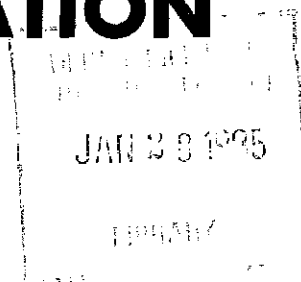


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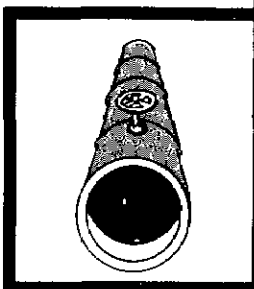
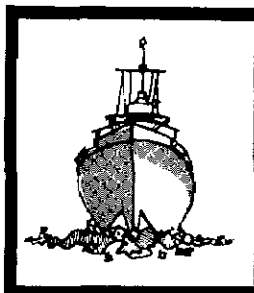
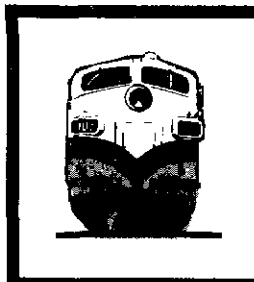
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# NATIONAL TRANSPORTATION SAFETY BOARD



WASHINGTON, D.C. 20594



## RAILROAD ACCIDENT REPORT

DERAILMENT OF SOUTHERN PACIFIC  
TRANSPORTATION COMPANY  
TRAIN NO. 01-BSMFF-05  
CARRYING RADIOACTIVE MATERIAL  
AT THERMAL, CALIFORNIA  
JANUARY 7, 1982

NTSB-RAR-83-1

UNITED STATES GOVERNMENT

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16. Abstract <p>About 9:50 p.m., P.s.t., on Thursday, January 7, 1982, Southern Pacific Transportation Company freight train No. 01-BSMFF-05, derailed 14 cars at Thermal, California, while traveling about 57 miles per hour on the tangent single main track. Four transients riding on the train were seriously injured, a fifth transient died as a result of injuries. No crewmembers were injured as a result of the accident. The presence of radioactive material in the derailed Trailer-On-Flat-Car train was discovered about 1 hour after the accident occurred, resulting in the handling of the emergency response effort as a serious radiological emergency. Contributing to misdirected emergency response efforts was erroneous and conflicting information concerning hazardous material on the train. Accurate information regarding the precise nature of the radioactive material shipment was not available at the accident site until about 5 hours after the derailment occurred; at that time radiological emergency procedures were terminated. Damage was estimated to be about \$1,015,350.</p> <p>The National Transportation Safety Board determines that the probable cause of this accident was the inadequate company evaluation of defect data which should have indicated that the rail in the vicinity of the derailment was approaching service life limit for main track use and the consequent failure of the company to initiate an accelerated inspection program to detect incipient fatigue fractures of the rail.</p>					
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## CONTENTS

<b>SYNOPSIS</b> . . . . .	1
<b>INVESTIGATION</b> . . . . .	1
Events Preceding the Accident. . . . .	1
The Accident . . . . .	3
Emergency Response . . . . .	3
Injuries to Persons . . . . .	7
Damage . . . . .	7
Personnel Information . . . . .	8
Train Information . . . . .	8
Method of Operation . . . . .	10
Track Information . . . . .	10
Meteorological Information . . . . .	13
Tests and Research. . . . .	13
Radioactive Material (RAM) Information . . . . .	14
Waybill Information . . . . .	14
Medical and Pathological Information. . . . .	20
Other Information . . . . .	20
<b>ANALYSIS</b> . . . . .	21
Rail Defects and Diagnosis . . . . .	21
Reliability of Hazardous Material Documentation . . . . .	24
<b>CONCLUSIONS</b> . . . . .	25
Findings . . . . .	25
Probable Cause . . . . .	27
<b>RECOMMENDATIONS</b> . . . . .	27
<b>APPENDIXES</b> . . . . .	33
Appendix A--Investigation . . . . .	33
Appendix B--Personnel Information . . . . .	34
Appendix C--Event Recording Tape . . . . .	35
Appendix D--Excerpts From FRA Track Safety Standards, (49 CFR 213.113). . . . .	36
Appendix E--SP Rail Defect Inspection Report. . . . .	38
Appendix F--Waybill Information (8 documents) . . . . .	39
Appendix G--Responses to Safety Recommendations R-82-82 through -85 .	47

**NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C. 20594**

**RAILROAD ACCIDENT REPORT**

**Adopted: January 19, 1983**

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**DERAILMENT OF SOUTHERN PACIFIC  
TRANSPORTATION COMPANY TRAIN NO. 01-BSMFF-05,  
CARRYING RADIOACTIVE MATERIAL,  
AT THERMAL, CALIFORNIA  
JANUARY 7, 1982**

**SYNOPSIS**

About 9:50 p.m., P.s.t., on Thursday, January 7, 1982, Southern Pacific Transportation Company freight train No. 01-BSMFF-05, derailed 14 cars at Thermal, California, while traveling about 57 miles per hour on the tangent single main track. Four transients riding on the train were seriously injured, a fifth transient died as a result of injuries. No crewmembers were injured as a result of the accident. The presence of radioactive material in the derailed Trailer-On-Flat-Car train was discovered about 1 hour after the accident occurred, resulting in the handling of the emergency response effort as a serious radiological emergency. Contributing to misdirected emergency response efforts was erroneous and conflicting information concerning hazardous material on the train. Accurate information regarding the precise nature of the radioactive material shipment was not available at the accident site until about 5 hours after the derailment occurred; at that time radiological emergency procedures were terminated. Damage was estimated to be about \$1,015,350.

The National Transportation Safety Board determines that the probable cause of this accident was the inadequate company evaluation of defect data which should have indicated that the rail in the vicinity of the derailment was approaching service life limit for main track use and the consequent failure of the company to initiate an accelerated inspection program to detect incipient fatigue fractures of the rail.

**INVESTIGATION**

**Events Preceding the Accident**

Train No. 01-BSMFF-05, originated at St. Louis, Missouri, on the St. Louis Southwestern Railway Company (SSW), and was received in interchange by the Southern Pacific Transportation Company (SP) at Corsicana, Texas. The train consisted mainly of flat cars equipped to accommodate highway truck trailers. At Hearne, Texas, (see figure 1) car No. TTAX982525 (TTAX car) was added into train No. 01-BSMFF-05. The car had been transported to Hearne in local service from the SP's Trailer-On-Flat-Car (TOFC) piggyback ramp in Dallas, Texas. In Dallas, two highway truck trailers had been loaded on the TTAX car. One of the truck trailers, the GILFLEX 10140 (GIL-10140), contained, among other merchandise, a shipment of americium, a radioactive material (RAM). The RAM had been tendered by the shipper at its facility in Houston, Texas, to a motor carrier company. The motor carrier company had consolidated the RAM with other merchandise on a truck trailer at its Grand Prairie, Texas, facility and had delivered the truck trailer to the SP at Dallas, Texas. Train No. 01-BSMFF-05 departed Hearne, Texas, en route to Los Angeles, California.



According to SP officials, train No. 01-BSMFF-05 received a 500-mile inspection at Tucson, Arizona, the last designated inspection point before the accident site, and no exceptions were taken. The 500-mile inspection met a regulatory requirement of the Federal Railroad Administration (FRA), as set forth in 49 CFR 232.19, Air Brake Tests On Run-Through And Unit Run-Through Trains. (Effective October 1, 1982, the FRA deleted 49 CFR 232.19 in its entirety from its Railroad Power Brakes and Drawbars regulations, among other revisions to those regulations.) A relief crew, consisting of an engineer, a fireman, a front brakeman, a conductor, and a flagman, took over the train at Yuma, Arizona, the eastern terminus of the SP's San Joaquin Division. At Yuma, the incoming engineer made a full service brake application and stopped the train. The outbound engineer released the brakes, and the train's rear-end crew, a conductor and a rear brakeman, performed a roll-by inspection of the train. The conductor testified after the accident that he and the rear brakeman inspected the train's running gear during the roll-by inspection and noted that the trailers were properly loaded, but that neither noted hazardous material placards on any trailer in the train. Hazardous material placards on TOFC or Container-On-Flat-Car (COFC) shipments are normally applied directly to the trailer and/or container, and as such are situated above the eye level of the crew performing the roll-by inspection. The conductor further testified that the train profile printout did not indicate the presence of a hazardous material shipment on the train. The train profile printout is used to indicate the train's mass distribution and to identify cars requiring special handling. According to SP rules, the presence of certain hazardous materials on the train, such as radioactive materials, is to be indicated in the train's designation symbol by the letter "K." Train No. 01-BSMFF-05 departed Yuma, Arizona, about 7:46 p.m., P.s.t. 1/

### The Accident

Shortly before 9:50 p.m., on Thursday, January 7, train No. 01-BSMFF-05, with a 5-unit locomotive and 56 cars, was approaching Thermal, California, on the single main track. A passing siding about 7,700 feet long extends westwardly from about milepost 620.2 (see figure 2). A color light signal governing westbound train movements is located to the north side of the track at milepost 620.2. The engineer and front brakeman testified that as the train approached the signal, the indication flashed momentarily from green (clear) to red (stop) and immediately back to green (clear). The engineer stated that he was preparing to reduce the train speed at that time to enter the switch into double track territory at milepost 618.49. The engineer stated that the speed of the train was about 53 miles per hour (mph) when the train's automatic air brake unexpectedly applied in emergency. The 5-unit locomotive and the head 36 cars of the train remained coupled and came to a stop with the rear truck of the 36th car derailed but remaining in line and upright. The 36th car came to rest at about milepost 619.5, about 1,980 feet west of the following car. The following 13 cars derailed and came to rest on the north side of the main track in an area about 900 feet long and extending about 75 feet north of the main track (see figure 3). All the derailed cars were flat cars carrying highway truck trailers. There was no fire in any of the derailed equipment. The derailment occurred about 9:50 p.m. near Thermal, California.

### Emergency Response

Immediately after the train stopped, the conductor and head brakeman walked from their respective ends of the train to assess the damage. After discovering that transients who had been riding on some of the flatcars had been injured in the derailment, the conductor immediately returned to the caboose, radioed the SP dispatcher, advised him

1/ All times herein after are Pacific standard time.

p. 12

LAB. PHOTOGRAPH 248-1. FAILED RAIL - THERMAL DERAILMENT 01-BSMFF-05, 1-7-82.

Rail portions received from subject derailment assembled to show locations of fractures at A-A, B-B, and C-C. Additional breaks also occurred within the joint.

Figure 5.--Rail containing fractures, retrieved from derailment site.

p. 15

LAB. PHOTOGRAPH 248-3. FAILED RAIL - THERMAL DERAILMENT 01-BSMFF-05, 1-7-82.

The fracture surfaces at A-A show a 35% detail fracture from shelling in the rail head gage side; remainder, rapid break. Arrows indicate origin.

Figure 7.--View of fracture at "A-A" showing detail fracture.

p. 16

LAB. PHOTOGRAPH 248-4. FAILED RAIL - THERMAL DERAILMENT 01-BSMFF-05, 1-7-82.

The fracture surfaces of the break at B-B show a 15% detail fracture from shelling in the rail head on gage side; remainder, rapid break with extensive battering.

Figure 8.--View of fracture at "B-B" showing detail fracture.

E R R A T A

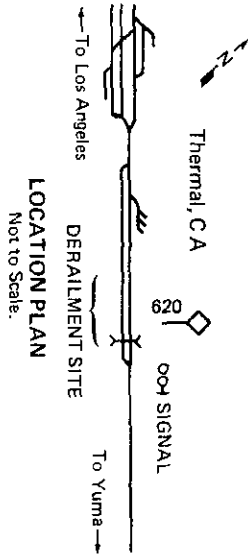
RAILROAD ACCIDENT REPORT  
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TRAIN NO. 01-BSMFF-05  
CARRYING RADIOACTIVE MATERIAL  
AT THERMAL, CALIFORNIA  
JANUARY 7, 1982

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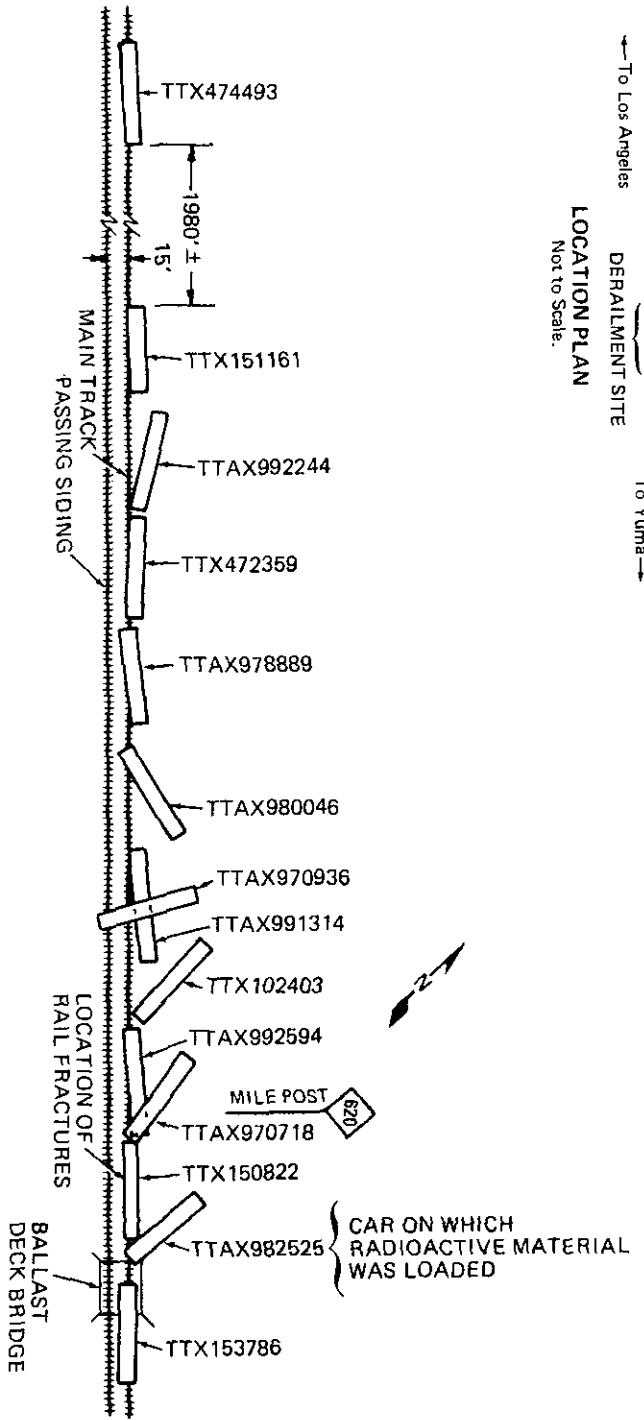
Change captions to pages 12, 15 and 16 as shown on reverse  
side of this errata sheet.

March 4, 1983





Thermal, California  
 Southern Pacific Transp. Co.  
 Train no. 01-BSMF-05  
 January 7, 1982



California State Highway No. 111

Not to Scale.

Figure 2.—Sketch of derailment site.



