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REPORT TO THE CONGRESS

Opportunity For AEC To Improve
Its Procedures For Making Sure
That Containers Used For
Transporting Radioactive Materials
Are Safe B-164105

Atomic Energy Commission

*BY THE COMPTROLLER GENERAL
OF THE UNITED STATES*

~~713735~~ **093363**

JULY 31, 1973



COMPTROLLER GENERAL OF THE UNITED STATES

WASHINGTON D C 20548

B-164105

To the President of the Senate and the
Speaker of the House of Representatives

This is our report on the opportunity for the Atomic Energy Commission to improve its procedures for making sure that containers used for transporting radioactive materials are safe.

We made our review pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act of 1950 (31 U.S.C. 67).

We are sending copies of this report to the Director, Office of Management and Budget, and to the Chairman, Atomic Energy Commission.

A handwritten signature in cursive script, reading "James B. Argets".

Comptroller General
of the United States

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ABBREVIATIONS

AEC	Atomic Energy Commission
DWMT	Division of Waste Management and Transportation
GAO	General Accounting Office

D I G E S T

WHY THE REVIEW WAS MADE

Because of concern that a transportation accident involving hazardous radioactive materials could seriously affect public health and safety, GAO reviewed the Atomic Energy Commission's (AEC's) controls governing the design, construction, and use of containers for transporting radioactive materials under its jurisdiction.

FINDINGS AND CONCLUSIONS

Most shipments of radioactive materials involve packages of relatively small quantities of radioisotopes for diagnostic or therapeutic applications. The Department of Transportation is responsible for safety in the transportation of such materials. AEC is responsible for safe containers to transport the more hazardous types of radioactive materials, such as nuclear reactor fuel. (See p. 5.)

Annual shipments of the more hazardous types of radioactive materials in the United States are expected to increase nearly eighteenfold--from 1,800 tons to 32,100 tons--between 1972 and 1985. (See p. 6.)

AEC has established requirements

for insuring that containers used to ship the more hazardous types of radioactive materials are designed, fabricated, and used in accordance with its regulations. AEC's Director of Regulation administers AEC requirements relating to the use of radioactive materials by private firms and institutions (licensees). AEC's General Manager administers requirements relating to the use of radioactive materials by AEC's license-exempt contractors. (See p. 9)

Review and approval
of container designs

AEC reviews container designs to determine whether they meet its performance standards. However, AEC has not defined the scope of its review, the extent of documentation needed to support its determinations, or the multiple-discipline expertise needed by review staffs.

As a result, the scope of such reviews and the review staffs' expertise vary significantly among the various AEC organizations involved. (See pp. 14 to 17.)

AEC's regulatory organization has adopted a policy to independently review all container designs submitted by licensees even if the General Manager organization has approved the designs for use by

contractors. Regulatory officials said this policy should not be construed as a reflection on the adequacy of the reviews by the General Manager organization.

In the regulatory organization's review of container designs approved by the General Manager organization, the regulatory organization raised questions, in a few instances, as to whether the containers met AEC's performance standards and withheld approval of the containers. (See pp. 17 to 19.)

Regulatory officials said that if the two organizations followed consistent review procedures and practices, the regulatory organization could minimize the extent of its reviews of containers approved by the General Manager organization.

AEC should develop uniform requirements for the expertise design review staffs must have and for the scope of their reviews, including documentation.

Such requirements should (1) provide greater assurance that containers are adequately designed and (2) enable the regulatory organization to minimize, consistent with its objective of protecting the health and safety of the public, the extent of its reviews of containers which have been approved by the General Manager organization. (See p. 19.)

AEC's regulations exempt certain containers from meeting AEC's current performance standards. These containers, used before the current performance standards were adopted in 1966, were evaluated

under an earlier set of standards which, AEC says, were similar in many respects to the current performance standards. (See p. 20.)

When GAO questioned the use of these containers, the General Manager organization stated that it would take steps to (1) identify them, (2) evaluate them in accordance with existing standards, and (3) upgrade them to current standards, if necessary, or restrict their use to insure that they could not be used beyond their design limitation. Regulatory officials said AEC regulations were being changed to accomplish these objectives. (See p. 21.)

Requirements to insure proper fabrication of containers

The General Manager organization requires contractors to develop quality assurance programs to be sure that containers are fabricated according to the approved design. AEC records showed, however, that certain AEC contractors either had not implemented such quality assurance programs or their quality assurance programs were deficient in certain areas. (See pp. 22 and 23.)

AEC's regulatory organization has not required licensees to develop quality assurance programs. However, licensees are required to assure the regulatory organization that their containers have been fabricated according to the approved design. AEC regulatory officials told GAO that efforts were underway to amend the regulations to require that licensees develop quality assurance programs. (See p. 23.)

Reporting container
contamination occurrences

The General Manager organization requires its field offices (operations offices) to report to AEC Headquarters if contamination, damage, or personal exposures occur because radioactive materials were released from containers beyond prescribed limits.

The operations offices included in GAO's review had placed different interpretations on the General Manager requirements for reporting contamination occurrences to AEC Headquarters. As a result, from July 1969 to June 1972, similar occurrences were reported by some offices but not by others.

After GAO brought these matters to AEC's attention, AEC said that it would give operations offices interpretations and guidance to clarify its reporting requirements. (See pp. 25 to 27.)

The regulatory organization does not prescribe limits beyond which licensees are required to report contamination occurrences on incoming shipments. Rather, the regulatory organization requires a report only when a licensee identifies a substantial reduction in a container's effectiveness. Regulatory organization officials told GAO that licensees had not reported any occurrences under this requirement. (See p. 27.)

To insure that occurrences are consistently reported and investigated, the regulatory organization should require licensees to report occurrences which would be

reportable under the General Manager organization's requirements. (See p. 27.)

Appraisal of contractors' and
licensees' activities

The regulatory and General Manager organizations require their respective field offices to periodically appraise licensees' and contractors' activities relating to the packaging of radioactive material and use of containers.

Four field offices GAO reviewed had not developed criteria required by the General Manager organization for making such appraisals. In addition, certain field offices did not sufficiently document the scope of their appraisals of licensees' and contractors' activities to permit AEC Headquarters to evaluate the adequacy of these field offices' appraisals. (See pp 28 and 29.)

Because of the tremendous growth in the transportation of radioactive material expected to occur as a result of the increased number of nuclear power plants being placed in operation, GAO believes it is important that consistent and systematic programs for insuring the safe transportation of this material be maintained.

