

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 3005081/85001(DRSS)

Docket No. 30-05081

Priority III

Category E(1)A

License No. 24-02261-03

Licensee: McDonnell Douglas Corporation  
P.O. Box 516  
St. Louis, MO. 63166

Licensee Management Meeting: September 26, 1985

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10-25-85  
Date

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10-28-85  
Date

Meeting Summary

Meeting on September 26, 1985 (Report No. 3005081/85001(DRSS))

Areas Discussed: This report contains the findings of the licensee's investigation into the loss and/or improper disposal of 11,781 bucking bars containing 2 to 8 microcuries of cesium-137 per bar, with a total quantity of approximately 66 millicuries of cesium-137 missing and or lost.

Results: The licensee's investigation identified one apparent violation of NRC requirement: 10 CFR 20.207 - Loss of control of licensed byproduct material.

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## DETAILS

### 1. Persons Contacted

- \*Don W. Clifford, Chairman, Radiation Safety Committee
- \*Thomas C. Linck, Radiation Protection Officer
- \*Debra J. Hillman, Authorized User
- \*Richard A. Meserve, Esq., Legal Counsel for McDonnell Douglas Corporation
- \*Dr. Herman Cember, Radiation Safety Consultant for McDonnell Douglas Corporation

\*Attended the management meeting in the NRC Region III office on September 26, 1985.

### 2. Purpose of the Meeting

The management meeting between both the NRC and the licensee was requested by the licensee in a letter dated September 20, 1985. The meeting was held on September 26, 1985 to discuss the licensee's investigation of the loss of 11,781 bucking bars containing 2 to 8 microcuries of cesium-137. A total quantity of approximately 66.0 millicuries was unaccountable due to being either lost or improperly disposed. The licensee presented to the NRC "Report to the Nuclear Regulatory Commission Cesium-137 Bucking Bar Disposition by McDonnell Douglas Corporation (St. Louis) September 1985." Volume 1, 2, and 3 Attached to this report as Attachment 1, 2 and 3.

### 3. Facts Determined During the Meetings and Executive Summary Volume 1

Beginning in 1955 the McDonnell Douglas Corporation, decided to tag all steel bucking bars with cesium-137. Bucking bars are small hand-held bars used to buck rivets during the fabrication of aircraft. The purpose of tagging the bars was to provide a means of detecting bars inadvertently left in aircraft during the assembly process. Foreign objects left in aircraft can be dangerous due to the possibility of jamming control surfaces or otherwise impairing the operation of the aircraft. By tagging bucking bars with a very low level radioactive source, a final check of the aircraft with a sensitive scintillation meter helped ensure that no bucking bars were left in the aircraft.

Over the period from 1955 through 1980 approximately 34,000 steel bucking bars were loaded with cesium-137 plugs. In most cases, one or more holes were drilled in the bars, a cesium-137 capsule was loaded into each hole, and a steel plug was welded into the top of each hole, permanently sealing the capsule(s) in the bar. The capsules ranged in activity from 2 to 8 microcuries each, so that in terms of cesium-137 activity, each source could have constituted a license exempt quantity. (10 CFR 30.71 Schedule B). By 1980, because of changes in aircraft structure and fastener technology, the need for tagged bars was eliminated. No bars were loaded after 1980. Since the bars were still needed for bucking rivets they were kept in service. The tagged bars in service were to be replaced through attrition.

Over the 30 year history of the program, encompassing seven major aircraft contracts, the disappearance of a relatively small number of bars per year could add up to several thousand over the life of the program. Because of the long period of time involved, none of the records that might have disclosed the whereabouts of the unaccounted bars remain. Consequently, the final disposition of all the missing bars was never known with any certainty.

McDonnell Douglas employed the services of an expert health physics consultant, Dr. Herman Cember of Northwestern University, to assess the potential health hazards associated with the most likely final dispositions of the bars. Dr. Cember's report revealed that no substantial health hazard could be expected from any of the loss mechanisms proposed. His analyses considered the melting of the bars as scrap metal, accidental inhalation or ingestion of cesium-137, and long-term personal exposure to bars in close proximity to sensitive organs. In all cases the potential hazard was considered negligible and below the NRC requirements of 10 CFR 20.