Figure 3.—Aerial view of accident site.

of the derailment, and requested medical assistance. At 9:55 p.m., the SP chief dispatcher in San Francisco notified the Riverside County Sheriff's office and requested that emergency services be dispatched to the accident site at Thermal. A County Sheriff's officer who was in the vicinity responded to the scene shortly after 9:55 p.m. and requested "all available ambulances" be sent to the derailment site. The officer then began searching for injured people.

Emergency medical and firefighting personnel began arriving at the scene about 10:15 p.m. The Riverside County Fire Chief stated he went to the caboose about 10:20 p.m., and asked the conductor "what cargo the train contained, and if the cargo was hazardous to the firefighters." The conductor later told Safety Board investigators that the train profile ". . . is supposed to have any dangerous material noted on the bottom of it, and my profile didn't show no hazardous materials and I told him (the fire chief) that there was none." As a result of his conversation with the conductor, the fire chief returned to the derailment area about 10:30 p.m. and advised the response personnel that ". . .there was nothing to worry about . . ." and to continue the efforts to locate any injured people. By this time, all the injured transients had been located.

After the fire chief left the caboose, the conductor began reviewing the individual waybills for the derailed cars in order to further apprise the SP dispatcher of the extent of the damages. Shortly before 11:00 p.m., the conductor found the waybill that, although not known at this time, erroneously identified the RAM on the 48th car in the train, the TTAX car, as "FISSILE CLASS III." 2/ He immediately took the waybill to the Sheriff's officer-in-charge, who then relayed the information on the waybill to the police dispatcher. The conductor then returned to the caboose to contact the SP dispatcher. The police dispatcher contacted the Radiation Health Unit of the Division of Occupational Safety and Health of the State of California (DOSH) and was told to have ". . . everyone stay back 100 yards, since there was no fire, and keep people there until a determination of radiation danger could be made."

The police dispatcher notified emergency response personnel through the command post, which had been established near the site, of DOSH's advice, and all personnel moved back from the derailment. In response to the police dispatcher's notification, DOSH also dispatched a Health Physicist to Thermal to investigate the effects of the uranium and americium reported to be involved in the derailment.

At 11:13 p.m., the California Highway Patrol closed about 6 miles of the adjacent State Highway No. 111 to seal off the derailment area. About 11:00 p.m., the Indio Community Hospital was advised by radio of the casualties in the train derailment and of potential radioactive contamination of exposed individuals. Two ambulances with the injured transients and an injured firefighter arrived at the hospital at 11:20 p.m. The patients were scanned for radioactive contamination before admission. No contamination was detected. A decontamination area was established outside the emergency treatment area before midnight, and the hospital was declared sealed, with no one allowed to leave, at midnight.

Meanwhile, the conductor who had returned to the caboose, radioed the SP dispatcher and informed him of the presence of the RAM on the derailed TTAX car. After accessing the Total Operations Processing System (TOPS) computer, the SP dispatcher advised the conductor that the TTAX car was not in train No. 01-BSMFF-05. The TOPS computer is utilized by the SP as a management tool for tracing car locations, train scheduling, and other similar functions. The TOPS computer is also used by the

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2/ Fissile is a term used to identify certain radioactive materials whose nuclei split, releasing large amounts of radioactivity and heat. See discussion Waybill Information.

and destroyed (see figure 4). The 49th car of the train derailed, but also remained upright and in line with the track structure. The trailers on this car remained attached and were not damaged in the derailment, but were damaged during wreckage clearing. All other truck trailers involved in the derailment were destroyed, and their lading were badly damaged or destroyed.

About 880 feet of the main track was damaged during the accident. The adjacent passing siding to the south of the main track was not damaged. A ballast deck bridge about 25 feet long and spanning a drainage ditch received damage to the bridge deck. The track circuit for the signal system was also damaged.

Damage was estimated as follows:

Equipment	\$ 241,000
Trailers	212,000
Lading	500,900
Track & Bridge	27,250
Signals	5,000
Wreck Clearing	29,200
Total	<u>\$1,015,350</u>

### Personnel Information

The engineer of train No. 01-BSMFF-05 had been trained at the SP's engineer training school in El Cerritos, California. The fireman was also qualified as a locomotive engineer. All the train crewmembers were current on SP operating rules and were qualified for their respective positions in accordance with SP requirements (see appendix B).

### Train Information

The locomotive of train No. 01-BSMFF-05 consisted of five diesel-electric locomotive units: SSW7657, SSW7656, SSW7655, SSW7654, and SSW9053. The first four units, respectively, were model GP-40-2, 4-axle, 3,000-horsepower units, manufactured by the Electro Motive Division (EMD) of General Motors Corporation. The fifth unit was a model SD-45, 6-axle, 3,000-horsepower unit, also manufactured by EMD. The locomotive weighed about 1,517,000 pounds. The units were equipped with operable radios, a 26-L airbrake system, extended range dynamic brakes, and speed indicators. The units were not equipped with alertness or deadman control devices, nor were such devices required. The third unit was equipped with an event recorder <sup>5/</sup> (see appendix C). The caboose was equipped with an operable radio.

The 56-car train was about 5,326 feet long and had a trailing tonnage of 3,883 tons. With the exception of five cars near the front of the train (two box cars, a container flat car, a covered hopper car, and a gondola), the train consisted of flat cars carrying loaded highway truck trailers containing various merchandise. The 48th car of the train also carried two truck trailers, in one of which was shipped a container of radioactive material americium. Although not seen by ground personnel during the roll-by inspection at Yuma or after the derailment, radioactive warning placards were found later one each on the sides and ends of this trailer. Train No. 01-BSMFF-05 was a through train with no scheduled stops, pickups, or setouts between Yuma, Arizona, and West Colton, California, the next crew change point.

<sup>5/</sup> The event recorder records elapsed time, speed in miles per hour, load in amps, travel direction, automatic brake pipe reduction, locomotive brake, throttle setting, and dynamic brake application.

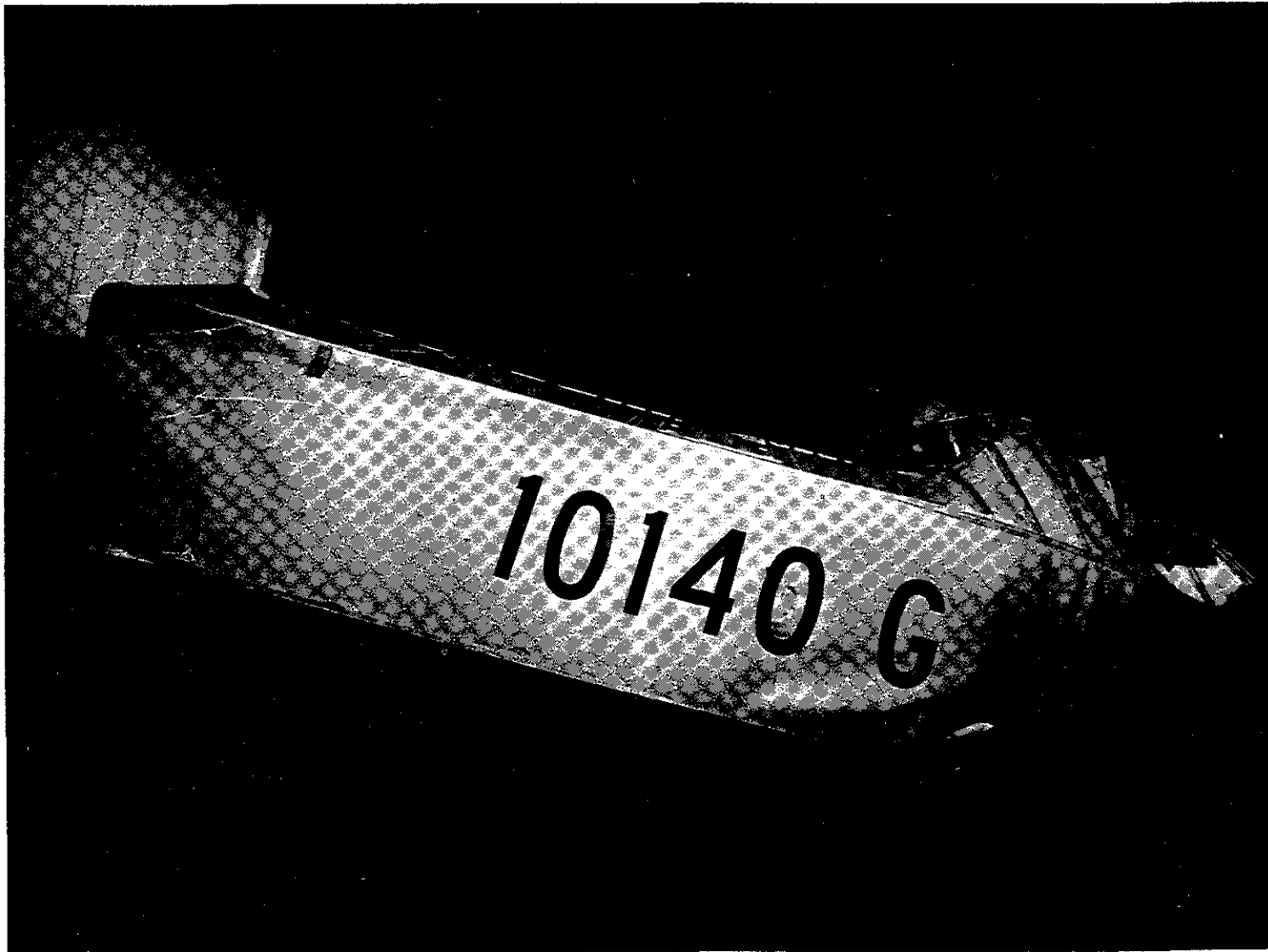


Figure 4.—View of truck trailer No. GILFLEX 10140, containing radioactive material, as it came to rest after the derailment.

### Method of Operation

Trains are operated through Thermal by timetable, train orders, and signal indications of the automatic wayside signals of a Centralized Traffic Control system (CTC). The maximum authorized speed for passenger trains is 70 mph and 55 mph for freight trains. Computer generated TOPS train identification symbols are assigned to certain freight trains which are authorized to operate at passenger train speeds. Train No. 01-BSMFF-05 is so identified in the timetable for the San Joaquin Division.

The timetable stipulates a 50-mph speed restriction for trains handling hazardous materials listed in Rule 827-A of the SP's Rules and Regulations of the Transportation Department. Rule 827-A states:

Trains except locals and road switchers, handling cars placarded "EXPLOSIVES A," "POISON GAS," "RADIOACTIVE," or tank cars containing a product classified as FLAMMABLE GAS or the individual commodities ANHYDROUS AMMONIA, CHLORINE, HYDROGEN CHLORIDE, HYDROGEN FLUORIDE or SULFUR DIOXIDE will be identified on train lists by "K" as the last letter in train identification. These trains are referred to as "K" trains.

At crew change locations, a "K" train must be given a rolling inspection by outbound crew unless the entire train has received a predeparture inspection by crew or by Mechanical Department employe.

At locations specified in timetable, "K" trains will stop and entire train must be inspected from both sides to check for obvious leakage or other unsafe condition of equipment before proceeding.

To assist in train handling, the conductor and engineer of each train are provided with a train mass profile printout generated by TOPS, which depicts the distribution of mass within the train. The profile is also used to convey special handling requirements or restrictions, such as the presence of hazardous materials. The profile for train No. 01-BSMFF-05 did not indicate the presence of hazardous materials in the train.

The Safety Board was informed by the SP that in the 30-day period preceding the accident, 565 trains were operated through Thermal, California.

### Track Information

The main track at Thermal is constructed of 136-lb RE section 6/ continuous welded rail (CWR). The rails are laid in 9 x 14 inch double shoulder tie plates, atop 9 x 7 inch by 9-foot treated hardwood crossties. The CWR is fastened by two rail holding spikes in each tie plate and is box anchored on alternate cross ties. The ends of the nominal 1/4-mile-long welded rails are connected by joint bars fastened with six bolts. The rails in the joint bar areas are anchored on each side of each crosstie to prevent joint pull-apart. The crossties are laid in copper slag ballast with compacted full tie cribs. The shoulder ballast section extends more than 12 inches beyond the crosstie ends. The most recent tie renewals and out-of-face surfacing had been completed in 1979. The track alignment is tangent and ascending westwardly at an approximate 0.10 percent grade and then at an approximate 0.22 percent grade. The track met or exceeded the

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6/ 136-lb RE section refers to rail which nominally weighs 136 pounds per lineal yard and is a standard rail section recommended for use by the American Railway Engineering Association (AREA).

minimum standards of the FRA's track safety standards for class 5 track. The total gross train tonnage which the track had been subjected to for the years 1965 through 1980 7/ was 715.4 Million Gross Tons. The CWR at Thermal was installed new in 1965.

A 25-foot-long ballast deck bridge, spanning an irrigation ditch, is located in the derailment area about milepost 620.02. Investigation of the track structure revealed several rail fractures near a rail joint in the north rail approximately 62 feet west 8/ of the west end of the ballast deck bridge. (See figure 5.) The fractures were 51 inches and 39 1/2 inches east of the rail joint and 16 inches west of the rail joint. Additional fractures were also found near the rail joint. The rail ends at the fractures displayed battering on their west fracture faces. The battering was more severely pronounced at the fractures which had occurred to the east of the rail joint. Safety Board investigators noted that the railheads of both rails in the general vicinity of Thermal displayed shelly spots. 9/ (See figure 6.) The SP's track inspection reports for the 30-day period preceding the accident did not take note of the shelly spots in the rails. The rail containing the fractures was sent to the SP's testing facility for metallurgical analysis of the rail fractures. 10/

Section 213.237 of the FRA's Track Safety Standards as set forth in 49 Code of Federal Regulations, requires that; ". . . at least once a year a continuous search for internal defects must be made of all jointed and welded rails in Classes 4 through 6 track, . . ." Section 213.113 of the Track Safety Standards prescribes the remedial action which applies when the owner of the track becomes cognizant of such internal defects (see appendix D). The SP's rail defect detection program is conducted with a company owned magnetic-type rail detector car, which last operated through Thermal on April 27, 1981. A footnote on the report of that inspection states; ". . . cut off work . . . acct. too many defects. . ." (See appendix E.) All of the defects detected during that internal rail inspection were corrected prior to this accident but a further internal rail inspection was not performed prior to this accident. The SP informed Safety Board investigators that the inspection ". . . cut off. . ." was a means of accommodating the internal rail inspection program into the constraints of scheduled train operations, and to provide for the rail repairs which had been made necessary by the inspection itself.