In commenting on GAO's findings, AEC officials stated that containers used to ship radioactive materials have not been involved in a transportation accident approaching the severity of the hypothetical accident conditions which containers are designed to withstand. They said also that no serious releases of radio-

activity had occurred during the transportation of radioactive materials. GAO's review of AEC's records did not disclose any such occurrences.

RECOMMENDATIONS

To help AEC in continuing to prevent major problems relating to container safety as the nuclear industry expands, GAO is making a number of recommendations related to the need to

--Provide greater assurance that container designs meet AEC's performance standards. (See pp. 20 and 21.)

--Insure the fabrication of containers in accordance with the approved designs. (See p. 24.)

--Insure that all occurrences involving the transportation of radioactive materials that might warrant an AEC investigation are reported. (See p. 27.)

--Improve AEC's appraisals of licensees' and contractors' activities relating to the packaging of radioactive materials and use of containers. (See p. 29.)

AGENCY ACTIONS AND UNRESOLVED ISSUES

AEC agreed with GAO's recommendations and said that it had taken, or was taking, the action necessary to put them into practice. (See pp. 20, 21, 24, 28, and 29.)

MATTERS FOR CONSIDERATION BY THE CONGRESS

This report informs the Congress of the management improvements AEC has made, or has agreed to make, for insuring that containers used for transporting radioactive materials are safe--an area of increasing public and congressional concern.

CHAPTER 1

INTRODUCTION

The public and the Congress have become increasingly concerned about public health and safety with respect to the transportation of radioactive materials. To protect the public from radioactive materials in transit, the Atomic Energy Commission (AEC), consistent with national and international regulations, relies primarily on the ability of shipping containers to satisfactorily contain radioactivity under normal transportation and serious accident conditions.

Most shipments of radioactive materials involve packages of relatively small quantities of radioisotopes for diagnostic or therapeutic applications. Safety in the transportation of such materials is the responsibility of the Department of Transportation and was discussed in a recent report to the Congress.¹ In that report, we discussed the need for the Department of Transportation to improve its inspection and enforcement in regulating the transportation of hazardous materials. One example in that report involved a passenger aircraft with a shipment of radioisotopes which leaked during transport. By the time the air carrier became aware of the container leak, the contaminated aircraft had passed through airports in 10 cities and had carried 917 passengers. However, a check of passengers and employees indicated that none had been subjected to an immediate health hazard.

A significantly increasing volume of large quantity² materials and fissile materials³ such as nuclear reactor fuel materials are being shipped. (See table on the following page.) These types of materials are hereinafter referred to as the more hazardous radioactive materials.

¹Report to the Congress on "Need for Improved Inspection and Enforcement in Regulating Transportation of Hazardous Materials" (B-164497, May 1, 1973).

²A quantity of any radioactive material, the aggregate radioactivity of which exceeds specified levels.

³Certain types of radioactive materials used to sustain a nuclear reaction.

Estimates of Radioactive Material Shipments
for the Domestic Nuclear Power Industry (note a)

<u>Commodity</u>	<u>1972</u>	<u>1975</u>	<u>1980</u>	<u>1985</u>
	----- (tons) -----			
Enriched uranium hexafluoride	1,000	3,500	7,000	13,000
New fuel elements	840	2,220	5,700	11,000
Spent reactor fuel	9	900	2,600	6,100
Intermediate-level waste (note b)	-	100	600	2,000
High-level waste (note c)	-	-	-	37
Total	<u>1,849</u>	<u>6,720</u>	<u>15,900</u>	<u>32,137</u>

^aTable provided by AEC.

^bIncludes concentrated sludges, irradiated reactor structural components, and nonrecoverable radioactive fuel scrap and cladding hulls.

^cSolidified, highly radioactive material resulting from the reprocessing of highly irradiated nuclear reactor fuels.

All the types of material shown in the above table must be transported in containers which will prevent the release of radioactivity during normal in transit conditions. In addition, containers for highly radioactive materials must be capable of preventing release of the contents in severe transportation accidents. These containers range from steel drums weighing less than 100 pounds and costing between \$30 and \$50 to 100-ton, heavy lead or uranium shielded, steel-encased casks costing as much as \$1,000,000 each. An AEC picture of one type of cask used for shipping spent reactor fuel is shown on the following page.

Casks containing nuclear fuel materials that weigh 25 tons or more usually are moved by train, most of the other nuclear fuel material is moved by truck.

BEST DOCUMENT AVAILABLE

Because of concern that a transportation accident involving the more hazardous types of radioactive materials could have a significant impact on public health and safety, we evaluated AEC's management controls over the design, fabrication, and use of containers by AEC contractors, private firms, and institutions. We have discussed the report with AEC representatives and have considered AEC's comments in finalizing the report.