Although no substantial health hazard exists, and although the loss of the bars probably occurred over 10 to 20 years ago, the licensee's report was submitted to the NRC in order to provide a complete record of the actions the licensee has taken in this matter.

In late 1984, McDonnell Douglas Corporation's byproduct material license from the Nuclear Regulatory Commission (License No. 24-02261-03) was revised substantially. As a result of the broadened scope of the license, the Radiation Safety Committee was given increased responsibility for administering the radiation safety program within the St. Louis complex. One provision of the new license was to review all radiation activities in progress and establish new sublicensing, reporting, training and control procedures. In the process of reviewing the bucking bar program, the committee decided to sublicense the tool cribs responsible for bucking bars, and provide training to all users and tool crib attendants.

When the sublicensing activity began in early 1985, it was estimated that only six to nine thousand of the bars which had been loaded over the 30 year program were actually in use. According to the inventory records about 7,000 bars had been properly scrapped, leaving about 20,000 bars which were thought to be in storage areas around the company. When the Safety Committee initiated an inquiry into the storage locations, all of the bars in storage could not be immediately located. However, because of the large number of possible storage locations, and because of the 30 year history of the program, the committee assumed that the stored bars would be found (records as far back as 1972 showed 19,000 bars in storage then and storage areas are constantly moved and changed to meet facility needs and requirements).

As a precautionary measure, senior management was alerted to the possible inventory discrepancies. Since tagged bucking bars were no longer needed, and because of the implications of the inventory issue, the committee recommended, and management approved, discontinuing the use of tagged

bars and removing all such bars from the plant, despite the significant cost of such a large effort. A special task force was formed and charged with the responsibility of finding and removing all tagged bars from the plant by October 1, 1985. The disposal effort was to include a physical search of all production and storage areas with a scintillation meter to ensure that all bars were found and removed.

Surveys were conducted in 72 buildings encompassing 6.2 million square feet of floor space and tool storage areas. The total number of bars collected and scrapped was 22,209. The remainder of the bars, approximately 11,781, could not be accounted for. The Radiation Safety Committee felt that no substantial hazard could be anticipated from the missing bars since the total amount of cesium-137 involved was only about 66 millicuries, and that amount was subdivided 11,781 times and welded into steel bars. However, the task force was directed to investigate and report on the possible disposition of the missing bars.

The task force investigation revealed that the bars have probably been missing for over 10 years. Annual inventory reports were generated by adding the number of new bars loaded to the previous total, and subtracting bars that were properly scrapped. The task force found evidence that as many as 8,000 bars might have been disposed of as scrap metal in 1973. Other possible causes of loss include paperwork errors, pilferage, improper disposal of worn out or broken bars, and wholesale shipment of material to government warehouses.

As of the date of this report, all tagged bucking bars on hand at McDonnell Douglas have been removed from service and storage and have been disposed of, or are awaiting pickup for final disposal. The cesium-137 tagged bucking bar program was terminated. After all collected bars have been disposed of, the company will no longer require license authority to conduct the program and will request a formal amendment to the license to terminate the use of bucking bars and only store and dispose of bucking bars that are subsequently found or returned.

### Results

10 CFR 20.207 states that: (a) Licensed materials stored in an unrestricted area shall be secured from unauthorized removal from the place of storage, and (b) Licensed materials in an unrestricted area and not in storage shall be tended under the constant surveillance and immediate control of the licensee.

Due to the fact that the licensee was unable to account for 11,781 bucking bars containing a total quantity of 66.0 millicuries of cesium-137 and because the licensee was unable to determine if the material was properly disposed of, this constitutes a violation of 10 CFR 20.207.

### Final Summary

During the management meeting on September 26, 1985, the licensee was informed that the NRC would consider all the facts of this incident and the licensee would be informed of the enforcement action to be taken.

#### Enclosures:

1. Cesium-137 Bucking Bar Disposition  
Volume 1, 2, and 3
2. Attachment 1
3. Attachment 2
4. Attachment 3