The following are excerpts from the Southern Pacific Transportation Company Rules and Regulations For the Maintenance Of Way and Structures regarding rail:

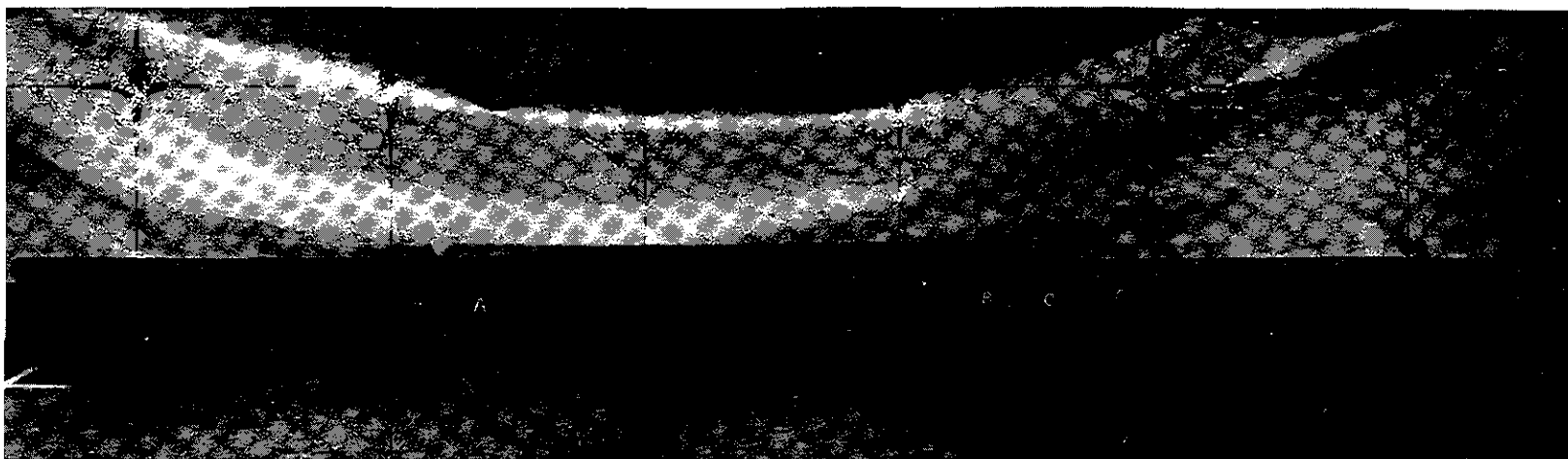
M971. Employees must be instructed to look out for broken or defective rails, to promptly report same when discovered and, if necessary, to protect track.

7/ The figures given were supplied by the SP as the most recent information available.

8/ SP trains operate northwest and southeast geographically through Thermal, but railroad timetable direction is west and east, respectively. For purposes of this report, railroad timetable directions will be used.

9/ According to the Manual For Railway Engineering of the AREA, a shelly spot is defined as: Where a thin (usually 3/8 in. in depth or less) shell-like piece of surface metal becomes separated from the parent metal in the railhead, generally at the gage corner. It may be evidenced by: (a) a black spot appearing on the head over the zone of separation; (b) a piece of metal breaking out completely, leaving a shallow cavity in the railhead. In the case of a small shell, there may be no surface evidence, the existence of the shell being apparent only after the rail is broken or sectioned.

10/ See discussion - Tests And Research.



LAB. PHOTOGRAPH 248-1. FAILED RAIL - THERMAL DERAILMENT 01BSMFF-05, 1-7-82.

Rail portions received from subject derailment assembled to show locations of fractures at A-A, B-B, and C-C. Additional fractures also occurred within the joint.

Figure 5.—Rail containing fractures, retrieved from derailment site.



M972. Broken rails must be replaced without delay, and shall in all cases be inspected by roadmaster. Rails having pieces of the head or base broken or those having cracks, splits or other flaws, which might result in failure, must promptly be removed from main track, or other important tracks.

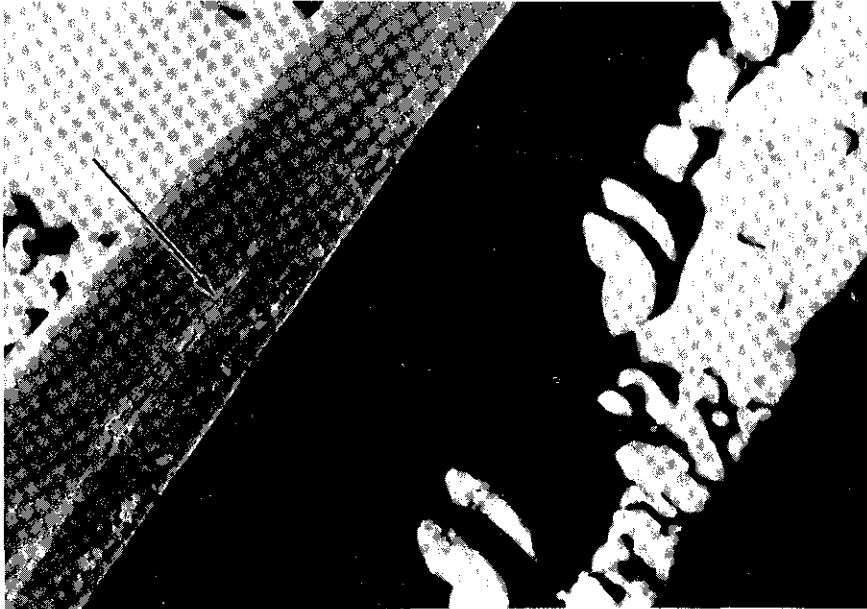


Figure 6.—View of rail displaying shelly spots.

### **Meteorological Information**

At the time of the accident, visibility was good. The temperature was about 39° F, the humidity was 17 percent, and the winds were from the north at about 8 knots.

### **Tests and Research**

An inspection of the locomotive and all of the cars of train No. 01-BSMFF-05 was performed shortly after the accident. The inspection disclosed no mechanical defects that would have contributed to the accident. No exceptions were taken by Safety Board investigators to the wheels, trucks, or car body structures.

After the accident, the event recorder was removed from the third unit of the locomotive and taken to the SP's Engine Service Training Center simulation facility for playback and verification. The wheel size of the locomotive unit was taped to calibrate the event recorder printout, and the stops at Yuma, Arizona, and Thermal, California, were established as the reference points. Results of the playback indicated that the train speed was about 57 mph at the time of the emergency airbrake application, and the maximum speed of the train before the derailment was about 73 mph. (See appendix C.)

A section of the north rail which contained the fractures was taken to the SP's facility for metallurgical analysis. Two of the fractures were detail fractures (see appendix D); one in the approximate 35-percent size classification 11/ and the other in the approximate 15-percent size classification. Results of the analysis indicated that the detail fractures originated from shelling on the gage side of the railhead (see figures 7 and 8). The remaining fractures were overstress pressure breaks.

### **Radioactive Material (RAM) Information**

The RAM involved in the derailment of train No. 01-BSMFF-05 was a special form radioactive material. 12/ The RAM consisted of 16 curies of americium-241 and beryllium in mixture to be utilized in oil well exploratory operations to survey underground geological formations.

During shipment, the RAM was enclosed in a container which had been certified for use by the U.S. Nuclear Regulatory Commission and the U.S. Department of Transportation. The container consisted of a welded mild steel closed cylinder, approximately 20.5 inches long and 17.3 inches in diameter. An inner 2-inch-diameter stainless steel tube containing a pressure vessel was centered in the cylinder. The interior void was filled with polyethylene, an absorbent shield for the radiation emitted by the RAM. The container's top closure was a plug secured by a locking scissors-type toggle arm assembly, and the bottom closure was a solid plug. The gross weight of this container was approximately 155 pounds. (See figure 9.) The stainless steel pressure vessel was approximately 7 inches long and 1 11/16 inches in diameter. The pressure vessel was designed to facilitate handling and to protect the RAM during the oil well explorations. The RAM was not intended to be removed from this pressure vessel during field operations. The third and innermost container contained the encapsulated radioactive material itself. This third double walled container was 4.835 inches long and 0.983 inches in diameter.

The outer container was visually examined after the accident and no apparent damage was noted (see figure 10). Radioactivity detection tests after the accident disclosed that the measured radioactivity from the container was at the same level as when the container had been prepared for shipment.

### **Waybill Information**

The originating shipper had arranged to transport the RAM shipment from its Houston, Texas, facility to its Ventura, California, facility. The RAM shipment was taken from the originating shipper in Houston, Texas, by a motor carrier, who then consolidated the RAM at Grand Prairie, Texas, with a trailer load of freight-all-kinds (FAK). The motor carrier then made arrangements with a freight forwarder to load the consolidated shipment onto a flat car at the SP's piggy back facility in Dallas, Texas. The freight forwarder never physically handled the shipment, and the motor carrier delivered the truck trailer containing the shipment to the SP in Dallas. The shipment was to be routed by rail to the SP's piggyback facility in Los Angeles, California, and then trucked by another motor carrier to its final destination at Ventura, California. The foregoing resulted in eight separate and distinct documents identifying the shipment. (See appendix F.)

11/ Percent size classification refers to the percentage of rail head cross-sectional area that is weakened by the presence of a transverse defect in the rail head.

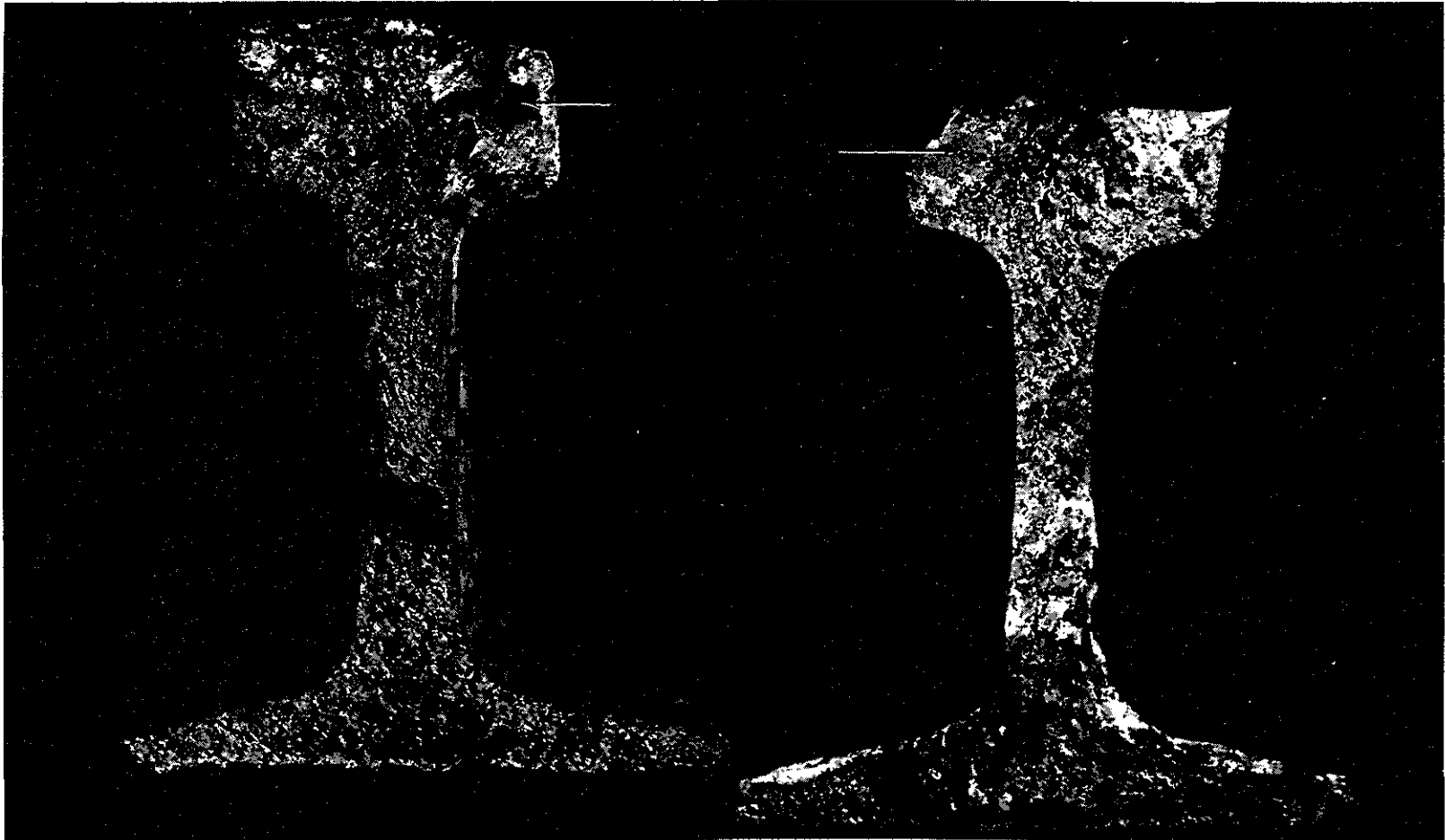
12/ According to 49 CFR 173.389(g), Special form radioactive material means that material which, if released from a package, might present some direct radiation hazard due to radiotoxicity, and [yet would present] little possibility of contamination. This may be the result of properties of the material (such as metals or alloys), or of acquired characteristics, such as encapsulation.



LAB. PHOTO 248-3. FAILED RAIL - THERMAL DERAILMENT 01SMFF-05, 1-7-82.

The fracture surfaces at A-A show a 35% derail fracture from shelling in the rail head gage side; remainder, rapid break. Arrows indicate origin.

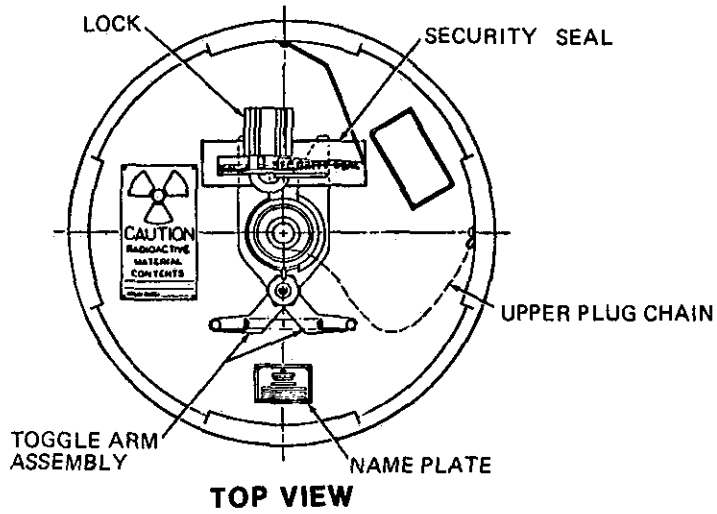
Figure 7.—View of fracture at "A-A" showing detail fracture.



LAB PHOTO 248-4. FAILED RAIL - THERMAL DERAILMENT 01BSFF-05, 1-7-82

The fracture surfaces of the breck at B-B show a 15% derail fracture from shelling in the rail head on gage side, remainder, rapid breck with extensive battering.

Figure 8.—View of fracture at "B-B" showing detail fracture.