RESPONSIBILITIES FOR REGULATING TRANSPORTATION OF RADIOACTIVE MATERIALS

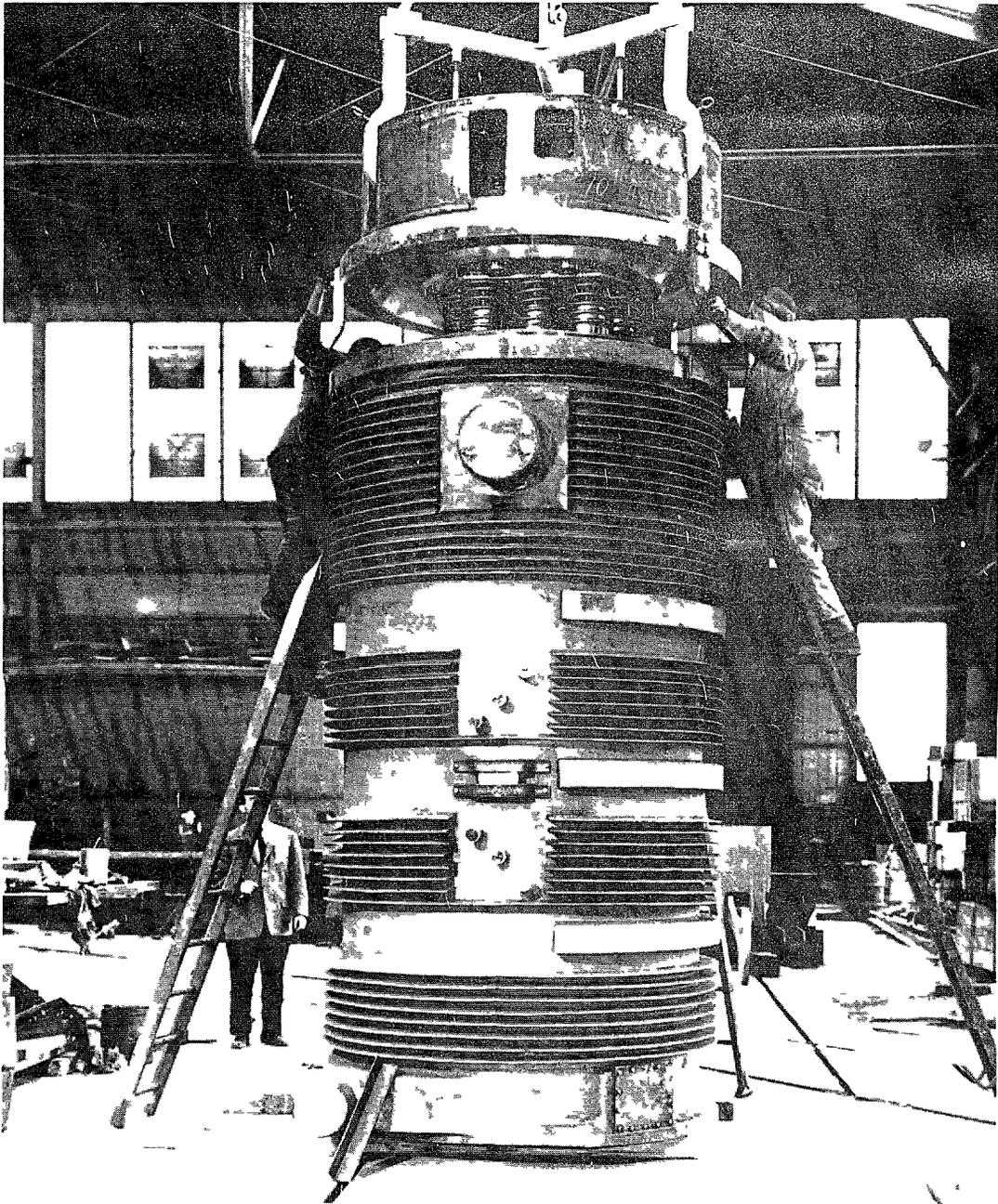
Under the Department of Transportation Act of 1966 (49 U.S.C. 1651), the Department of Transportation has regulatory responsibility for safety in the transportation of radioactive materials by all modes of transport in interstate and foreign commerce.¹ Under the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011), AEC also has responsibility for safety in the possession, use, and transportation of certain nuclear materials.

Because their statutory responsibilities overlapped, AEC and the Interstate Commerce Commission set forth each agency's responsibilities in a March 1966 Memorandum of Understanding² designed to (1) minimize duplication of effort, (2) provide as much consistency as possible in regulations and requirements for transporting radioactive materials, and (3) insure that all shipments of radioactive material within the jurisdiction of the two agencies were subject to the regulations of either AEC or Transportation.

Under the terms of the memorandum, Transportation establishes general regulations for packaging standards, including package specifications, limitations on contents,

¹The Interstate Commerce Commission formerly had responsibility for both the safety and economic aspects of transporting radioactive materials by land and inland waterways, but the safety responsibility was transferred to Transportation when it was formed in April 1967.

²Transportation adopted the terms of the Memorandum of Understanding in April 1967.



IRRADIATED FUEL CASK

BEST DOCUMENT AVAILABLE

marking, labeling, inspections, and shipping papers for all carriers. AEC establishes regulations for performance standards relating to packages for the more hazardous radioactive materials.

Transportation regulations require that a container used for transporting materials under AEC's jurisdiction be covered by a special permit issued by Transportation.¹ Before Transportation issues a special permit, AEC performs a technical safety review of an applicant's proposed container design to insure that it complies with the standards set forth in AEC and Transportation regulations. The applicant then sends AEC's notification of approval to Transportation, which further reviews the design and issues the permit. Usually Transportation's special permits incorporate AEC's approval by reference.²

Within AEC, responsibility for controlling the design, fabrication, and use of containers lies with either the Director of Regulation or the General Manager, depending on whether a private firm or an AEC contractor is shipping the material. The Director of Regulation exercises such responsibility over private firms and institutions (licensees) through a regulatory program which includes review and approval of new and amended license applications. To possess, use, or transport certain nuclear materials, private firms must have licenses issued by the Director of Regulation. The General Manager exercises this responsibility over AEC's license-exempt contractors, which help AEC develop atomic energy, through contractual agreements.

The responsibilities of the various AEC organizations concerned with insuring compliance with AEC regulations for the proper design, fabrication, and use of radioactive material containers are shown in the chart in appendix I.

¹Shipments of classified materials (such as nuclear weapons) are exempt from Transportation regulations, under 18 U.S.C. 832c, to the extent necessary to prevent disclosing classified information to carriers and other unauthorized persons.

²In March 1973, AEC and Transportation signed a second Memorandum of Understanding which provided that AEC issue the final approval for containers of the more hazardous radioactive materials.

