ANALYSIS OF TRANSPORTING HIGHWAY ROUTE-CONTROLLED QUANTITIES; AN OVERVIEW OF 1985-1990*

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ABSTRACT

A postnotification record is required for all Highway route Controlled Quantities of radioactive materials that are shipped in the United States. These reports, which are required by 49 CFR 172.203(d), are compiled in the Radioactive Materials Routing Report (RAMRT) database at the U. S. Department of Transportation (DOT). Sandia National Laboratories' has developed an expanded version of the RAMRT which is entitled the Radioactive Materials Postnotification (RAMPOST) database. This paper provides the summary detail on the following topics: major carriers of highway route controlled quantities, major U. S. Department of Energy (DOE) shippers, major U. S. Nuclear Regulatory Commission (NRC) shippers and a breakdown of the types of Highway Route Controlled Quantities that have been shipped for the time period of 1985-1990.

INTRODUCTION

The U. S. Department of Transportation (DOT) regulations specify in the U. S. Code of Federal Regulations, 49 CFR 172.203(d), that a postnotification report must be made by the shipper of all shipments of Highway Route Controlled Quantities (HRCQ) of radioactive materials. The DOT has compiled these records in a database called Radioactive Materials Routing Report (RAMRT), which is accessed through the Transportation Systems Center (TSC) in Cambridge, Massachusetts. Although HRCQ Shipments have been collected since 1982, the TSC system has available only those records from 1987-1990. To obtain information on HRCQ shipments prior to 1987, another database system must be queried by contacting the DOT in Washington, D.C.

Data from the RAMRT database are an important element in a project underway in the Transportation Technology Department (TTD) at Sandia National Laboratories. The project, identified as Surveying the Transportation of Radioactive Materials (STORM), requires shipment data of Highway Route Controlled Quantities. The Radioactive Materials Postnotification (RAMPOST) database was created at the TTD in an effort to combine the segmented versions of the RAMRT database so that shipment data could be extracted from one source. This paper will provide some of the preliminary data analysis from this newly created database, RAMPOST.

DISCUSSION

In 1982, the Federal Register published as a final rule the Department of Transportation's rulemaking, HM-164, which was codified in the U. S. Federal Regulations at 49 CFR 173.22. One of the provisions of the HM-164 was a requirement for shippers of "large quantities" or radioactive materials to submit a copy of the route plan to the DOT within 90 days following the shipment. A new criteria was established on July 1, 1983 for classifying radionuclides based on A_1/A_2 values and the term "Large Quantity" was replaced with "Highway Route Controlled Quantity" (HRCQ). This reclassification reduced the number of shipments that were reported to the DOT; most notably, most radiopharmaceutical shipments and some waste shipments were eliminated from the postnotification reporting requirements.

The RAMPOST database contains thirteen data fields which are defined as follows and shown in Fig. 1:

1. RAM ID Number - This is a unique identifier which is assigned by the DOT for each reported shipment record.
2. Origin - This field contains information on where the shipment originated or if it is a foreign shipment, the border or port through which it entered the United States.
3. Destination - The city and state information on the destination of the shipment is entered in this field. Other pertinent geographical data on the shipment is provided if it is available.
4. Date - This field may contain either a single date of shipment or a range of dates. Records with a range of dates seem to be those which express the begin and end dates of the shipment.
5. Special Types - Generally, this field includes a notation if the shipment was foreign or a DOE shipment.
6. Carrier - The name and address of the company that transported the shipment.
7. Shipper - The name and address of the company that shipped the material. In some cases, the shipper may be an agent, as an example, Edlow International which would ship the material for another entity.
8. Consignee - The name and address of the company that is to receive the shipment.
9. Packaging - If known, the package type is noted in this field. For many of the earlier shipments, it is possible that the package certificate number was not noted on the shipping papers.

* This work performed at Sandia National Laboratories, Albuquerque, New Mexico, supported by the United States Department of Energy under Contract No. DE-AC04-76DP00789.

