RADIOACTIVE MATERIAL TRANSPORTATION SURVEILLANCE

CONTRACT #NRC-06-77-051

Second Quarterly Progress Report
(December 1, 1980 - February 28, 1981)

Fourth Contract Year

Introduction

The companies under investigation this quarter were:

American Airlines Freight System

Emery Air Freight

Federal Express

Northwest Orient Airlines

Republic Airlines

Sajen Air

Zantop International Airlines Corporation

Casperson, Inc.

Purolator Courier, Inc.

Pharmatopes, Inc.

Donald C. Cook Nuclear Power Plant

Palisades Nuclear Power Plant

Big Rock Point Nuclear Power Plant

Elliot Lake Freight Lines

Table I shows the number of field investigations made at various locations this quarter. One investigation of Willow Run and Detroit Metropolitan airports was cancelled due to adverse weather.

Package surveys are summarized in Tables II and III. Vehicle surveys are listed in Tables IV and V.

Tables VI, VII, and VIII summarize actual data from thermoluminescent dosimeters (TLDs) and project the exposures for 90 day quarters.

Tables IX, X, XI, and XII list the radioactive material shipments reported through the Michigan State Police to the Division of Radiological Health. These are to or from the three operating nuclear power plants and from Canadian uranium mines. Also reported but not placed in any of the tables was a shipment to Dow Chemical Company, Midland, Michigan of contaminated equipment being returned after use at the Three Mile Island Nuclear Power Plant.

Wipe tests taken this quarter indicated contamination levels that were undetectable in many cases and below U. S. Department of Transportation (DOT) 49 CFR limits in all cases.

Airlines and Airfreight at Detroit Metropolitan Airport (Metro)

American Airlines continues to carry most of the radiopharmaceuticals that arrive at Metro on regularly scheduled passenger flights. The area monitor readings in Table VI indicate the presence of radioactive material (RAM), but the freight handler's badge indicates background levels. More handlers have been assigned TLD badges. Data from these will be included in the report for the next quarter. Most of the packages received are from MediPhysics. As in past quarters, these packages were in compliance with Federal regulations. Labeling and packaging were as required, and exposure rates were less than the transport indices (T.I.s) would indicate because of reduction by decay. Mallinckrodt shipments were also observed. Several were not surveyed due to a lack of cooperation by the Purolator driver. When surveys were permitted on two occasions, one package in each shipment exceeded the labeled T.I. In one case Federal Aviation Administration (FAA) and Office of Motor Carrier Safety personnel were at hand to observe the recurrence of this chronic problem. This quarter, for the first time, a Union Carbide technetium-99m generator was surveyed at American. The only problem with the package was that the DOT 7A Type A specification was covered by a label.

At Emery Air Freight no RAM packages were observed, and no RAM shipping papers were on file. Nevertheless, contact with the company will be maintained.

Federal Express occasionally carries RAM packages, both medical and industrial. A package of iridium-192 seeds being returned to the supplier by Oakwood Hospital, Dearborn was rejected. A freight handler was examining the package (the Yellow II in Table II) with a digital readout Geiger-Mueller instrument that only read in whole mR/hr with no tenths indicated. While it was inadequate to determine the exact T.I., the meter reading was sufficient to arouse his suspicion. Readings with the Division ion chamber instrument indicated 79 mR/hr at the surface and 2.3 mR/hr at 3 ft, as compared to 50 mrem/hr and 1.0 mrem/hr, respective maximums for a Yellow II. The package bore a Yellow II label with 1.0 T.I., which was less than half of the 3 ft reading instead of numerically equal to it. On the basis of these readings the package was rejected. The opening of a second building at Metro has made access to the old building

and the area monitor TLDs more difficult since the open hours have been shortened at the old building. Less freight now passes through it, but area monitors will be maintained there until they indicate only background levels. Slight exposure above background is observed in Table VII for area monitors, but not for personnel monitors.

Northwest Orient Airlines receives Skycab overpacks containing Squibb products. Two shipments were examined, both of which had no shipper certification but only standard air bills. This was called to the manager's attention, and he contacted the facility that had accepted the shipments. One of the shipments was transported from the aircraft to the freight terminal in the same cart as live rats. Although the cart could be considered as one compartment, the separation distance between the packages was 40 inches, greater than the minimum requirement of 24 inches for this 1.1 T.I. shipment.