NOTE: Not to scale

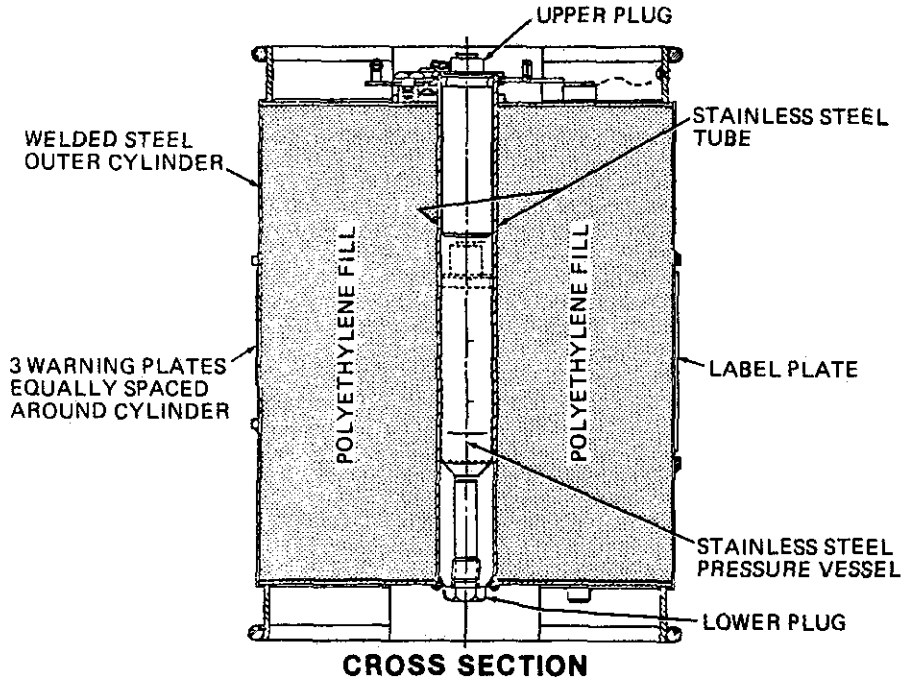


Figure 9.—RAM container.

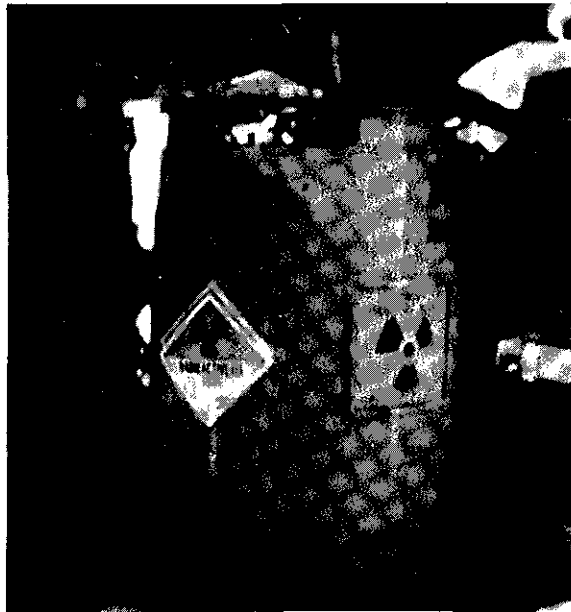


Figure 10.--View of RAM container after derailment.

The documentation for shipping the RAM began with a shipping order presented by the originating shipper to the motor carrier at Houston, Texas. The document (see appendix F, page 1 of 8) described the shipment as "RADIOACTIVE MATERIALS, SPECIAL FORM, N.O.S., NA9182, 180#." The abbreviation "N.O.S." means not otherwise specified. "NA9182" is the identification number assigned to the above described material in accordance with 49 CFR 172.101, Purpose and Use of Hazardous Materials Table. The designation "180#" refers to the gross weight of the RAM shipment in its container. The form also described the shipment as Category "III YELLOW LABEL" indicating the physical properties of the RAM source, in accordance with 49 CFR 172.403(d), labeling requirements for radioactive material. The form also contained packaging, marking, and labeling information. In addition, the shipping order listed one box of oilwell drilling tools and was dated December 31, 1981.

The motor carrier then prepared a freight bill for the shipment, also dated December 31, 1981. (See appendix F, page 2 of 8.) Both the shipping order and the freight bill accompanied the RAM shipment to the motor carrier's facility in Grand Prairie, Texas, where the shipment was transferred and consolidated with a trailer load of air circulating fans. At this time, the motor carrier prepared a straight bill of lading for a trailer load of FAK, dated January 4, 1982. (See appendix F, page 3 of 8.) This bill did not reflect the presence of the RAM shipment in the trailer. The motor carrier then contacted a freight forwarder specializing in TOFC rail shipping to arrange for transport of the consolidated shipment in the GIL-10140 trailer from Dallas, Texas, to Los Angeles, California.

The freight forwarder prepared a uniform straight bill of lading which reflected the RAM shipment in truck trailer GIL-10140, and which also reflected the hazardous material identification number NA9182. This bill was dated January 4, 1982. (See appendix F, page 4 of 8.) The freight forwarder then prepared a transportation contract form for the shipment of trailer GIL-10140 over the SP to Los Angeles. This form indicated "160 pounds of radioactive material, NOT PLACARDED (NA9182)," and was dated January 4, 1982. (See appendix F, page 5 of 8.) The form was subsequently revised and reissued as a corrected bill (see appendix F, page 6 of 8). The freight forwarder did not have the shipment in its possession during these transactions.

The motor carrier delivered the GIL-10140 trailer to the SP's TOFC ramp in Dallas, Texas, on January 5, 1982. The shipping order presented by the motor carrier's driver at that time indicated one trailer load FAK and did not reflect the RAM shipment in the consolidated trailer. The SP's intermodal freight manager stated that he telephoned the motor carrier's traffic manager to obtain clarification of the contents of the FAK shipment because the motor carrier's straight bill of lading was inconsistent with the freight forwarder's description which listed a radioactive material in the shipment. Based on information received by telephone from the motor carrier's traffic manager, SP's intermodal freight manager added the following information to the shipping order:

NA 9182

---

(URANIUM 1)  
HAZARDOUS MATERIALS IS  
1 CTN 180 LBS YELLOW  
LABEL III RADIOACTIVE  
LABELS REQUIRED

---

SHIPPER CERTIFIES MATERIAL IS PACKED AND LOADED IN  
ACCORDANCE WITH CURRENT DOT REGULATIONS

The SP's intermodal freight manager then requested the truckdriver to initial the URANIUM 1 entry and the shipper certification entry and also to sign the shipping order. The truckdriver acquiesced and dated the form January 5, 1982, at 6:30 p.m. (See appendix F, page 7 of 8.) After the trailer was placarded, the SP then accepted the GIL-10140 trailer for shipment.

After accepting the trailer, the freight manager prepared a freight waybill to accompany the shipment, based on the information on the motor carrier's shipping order, as revised by the freight manager. (See appendix F, page 8 of 8.) This waybill listed the freight forwarder as the shipper of the trailer. The SP freight manager stated after the accident that he could not recall the reason for the waybill entries of "FISSILE CLASS III, 13/ or URANIUM 1" but did recall making those entries. This information was entered into the SP's TOPS computer, and the Standard Transportation Commodity Code (STCC) 14/ No. 4927450 was added to the waybill. After the information was entered into the TOPS computer, it became available throughout the SP's communications network.

13/ See footnote 2.

14/ Standard Transportation Commodity Code (STCC) numbers are seven digit numbers defining a specific hazardous material as indexed in the Association of American Railroads Standard Transportation Commodity Code of Hazardous Materials.

### Medical and Pathological Information

Five transients who had been riding on the decks of the flatcars received injuries as a result of the derailment. One of the transients died in the hospital as a result of multiple traumatic injuries and hemorrhagic shock. The other four transients suffered fractures, lacerations, and trauma, and were admitted and held for treatment. One firefighter received injuries to his knee during the rescue, and was treated and released.

### Other Information

During the investigation of this accident, the Safety Board became aware of derailments of TOFC/COFC trains at Ludowici, Georgia, on March 23, 1982, and at La Porte, Indiana, on April 2, 1982. Both of these accidents involved waybills that did not adequately identify the hazardous materials for responding emergency or railroad personnel.

The accident at Ludowici, Georgia, involved the release of a Class B poison, a mercury-based pesticide, into the atmosphere during the post-derailment fire. The hazardous material was not identified on the waybill for the TOFC shipment. The waybill indicated "1 Trailer Load FAK" and a "46 111 10" commodity code, which denotes nonhazardous materials. The trailer was not placarded, and the train consist did not indicate the presence of hazardous materials. An intense fire ensued in the derailment and burned for about 50 hours before it was extinguished. The railroad notified shippers soon after the accident and eventually received information from the shipper of the Class B poison about 31 hours after the derailment. Special hazardous materials emergency procedures were then initiated, the area was evacuated, and exposed personnel were tested for contamination.

The accident at La Porte, Indiana, involved the release of an oxidizing material, trichloroisocyanuric acid, which when wet releases chlorine gas. Although the train consist indicated the presence of other hazardous materials in the piggyback train, the hazardous material which was released was not listed. The waybill described the shipment as "3 containers FAK" and the commodity code as "46 111 10." The container was not placarded. The conductor of the train became aware of the hazardous material by the chlorine-like odor of the spilled contents which had been wetted by rain; he immediately informed responding emergency personnel. About 200 people were evacuated, and special hazardous materials emergency procedures were initiated.

As a result of these accidents, the Safety Board recommended on September 2, 1982, that the Association of American Railroads (AAR):

Advise its member railroads to warn employees who may be at the scene of accidents that: "FAK" waybills may not properly identify or describe hazardous materials loaded in TOFC trailers and COFC containers.  
(R-82-82)

Develop and disseminate among member railroads procedures designed to provide timely detection and accurate identification of hazardous materials carried in TOFC trailers or COFC containers during rescue, firefighting, or wreck clearing operations at railroad accidents.  
(R-82-83).

On September 27, 1982, the AAR responded to these two recommendations and enclosed a copy of a letter to the chief operating officers of its member railroads. (See appendix G for additional information.)



The Safety Board also recommended on September 2, 1982, that the American Short Line Railroad Association (ASLRA):

Advise its member railroads which handle piggyback traffic to warn employees who may be at the scene of accidents that waybills may not properly identify or describe hazardous materials loaded in TOFC trailers and COFC containers. (R-82-84)

On September 15, 1982 the ASLRA responded to this recommendation advising that the recommendation has been supplied to every common carrier in the ASLRA. (See appendix G for additional information.)

Again, on the same date and as a result of these accidents, the Safety Board made the following recommendation to the International Association of Fire Chiefs; the International Association of Chiefs of Police; the National Fire Protection Association; and the Federal Emergency Management Agency:

Warn firefighters and law enforcement personnel through available communications or training programs that railroad waybills for piggyback TOFC trailers and COFC containers carrying hazardous materials may not adequately describe their contents, and that the contents of derailed trailers or containers must be checked for possible hazardous materials during rescue or firefighting operations at TOFC or COFC derailments. (R-82-85)

On September 2, 1982, the International Association of Fire Chiefs responded to the recommendation advising that it is immediately alerting emergency responders, and on September 9, 1982, the National Fire Protection Association responded advising of the publishing of the recommendation in its publication. The Safety Board commends these responding organizations for their interest in safety. (See appendix G for additional information.) The Safety Board has not yet received a response from the other parties.

### ANALYSIS

The crew of train No. 01-BSMFF-05 were properly qualified for their respective positions in accordance with SP requirements. A post-accident inspection of the five-unit locomotive and the cars disclosed no mechanical defects that would have contributed to the accident. Weather was not considered a factor in this accident.

### Rail Defects and Diagnosis

Metallurgical analysis of the broken rail indicated that two of the fractures were detail fractures which originated from shelling. Shelling is a condition which occurs when contact stresses between wheels and the railhead exceed the elastic limit of the steel, and can result in deformation and subsurface shear in the railhead. The subsurface shear normally originates in a longitudinal plane, but then turns downward to a transverse plane. Detail fractures are unique in contrast to other transverse defects because they are not the result of metallurgical factors such as inherent inclusions<sup>15/</sup> in the rail steel. Rather, they are the result of the excessive contact stresses of heavy wheel loads over an extended time frame, and as such are fatigue-related defects. The growth of a detail

<sup>15/</sup> Inclusion is a term used to identify a small quantity of gas or slag that is trapped in molten steel during the process of manufacturing rail and which remains in the rail after cooling.

fracture from shelling occurs rapidly in contrast to other transverse fissures. The remaining rail fractures were caused by instantaneous overstress, which probably occurred during the derailment. The fact that the rail fracture surfaces displaying detail fractures were battered also indicated that the detail fractures preceded the instantaneous overstress fractures. Although the precise moment of the rail failure could not be established, the signal's momentary flash from green (clear) to red (stop) to green (clear) as train No. 01-BSMFF-05 approached, indicated a momentary disruption of the signal circuit, which was conveyed through the rails. The dynamics imposed on the rails by the approaching train could have caused a slight longitudinal motion of the rails inducing the momentary disruption of the signal circuit. The Safety Board believes that the initial rail failure most likely occurred before the passage of train No. 01-BSMFF-05.

The shelling condition precipitating the detail fractures was visually evident and should have served as a warning to SP of a potential rail failure, and also should have indicated the necessity of more frequent internal defect inspections. At the time of the accident, Section 213.113(b) of the FRA Track Safety Standards prescribed the remedial action to be taken when shelly spots became evident in rails. The prescribed remedial action depended on the track inspector's subjective determination of whether or not the condition required that the rail be replaced. If the inspector decided that the shelling condition required that the rail be replaced, a 20-mph speed restriction was to be imposed and the rail was to be scheduled for replacement. If the inspector decided that the condition did not require that the rail be replaced, the rail then had to be inspected for internal defects at intervals of not more than every 12 months. Since the carrier determined that the rail did not require replacement and had inspected the rails for internal defect conditions on April 27, 1981, it considered itself to be in compliance with the Federal regulations. The degree or limits of surface defects listed in Section 213.113(b) are not defined by the FRA. The condition becomes a deviation from the FRA track standards only if the track owner's designated inspector decides that the rail condition is serious enough to require replacement of the rail. In this regard, the FRA track standards can have the effect of tacitly condoning excessive delay by a railroad in the replacement of defective rail.

On April 27, 1981, the SP inspected the rails for internal defects to comply with Section 213.237 of the FRA Track Safety Standards, which require that once a year a search for internal defects be made on Classes 4 through 6 track. The report of that inspection contained a footnote stating, ". . .cut off work. . .acct. too many defects. . . ." Although SP management officials did not attach significance to that footnote, the Safety Board believes that the discovery of 10 separate internal rail defects within the 15 miles of track internally inspected on April 27, 1981, should have served as a warning that the rails were approaching their service life limits for main track use, and would require more frequent internal inspection for defects in order to assure continued safe use of that rail. Although there is no standard method to determine the point at which the rate of rail fatigue failures indicates an approaching limit on safe operation, the Safety Board believes that owners of track need to recognize the risks associated with train operations on rails containing internal defects, especially rails which have been subjected to gross tonnage of the magnitude carried on the SP's main track at Thermal.

The SP's Rules M971 and M972, Rules and Regulations For The Maintenance Of Way And Structures, address inspection and removal of defective rails. Had these rules been effectively implemented through more frequent internal defect inspections to locate and remove defective rails, the Safety Board believes this accident would have been avoided. The results of the April 27, 1981 inspection, the shelling condition of the rail, and the continued high volume of traffic should have indicated to SP personnel the need for more frequent inspections.