PERFORMANCE STANDARDS

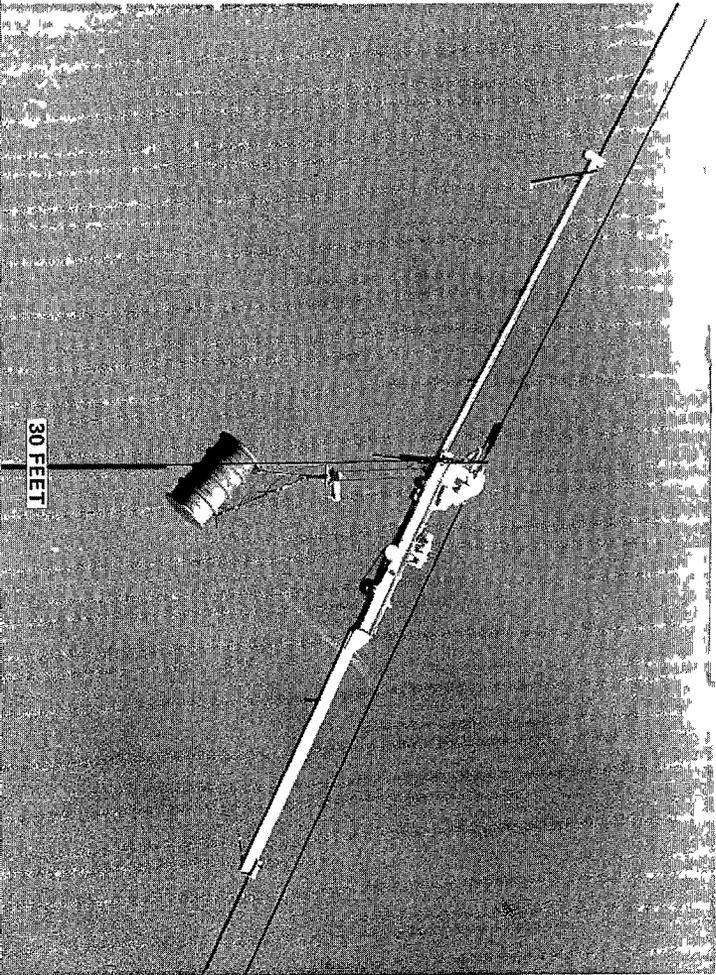
To protect public health and safety, AEC depends on shipping containers to satisfactorily contain radioactivity under normal transportation and severe accident conditions. To insure that the containers withstand these conditions and thereby (1) satisfactorily contain the radioactive material, (2) provide adequate shielding, and (3) avoid accidental criticality (an unplanned nuclear chain reaction), AEC has adopted performance standards that containers must be designed to meet.

Containers for large quantities of radioactive materials and fissile material must be able to (1) withstand certain serious hypothetical accident conditions with only a limited loss of shielding capability and essentially no loss of containment and (2) avoid nuclear criticality. To meet these conditions the performance standards provide that the containers be able to withstand in sequence

1. A 30-foot drop onto an unyielding surface. (See p. 11.)
2. A puncture test which consists of a free drop from 40 inches onto a 6-inch-diameter steel pin.
3. Thermal exposure at 1,475° for 30 minutes.
4. Water immersion for 8 hours (fissile materials only). (See p. 12.)

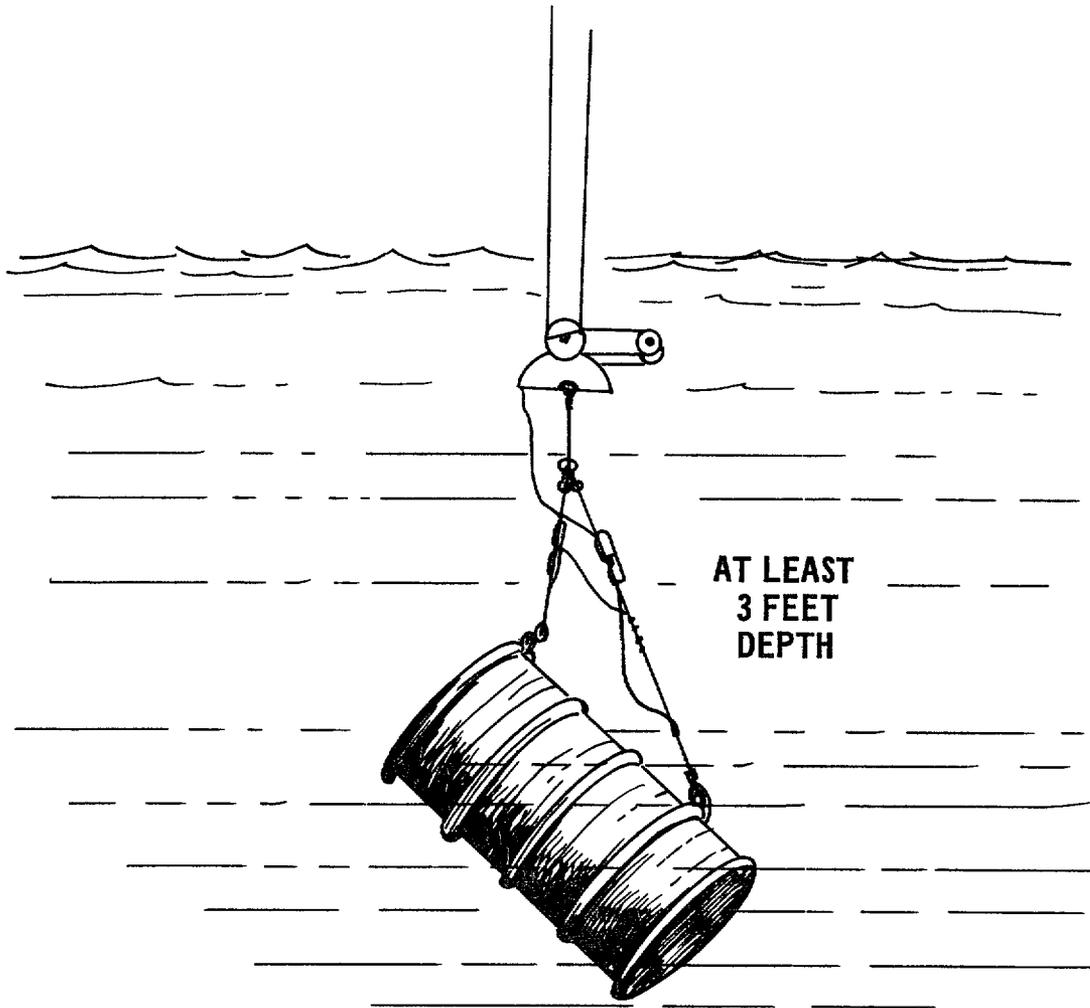
AEC contractors and licensees are required to demonstrate to AEC that their containers meet the performance standards. Such a demonstration may consist of either (1) testing a sample or prototype container, (2) an engineering assessment by the container designer, or (3) a comparison of the container features with those of similar container designs which AEC has approved.

30-FOOT DROP TEST



30 FEET

WATER IMMERSION TEST



THE WATER IMMERSION TEST AT A MINIMUM DEPTH OF 3 FEET EVALUATES THE LEAK TIGHTNESS OF A CONTAINER AFTER IT HAS BEEN SUBJECTED TO SHOCK, PENETRATION, AND FIRE.

CHAPTER 2

OPPORTUNITY TO IMPROVE MANAGEMENT CONTROLS

OVER DESIGN, FABRICATION, AND USE OF CONTAINERS

AEC's system for insuring that containers are safe basically consists of

- review and approval of container designs,
- requirements that containers be fabricated in accordance with the approved design,
- requirements for licensees and contractors to report to AEC occurrences involving the transportation of radioactive materials, such as accidental releases of radioactive material,
- appraisals of licensees' and contractors' activities to insure compliance with regulations and requirements for transporting radioactive materials.