Republic Airlines was investigated regarding the Thanksgiving Day incident reported in last quarter's report. Because of this accident, which involved the damaging of a White I package, FAA officials called attention to the need for notification of the Division in any similar circumstances. At a Metro meeting, all airlines were told by the FAA to add the notification of the Division to the written emergency procedures.

Sajen Air charter flights continue to transport New England Nuclear radiopharmaceuticals several times each week. Examination of the latest version of the exemption has pointed out two possible problems. First, Purolator Courier drivers have no dosimeters, although they are required for anyone handling packages during unloading of the plane. Since Purolator is not a party to the exemption, the drivers may not be bound by the terms of the exemption. The dosimetry problem has been mentioned to a Sajen pilot, who was to inform the management. Second, the radiation level at the wing fill caps may be as high as 5 or 6 mR/hr for large shipments. Refuelers working in this area are exposed to radiation fields exceeding the 2 mrem/hr limit of the exemption. Also, Michigan's Ionizing Radiation Rules state that a member of the general public is not to be exposed to more than 2 mrem in any one hour.

United Airlines carries several Union Carbide technetium-99m generators each week. A quarterly spot check was to be included in a trip which was cancelled because of weather conditions. No other trips were scheduled to United after the cancellation due to other field work already planned.

Airfreight at Willow Run Airport

Phoenix Memorial Laboratories, University of Michigan, ships bromine-82 labeled motor oil to a St. Louis, Missouri piston ring company on a weekly basis. The packages have been picked up by First Flight Freight Service and delivered to Zantop International Airlines. First Flight acts as an agent for Five Star Freight Lines, St. Louis, Missouri. Two packages in one shipment were monitored and both had exposure

rates in excess of 200 mR/hr at the bottom surface. See Table II. Also, the DOT 7A Type A label was obscured on one package. Since both situations had been observed before, Phoenix was informed of the problems. During a followup telephone call, the laboratory promised that the shipping papers would be properly affixed and that more shielding would be added to the bottoms of the shipping containers. Two packages examined since then were both in compliance with Federal regulations. Truck delivery of the packages to Zantop has been deficient. There has been no blocking and bracing of packages, and a frequent lack of maintenance of separation distances has been observed. In Table V the first truck had an improper separation distance, and the second had the maximum distance. Note the reduced driver exposure. Phoenix Lab is trying to solve these problems, but the trucking company also needs to train the drivers about DOT regulations.

Courier Companies

Cooperation by Purolator Courier Corporation has been in a state of flux this quarter. Since January, 1980 formal cooperation has been terminated by the company. Most of the TLDs issued were recovered, and access to the terminal was not allowed. News of an impending DOT fine reached the drivers. The regular Metro airport driver became very angry and refused to allow the survey of packages or vehicles. During the last week of the quarter the Purolator regional manager agreed in a phone conversation to allow the reissuing of TLD badges, access to the terminal, and surveys of packages and vehicles. A letter confirming this conversation was written by the Division. A reply was received requesting a meeting to discuss terms. Anonymity of Purolator promised to be a major topic of discussion at a meeting scheduled for the last week of March.

A joint investigation with the Office of Motor Carrier Safety revealed no violations on the two vans that met a Sajen Air charter flight. Current operating procedures keep vehicles below the 50 T.I. maximum and insure that the shipping papers accompany the packages.

If the Purolator terminal is reopened to investigations, Casperson, Inc. vehicles will be examined again. Since the termination of Purolator cooperation, no Casperson vans had been examined. They are nearly impossible to find in transit. As deduced from the TLD readings in Table VIII for lower peninsula drivers (1 through 5), the exposure rates in the vans must be excessive. During this quarter four of these five drivers have exceeded 125 mR, one fourth of the 500 mrem annual dose limit for the general public. Three of the four exposures are two or more times the limit. By contrast, the exposures of all of the upper peninsula drivers are below 125 mR, which is typical for that group. Data from the last quarter included in the table was received too late to include in the previous report.