RADIOACTIVE MATERIALS POSTNOTIFICATION (RAMPOST) DATA BASE RETRIEVAL

Time:	Wed Dec 18 10:14:50 1991	
Shipment Number:	01823 (#70 of 81 shipments retrieved)	
Origin:	LONG MEADOW ROAD TUXEDO PARK NY	
Destination:	SAVANNAH RIVER PLANT AIKEN SC	
Date:	21-Oct-1988 thru 22-Oct-1988	
Special Types:	DOE;	
Carrier:	TRI-STATE MOTOR TRANSIT CO PO BOX 113 JOPLIN, MO	
Shipper:	CINTICHEM INC LONG MEADOW ROAD TUXEDO NY	
Consignee:	U S GOVT - DOE SAVANNAH RIVER PLANT AIKEN SC	
Consignee:	U S GOVT - DOE	
Packaging:	USA/5957/B( )F	
Products:	Uranium	U-235
	Mixed Fission Products	MFP
Activity:	17440 curies 645 terabequerelles	3339 Grams
Route:	States and Highways in Order of Travel	

New York:	U-17 I-84
Pennsylvania:	I-84 I-81
Maryland:	I-81
West Virginia:	I-81
Virginia:	I-81 I-77
North Carolina:	I-77
South Carolina:	I-77 I-20 U-1 S-19

Fig. 1. An example of a postnotification record from the RAMPOST database.

10. Products - This field contains the radioactive material being transported, e.g., cobalt, mixed fission products, etc. Many reports use the term "mixed fission products" which will be evaluated to determine if the shipment was actually spent fuel research reactor fuel, or mixed fission products.
11. Activity - The curie level of the shipment is denoted in this field. The amount of activity in terabequerelles is also expressed.
12. Foreign Origin - This field indicates the city and country from which the shipment originated.
13. Route - The data included in this field provides the state and highway route information for each shipment. The data are presented in the order the travel was taken.

Preliminary RAMPOST Statistics 1985-1990

In May, 1988, the DOT published a change to the reporting requirements; now the carriers, not the shippers, are to post-notify their HRCQ shipments. Currently, postnotification records are received from three sources: (1) the carriers; (2) the U. S. Nuclear Regulatory Commission (NRC), who submits data from their prenotification database; and (3) the DOE, who periodically provides their shipment data.

The analysis presented in this paper involved reviewing the 851 records for the time period 1985-1990. These data are considered preliminary since all the data for the year 1990 may not yet be entered into the DOT database. Table I provides a tabulation by year of the number of shipments of Highway Route Controlled Quantities made within the United States from 1985-1990.

RAMPOST classifies the shippers of HRCQ as NRC shippers, DOE shippers and Foreign shippers, NRC shippers

TABLE I
Yearly Summary of Highway Route Controlled Quantitites Shipped

Year	Number of Shipments
1985	298
1986	183
1987	141
1988	81
1989	79
1990	69
Total	851

TABLE II

Major Shippers of DOE Shipments (1985-1990)

EG&G Idaho, Inc. (INEL)	115	(25%)
Rockwell	80	(17%)
Oak Ridge National Laboratory	65	(14%)
Brookhaven National Laboratory	32	(7%)
Savannah River Plant	32	(7%)
Cintichem	28	(6%)
Others (General Atomic, Bettis, Los Alamos, etc.)	113 465	(24%) (100%)

are those who adhere to the transportation regulations as outlined by the DOT as well as the NRC regulations. Likewise, a DOE shipper is governed by the DOT regulations in addition to those of the DOE. Generally, an NRC shipper transports the radioactive materials of those possessing an NRC license. DOE shippers transport materials that are covered under the Atomic Energy Act.

As shown in Table II, over one-half (465) of the HRCQ shipments in the United States are attributed to the DOE, with EG&G Idaho, Inc. (including others at the Idaho National Engineering Laboratory) being the major shipper for this six-year period. The next most frequent DOE shipper was Rockwell International with 80 shipments for this period.