We found certain situations that indicated a need for corrective action in each of the above areas. For example

- The scope of reviews of container designs made by the General Manager organization were less than the scope of reviews made by the regulatory organization.
- The General Manager organization staffs that reviewed the designs did not have the expertise AEC deemed necessary.
- The regulatory organization did not require licensees to develop programs to insure the quality of container fabrication although AEC contractors were subject to this requirement
- Licensees were not required to report to AEC releases of contamination although AEC contractors had to do so.
- Contractors had to report to AEC if a vehicle transporting radioactive material was contaminated but did not have to report if only the container of the material was contaminated

--AEC's appraisals of contractors and licensees--the fourth control in AEC's system--were not adequately documented to permit AEC Headquarters to evaluate these appraisals.

Because of the tremendous growth in the transportation of radioactive material expected to occur as a result of the increased number of nuclear power plants being placed in operation, we believe it is important that consistent and systematic programs for insuring the safe transportation of this material be maintained

In commenting on our findings, AEC officials stated that containers used to ship radioactive materials have not been involved in a transportation accident approaching the severity of the hypothetical accident conditions which containers are designed to withstand. They said also that no serious releases of radioactivity had occurred during the transportation of radioactive material. Our review of AEC's records did not disclose any such occurrences.

REVIEW AND APPROVAL OF CONTAINER DESIGNS

AEC reviews container designs to determine whether they meet AEC's performance standards in its regulations. AEC has not defined the scope of the review, including documentation, needed to make this determination, nor has it defined the multiple-discipline expertise needed by review staffs to adequately review a container design. As a result, the scope of such reviews and the expertise of AEC review staffs has varied among the AEC organizations involved.

Scope of container design review

One group in AEC's regulatory organization reviews all container designs submitted by licensees. The assistant director of this group told us that regulatory reviewers analyze and independently verify licensees' assumptions and calculations made to demonstrate that their container designs meet AEC's performance standards. From our review of the records supporting the regulatory reviews of container designs for fiscal years 1971 and 1972, it appeared that the reviewers had analyzed and verified each container design submitted and that their reviews were consistent from one container design review to another.

AEC contractors must submit container designs for review and approval to the operations office responsible for their activities. Eight operations offices review and approve container designs for the General Manager organization.

The four operations offices included in our review--Albuquerque, New Mexico; Oak Ridge, Tennessee; Richland, Washington, and Savannah River, Aiken, South Carolina--did not adequately document the extent of their reviews to enable reviewing parties to independently determine the scope of the reviews. Therefore, we requested container design reviewers at these four operations offices to describe their procedures and practices.

The procedures and practices described varied. For example, container design reviewers at the Oak Ridge operations office told us that they followed the practice of verifying the contractor's assumptions and calculations. This practice is similar to that followed by the regulatory organization. At the Albuquerque operations office, the container design reviewer told us that only occasionally had he verified the calculations or analyzed contractors' designs because he believed that, on the basis of his experience with the contractors, they had the necessary expertise and concern for safety to design an acceptable container. He told us that he generally limited his review to ascertaining whether the contractors had analyses to show that the containers met the performance standards. He said that the designing contractor would analyze and evaluate the designs in detail.

Expertise of container design review staffs

AEC's performance standards provide that containers shall be designed to meet certain technical requirements relating to structural integrity, thermal resistance, radiation shielding, and nuclear criticality safety. Officials of the General Manager and regulatory organizations told us that to verify that container designs meet these technical requirements, the design should be reviewed by individuals having expertise in each of the above four areas.

During our review we learned that both the General Manager and regulatory organizations planned to evaluate

contractors' and licensees' quality assurance program plans as part of their review of all container designs. Quality assurance programs are designed to insure that containers are fabricated in accordance with approved designs. AEC officials told us that they intend to have quality assurance plans reviewed by individuals having expertise in this area.

At the time of our review, a five-member staff within the regulatory organization was responsible for reviewing container designs submitted by licensees. The records we reviewed showed that this staff had expertise in each of the four desired technical areas.

At the four operations offices included in our review, staffs of one to three individuals were responsible for reviewing container designs during fiscal years 1970-72. The following table shows the areas of expertise which the review staffs stated they had, along with the number of containers they reviewed during fiscal years 1970-72.

<u>Operations office</u>	<u>Areas of expertise</u>	<u>Number of containers reviewed</u>
Albuquerque	Nuclear criticality safety	8
Oak Ridge	do. Structural integrity	30
Richland	Nuclear criticality safety	10
Savannah River	do. Thermal resistance Radiation shielding Structural integrity	20

The above table shows that the container design review staffs at three operations offices did not have the expertise AEC deemed necessary. In commenting on this lack of expertise, the Chief of the Transportation Branch, Division of Waste Management and Transportation (DWMT) provided us with the following statement

"In some cases, the AEC operations offices are adequately staffed with engineers and physicists with a sufficiently varied background to perform

a detailed independent safety review. In other cases, the operations office review is actually performed by the contractor designing the package, with the AEC operations office ascertaining that the contractor-prepared approval document is complete in all respects. Since the several operations offices have a different spectrum and level of competency in package design review (as an outgrowth of their different operational responsibilities for site activities), the depth of review is not consistent throughout AEC. Interpretations of the regulations may vary between operations offices."

The DWMT official said DWMT recognized that the review procedure for contractors carries with it a potential for conflict of interest because the contractor designs the container and assists in reviewing its adequacy.

Duplicate reviews by regulatory organization of General Manager-approved containers

AEC contractors are authorized to use containers approved by the regulatory organization without further review and approval by a General Manager's operations office. Licensees, however, are not authorized to use containers approved by the General Manager organization without further review and approval by the regulatory review staff.

As mentioned on page 9, the regulatory organization has the responsibility for controlling licensees' design, fabrication, and use of containers. Regulatory officials told us that their organization has adopted a policy to independently review all container designs submitted by licensees, even if the designs have been approved by the General Manager organization for use by contractors. They stated that this policy should not be construed as a reflection on the adequacy of reviews by the General Manager organization or on the reviewers' capability.

These officials told us, however, that the differences in the review procedures and practices of the General Manager organization have had a bearing on the extent of the regulatory organization's reviews of container designs approved by

the General Manager organization. Furthermore, they said that, if the two organizations followed consistent review procedures and practices, the regulatory organization would rely more on the General Manager organization's review and thereby could minimize the extent of its reviews of containers approved by the General Manager organization.