Nuclear Power Plant Shipments

Big Rock Point Nuclear Power Plant shipped four truck loads of waste and two truck loads of cobalt-60 this quarter. The first cobalt shipment was under close surveillance by the Michigan State Police because of an overturned propane tank truck on its reported route. As it developed, the driver was required to stop driving before reaching the accident site because of road-time restrictions. An attempt was made to intercept and examine the second cobalt shipment as it crossed a State Weigh Station at the Michigan-Ohio border. The route was incorrectly reported to the Division, however, and the truck never passed the Weigh Station. Assurances have been given that the error will not be repeated.

Palisades Nuclear Power Plant made five shipments, none of which was extraordinary. All were composite loads containing some trash and some steel tanks of cement-solidified evaporator concentrates. Despite the desire to see the new method of shipping concentrate liners on a full pallet, none of the shipments was examined. All were shipped at a time that conflicted with other plans. The shipments were few in number due to concerns over free-standing water. Since most of the waste buildings are unheated, free-standing water would have been difficult to detect. With the advent of warmer weather more frequent shipments will be made, and attempts will be made to examine them.

D. C. Cook Nuclear Power Plant made the most shipments of the three operating nuclear power plants in the State. Four trips were made to the plant during the quarter, one of which netted two waste truck examinations. Experiences that day demonstrated the flexibility of waste shipments. The intent for the trip was to examine two trucks at D. C. Cook and one at Palisades, which is a short drive from the Cook plant. At various times throughout the day, one of the shipments at Cook was cancelled, the Palisades shipment was cancelled, and another Cook shipment was added. One Cook plant shipment that was examined read 14 mR/hr at 3 ft. from the cask surface. Since the cask was on an open flatbed trailer, this is in excess of the 10 mrem/hr limit set forth in IE Information Notice No. 80-32 from the NRC. The shipment was authorized to leave the plant because this directive is still under dispute and is not being enforced. All other shipments were made without incident.

Between the time when the ground thaws and the time when it dries out after the thaw, heavy cask shipments may be prohibited on certain roads and unable to enter or leave the plants. Upon lifting of these "frost law" load limits, any container not meeting the post June 1, 1981 high integrity container standards will be shipped. This could create a bustle of activity at some or all of the plants, depending on the number of old design liners on hand at each plant.

Yellowcake Shipments

As indicated in Table XII, the shipments of uranium ore concentrates (yellowcake) continue to be sporadic. None had occurred last quarter

in the months of October and November. This quarter, December and February were heavy months, but nothing was shipped in January. The last shipments, five trucks on one day, came from Rio Algoma Mines, Ltd. rather than Denison Mines, Ltd. and were destined for Gore, Oklahoma rather than Metropolis, Illinois. Elliot Lake Freight Lines, Ltd. was still the carrier, and the route in Michigan remained the same.

TABLE I

FIELD INVESTIGATIONS

Radioactive Material Transporter	Number of Investigations
American Airlines	4
Emery Air Freight	4
Federal Express	4
Northwest Orient Airlines	4
Republic Airlines	1
Sajen Air	4
Zantop International Airlines, Inc.	4
Purolator Courier Corporation	3
Casperson, Inc.	1
First Flight Freight Service	1
Donald C. Cook Nuclear Power Plant	4
Big Rock Point Nuclear Power Plant	1
Total	35

This document paid for with State funds

TABLE II

Package Surveys

Label	Number	Label T.I.			mR/hr @ Surface			mR/hr @ 3 ft.		
		Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
I	0	-	-	-	-	-	-	-	-	-
II	1	1.0	1.0	1.0	79	79	79	2.3	2.3	2.3
III	10	1.5	6.4	10.0	32	125	230	1.1	4.9	7.1

TABLE III

Overpack Surveys

Label	Number	Label T.I.			mR/hr @ Surface			mR/hr @ 3 ft.		
		Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
I	0	-	-	-	-	-	-	-	-	-
II	20	0.1	0.5	0.9	0.6	5.0	36.	0.0	0.2	0.9
III	3	1.3	1.4	1.6	18	34.7	67	0.6	1.1	1.8