The Safety Board investigated a derailment of a freight train at Grande, New Mexico, on May 9, 1981, which was caused by detail fractures in the rail. 16/ The broken rail in that accident had been internally inspected for rail flaws less than 3 months before the accident occurred, but the inspection did not discover the detail fractures in the rail. A visual track inspection performed earlier in the day of the accident did not reveal any defects. The rails at that location had also been subjected to heavy gross tonnages in unit ore train operations. The rail showed evidence of head checking, which is a condition that also precipitates rail failure by detail fractures.

The Safety Board believes that these types of occurrences indicate that the FRA should reassess Paragraph 213.113 of the Track Safety Standards, "Defective Rails," with regard to detail fractures and their diagnosis to provide for the integrity of high speed main tracks through effective internal and visual inspection of rails. Currently, prescribed remedial actions depend on the subjective evaluation of the track owners determination of need for rail replacement. The Safety Board concludes that defined limits of allowable external rail conditions, which serve as warnings of potential rail failure, and more frequent internal rail defect inspections of rails that have had histories of detail fracture are required.

The Safety Board has made several recommendations to the FRA regarding the detection of defects. As a result of a Special Study regarding broken rails, 17/ the Safety Board recommended that the FRA:

Study the factors that affect rail failures and develop criteria that will promote effective rail inspection procedures and regulations. (R-74-4)

The recommendation has been placed in a "Closed--Unacceptable Action" status. The FRA initially responded that studies in fracture mechanics and investigation of rail failures would be implemented to generate data to be used in the development of standards. On June 25, 1981, the FRA withdrew its Notice of Proposed Rule Making (NPRM) stating it was not at that time practicable to develop final rules on the basis of that NPRM.

As a result of an accident which occurred at Belt, Montana, on November 26, 1976, 18/ the Safety Board recommended that the FRA:

Revise 49 CFR 213.237, Inspection of Rail, to ensure the discovery of internal defects in all tracks, Classes 3 to 6, inclusive, before those defects develop into failures. (R-77-29)

The recommendation has been placed in a "Closed--Unacceptable Action" status. The FRA initially responded that it was undertaking a number of projects that would specifically address internal rail defects, and that based on comments from a public hearing and research results, amendments would be proposed. On June 25, 1981, the FRA withdrew its NPRM, stating it was not at that time practicable to develop final rules on the basis of that NPRM.

16/ National Transportation Safety Board-Fort Worth Field Office-Field Report of Railroad Accident Investigation-Burlington Northern Railroad Company Freight Train Derailment at Grande, New Mexico, May 9, 1981, (FTW-81-F-R-049).

17/ National Transportation Safety Board-Special Study-"Broken Rails: A Major Cause of Train Accidents" (NTSB-RSS-74-1) January 2, 1974.

18/ National Transportation Safety Board, Railroad Accident Report--"Derailment of a Burlington Northern Freight Train-Belt, Montana, November 26, 1976" (NTSB-RAR-77-7).

As a result of an accident which occurred at Glacier Park, Montana, on March 14, 1980, 19/ the Safety Board recommended that the FRA:

Amend track safety standard 49 CFR 213.241, Inspection Records, to require railroad inspectors to list on their inspection records the location of rails which exhibit the external conditions listed in subpart (b) of 49 CFR 213.113, Defective Rails, and the remedial action they have taken. (R-80-32)

The recommendation has been placed in a "Closed—Unacceptable Action" status. The FRA responded that "... Section 213.241 of the Federal Track Safety Standards already requires railroad inspectors to record the location and nature of any deviation from the requirements and the remedial action taken." The Safety Board notes, however, that the external conditions cited in Section 213.113(b) are not deviations until the track owner's designated inspector decides that the condition requires rail replacement, and that the degree or limits of the external conditions are not defined by the FRA.

On February 18, 1982, the FRA published NPRM "Track Safety Standards; Miscellaneous Amendments," Docket No. RST-3, Notice No. 3. The FRA proposed in that NPRM to eliminate Section 213.113(b) and Section 213.113(c) (12 through 14), among other revisions and deletions. The Safety Board believes that this action will adversely affect the safety of train operations and that accident history requires the FRA to strengthen and clarify its Track Safety Standards, rather than weaken them. The Safety Board expressed this view in testimony before and in correspondence with the FRA relative to the NPRM. On September 7, 1982, the FRA published the revised Track Safety Standards, which among other revisions and deletions, eliminated the existing Section 213.113(b) and Section 213.113(c) (12 through 14).

The Safety Board concludes that in view of these recent revisions to the Track Safety Standards, the benefits of safety require the establishment of a model plan of recommended inspection practices for the use of industry employed inspectors, to provide for a safety factor in track that the present standards do not provide.

### **Reliability of Hazardous Material Documentation**

The train identification symbol "BSMFF" contributed to the traincrew's initial belief that their train was not carrying hazardous materials. Since the SP normally identifies trains carrying certain hazardous materials, such as radioactive material, with a "K" designation, the crew assumed that train No. 01-BSMFF-05 did not contain hazardous materials. In addition, the profile for train No. 01-BSMFF-05 did not indicate the presence of hazardous materials on the train. Since train No. 01-BSMFF-05 was a through train with no scheduled stops, pickups, or setouts, the conductor did not review the individual waybills, and consequently did not discover the presence of the hazardous materials until after the accident when he did look at the waybills to apprise the SP dispatcher of the damages. Because the engineer did not have any waybills on the locomotive, he and the head-end crew relied on the erroneous profile on the train consist to operate the train.

Had the proper train identification symbol been assigned, the maximum authorized speed would have been 50 mph rather than 70 mph. The speed of the train at the time of the derailment was about 57 mph, and the train speed had reached 73 mph before the

19/ National Transportation Safety Board, Railroad Accident Report--"Derailment of Amtrak Train No. 7, The Empire Builder, On Burlington Northern Track, Glacier Park, Montana, March 14, 1980" (NTSB-RAR-80-6).

derailment. The Safety Board concludes that although the effects of the overspeed could not be quantified, the speed of the train did not have a significant effect on the severity of the accident. However, the erroneous train identification symbol and profile resulted in initial misdirected efforts in the emergency response during the first hour after the derailment. The SP's TOPS program failed to classify train No. 01-BSMFF-05 as a "K" train despite the presence of a placarded trailer containing radioactive material. The Safety Board believes that the TOPS concept is a worthwhile tool for the management of train operations. However, the Board believes that the SP should strive to improve the accuracy of the TOPS program in identifying trains carrying hazardous materials, particularly TOFC/COFC trains.

When the traincrew relayed the train profile information to the first arriving emergency personnel, the emergency personnel believed that a serious hazardous material emergency did not exist. However, about 1 hour later, contradictory information from an erroneous waybill resulted in an over-reaction to the situation that actually existed. The response personnel were thus led to believe that a serious radiological emergency was at hand, with the presence of a large amount of fissionable material to which the emergency personnel might have been exposed. The Safety Board believes the emergency response forces were prompt, efficient, and well organized in their efforts. These efforts were, however, needlessly complicated by erroneous and contradictory information being conveyed to them about the hazardous material.

The shipping forms presented to SP and consequently the waybills carried on the train did not reflect accurate information regarding the RAM shipment as contained in the originating shipping order. To determine the exact nature of the RAM shipment, SP personnel were required to backtrack through a series of shipping papers before they were able to contact the originating shipper who had the technical information that was necessary to properly assess the emergency and necessary response action. The Safety Board believes that although the RAM shipment in this accident posed no significant hazard to the involved personnel, improvements are needed in the methods of disseminating vital information concerning hazardous materials shipments which is contained on the originating shipping orders. The Safety Board is concerned that derailments may occur in which erroneous waybill information could fail to disclose the presence of extremely hazardous material and that as a result, proper emergency procedures might not be implemented. This is especially true for TOFC/COFC shipments, for which a series of shipping documents may be issued. Emergency personnel need to know the precise nature of hazardous materials shipments in order to properly respond to the situation. Had the originating shipper's documentation of the hazardous material accompanied all successive documents, the nature of the shipment and the appropriate emergency procedures to follow would have been known to responding personnel more promptly. This could be accomplished by requiring that the originating shipper's documentation accompany all successive documents for a hazardous material which may be shipped via a TOFC/COFC shipment.

## CONCLUSIONS

### Findings

1. There were no car or locomotive mechanical defects that would have contributed to the accident sequence.
2. The shelling condition precipitating the detail fracture should have been evident to Southern Pacific Transportation Company inspectors, and should have served as a warning of a potential rail failure.

3. Defined limits of allowable track structure conditions which serve as potential warnings of rail and track failure are not established by the present Track Safety Standards of the Federal Railroad Administration.
4. The number of internal defects requiring replacement of sections of rail on track subjected to high gross tonnage should have warned the Southern Pacific Transportation Company the rail was approaching its service life limit for main track use, and that continued safe use of that rail would require more frequent internal defect inspections.
5. Southern Pacific Transportation Company Rules And Regulations For The Maintenance Of Way And Structures requiring that rails having defects which might result in failure be replaced, were not effectively implemented when more frequent internal defect inspections were not made.
6. The Southern Pacific Transportation Company's Total Operations Processing System (TOPS) failed to assign train No. 01-BSMFF-05 the "K" train designation for a train containing hazardous materials, despite the presence of a placarded trailer containing radioactive material.
7. The train profile, generated by TOPS, did not indicate the presence of the hazardous material in train No. 01-BSMFF-05.
8. Train No. 01-BSMFF-05 was not operated in accordance with applicable Southern Pacific Transportation Company rules regarding trains carrying certain hazardous materials because of erroneous information made available to the traincrew.
9. The conductor of train No. 01-BSMFF-05 did not review the individual waybills for the train until after the accident occurred because there were no scheduled stops, pickups, or setouts of cars.
10. The motor carrier employed by the originating shipper of the radioactive material consolidated the hazardous materials into a trailerload of general merchandise and then presented the trailerload to the Southern Pacific Transportation Company as a trailerload of "Freight-All-Kinds."
11. The Southern Pacific Transportation Company's intermodal freight manager made entries on the waybill which erroneously indicated the presence of fissionable radioactive material in the shipment.
12. The shipment of the radioactive material was evidenced by eight separate documents, six of which contained erroneous or conflicting information, and one of which had no information on the radioactive material.
13. The waybill information available to the conductor and emergency response personnel at the accident site contained erroneous information which resulted in an overreaction to the situation that actually existed.
14. The lack of identification of the originating shipper on the waybill caused the delay in securing the necessary technical emergency response information at the accident site.

15. The radioactive material and its container survived the derailment without damage and the radioactivity from the container was at the same level after the accident as when the container had been prepared for shipment.
16. The radioactive material shipment in this accident posed no significant hazard but its precise nature was not disclosed because of train profile and waybill documentation omissions or errors. The same set of circumstances could occur in a situation where erroneous waybill information fails to disclose the presence of extremely hazardous materials and as a result, proper emergency procedures might not be implemented.
17. The complexity of present documentation procedures for hazardous materials in Trailer-On-Flat-Car or Container-On-Flat-Car shipments creates an unacceptable potential for errors detrimental to the implementation of effective emergency procedures.

### Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was the inadequate company evaluation of defect data which should have indicated that the rail in the vicinity of the derailment was approaching service life limit for main track use and the consequent failure of the company to initiate an accelerated inspection program to detect incipient fatigue fractures of the rail.

### **RECOMMENDATIONS**

As a result of its investigation of this accident, the National Transportation Safety Board made the following recommendations:

—to the Southern Pacific Transportation Company (SP);

Review, and modify if necessary, the evaluation process concerning track inspection defect data for tracks carrying passenger trains or trains with hazardous materials to better assure that rails having defects which might result in catastrophic failure are replaced. (Class II, Priority Action) (R-83-1)

Improve current Total Operations Processing System Procedures to better assure that traincrews of trains carrying hazardous materials are furnished accurate information regarding the train consist and the appropriate emergency response for the hazardous material. (Class II, Priority Action) (R-83-2)

Initiate procedures to require that waybills for Trailer-On-Flat-Car and Container-On-Flat-Car shipments containing hazardous material include accurate information regarding the contents of the trailers and/or containers. (Class II, Priority Action) (R-83-3)

Require train crewmembers to review carefully all shipping documentation in their possession to determine whether any hazardous materials are present on the train. (Class II, Priority Action) (R-83-4)

--to the Research and Special Programs Administration (RSPA):

Require that all shipping papers accompanying hazardous materials in Trailer-On-Flat-Car, or Container-On-Flat-Car shipments identify the originating shipper of the hazardous materials in order to facilitate access to technical emergency response information in the event of a hazardous material incident. (Class II, Priority Action) (R-83-5)

In conjunction with the Association of American Railroads, the American Trucking Associations, Inc., the Federal Highway Administration, and the Federal Railroad Administration, develop, validate, and urge implementation of a model plan for use by railroads and motor carriers to make certain that waybills for Trailer-On-Flat-Car and Container-On-Flat-Car shipments containing hazardous materials include accurate information regarding the contents of the trailers and/or containers. (Class II, Priority Action) (R-83-6)

--to the Association of American Railroads (AAR):

Inform its membership of the facts, conditions, and circumstances of the accident which occurred at Thermal, California, on January 7, 1982, and recommend to its member railroads that they:

Review, and modify if necessary, their evaluation process concerning track inspection defect data for tracks carrying passenger trains or trains with hazardous materials to better assure that rails having defects which might result in catastrophic failure be replaced. (Class II, Priority Action) (R-83-7)

Assess their procedures to make certain that traincrews of trains carrying hazardous materials have in their possession accurate documentation of, and emergency response information for, all hazardous materials being carried. (Class II, Priority Action) (R-83-8)

In conjunction with the American Trucking Associations, Inc., the Federal Highway Administration, the Federal Railroad Administration, and the Research and Special Programs Administration, develop, validate, and urge implementation of a model plan for use by railroads and motor carriers to make certain that waybills for Trailer-On-Flat-Car and Container-On-Flat-Car shipments containing hazardous materials include accurate information regarding the contents of the trailers and/or containers. (Class II, Priority Action) (R-83-9)

--to the American Short Line Railroad Association (ASLRA):

Inform its membership of the facts, conditions, and circumstances of the accident which occurred at Thermal, California, on January 7, 1982, and recommend to its member railroads that they:

Review, and modify if necessary, their evaluation process concerning track inspection defect data for tracks carrying passenger trains or trains with hazardous materials to better assure that rails having defects which might result in catastrophic failure be replaced. (Class II, Priority Action) (R-83-10)



Assess their procedures to make certain that traincrews of trains carrying hazardous materials have in their possession accurate documentation of, and emergency response information for, all hazardous materials being carried. (Class II, Priority Action) (R-83-11)

--to the American Trucking Associations, Inc. (ATA):

Inform its membership of the facts, conditions and circumstances of the accident which occurred at Thermal, California, on January 7, 1982, and recommend to its membership that they assess their procedures to make certain that waybills for Trailer-On-Flat-Car and Container-On-Flat-Car shipments containing hazardous material include accurate information regarding the contents of the trailers and/or containers. (Class II, Priority Action) (R-83-12)