DWMT and operations office officials told us that several licensees had submitted to the regulatory staff container designs which had been approved for use by AEC contractors. They told us that in such cases the licensee generally obtained the data the contractor had used to demonstrate that the container design met AEC's performance standards. They also informed us that in a few of these cases the AEC regulatory organization questioned whether the data submitted by the licensees adequately demonstrated that the container design met AEC's performance standards and withheld approval of the container design.

Although DWMT and operations office officials could not readily determine the number of containers being used by AEC contractors, the design of which had been questioned by the regulatory staff, they identified three such containers in use at the time of our review.

In one of these cases, a licensee, in December 1969, requested the regulatory organization's approval to use a container for shipping irradiated fuel. The Albuquerque operations office had approved the container and AEC contractors had used it. After reviewing the licensee's application, the regulatory organization raised several questions about the container's ability to meet certain performance standards, particularly the 30-foot drop test, and withheld approval of the container.

Regulatory officials who reviewed the design told us that there was little evidence that it would meet the 30-foot drop test without a modification. They further stated that (1) they questioned several assumptions submitted to demonstrate the container's integrity and (2) the licensee did not submit data showing that the container lid could withstand the drop test. The licensee subsequently withdrew his request.

The container design reviewer at the Albuquerque operations office told us that the container had been used several

times since the regulatory organization questioned its integrity and, in his opinion, met the performance standards.

CONCLUSIONS

To provide greater assurance that container designs meet performance standards, AEC should develop specific requirements for review staffs' expertise, their degree of independence, and the scope of their reviews, including appropriate documentation. These requirements should help insure that container design reviews are consistent and effective throughout AEC. In addition, such requirements should enable the regulatory organization to minimize, consistent with its objective of protecting the health and safety of the public, the extent of its reviews of containers which the General Manager organization has approved.

RECOMMENDATION TO THE CHAIRMAN, AEC

We recommend that the Chairman, AEC, provide for

- Requirements for review staffs' expertise and their degree of independence
- Uniform scope of container design reviews by the regulatory and General Manager organizations, including adequate documentation of such reviews by operations offices

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AEC said that it was in the process of providing its operations offices with more specific guidance on the expertise and documentation needed for these reviews. In addition, AEC told us that, if operations offices did not have the expertise in the desired technical areas, they would have to obtain it either from a qualified contractor (other than the designing contractor), private consultants, or other AEC personnel.

CONTAINER DESIGNS NOT MEETING
CURRENT PERFORMANCE STANDARDS

AEC's regulations contain a grandfather clause exempting certain containers used before 1966 from being evaluated under the current performance standards. These containers had been evaluated under an earlier set of standards which AEC told us were similar in many respects to the current performance standards.

In September 1972, AEC advised us that it did not know how many types of grandfather clause containers were being used by contractors and licensees but estimated that 15 types were in use. AEC officials told us that, at the time the current standards were adopted, they had determined that these containers could adequately protect the public and the environment, even though some of these containers might not meet the current performance standards. These officials did not have information as to the specific areas in which these containers did not meet current performance standards.

CONCLUSION

Using containers which have not been evaluated under current performance standards weakens the controls AEC is using to insure the safety of containers.

RECOMMENDATION TO THE CHAIRMAN, AEC

We recommend that the Chairman, AEC, identify all containers in use under the grandfather clause and review their designs to insure that they meet current performance standards or that their use is appropriately restricted.

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Officials of the General Manager organization told us they would take steps to (1) identify the containers they approved for use by contractors, (2) evaluate them in accordance with existing standards, and (3) upgrade them if necessary or appropriately restrict their use to insure that they are not used beyond their design limitation. Officials of the regulatory organization told us that a proposed change to its regulations was in process to accomplish these steps for containers approved for use by licensees.

REQUIREMENTS TO INSURE PROPER FABRICATION OF CONTAINERS

The General Manager organization required its contractors to develop quality assurance programs to insure that containers which the contractors fabricated in-house or through other contractors complied with the approved designs. AEC records showed, however, that certain contractors either had not implemented such quality assurance programs or their quality assurance programs were deficient in certain areas.

Although the regulatory organization did not require its licensees to develop quality assurance programs, it did require them to assure the regulatory organization that the containers which they fabricated in-house or through contractors complied with the approved designs. Regulatory officials told us that efforts were underway to amend the regulations to require licensees to develop quality assurance programs

General Manager's activities to insure
proper container fabrication

In 1970 an AEC transportation task group report concluded that contractors had not adequately documented the way they fabricated containers and therefore could not show that containers had been built to the designers' specifications. The report stated that a more formal inspection of containers fabricated for AEC contractors by other contractors would be particularly beneficial and that a step-by-step inspection of special-purpose or complex containers, to confirm compliance with the specifications, would minimize the chance of container failure. The report recommended that AEC establish practices to insure that containers are fabricated as intended by the designer and that adequate documentary records are maintained as long as a container is used

Accordingly, in March 1971, the General Manager issued a directive requesting that operations offices require contractors under their cognizance to establish procedures to insure that containers are properly fabricated.

Operations office appraisal reports for seven AEC contractors showed, however, that as of August 1972 (1) one contractor had not implemented quality assurance procedures and (2) there were deficiencies in the other six contractors' quality assurance procedures. Operations office officials told us that, in their opinion, this situation existed because AEC Headquarters had not given sufficient guidance to the operations offices and the contractors regarding acceptable quality assurance procedures.

The appraisal reports noted one or more of the following problems at the six contractor locations

- Quality assurance procedures had not been applied to all containers fabricated.
- Quality assurance records had not been maintained in an auditable file.
- The results of inspections of reusable containers to insure that they continued to meet applicable design standards had not been documented

--A determination that containers obtained from other contractors met the quality assurance requirements had not been made

Regulatory activities to insure proper container fabrication

The regulatory organization did not require licensees to develop quality assurance procedures for fabricating containers. It did, however, require four licensees, whose designs were for large, complex containers, to include descriptions of their quality assurance programs in their container design applications

All licensees were required to assure the regulatory organization that their containers had been fabricated according to the approved design. The regulatory organization satisfies itself that licensees meet this requirement through its licensee appraisal program. The organization's Directorate of Regulatory Operations, through the five regulatory regional offices, is responsible for making, among other things, compliance appraisals of licensees' transportation activities (including their design, fabrication, and use of containers) on a regular basis.