TABLE IV

Sajen Air Airplane Surveys

Date	T.I. Carried	mR/hr in Cockpit
12/9/80	89.1 (23.7)*	28.0 (2.9)*
12/16/80	19.8 (13.9)*	0.2 (0.0)*
1/20/81	85.9 (23.2)*	11.0 (2.3)*
2/24/81	75.8 (8.3)*	3.2 (0.3)*

* Numbers in parentheses are after unloading at Metro

TABLE V

Truck Surveys

First Flight Freight Service

Date	T.I. Carried	mR/hr in Cab
12/8/80	15	13.5
12/15/80	16	0.4

TABLE VI

DIRECT RADIATION EXPOSURE MEASUREMENTS
USING LiF THERMOLUMINESCENT DOSIMETERS

Station, Location, & Monitoring Period		Monitoring Days	Total mR For Period	Gross mR Per Day	*Net mR Per Day	mR Per Quarter
American Airlines						
Detroit Metropolitan						
Airport - Romulus						
Area Monitors Over RAM carts Dec. 8, 1980 - Feb. 23, 1981	#1	78	176.0	2.26	2.14	192
	#2	78	181.8	2.33	2.21	199
Area Monitors Near Men's Room Dec. 8, 1980 - Feb. 23, 1981	#3	78	27.50	0.35	0.23	21
	#4	78	27.23	0.35	0.23	21
Handler 1 Dec. 8, 1980 - Feb. 23, 1981		78	10.67	0.14	0.02	2

* Background = 0.12 mR/day

TABLE VII

DIRECT RADIATION EXPOSURE MEASUREMENTS
USING LiF THERMOLUMINESCENT DOSIMETERS

Station, Location, & Monitoring Period		Monitoring Days	Total mR For Period	Gross mR Per Day	*Net mR Per Day	mR Per Quarter
Federal Express						
Romulus						
Area Monitors Beside Phone Dec. 8, 1980 - March 17, 1981	#1	99	17.73	0.18	0.06	5
	#2	99	17.88	0.18	0.06	5
Area Monitors Under Rollers Dec. 8, 1980 - March 17, 1981	#3	99	18.05	0.18	0.06	5
	#4	99	18.01	0.18	0.06	5
Area Monitors On Wall Dec. 8, 1980 - March 17, 1981	#5	99	12.43	0.13	0.01	1
	#6	99	11.87	0.12	0.00	0
Area Monitors In Van One Dec. 8, 1980 - March 17, 1981	#7	99	12.84	0.13	0.01	1
	#8	99	13.76	0.14	0.02	2
Handler/Driver 1	Badge lost					
Handler/Driver 2 Dec. 8, 1980 - March 17, 1981		99	12.42	0.13	0.01	1
Handler/Driver 3 Dec. 8, 1980 - Feb. 24, 1981		78	11.22	0.14	0.02	2

* Background = 0.12 mR/day

TABLE VIII

DIRECT RADIATION EXPOSURE MEASUREMENTS
USING LiF THERMOLUMINESCENT DOSIMETERS

Station, Location, & Monitoring Period	Monitoring Days	Total mR For Period	Gross mR Per Day	*Net mR Per Day	mR Per Quarter
Casperson, Inc.					
Driver 1					
Aug. 9, 1980 - Dec. 12, 1980	149	514.9	3.46	3.32	302
Dec. 4, 1980 - March 11, 1981	97	456.8	4.71	4.57	411
Driver 2					
Aug. 9, 1980 - Dec. 12, 1980	149	494.2	3.32	3.18	289
Dec. 4, 1980 - March 11, 1981	97	264.7	2.73	2.59	233
Driver 3					
Aug. 9, 1980 - Dec. 12, 1980	149	181.6	1.22	1.08	98
Dec. 4, 1980 - March 11, 1981	97	143.4	1.48	1.34	120
Driver 4					
Aug. 9, 1980 - Dec. 12, 1980	149	31.43	0.21	0.07	6
Dec. 4, 1980 - March 11, 1981	97	50.00	0.52	0.38	34
Driver 5					
Aug. 9, 1980 - Dec. 12, 1980	Badge lost in the mail				
Dec. 4, 1980 - March 11, 1981	97	315.0	3.25	3.11	280
Driver 6					
Dec. 4, 1980 - March 11, 1981	97	19.29	0.20	0.00	0
Driver 7					
Dec. 4, 1980 - March 11, 1981	97	87.91	0.91	0.71	64
Driver 8					
Dec. 4, 1980 - March 11, 1981	97	19.97	0.21	0.01	1

