.

ARGUMENT OF SKINNER AFFIDAVIT

a. Refers to Willrich and Taylor, "Nuclear Theft: Risks and Safeguards," which points out the safeguards problem posed by high enriched $UF_6$ in fuel cycle.

b. Calculates that 158 kg $UF_6$ enriched to 79 w/o U-235 would yield sufficient U-235 metal for 4 to 5 fission bombs.

Staff Response:

a. Formula quantities of strategic special nuclear material (SSNM) are afforded safeguards protection in transit under present regulations. These materials and quantities include amounts exceeding 5 kg U-235 in uranium enriched to 20 w/o or more, 2 kg U-233, and 2 kg Pu.

b. The calculation of critical masses of U-235 in 158 kg of 79 w/o enriched $UF_6$ is reasonable, although we calculate 84 kg U-235 rather than 107 kg U-235 as stated in the affidavit, but fails to note that a good neutron reflector is implicit in the Willrich and Taylor estimates or that far smaller amounts of such material are safeguarded in transit.

Comment 50: Independent Phi Beta Kappa Environmental Study Group

"If NRC is to protect public health and welfare as a primary mission, . . . no shipments of powdered plutonium or plutonium in any form should pass through Kennedy airport or through New York City."

Staff Response: These comments are considered in the environmental impact statement.

Comment 51: Neal Kilminster

Air shipments of plutonium are not justified, since the danger to the public is intolerable. All shipments of plutonium should be discontinued pending a thorough study of the dangers.

Staff Response: See Comment 3. The dangers of such shipments are considered in the environmental impact statement.

Comment 52: Environmental Protection Agency

a. NRC should consider the use of alternative air terminals to reduce the population risk until a risk assessment is completed.

b. While the risk assessment should contain detailed developments of both the probability and the consequences of an accident, special attention should be given to the probable package damage and probable release of radioactive contents.

Staff Response

a. See Comment 3.

b. Information on the performance of some packages in certain accident environments has been developed in a testing program conducted at Sandia Laboratories.

Comment 53: Environmental Analysis Laboratories

Samples of Pu and Am scheduled for analysis by this laboratory are encountering transportation problems to the laboratory. Proposed rulemaking should not restrict laboratory analysis work.

Staff Response: The laboratory's receiving problems are probably the result of the ALPA embargo of 1974 and Congressional action of 1974-75. No NRC rules to eliminate air radioactive materials from any mode of transport are being contemplated.

Comments 54-60: Private Individuals

a. Donald Gjerdevig

Pu should not be transported by any method - danger to this and future generations are too great.

b. N. Joan Sandler

Pu is too deadly to be handled in a public place, particularly in powder form. Risk of international contamination is extremely high at JFK, or any transportation site.

c. Marianne K. Montoux

Pu in powder form is highly vulnerable to theft or sabotage.

d. Penelope S. Waites

No strong, permanent container has been devised which can contain Pu for the immense time periods required.

e. Joyce A. Murphree

"The chance of an accident may be small but the risk we are taking is too great to chance."

f. Sandra Johnson

The transportation of Pu is a serious accident waiting to happen.

g. Linda E. Schweber

The last place Pu belongs is in a public place because it is of extreme toxicity and is all that much more easy to steal.

Staff Response:

a. Regulations require Pu to be contained within packaging designed to withstand both accident and normal conditions of transport. Results of the environmental impact statement indicate that the risks associated with the air transport of plutonium are small.

b. Same as response to Comment a.

c. Not true. Formula quantities of strategic special nuclear materials, which include Pu, are required by regulations to be guarded in transit. All quantities and forms of Pu are packaged to prevent release of Pu to the atmosphere. The risk of theft or sabotage is small, not large.

d. This comment appears to be addressed at plutonium as a waste product and is beyond the scope of this rulemaking proceeding.

e. The risk of surface mode transportation of Pu to public health and safety has been shown to be less than the risk of other commonly accepted situations. The risk of air transport of Pu is evaluated in the environmental impact statement.

f. The same statement applies to other situations in life. The frequency of serious accidents has been estimated as very low. It is impossible to predict when, if ever, a serious accident involving plutonium may occur.

g. Same as response to Comments a. and c.

Comment 61: United Airlines

a. Fissile material should be prohibited from passenger and cargo air transport, since the operating environment is sensitive and since alternate transport modes are more amenable to safeguards requirements.

b. Radioactive materials allowed on aircraft should be limited to those related to medical research, diagnosis and treatment.

Staff Response:

a. Safeguards requirements for air shipment of SNM are discussed in the environmental impact statement. In addition, see Comment 3.

b. This comment was considered in the DOT rulemaking proceeding on the air transport of radioactive material.

Comment 62-70: Private Individuals

a. Mrs. Patricia Campbell

The risk of exposing millions of people to this toxicity (of Pu) is too great in a flight operation.

b. Linda Budowski

The possible dangers to life posed by the handling of plutonium far outweigh any other consideration.

c. Mrs. John Pilmulder

Flying plutonium in and out of Kennedy Airport is a violation of public safety.

d. Clara L. Fayette

Flying nuclear waste products in and out of Kennedy Airport should not be done . . . . There is no known way of disposing of them and they could--if there were an accident--cause death and cancer to a great many people.

e. Meredith Puterbaugh

Flying radioactive material into Kennedy Airport poses a needless hazard to life. An airplane crash dispersing plutonium oxide would be catastrophic.

f. Virginia Day

Plutonium is incredibly toxic and also is a fissionable material, which can be used in the making of bombs. An AEC report has labeled security precautions as highly inadequate in regard to nuclear wastes, and I feel that just accents the point that it should not be transported in and out of a huge, crowded airport.

g. Virginia Karstedt

Wide scale use and production of radioactive materials will accmulate through little accidents a higher world radioactivity than life can handle.

h. Claire McCarthy

Unwise and irresponsible measures, such as shipping plutonium powder via Kennedy Airport in New York, on the part of an agency whose alleged purpose is to safeguard the public from misuse or diversion of nuclear materials might account for its present credibility dilemma.

i. Tim Vorce

Flying plutonium is alarming - an airport accident would no doubt be in the middle of a large city, creating a real danger; mid-air accident could spread radioactivity over a very wide area; the danger of a terrorist blowing up or hijacking a plane carrying plutonium is greater than otherwise; and plutonium is the most lethal substance known to man.

Staff Response: Each of these commentors express the sentiment against air transport of plutonium. The risk of air transport of Pu is evaluated in the

environmental impact statement. Present information indicates that millions of persons would not be exposed in a flight operation, including an accident, and that the risk is orders of magnitude smaller than the risk associated with any of several other commonly accepted hazardous situations. Air shipments of plutonium are now required to be made in packages that can withstand severe aircraft crashes.

Comment 71: Eberline Instrument Corporation

In a letter to Congressman Lujan, Congress is requested to grant the NRC some administrative leeway in its enforcement of the Scheuer amendment (Section 201 of Public Law 94-79), since Congress probably didn't mean to exclude air shipment of exempt quantities of plutonium, such as the minute quantities likely to be found in any soil sample from radioactive fallout.

Staff Response: The law permits air transportation of plutonium contaminated soil samples if they are contained in a certified package. A rulemaking proceeding is currently underway to establish regulations governing the air transport of plutonium.