In conjunction with the Association of American Railroads, the Federal Highway Administration, the Federal Railroad Administration, and the Research and Special Programs Administration, develop, validate, and urge implementation of a model plan for use by railroads and motor carriers to make certain that waybills for Trailer-On-Flat-Car and Container-On-Flat-Car shipments containing hazardous materials include accurate information regarding the contents of the trailers and/or containers. (Class II, Priority Action) (R-83-13)

--to the Federal Railroad Administration (FRA):

Develop, validate, and implement a model plan of recommended inspection practices containing clearly defined limits of allowable track structure conditions for the use of industry employed railroad track inspectors to facilitate uniform and knowledgeable appraisals of defective track structure conditions. (Class II, Priority Action) (R-83-14)

In conjunction with the Association of American Railroads, the Federal Highway Administration, the American Trucking Associations, Inc., and the Research and Special Programs Administration, develop, validate, and urge implementation of a model plan for use by railroads and motor carriers to make certain that waybills for Trailer-On-Flat-Car and Container-On-Flat-Car shipments containing hazardous materials include accurate information regarding the contents of the trailers and/or containers. (Class II, Priority Action) (R-83-15)

In conjunction with the Federal Highway Administration, initiate a regulatory compliance study which samples Trailer-On-Flat-Car and Container-On-Flat-Car shipments designated as Freight-All-Kind to determine if those shipments contain hazardous materials and take enforcement action as required in those cases of noncompliance. (Class II, Priority Action) (R-83-16)

—to the Federal Highway Administration (FHWA):

In conjunction with the Federal Railroad Administration, initiate a regulatory compliance study which samples Trailer-On-Flat-Car and Container-On-Flat-Car shipments designated as Freight-All-Kind to determine if those shipments contain hazardous materials and take enforcement action as required in those cases of noncompliance. (Class II, Priority Action) (R-83-17)

In conjunction with the Association of American Railroads, the Federal Railroad Administration, the Research and Special Programs Administration and the American Trucking Associations, Inc., develop, validate, and urge implementation of a model plan for use by railroads and motor carriers to make certain that waybills for Trailer-On-Flat-Car and Container-On-Flat-Car shipments containing hazardous materials include accurate information regarding the contents of the trailers and/or containers. (Class II, Priority Action) (R-83-18)

**BY THE NATIONAL TRANSPORTATION SAFETY BOARD**

/s/ JIM BURNETT  
Chairman

/s/ PATRICIA A. GOLDMAN  
Vice Chairman

/s/ FRANCIS H. McADAMS  
Member

/s/ G. H. PATRICK BURSLEY  
Member

/s/ DONALD D. ENGEN  
Member

Donald D. Engen, Member, filed the following concurring and dissenting statement:

I agree with the majority's probable cause statement so far as it goes and with the entire remainder of the report. However, I do not believe the majority's probable cause statement goes far enough in explaining why this accident occurred. The result is a probable cause statement which I believe to be unclear and somewhat ambiguous.

The essential elements of the majority's probable cause statement are (1) inadequate company evaluation of defect data, and (2) the consequent failure of the company to initiate an accelerated program to detect incipient fatigue fractures of the rail. While I readily agree that these company omissions were causal factors, I believe the majority's failure (1) to state explicitly the real physical cause of the accident, i.e., the failure of the rail due to fatigue fractures, and (2) to tie the company's omissions into the physical cause of the accident, leave the probable cause statement incomplete. As a general matter, I do not believe it is sufficient for the Board to state that company omissions probably caused an accident, unless the Board describes in the probable cause statement how the nonoccurrence of such omissions might have prevented the accident.

I would add such a descriptive sentence at the end of the majority's probable cause statement, and would thus state the probable cause as follows:

The National Transportation Safety Board determines that the probable cause of this accident was the inadequate company evaluation of defect data which should have indicated that the rail in the vicinity of the derailment was approaching service life limit for main track use and the consequent failure of the company to initiate an accelerated inspection program to detect incipient fatigue fractures of the rail. Initiation of the inspection program would have increased the likelihood of the timely detection of the fatigue fractures which led to the failure of the rail.

/s/ Donald D. Engen  
Member

January 19, 1983

**APPENDIXES**  
**APPENDIX A**  
**INVESTIGATION**

Investigation

The National Transportation Safety Board was notified of the accident about 2:30 a.m., on January 8, 1982. A Los Angeles Field Office investigator was immediately dispatched to the accident site. The Safety Board also dispatched three investigators from its Washington, D.C., headquarters to the accident site.

Groups formed to investigate the hazardous material, mechanical, operating, and track aspects of the accident were comprised of personnel from the Safety Board, Southern Pacific Transportation Company, California Public Utilities Commission, California Division of Occupational Safety & Health, Federal Railroad Administration, and Emergency Response Groups.

## APPENDIX B

### PERSONNEL INFORMATION

#### Conductor

Brock, Clarence W., was first employed by the SP as a brakeman on March 5, 1946. He was promoted to conductor on April 1, 1953. He was recertified on SP operating rules in September, 1981.

#### Engineer

Gibson, Roger S., was first employed by the SP as a student fireman on June 7, 1972. He attended the SP's engineer training school at El Cerritos, California, and was promoted to engineer on December 22, 1973. He was recertified on SP operating rules in September, 1981.

#### Fireman

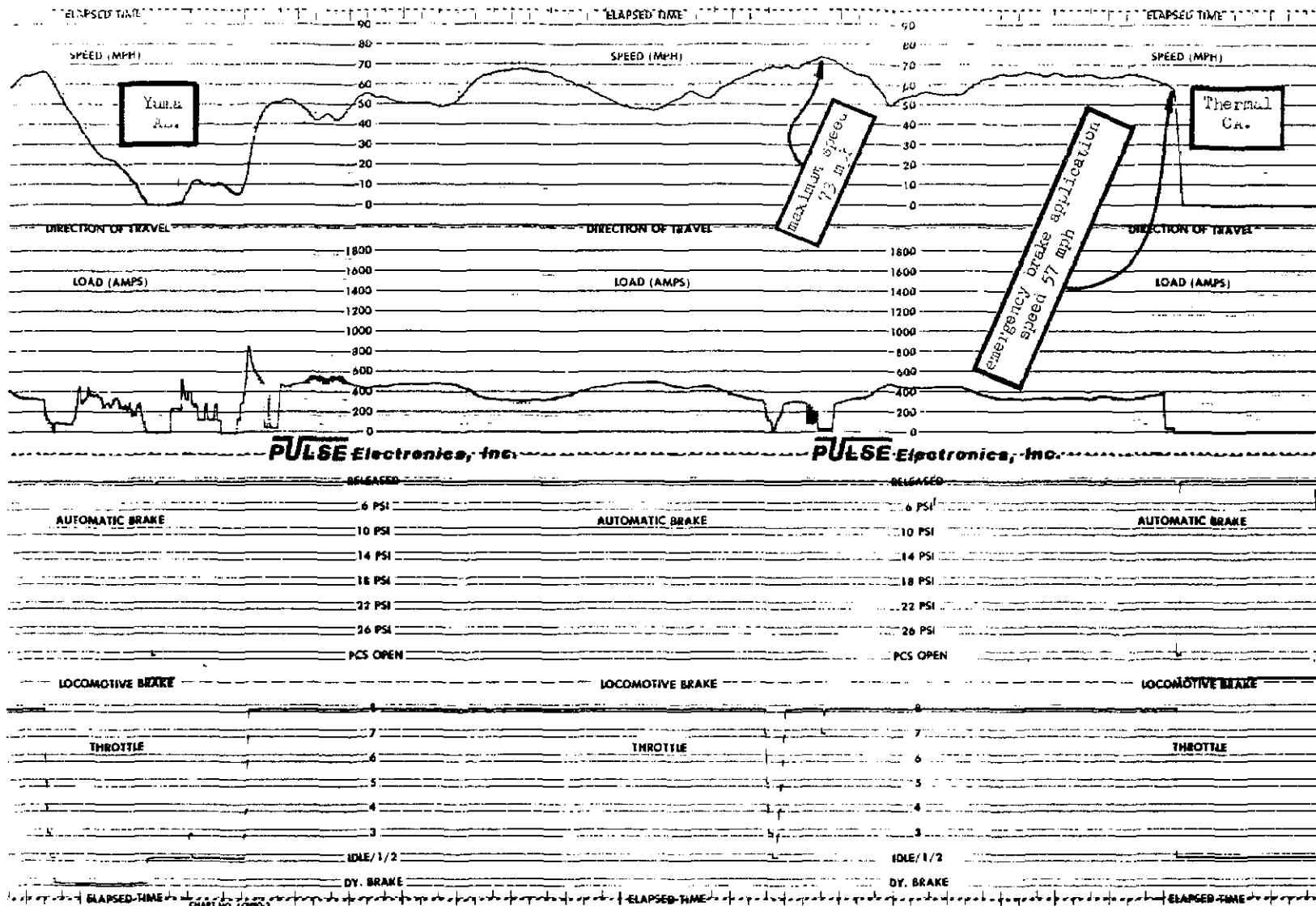
Kromwall, James A., was first employed by the SP as a track laborer on June 6, 1968. He transferred to train and engine service and became a fireman on January 15, 1969. He was promoted to engineer on October 23, 1976. He was recertified on SP operating rules in September, 1981.

#### Front Brakeman

Friedeck, Clifford E., was first employed by the SP as a trainman on July 24, 1963. He was recertified on SP operating rules in September, 1981.

#### Rear Brakeman

Shanabarger, Jerry E., was first employed by the SP as a trainman on June 20, 1959. He was promoted to conductor on September 8, 1966. He was recertified on SP operating rules in September, 1981.



APPENDIX D

EXCERPTS FROM FRA TRACK SAFETY STANDARDS  
(49 CFR 213.113)

§ 213.113 Defective rails

(a) When an owner of track to which this part applies learns, through inspection or otherwise, that a rail in that track contains any of the defects listed in the following table a person designated under § 213.7 shall determine whether or not the track may continue in use. If he determines that the track may continue in use, operation over the defective rail is not permitted until—

- (1) The rail is replaced; or
- (2) The remedial action prescribed in the table is initiated.

REMEDIAL ACTION

Defect	Length of defect (inch)		Percent of railhead cross sectional area weakened by defect		If defective rail is not replaced, take the remedial action prescribed in note—
	More than	But not more than	Less than	But not less than	
Transverse fissure			20		B
			100		B
Compound fissure			20		A
			100		B
Detail fracture			20		A
Engine burn fracture			100		C
Defective weld				20	D
Horizontal split head	0	2			A or E and H
	2	4			H and F
	4				I and G
Vertical split head	(1)	(1)			B
Split web	0	1/2			A
Peeped rail	1/2	3			H and F
	3				I and G
Head web separation	(1)	(1)			B
	0	1/2			A
	1/2	1 1/2			H and F
Bolt hole crack	1 1/2				I and G
	(1)	(1)			B
Broken base	0	6			A
	6				E and I
Ordinary break					(Replace rail)
Damaged rail					A or E
					C

<sup>1</sup> Break out in railhead

NOTES:

- A—Assign person designated under § 213.7 to visually supervise each operation over defective rail
- B—Limit operating speed to 10 m.p.h. over defective rail
- C—Apply joint bars bolted only through the outermost holes to defect within 20 days after it is determined to continue the track in use. In the case of classes 3 through 6 track, limit operating speed over defective rail to 30 m.p.h. until angle bars are applied; thereafter limit speed to 50 m.p.h. or the maximum allowable speed under § 213.9 for the class of track concerned whichever is lower.
- D—Apply joint bars bolted only through the outermost holes to defect within 10 days after it is determined to continue the track in use. Limit operating speed over defective rail to 10 m.p.h. until angle bars are applied; thereafter limit speed to 50 m.p.h. or the maximum allowable speed under § 213.9 for the class of track concerned whichever is lower.
- E—Apply joint bars to defect and bolt in accordance with § 213.121 (d) and (a).
- F—Inspect rail 90 days after it is determined to continue the track in use.
- G—Inspect rail 30 days after it is determined to continue the track in use.
- H—Limit operating speed over defective rail to 50 m.p.h. or the maximum allowable speed under § 213.9 for the class of track concerned whichever is lower.
- I—Limit operating speed over defective rail to 30 m.p.h. or the maximum allowable speed under § 213.9 for the class of track concerned whichever is lower.

(b) If a rail in classes 3 through 6 track or class 2 track on which passenger trains operate evidences any of the conditions listed in the following table, the remedial action prescribed in the table must be taken:

Condition	Remedial action	
	If a person designated under § 213.7 determines that condition requires rail to be replaced	If a person designated under § 213.7 determines that condition does not require rail to be replaced
Shelly spots	Limit speed to 20 m.p.h. and schedule the rail for replacement	Inspect the rail for internal defects at intervals of not more than every 12 months
Head checks		
Engine burn (but not fracture)	do	Inspect the rail at intervals of not more than every 6 months
Mit defect		
Flaking		
Silvered		
Comugated		
Corroded		

(c) As used in this section—

(1) "Transverse Fissure" means a progressive crosswise fracture starting from a crystalline center or nucleus inside the head from which it spreads outward as a smooth, bright, or dark, round or oval surface substantially at a right angle to the length of the rail. The distinguishing features of a transverse fissure from other types of fractures or defects are the crystalline center or nucleus and the nearly smooth surface of the development which surrounds it.

(2) "Compound Fissure" means a progressive fracture originating in a horizontal split head which turns up or down in the head of the rail as a smooth, bright, or dark surface progressing until substantially at a right angle to the length of the rail. Compound fissures require examination of both faces of the fracture to locate the horizontal split head from which they originate.

(3) "Horizontal Split Head" means a horizontal progressive defect originating inside of the rail head, usually one-quarter inch or more below the running surface and progressing horizontally in all directions, and generally accompanied by a flat spot on the running surface. The defect appears as a crack lengthwise of the rail when it reaches the side of the rail head.

(4) "Vertical Split Head" means a vertical split through or near the middle of the head, and extending into or through it. A crack or rust streak may show under the head close to the web or pieces may be split off the side of the head.

(5) "Split Web" means a lengthwise crack along the side of the web and extending into or through it.

(6) "Piped Rail" means a vertical split in a rail, usually in the web, due to failure of the sides of the shrinkage cavity in the ingot to unite in rolling.

(7) "Broken Base" means any break in the base of a rail.

(8) "Detail Fracture" means a progressive fracture originating at or near the surface of the rail head. These fractures should not be confused with transverse fissures, compound fissures, or other defects which have internal origins. Detail fractures may arise from shelly spots, head checks, or flaking.

(9) "Engine Burn Fracture" means a progressive fracture originating in spots where driving wheels have slipped on top of the rail head. In developing downward they frequently resemble the compound or even transverse fissure with which they should not be confused or classified.

(10) "Ordinary Break" means a partial or complete break in which there is no sign of a fissure, and in which none of the other defects described in this paragraph are found.

(11) "Damaged rail" means any rail broken or injured by wrecks, broken, flat, or unbalanced wheels, slipping, or similar causes.

(12) "Shelly spots" means a condition where a thin (usually three-eighths inch in depth or less) shell-like piece of surface metal becomes separated from the parent metal in the railhead, generally at the gage corner. It may be evidenced by a black spot appearing on the railhead over the zone of separation or a piece of metal breaking out completely, leaving a shallow cavity in the railhead. In the case of a small shell there may be no surface evidence, the existence of the shell being apparent only after the rail is broken or sectioned.