* Background = 0.14 mR/day for drivers 1-5; = 0.20 mR/day for drivers 6-8

TABLE IX

REPORTED RADIOACTIVE MATERIAL SHIPMENTS

to and from

Donald C. Cook Nuclear Power Plants

Indiana & Michigan Electric Company

Bridgman, Michigan

Date Time	Description of Shipment	Curies	mR/hr. at 6 ft.	Destination
11/5/80 3:45 P.M.	Contaminated Test Equipment	0.006	1.0	Pittsburg, PA
11/6/80 12:45 P.M.	Dry Solid Trash	0.011	0.5	Beatty, NV
-	New Fuel	6.6	-	Cook Plants
11/12/80 5:40 A.M.	New Fuel	9.90	1.5	Cook Plants
11/12/80 3:55 P.M.	Scintillation Vials Compacted Trash	0.390	5.	Beatty, NV
11/18/80 11:00 A.M.	Solidified Evaporator Concentrates	0.265	1.5	Barnwell, SC
11/19/80 5:45 A.M.	New Fuel	9.90	1.5	Cook Plants
11/22/80 12:00 Noon	Solidified Evaporator	0.041	1.8	Barnwell, SC
12:00 Noon	Concentrates	0.057	0.3	Barnwell, SC
12/1/80 1:00 P.M.	Solidified Evaporator	0.081	1.6	Barnwell, SC
1:00 P.M.	Concentrates	0.025	0.6	Barnwell, SC
4:20 P.M.	Non-compactible Trash	0.012	0.6	Beatty, NV
12/3/80 6:57 A.M.	New Fuel	9.90	1.5	Cook Plants
12/10/80 11:45 A.M.	Solidified Evaporator	0.583	1.0	Barnwell, SC
11:45 A.M.	Concentrates	0.223	1.2	Barnwell, SC
12/12/80 3:30 P.M.	Dewatered Resin	0.07	<0.1	Barnwell, SC
12/17/80 5:45 A.M.	New Fuel	9.90	-	Cook Plants

TABLE IX cont.

REPORTED RADIOACTIVE MATERIAL SHIPMENTS

to and from

Donald C. Cook Nuclear Power Plants

Indiana & Michigan Electric Company

Bridgman, Michigan

Date Time	Description of Shipment	Curies	mR/hr. at 6 ft.	Destination
12/22/80 8:45 P.M.	Dewatered Resin	147.89	4.0	Barnwell, SC
12/29/80 1:00 P.M.	Solidified Evaporator Concentrates	0.212	0.4	Barnwell, SC
1/5/81 11:10 A.M.	Contaminated Equipment	0.005	<0.2	Pittsburg, PA
1/7/81 8:40 P.M.	Solidified Evaporator	0.256	4.0	Barnwell, SC
8:40 P.M.	Concentrates	0.081	2.6	Barnwell, SC
1/20/81 12:00 P.M.	Dry Solid Trash	0.024	2.5	Barnwell, SC
1/21/81 12:45 P.M.	Solidified	0.200	1.0	Barnwell, SC
1:00 P.M.	Evaporator	0.027	0.4	Barnwell, SC
4:45 P.M.	Concentrates	0.136	1.1	Barnwell, SC
1/27/81 3:00 P.M.	Solidified Evaporator Concentrates	0.094	0.2	Barnwell, SC
1/28/81 2:30 P.M.	Solidified Evaporator Concentrates	0.141	2.0	Barnwell, SC
2/4/81 9:00 A.M.	Dry Solid Trash Dry Resin	1.31	<0.2	Barnwell, SC
2/9/81 3:00 P.M.	Solidified Evaporator Concentrates	0.898	2.0	Barnwell, SC
2/11/81 11:00 A.M.	Solidified Evaporator Concentrates	0.182	0.2	Barnwell, SC
2/17/81 5:45 P.M.	High-level Filters	19.8	5.0	Barnwell, SC

TABLE IX cont.