Our review of reports of appraisals made between July 1969 and June 1972 by two regulatory regional offices showed that licensees' transportation activities had not been regularly appraised. According to officials under the Directorate of Regulatory Operations, this situation resulted from an increase in the number of facilities requiring appraisal and from limited staff

CONCLUSION

The General Manager and regulatory organizations need to improve their programs for insuring the fabrication of containers in accordance with approved designs. Especially needed is a requirement, similar to that placed on AEC contractors, that licensees develop quality assurance programs for containers.

RECOMMENDATIONS TO THE CHAIRMAN, AEC

We recommend that the Chairman, AEC

- Develop quality assurance requirements for licensees to follow in fabricating containers.
- Give operations offices more guidance on what constitutes acceptable quality assurance procedures for AEC contractors.
- Insure that licensees' transportation activities are appraised regularly.

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Officials of the regulatory organization's Directorate of Licensing told us that quality assurance programs for all containers are needed and that a draft of a proposed amendment to the regulations was being prepared to require such programs. Regulatory officials advised us that they planned to (1) develop specific guidelines for the areas to be covered by the regional offices in their appraisals and (2) require their regional offices to appraise licensees' container fabrication activities. Officials in the General Manager organization told us that they would determine the additional guidance operations offices need to insure that contractors develop acceptable quality assurance programs. AEC also told us that the General Manager organization was working closely with the Directorate of Licensing to develop more detailed quality assurance guides for AEC contractors and licensees.

IDENTIFYING, REPORTING, AND INVESTIGATING
CONTAINER CONTAMINATION PROBLEMS

Both the regulatory and General Manager organizations require licensees and contractors to report to AEC certain occurrences involving shipments of radioactive materials. These reporting requirements were established so that AEC could determine whether an investigation should be made to identify the cause of the occurrence and the necessary measures to prevent recurrences.

Under the General Manager organization requirements, various types of occurrences involving the transportation of radioactive materials must be reported to AEC Headquarters. Among these are occurrences where release of radioactive material from a container is beyond the limits prescribed for contamination, damage, or personal exposure. Depending on their severity, occurrences must be reported immediately, within 72 hours, or quarterly. After being notified of each such occurrence, AEC Headquarters decides whether to investigate.

The reporting requirement which primarily pertains to the shipment of radioactive materials specifies that contractors report to AEC Headquarters within 72 hours when the internal surfaces of a vehicle are found, on arrival at an AEC facility, to be contaminated above levels specified in Transportation regulations. Although only instances of vehicle contamination were reportable under AEC's requirements, officials of the Richland and Oak Ridge operations offices told us that their offices consider any contamination occurrence reportable, whether it affects the vehicle, container, or any other part of the shipment.

Our review of AEC and contractor records for the period July 1969 through June 1972 and our discussions with AEC and contractor officials showed (1) 25 unreported instances when contamination of a vehicle's internal surfaces exceeded specified levels and (2) 39 unreported instances when containers, not vehicles, were contaminated above the levels.

AEC contractor and operations office officials said the 25 contamination occurrences were not reported because (1) the reporting requirement was too stringent and (2) the notification and reporting requirements were not clear

AEC operations office personnel told us that the contamination level on which the reporting standard is based was below the level at which a health and safety problem is involved. In addition, the requirements do not designate the operations offices (shipping or receiving) responsible for reporting occurrences which take place while the container is in transit between AEC or AEC contractor facilities. Several operations office officials stated that the shipping office should make such reports to AEC Headquarters, but an official of another operations office stated that the receiving office should make the report.

The operations offices included in our review had placed different interpretations on the requirements for reporting contamination occurrences. For example, the Savannah River operations office considers contamination above AEC-prescribed limits on any accessible parts of incoming vehicles to be reportable. The Albuquerque and Idaho operations offices consider as reportable only those occurrences which involve contamination of the internal surfaces of a vehicle such as an enclosed truck trailer. Thus, if only the container were contaminated, these three offices would not report the occurrence to AEC Headquarters.

Further, our review showed that two types of containers had, over a period of 2 to 3 years, continually experienced contamination problems which were not reported to AEC Headquarters. One type was involved in at least six occurrences between March 1969 and June 1972, in which contamination levels exceeded the allowable limits.

We brought these matters to the attention of AEC Headquarters officials, who said that it was important for them to have the opportunity to decide whether an investigation of all such occurrences was needed and that if, in their judgment, the indicated cause of a contamination occurrence was not significant, they would not further investigate the problem.

We recognize that a particular occurrence may not warrant further AEC investigation. However, a container's involvement in a number of occurrences could indicate a problem with the container which might not become evident from an analysis of a particular occurrence, therefore, an analysis of all occurrences involving the container may be warranted.

Thus, AEC should periodically identify containers which have continually been involved in contamination occurrences to determine whether there is a problem related to the container's general characteristics.

AEC's regulatory organization has established reporting requirements for licensees which differ from those established for contractors. The regulatory organization does not prescribe limits beyond which licensees are required to report contamination occurrences on incoming shipments. Rather, a licensee must report to the regulatory organization only when the licensee finds that a container's effectiveness has been substantially reduced. Officials under the Directorate of Licensing told us that licensees had not reported any such instances.

CONCLUSIONS

AEC's systems for reporting contamination occurrences have not, in our opinion, insured that all occurrences that might warrant an AEC investigation are reported to AEC. The primary reasons for this situation are (1) the lack of adequate reporting requirements for licensees and (2) unclear reporting requirements for AEC contractors and operations offices.

RECOMMENDATIONS TO THE CHAIRMAN, AEC

We recommend that the Chairman, AEC

- Require licensees to report contamination occurrences on incoming shipments above specific levels to AEC Headquarters for a decision as to whether an investigation is warranted.
- Clarify to the operations offices reporting requirements regarding contamination of contractors' containers.
- Periodically evaluate contamination occurrences to determine whether significant patterns exist in such occurrences and whether they should be investigated further to identify their cause and the action necessary to prevent recurrences.

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Officials of the General Manager organization told us that they would (1) revise the reporting requirements so that all contamination occurrences affecting a vehicle or container would be reportable, (2) emphasize to AEC Headquarters appraisers the importance of examining operations office and contractor records on contamination occurrences to insure compliance with AEC reporting requirements, (3) establish procedures to periodically identify and evaluate the causes of occurrences involving the same type of container, and (4) initiate actions to clarify reporting requirements for operations offices

Regulatory officials told us that they were going to amend the regulations pertaining to licensees to include requirements for reporting contamination occurrences above specific levels to AEC Headquarters.