(13) "Head checks" mean hair fine cracks which appear in the gage corner of the rail head, at any angle with the length of the rail. When not readily visible the presence of the checks may often be detected by the raspy feeling of their sharp edges.

(14) "Flaking" means small shallow flakes of surface metal generally not more than one-quarter inch in length or width break out of the gage corner of the railhead.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 875, Jan. 5, 1973; 38 FR 1508, Jan. 15, 1973]



APPENDIX E  
SP RAIL DEFECT INSPECTION REPORT

J. J. Diener

4 2 61

TC

1

Indic

So, Calif. Section

7:00 AM  
8:40 AM  
12:30 PM  
2:00 PM

15.00

1 -4

624.00 S 618.50 W  
618.50 S 609.50 W      uma to Colton

471	DF	1851	623.85	M	S	L	135	RH	CF	64	L
472	F	1851	623.79	M	S	R	135	RH	CF	64	L
473	DF	1851	623.10	M	S	L	135	RH	CF	59	L
474	CF	1851	621.30	M	S	R	135	RH	CF	72	L
475	DF	1851	621.25	M	S	L	135	RH	CF	59	S
476	DF	1851	619.85	M	S	L	135	RH	CF	64	S
477	DF	1851	618.65	M	S	L	135	RH	CF	59	L
478	HS	1851	618.64	M	S	L	135	RH	CF	50	L
479	DF	1851	617.85	M	WS	L	132	RH	TC	40	S
480	DF	1851	610.70	M	W	L	132	RH	CF	48	R

L. Hall

3 Grains 1 Hr. 30 Min. cut off work by L. Hall. Acct. too many defects

Tested Thermal Sdg. Total Mileage 16.70

APPENDIX F

WAYBILL INFORMATION (8 DOCUMENTS)

THIS SHIPPING ORDER must be legibly filled in, in ink, in Indelible Pencil, or in Carbon, and retained by the Agent

M JONES (Name of Consignor) Carrier No. 18528

RECEIVED subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading. At 5000 GULF FREEWAY, HOUSTON, TEXAS 77023 12/31/81 FROM: SCHLUMBERGER WELL SERVICES A Division of Schlumberger Technology Corporation

Consigned to SCHLUMBERGER 1710 CALLENS ROAD (Mailed or street address of consignee for purposes of notification only)

Destination VENTURA, CALIFORNIA State of County of

Table with columns: NO PKGS, NM, ITEM, WEIGHT (SUBJ. TO CORR.), RATE (CWT), FREIGHT AMOUNT. Includes handwritten notes: 2.85 D L JAN 3 001 3/1

Subject to Section 7 of Conditions of applicable bill of lading if this shipment is to be delivered to the consignee without recourse on the consignor the consignor shall sign the following statement: The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges

ADDITIONAL INFORMATION REQUIRED FOR FISSILE MATERIALS ONLY

EXEMPTED FROM THE ADDITIONAL REQUIREMENTS FOR FISSILE MATERIALS SPECIFIED IN 7.1 OF PART 2 OF THE IATA RESTRICTED ARTICLES REGULATIONS [ ] NAMES PLUS QUANTITY IN GRAMS OR CONCENTRATION OR ENRICHMENT IN U235: 71 - 29

NOT EXEMPTED: FISSILE CLASS I [ ] FISSILE CLASS II [ ] FISSILE CLASS III [ ]

Additional certificates obtained by the Shipper when necessary: Special Form Encapsulation Certificate(s) [ ] Certificate(s) for Large Radioactive Source [ ] Type "B" Packaging Certificate(s) [ ] Government Approvals/Permits [ ] Certificate(s) for Fissile Material [ ]

(Signature of consignor) If charges are to be prepaid, write or stamp here: "To be Prepaid" prepaid

NATURE AND QUANTITY OF CONTENT

Table with columns: RADIONUCLIDE, GROUP, FORM, ACTIVITY, CATEGORY, TRANSPORT INDEX, TYPE. Includes handwritten note: 16.0 CURIE, III YELLOW LABEL, 6.7, type B

Received \$ to apply in prepayment of the charges on the property described herein Agent or Cashier Per (The signature here acknowledges only the amount prepaid)

JTL HO '8 DEC 1981 JTL REC. JTL REV. JTL PAY. 60-C DESK CODE CUST. CODE GENL. CODE EXCP. CODE LOAD TO NO. OF PGS. 113 PROJECT NO. WJH CHECKER

Handwritten numbers: 16.0 CURIE, III YELLOW LABEL, 6.7, type B, 0556601

1 This is to certify that the above-named articles are properly classified, described, packaged, marked and labeled, and are in safe and sound condition for transportation according to the applicable regulations of the Department of Transportation.

The blue boxes used for this shipment conform to the specifications set forth in the law maker's certificate (shown) and all other requirements of Rule 41 of the Consolidated Freight Classification. Shipper's liability in loss of items not a part of bill of lading approved by the Interstate Commerce Commission. \*If the shipment consists of two parts by a carrier by water, the law requires that the bill of lading shall state whether it is "tonnage" or "weight" or "value" - unless the rate is dependent on value. Shippers are required to state specifically in writing the agreed or declared value of the property. The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding \$1,000 per pound.

SCHLUMBERGER WELL SERVICES A Division of Schlumberger Technology Corporation

Shipper's signature and stamp: Agent must detach and retain this Shipping Order and must sign the Original Bill of Lading.

Per: H. IGARSA KR Permanent post-office address of shipper: HOUSTON, TEXAS



**JONES TRUCK LINES, Inc. JTLS**

ACCOUNTING COPY

7

D-U-N-S 870 E EMMA GENERAL OFFICES SPRINGDALE, ARK. 72784  
 700-690-3684 29 955660

DATE & INITIALS

12/31/91 SM GP

9556601

DELUERFORS 17 A CALLENS RD. VENITRA CALIF

SCHEUNFROR WELL SUP. 5000 GULF FW HOUSTON TEXAS 77007

18 CAL-KN-4852F

		LOAD TO	PCS		
		LA DOT			
		RE	FL REV	JTL PAY	
		52 607	143.26	44.26	
		LT CODE	UM CODE	EXCEPTION CODE	
		WEIGHT	RATE	EXTENSION	
1	PC RADIOACTIVE MATERIALS SPECIAL FORM NOS/ AMERICIUM 241 GR	180	6100	109.80	
1	TE SPECIAL FORM 16.0 CURIE AMER 6.7/TYP B/ NA9182	190	2364	.44.9.	
2	BA BILWELL DRILLING TOOLS FSC			4.80 FSC	
	<b>TOTAL</b>	<b>370</b>		<b>159.52 PFD</b>	
NO PCS	DATE	JTL DRIVER	RECEIVED IN GOOD ORDER EXCEPT AS NOTED BY:		

FORM 4 D

(7A)

NO 7397  
J-33724

SPRINGER & MOORE BUSINESS FORMS, INC., P.O. SMITH AVE. - N. Y. 10097



**STRAIGHT BILL OF LADING - SHORT FORM - Original Not Negotiable**  
RECEIVED subject to the classifications and tariffs in effect on the date of the issue of this Original Bill of Lading

SHIPPER NO. 4 126  
CARRIER NO.  
DATE 1-4-62

**JONES TRUCK LINES, INC. JTLS**

(NAME OF CARRIER) (ISCAC)

TO CONSIGNEE	NATIONAL PIGGY BACK SERVICE	FROM SHIPPER	JONES TRUCK LINES, INC.
STREET		STREET	
DALLAS, TEXAS		1002 OAKDALE RD.	
DESTINATION		ORIGIN	
DALLAS, TEXAS		GRAND PRAIRIE TEXAS	
ZIP		ZIP	
		75050	

ROUTE: VEHICLE NUMBER GILFLEX 10140

NO SHIPPING UNITS	*NM	KIND OF PACKAGING DESCRIPTION OF ARTICLES SPECIAL MARKS AND EXCEPTIONS	Weight (Subject to Correction)	Rate	CHARGES (for Carrier use only)
1		TPLR LOAD F.A.K. SEAL NUMBERS 114076 AND 119080 PRIVATE MILNE TRAILER /RATES TO APPLY DELIVER TO: MILNE TRUCK LINES INC. 3209 WORKMAN MILL RD. WHITTIER CALIF 90601. RELEASE TO: MILNE TRUCK LINES INC. WHITTIER CALIF. 90601 CALL ON ARRIVAL C.D. LOWERY OR BILL McMULLEN 913-695-420 OR 699-9901.	24152		PREPAID
		29 BILLS.			

EMT O.D. TO: ADDRESS	<b>COD</b> AMT \$	C.O.D. FEE PREPAID COLLECT \$
<small>*NM - Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property. The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding \$ _____ per _____.</small>	<small>Subject to Section 7 of the conditions, if the shipment is to be delivered to the consignee without account on the consignor, the consignor shall sign the following statement: The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.</small>	TOTAL CHARGES \$
	<small>Signature of Consignor</small>	<small>If charges are to be prepaid, write or stamp here "To be Prepaid"</small>

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading the property described above in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned and destined as indicated above which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of, said property over all or any portion of said route to destination and as to each party at any time interposed in all or any said property that every service to be performed hereunder shall be subject to all the bill of lading terms and conditions in the governing classification on the date of shipment. Shipper hereby certifies that he is familiar with all the bill of lading terms and conditions in the governing classification on and the said terms and conditions are hereby agreed to by the shipper and accepted to himself and his assigns.

This is to certify that the above-named articles are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.	SHIPPER	CARRIER
	PER	PER
	DATE	DATE

**RECEIVED**  
JAN 6 1962  
DALLAS, TX

\*DMM 17 (9-77)  
\*Mark with "X" to designate the Hazardous Material as defined in Title 49 of the Code of Federal Regulations.

Uniform Domestic Straight Bill of Lading, adopted by Carriers to Transact Southern Western and Branch Traffic, San Francisco March 15, 1922, as amended August 1, 1930 and June 1, 1941

UNIFORM STRAIGHT BILL OF LADING / ORIGINAL - NOT NEGOTIABLE

NP 7397  
Agent's No. 33735

Actual Copy of original [Signature]

RECEIVED: [Signature] and [Signature] in effect on the date of the issue of this Bill of Lading.

At Dallas  
From NP

1-4 1942

The carrier described below, in whatever good order, except as noted elsewhere on this bill of lading, packed, consigned and delivered as indicated below, which said carrier, the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract, agrees to carry to its usual place of delivery at said destination, if on its own road or to some other place, or to deliver to another carrier on its route to said destination. It is mutually agreed as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every invoice to be rendered hereunder shall be subject to all the conditions set forth whether printed or written, herein contained, including the conditions on back hereof, which are hereby agreed to by the shipper and accepted for himself and his assigns.

(Mail or street address of consignee - For purposes of notification only)

Consigned to: Milne Truck  
Destination: LA State CA County  
Route: SP

Delivering Carrier: 2 1/2 Car Initials Car No.

No. Pkg.	DESCRIPTION OF ARTICLES, SPECIAL MARKS, AND EXCEPTIONS	Weight (Subl. to Carr.)	Class or Rate	Check Col.	Subject to Section 7 of conditions, if this shipment is to be delivered to the consignee without recourse on the consignee, the shipper shall sign the following statement: The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.
10140		24 1/2			(Signature of consignee) If charges are to be prepaid, write or stamp here, "Prepaid" Rec'd \$ to apply in prepayment of the charges on the property described hereon Agent or Cashier Per: [Signature] (The signature here acknowledges only the amount prepaid.)
1614	RAMRL				
	NA 9182				

If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight."  
NOTE - Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property  
The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding per Charges Advanced \$

INBOUND REFERENCE

Tender is hereby made of the following recorded Freight Bills or Transit Tonnage Credit Slips, to be applied on the above outbound shipment:

Transit Bureau No.	Commodity	Transit Operation	FROM	Car No.	Way-Bill Date	Way-Bill No.	Issuing Road	Rate	Transit Weight	Transit Weight Used	Balance Due Transit House	Balance of Pkg

NP  
Per: Darlene  
Shipper: WC  
Agent: [Signature]  
1

EXEMPT TOFC/COFC TRANSPORTATION CONTRACT

SOUTHERN PACIFIC RAILROAD

COMPANY

10A ORIGINAL NOT NEGOTIABLE  
Shipper's No: ND 7397 25735

RECEIVED, subject to the charges provisions and conditions contained in intermodal directories in effect on the date of this agreement

at DALLAS JANUARY 4 19 82 From National Piggyback Services, Inc

The property described below in apparent good order, except as noted (contents and condition of contents of packages unknown, marked, consigned, or otherwise indicated) show which and carry the word "garage" being understood throughout this contract as meaning any person or corporation in possession of the property under the contract to carry to the usual place of delivery or such destination, if an alternate address to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property and all or a portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions not prohibited by law, whether printed or written, herein contained.

BILL FREIGHT CHARGES TO: NATIONAL PIGGYBACK SERVICES, INC 545 Murray Ave Suite 300 Memphis, Tenn 38119

Destination Ramp LOS ANGELES State of CALIFORNIA

PREPAID COLLECT

ROUTE SP

PLAN II

CIRCULAR # CONTRACT # OTHER SPZ 6015

FIRST OF TWO TRAILERS RELEASED WITHIN TIME ALLOTTED SECOND MATE TRAILER # WEIGHT

Trailer/Container: PVT 10140 161L 10140 SEALS  
CONSIGNEE: MILNE TRUCK LINES 3200 Workman Mill Road Whittier, Ca  
RELEASE TO: Consignee 213-699-9901  
SPECIAL INSTRUCTIONS:  
Table with columns: No Packages, HM, Kind of Packages, Description of Articles, Special Marks and Exceptions, WEIGHT (Sub to Car)  
1 TRLR 160 lbs radio active materials \* NOT PLACARDED (NA9182) 24,152 lbs  
STCC # BENEFICIAL OWNERS WILL BE FURNISHED UPON REQUEST. REQUIRED INTERCHANGE CERTIFICATE ATTACHED

THIS IS TO CERTIFY THAT THE ABOVE NAMED MATERIALS ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE DEPARTMENT OF TRANSPORTATION.

THE AGREED OR DECLARED VALUE OF COMMODITIES INCLUDED IN THIS TRAILERLOAD/CONTAINERLOAD SHIPMENT IS HEREBY SPECIFICALLY STATED BY THE SHIPPER TO BE NOT EXCEEDING THE RELEASED VALUATION AS PROVIDED FOR IN THE INDIVIDUAL LINE CIRCULARS. WHEN MORE THAN ONE RELEASED VALUATION IS PROVIDED FOR ANY COMMODITY INCLUDED IN THIS SHIPMENT IN THE CIRCULAR THE LOWEST VALUATION FOR THE COMMODITY WILL APPLY AS RELEASED VALUATION WHEN SHIPPED UNDER RATES AUTHORIZED BY CIRCULARS MAKING REFERENCE TO RELEASED RATES DATED MARCH 22 1981 AND THE LATEST.