REPORTED RADIOACTIVE MATERIAL SHIPMENTS

to and from

Donald C. Cook Nuclear Power Plants

Indiana & Michigan Electric Company

Bridgman, Michigan

Date Time	Description of Shipment	Curies	mR/hr. at 6 ft.	Destination
2/20/81 5:32 P.M.	Trash	0.0208	1.0	Beatty, NV
2/25/81 12:40 P.M.	Solidified Evaporator	0.074	<0.2	Barnwell, SC
2:35 P.M.	Concentrates	0.720	1.0	Barnwell, SC
2/27/81 1:20 P.M.	Solidified Evaporator Concentrates	0.023	0.8	Barnwell, SC
4:00 P.M.	Dry Solid Trash	0.1	4.0	Barnwell, SC
	Total incoming	46.2 curies		
	Total outgoing	174. curies		

< means less than

TABLE X

REPORTED RADIOACTIVE MATERIAL SHIPMENTS

to and from

Big Rock Point Nuclear Power Plant

Consumers Power Company

Charlevoix, Michigan

Date Time	Description of Shipment	Curies	mR/hr at 6 ft.	Destination
12/5/80 7:00 P.M.	Co-60 rods	350,000	8.5	Dickerson, MD
12/17/80 6:30 P.M.	Waste	8.41	5.0	Barnwell, SC
1/6/81 2:30 P.M.	Fuel Inspection Equipment	0.056	2.5	Richland, WA
1/14/81 6:40 P.M.	Misc. Contaminated Material	2.7	2.5	Barnwell, SC
1/26/81 7:00 P.M.	Co-60 rods	350,000	3.5	Dickerson, MD
2/18/81 12:30 P.M.	Compacted General Waste	2.02922	8.0	Richland, WA
	Total outgoing	700,013. curies		

TABLE XI

REPORTED RADIOACTIVE MATERIAL SHIPMENTS

to and from

Palisades Nuclear Power Plant

Consumers Power Company

South Haven, Michigan

Date Time	Description of Shipment	Curies	mR/hr at 6 ft.	Destination
11/25/80 4:45 P.M.	Compacted Trash Solidified Evaporator Concentrates	0.496	1.5	Richland, WA
12/5/80 4:00 P.M.	Compacted Trash Non-compressible Trash	0.091	0.5	Richland, WA
12/15/80 6:30 P.M.	Solidified Evaporator Concentrates	0.81	5.0	Richland, WA
1/8/81 4:30 P.M.	Solidified Evaporator Concentrates Non-compressible Trash Compacted Trash	0.568	3.0	Richland, WA
2/26/81 11:00 A.M.	Compacted Trash Non-compressible Trash Solidified Evaporator Concentrates	0.831	7.0	Richland, WA
	Total outgoing	2.796 curies		

TABLE XII

REPORTED YELLOWCAKE SHIPMENTS

from

Denison Mines Ltd.

Elliot Lake, Ontario, Canada

to Metropolis, Illinois

Date Time	Number of Trucks	Curies	mR/hr at 6 ft.
12/11/80 8:30 P.M.	1	5.8	5
12/12/80 1:19 A.M.	2	5.8	5
6:00 P.M.	2	5.8	5
12/14/80 7:00 P.M.	1	5.8	5
12/15/80 8:10 P.M.	1	5.8	5
12/16/80 12:33 A.M.	1	5.8	5
10:40 P.M.	1	5.8	5
12/17/80 2:03 A.M.	1	5.8	5
2/11/81 10:15 P.M.(1)	3	5.8	5
2/12/81 12:01 A.M.	2	5.8	5
2/17/81(2) 5:20 P.M.	5	5.8	5
	Total	116.0 curies	

(1) Time is at Mackinac Bridge, all other times are at the International Bridge, Sault Ste. Marie.

(2) Trucks are from Rio Algoma Mines, Ltd. and going to Gore, OK.