APPRAISAL OF CONTRACTORS' AND LICENSEES' USE OF CONTAINERS

The regulatory and General Manager organizations require their field offices to periodically appraise licensees' and contractors' radioactive material packaging activities. These appraisals are made to insure that AEC-approved containers are used to ship the quantities and types of radioactive materials for which the containers were designed and that such containers continually meet performance standards. In addition, the regulatory and General Manager Headquarters organizations appraise the adequacy of regional office appraisals of licensee activities and operations office appraisals of contractor activities.

We reviewed the information in the appraisal reports on licensees and contractors for fiscal years 1970 through 1972 and found that

- The four operations offices we reviewed had not developed criteria required by the General Manager organization for appraising contractor performance relating to radioactive material packaging activities. In addition, AEC Headquarters representatives, in their appraisals of operations offices' activities, had not determined whether these offices had developed the required criteria.
- Certain regional and operations offices did not sufficiently document the scope of their appraisals of

licensees' and contractors' activities to permit AEC Headquarters to evaluate the adequacy of these field offices' appraisals

CONCLUSION

AEC's appraisals of licensee and contractor activities need improvement in (1) the development of criteria for appraising contractor activities and (2) the documentation of the scope of appraisals made of licensees and contractors

RECOMMENDATIONS TO THE CHAIRMAN, AEC

We recommend that the Chairman, AEC

- Emphasize to operations offices the importance of developing specific criteria before appraising contractors' use of containers.
- Develop requirements for documenting the appraisals of licensee and contractor activities relating to the packaging of radioactive material, to help Headquarters appraise field office activities.

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AEC officials told us that they would emphasize to the General Manager and regulatory organizations the need for (1) operations offices to develop specific criteria for appraising contractor performance, (2) Headquarters representatives to determine whether the operations offices have developed such criteria, and (3) field offices to sufficiently document their appraisals of licensee and contractor activities

CHAPTER 3

SCOPE OF REVIEW

We evaluated AEC's policies, procedures, and practices for insuring that containers transporting hazardous radioactive materials are properly designed, fabricated, and used. We did our work at AEC Headquarters in Germantown, Maryland, AEC's regulatory headquarters office in Bethesda, Maryland, Transportation headquarters in Washington, D C , and the following AEC offices

Operations offices

- Albuquerque, New Mexico
- Oak Ridge, Tennessee
- Richland, Washington
- Savannah River, Aiken, South Carolina

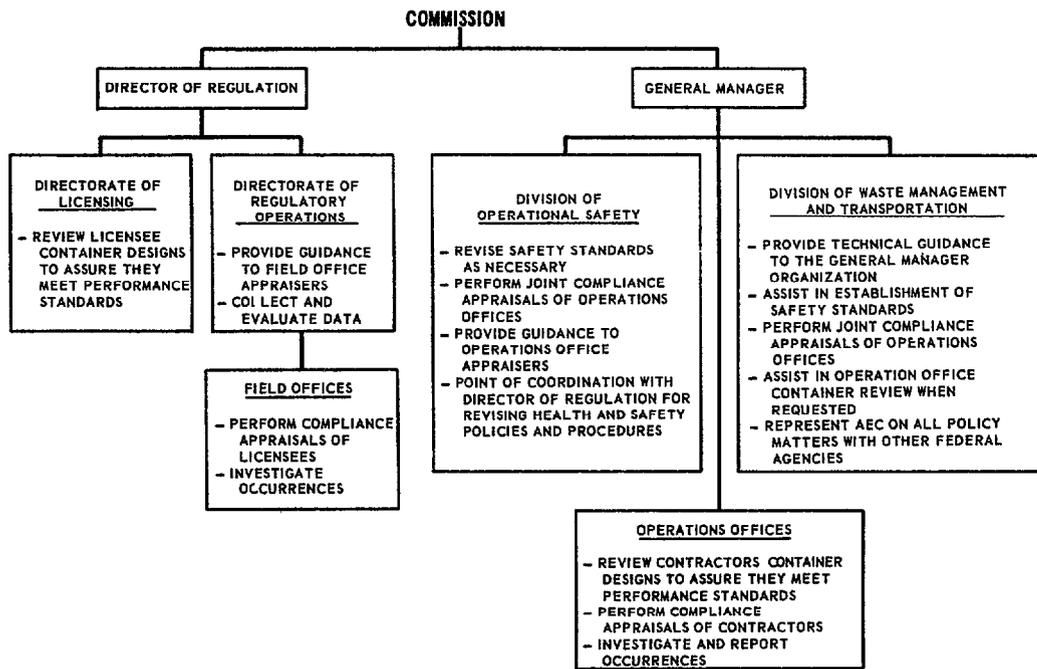
Regulatory field offices

- Atlanta, Georgia
- Newark, New Jersey

In addition, we examined selected container-related activities at (1) contractor sites under the cognizance of the operations offices mentioned above and (2) the Idaho operations office

We reviewed applicable legislation and regulations related to AEC's transportation activities. We also examined available records and obtained the views of AEC officials, contractors, and licensees who administer and conduct activities relating to container design, fabrication, and use. We evaluated AEC's decisions to approve and use radioactive material containers on the basis of their consistency between the General Manager and regulatory organizations and their conformance with AEC's requirements. We did not evaluate the technical adequacy of AEC's judgments.

**AEC ORGANIZATIONAL RESPONSIBILITIES FOR
RADIOACTIVE MATERIAL TRANSPORTATION ACTIVITIES**



BEST DOCUMENT AVAILABLE

APPENDIX II

PRINCIPAL AEC MANAGEMENT OFFICIALS
 RESPONSIBLE FOR ADMINISTERING THE ACTIVITIES
 DISCUSSED IN THIS REPORT

	<u>Tenure of office</u>	
	<u>From</u>	<u>To</u>
Chairman		
Dixy Lee Ray	Feb. 1973	Present
James R Schlesinger	Aug 1971	Feb. 1973
Glenn T Seaborg	Mar 1961	Aug 1971
General Manager.		
Robert E. Hollingsworth	Aug. 1964	Present
Director of Regulation		
L. Manning Muntzing	Oct. 1971	Present
Harold L Price	Sept. 1961	Oct. 1971

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