Table III summarizes the major NRC shippers of HRCQ shipments. Most of the NRC shippers do not possess, own or directly use radioactive materials but they do make the necessary arrangements for transportation for the NRC licensees. Additionally, they also handle most of the international shipments into and out of the United States. The two major NRC shippers, Nuclear Assurance Corporation and Transnuclear, account for 64% of the NRC shipments.

Motor carrier data for the Highway Route Controlled Quantities are displayed in Table IV. As is evidenced by the tabulation, over the six-year time period presented. Tri-State Motor Transit Company easily accounted for over one-half (62%) of the shipments made. Most of the shipments made were with common carriers as compared with private carriers, which are those that own or possess the radioactive material.

TABLE III

Major Shippers of NRC Shipments (1985-1990)

Nuclear Assurance	92	(34%)
Transnuclear	82	(30%)
Fort St. Vrain	23	(8%)
General Electric	22	(8%)
Edlow International	18	(7%)
Others (Babcock & Wilcox, 36 UVA, U of MI, etc.)	(13%) 273	(100%)

One of the most difficult data elements to evaluate in the RAMPOST database is the commodity shipped. In many instances, the commodity is listed as mixed fission products, which may mean spent fuel, spent fuel from research reactors, or other mixed fission products. Every entry for this six-year time period was examined and the best approximation to date of the distribution of the commodities shipped is presented in Table V. The number of spent fuel shipments rapidly decreased after 1985 when there were 90 shipments down to 1 shipment listed in 1990. However, the shipment of spent fuel from research reactors has remained relatively constant over the six years, with a high of 42 in 1987 to a low of 11 in 1990. The category identified as "Other" includes shipments with a mixture of radionuclides.

One of the more important aspects of the RAMPOST database is the route information that is provided for each record. It is possible to detect some trends in the movement of Highway Route Controlled Quantities over a period of time with the origin and route data. As an example, West Valley, New York was a very active origin for the time period 1982-1987; whereas, for the period 1985-1990, the entry port in New York accounts for nearly one-fourth of all shipments made due to the import of cobalt 60.

One of the most active origins of HRCQ shipments is the Portsmouth or Newport News, Virginia ports, which account for 91 shipments for 1985-1990. These shipments are incoming return research reactor fuel or mixed fission products. Two other active origins are Martin Marietta in Oak Ridge, Tennessee and the Idaho National Engineering Laboratory, Idaho with 49 and 30 shipments, respectively.

The Savannah River Operations, near Aiken, South Carolina was the most active destination point for HRCQ shipments. For the six-year time period, there were 182 shipments.

CONCLUSIONS

The future activities involved with the RAMPOST database include a complete and thorough review of every DOT record to ensure consistency throughout the database. Many early records (1982-1986) in the database show incomplete information. One goal is to update these records and to carefully review the shipping papers for additional details. It is expected that with a complete quality review, trends and patterns of these historical data will provide sufficient data for comparisons and validations of the routing methods currently used.

TABLE IV

Major Motor Carriers of Highway Route Controlled Quantities
(1985 - 1990)

	1985	1986	1987	1988	1989	1990	Total
Argonne	1	0	1	0	0	0	2
Emery World Wide	3	1	2	0	0	0	6
Hittman	0	0	0	0	2	0	2
Home/McGil	12	8	18	19	5	12	74
A. J. Metler	39	48	10	7	0	0	104
Tri-State Motor	222	122	107	376	19	19	525
Truckit Transport	0	0	0	17	12	0	29
Triple K	0	0	0	0	2	21	23
Christie Transport	0	0	0	0	0	12	12
Rumble	0	0	0	0	32	0	32
Others	21	4	3	2	7	5	42
Total	298	183	141	81	79	69	851

TABLE V

Types of Highway Route Controlled Quantitites Shipped
(1985-1990)

	1985	1986	1987	1988	1989	1990	Total
Cobalt 60	9	12	11	35	54	46	167
High Curie MFP	83	50	32	8	0	8	181
Spent Fuel	90	47	15	3	2	1	158
Spent Fuel, 37 Research Reactor	19	42	25	14	11	148	
Other	79	55	41	10	9	3	197
Total	298	183	141	81	79	69	851