NOTE: Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property. The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding \$ per

National Piggyback Services, Inc Shipper's Agent

EXEMPT TERC/COFC TRANSPORTATION CONTRACT

THIS IS A CORRECTED BILL

SOUTHERN PACIFIC RAILROAD

COMPANY

Shipper's No: 108 ORIGINAL 1 OF NEGOTIABLE ND 7397 33735

RECEIVED subject to the charges, provisions and conditions contained in Intermodal directories in effect on the date of this agreement

1-4-82

at DALLAS JANUARY 6 19 81 From National Piggyback Services, Inc

the property described below, in apparent good order, except as noted (contents and condition of packages unknown), marked, consigned, and delivered as indicated below which need carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agree to carry to its usual place of delivery or final destination, if an invoice reference to delivery to another carrier on the route to said destination. It is mutually agreed, as to carrier, its terms of bill or any of said property over bill or any portion of said route to destination, and as to each party of any time interrelated in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions not prohibited by law, whether printed or written, herein contained.

BILL FREIGHT CHARGES TO: NATIONAL PIGGYBACK SERVICES, INC 5545 Murray Ave Suite 300 Memphis, Tenn 38119

Destination Ramp LOS ANGELES State of CALIFORNIA

PREPAID COLLECT

ROUTE SP PLAN II TIME VOLUME

CIRCULAR # CONTRACT # OTHER SPZ 6015 FIRST SECOND OF TWO TRAILERS RELEASED WITHIN TIME ALLOTTED MATE TRAILER # WEIGHT

Trailer/Container details for /FVT 10140, including consignee MILNE TRUCK LINES, release to consignee 213-699-9901, and a table of 1 trailer with 24,152 lbs of radio active materials.

THIS IS TO CERTIFY THAT THE ABOVE NAMED MATERIALS ARE PROPERTY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELED AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE DEPARTMENT OF TRANSPORTATION.

THE AGREED OR DECLARED VALUE OF COMMODITIES INCLUDED IN THIS TRAILER/LOAD CONTAINER/LOAD SHIPMENT IS HEREBY SPECIFICALLY STATED BY THE SHIPPER TO BE NOT EXCEEDING THE RELEASED VALUATION AS PROVIDED IN THE INDIVIDUAL LINE CIRCULARS. WHEN MORE THAN ONE RELEASED VALUATION IS PROVIDED FOR ANY COMMODITY INCLUDED IN THIS SHIPMENT IN THE CIRCULAR THE LOWEST VALUATION FOR THE COMMODITY WILL APPLY AS A RELEASED VALUATION WHICH SHIPPED UNDER RATES AUTHORIZED IN CIRCULARS MAKING REFERENCE TO RELEASED RATES DATED MARCH 23, 1981 AND THEREAFTER.

NOTE: Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property. The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding \$\_\_\_\_\_.

National Piggyback Services, Inc. Shipper's Agent

Signature of shipper's agent.

Signature of H.D. Smith and date 1-11-82.

Note: Actual Copy of Original  
J. Smith



**THIS SHIPPING ORDER** must be legibly filled in, in ink, in indelible pencil or in Carbon and retained by the Agent  
RECEIVE subject to the classifications and tariffs in effect on the date of this Shipping Order

SHIPPER NO. **1126**  
CARRIER NO. \_\_\_\_\_  
DATE **1 4 82**

**JONES TRUCK LINES, INC. JTLS**  
NAME OF CARRIER

TO CONSIGNEE **NATIONAL PIGGYBACK SERVICE** FROM SHIPPER **JONES TRUCK LINES, INC.**  
On Collect on Delivery Shipments the letters "COD" must appear before consignee's name  
STREET **9550 FOREST LANE SUITE 402** STREET **1002 OAKDALE ROAD**  
DESTINATION **DALLAS, TEXAS 75243** ORIGIN **GRAND PRAIRIE, TEXAS 75050**

ROUTE: \_\_\_\_\_ VEHICLE NUMBER **GILFLEX 10140**

NO SHIPPING UNITS	PKGS	KIND OF PACKAGING DESCRIPTION OF ARTICLES SPECIAL MARKS AND EXCEPTIONS	Weight (Subject to Correction)	Rate	CHARGES (For Carrier use only)
1		TLR LOAD FAK <i>NA 9182</i> SEAL NUMBERS 119076/119080 PRIVATE MILNE TRLR/RATES TO APPLY DELIVER TO: MILNE TRUCK LINES INC 3200 WHITXZ WORKMAN MILL RD WHITTIER, CALIF 90601 CALL ON ARRIVAL C.D. LOWERY OR BILL MCMULLEN AT 213-685-9420 OR 699-9901	24152		PREPAID
					90
					(URANIUM 1)
					HAZARDOUS MATERIALS IS
					1 CTN 180LBS YELLOW
					LABEL 111 RADIOACTIVE
					LABELS REQUIRED

SHIPPER CERTIFIES MATERIAL IS PACKED AND LOADED IN ACCORDANCE WITH CURRENT DOT REGULATIONS  
REMIT C.O.D. TO ADDRESS \_\_\_\_\_ AMT \$ \_\_\_\_\_ C.O.D. FEE PREPAID COLLECT \_\_\_\_\_ TOTAL CHARGES \$ \_\_\_\_\_  
Note: Where the rate is dependent on value, amounts are required to be appropriately marking the agreed or declared value of the property. The agreed or declared value of the property is hereby irrevocably stated by the shipper as correct and accurate.  
Subject to Section 7 of the conditions, if this shipment is to be delivered to the consignee without payment by the consignee, the shipper shall sign the following statement: The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

RECEIVED, subject to the classifications and tariffs in effect on the date of shipment of this Bill of Lading, the property described above in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned and delivered as indicated on this bill of lading to the carrier (the carrier) being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agree to carry to its usual place of delivery at said destination, if an as carrier otherwise to deliver to another carrier on the route to said destination. It is justly agreed as to each carrier of all or any of, said property over all or any portion or part route to destination and on so on a party at any time interested in all or any said property that every carrier to be performed hereunder shall be subject to all the bill of lading terms and conditions in it governing classification on the date of shipment.  
Shipper hereby certifies that he is familiar with all the bill of lading terms and conditions on the governing classification and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his agents.

This is to certify that the above-stated articles are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation  
SHIPPER *J. Smith* CARRIER *WD Smith*  
PER *1-5-82 6:30 pm* PER *1-5-82*  
DATE *1-5-82*

Carrier must detach and retain this Shipping Order and must sign the Original Bill of Lading



PLACE SPECIAL SERVICE PAPERS HERE  
 \*\*\*\*\*  
 \* RADIOACTIVE MATRL \*  
 \*\*\*\*\*

FREIGHT WAYBILL - ORIGINAL  
 DUPLICATE - DESTROYED

PAGE OTHER THAN 01

SF 1988  
 (Signature)

TRANSFERRED TO CAR		END	WEIGHT IN TONS		LENGTH OF CAR		CAPACITY OF CAR	
CAR INITIALS AND NUMBER		END	GROSS	NET	ORDERED	FURNISHED	ORDERED	FURNISHED
TTAX 902525								
TRAILER INITIALS AND NUMBER		LENGTH	PLAN NUMBER		DATE OF SHIPMENT		WAYBILL NUMBER	
/CIL 10140 ZDU		40	03		01-04 02		33735	
CONSIGNEE AND ADDRESS AT STOP								

STOP AT  
 THIS AT  
 CAR AT

TO NO	STATION	STATE OR PROV	FROM NO	STATION	STATE OR PROV
	LOS ANGELES TDFC	CA	22572	DALLAS TDFC	TX
			B/A	DALLAS TDFC	TX

ROUTE	SHIPPER
SP	NATIONAL LOGISTICS SERVICES 9550 FOREST LANE, DALLAS TX 75243 S/HQ-ND 7397 EL 500 01/03 10/0

RECONSIGN TO	ORIGIN AND DATE ORIGINAL CAR, ETC
	ICCSH 106015

AUTHORITY  
 CONSIGNEE AND ADDRESS  
 MILNE TRUCK LINES  
 NOA 213 699-9901

WEIGHT  
 SHIPPER CERTIFIED WEIGHT

FINAL DESTINATION AND ADDITIONAL ROUTING

INSTRUCTIONS  
 RADIOACTIVE MATRL  
 SHIPPER CERTIFIES MATERIAL IS  
 PACKED AND LOADED IN ACCORDANCE  
 WITH CURRENT DOT REGULATIONS

DESCRIPTION OF ARTICLES	COMMODITY CODE NO.
RADIOACTIVE MATERIAL, SPECIAL FORM, H.B.S. FISSILE CLASS III RADIOACTIVE MATRL NA 9102 FLAGGED RADIO ACTIVE	4927400

-- IN CASE OF CHEMICAL EMERGENCY --  
 -- CALL CHEMTREC 1-800-424-9300

1 T/L LBR INCLUDING 1 CARTON  
 URANIUM 1 100 LBS SPECIAL FORM  
 NOS. AMERICIUM 241, GROUP 1, SOLID  
 STATE SPECIALTY 16-4, CURIE YELLOW  
 LABEL 6.7 TYPE II  
 SWLC

-----ADDITIONAL INSTRUCTIONS-----  
 MAIL FREIGHT BILL TO: NATIONAL LOGYBACK, 5545 MURRAY AVE, SUITE 300,  
 MEMPHIS TN 38117

IF CHARGES ARE TO BE PREPAID, WRITE OR STAMP HERE "TO BE PREPAID"	WHEN SHIPPER IN THE UNITED STATES EXECUTES THE NO. RECURSE CLAUSE OF SECTION 7 OF THE BILL OF LADING INSERT YES
TO BE PREPAID	NO

WEIGHT	RATE	FREIGHT	ADVANCES	PREPAID
		WGT & LBS TO FOLLOW FPD		
		24152		

INBOUND BILLING REFERENCES					
POINT OF ORIGIN	WB REF.	TERMINALS AND ROUTE	COMMODITY	DATE	CHARGE
PRINTED AT: 72704 01/05 ENLRLD AT: 72704 01/05 ENLRLD WC - LNS					

FUNCTION AND YARD STAMPS TO BE PLACED ON BACK HEREOF

APPENDIX G

RESPONSES TO SAFETY RECOMMENDATIONS R-82-82 THROUGH -85



ASSOCIATION  
OF AMERICAN  
RAILROADS

A. W. Johnston  
Vice President

September 27, 1982

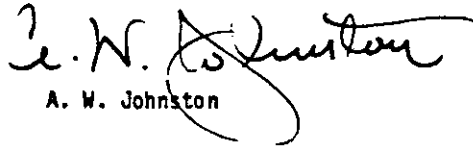
Honorable Jim Burnett  
Chairman  
National Transportation Safety Board  
Washington, DC

Dear Mr. Burnett:

We have your letter of September 2, 1982 containing Safety Recommendations R-82-82 and -83, relating to railroad derailments involving hazardous materials carried in trailer or containers in TOFC or COFC service. Mr. Dempsey has requested that I respond to you on behalf of the Association.

From the attached letter directed to the Chief Operating Officers of AAR member companies, you will note that we do recognize the problem you have described, and initiated action which we hope will lead to means by which to cope with it. We will keep you informed about the activities of the Task Force and its recommendations for improvement in the safety of hazardous materials transportation by rail.

Sincerely,

  
A. W. Johnston



ASSOCIATION  
OF AMERICAN  
RAILROADS

September 27, 1982

A. W. Johnston  
Vice President

CHIEF OPERATING OFFICERS

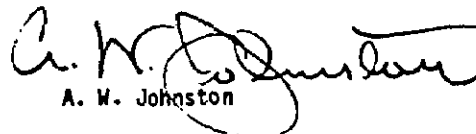
Gentlemen:

In the attached letter Jim Burnett, Chairman of the National Transportation Safety Board, has described problems encountered in handling three deraillments investigated by the Board in which trailers or containers containing hazardous materials were involved. In two incidents, the contents were described as F.A.K. (freight all kinds) and the shipping papers bore no reference to hazardous materials and no placards were applied. While in the third accident the trailer was placarded, the waybill improperly described the radioactive commodity and substantial time was spent in obtaining accurate information about the shipment before the radiological protection procedures which had been instituted were rescinded.

Mr. Burnett has recommended that railroad employes be warned that F.A.K. descriptions may not properly identify or describe hazardous materials loaded in trailers or containers, and that procedures be developed to provide timely and accurate identification of hazardous materials at accident sites.

The problems outlined by Mr. Burnett are recognized by some railroad personnel as well as representatives of the chemical industry. You are aware that the AAR, the Chemical Manufacturers Association and the Railway Progress Institute recently established an Inter-Industry Task Force on Hazardous Materials Transportation, to follow up on activities conducted by a similar organization several years ago. At the first meeting of the Steering Committee, held in Washington on August 10, 1982, it was agreed that the Bureau of Explosives Steering Committee and the CHEMTREC Advisors would address this subject. When a report and recommendations are available, copies will be distributed throughout the industry. In the meantime, it is suggested that employes and emergency response personnel be cautioned to exercise care when attempting to identify commodities carried in TOFC trailers and COFC containers involved in accidents.

Sincerely,

  
A. W. Johnston

Operations and Maintenance Department  
1920 L Street, N.W., Washington, D.C. 20036 (202) 635-9250



The American Short Line Railroad Association

P. H. Croft  
President

2000 MASSACHUSETTS AVENUE N.W.  
WASHINGTON D.C. 20036  
(202) 785 2250

September 15, 1982

Hon. James E. Burnett, Jr.  
Chairman  
National Transportation Safety Board  
Washington, D.C. 20423

Dear Mr. Chairman:

Rather than advise our members which handle piggyback traffic only, National Transportation Safety Board's Safety Recommendation, R-82-84 has been supplied to every common carrier in our Association.

Yours truly,

*P. H. Croft*  
P. H. Croft

PHC:es

**INTERNATIONAL ASSOCIATION OF FIRE CHIEFS** • INCORPORATED

1329 18th STREET, N.W. • WASHINGTON D.C. 20036

AREA CODE 202  
833 3420

September 8, 1982

Mr. Jim Burnett  
Chairman  
National Transportation Safety Board  
Federal Building 10A  
300 Independence Avenue, SW  
Washington, D.C. 20594

Dear Mr. Burnett:

I appreciate the opportunity of responding to Safety Recommendation R-82-35 of the National Transportation Safety Board. This recommendation dealt with the need for recognizing inadequately described contents on piggy-back TOFC trailers and CCFC containers carrying hazardous materials.

We are immediately using a variety of communication methods to alert emergency responders of this potential hazard.

The International Association of Fire Chiefs appreciate the opportunity of receiving this alert and pledges to cooperate in this and other emergency alert actions of the National Transportation Safety Board.

Sincerely,

A handwritten signature in cursive script, appearing to read "Donald D. Flinn".

DONALD D. FLINN  
General Manager

DDF:nlb

cc: Chief Warren Isman  
IAFC Executive Committee



NATIONAL  
FIRE PROTECTION  
ASSOCIATION  
INTERNATIONAL

ROBERT W. GRANT, President

September 9, 1982

Honorable Jim Burnett  
Chairman  
National Transportation Safety Board  
Washington, DC 20594

Dear Mr. Burnett:

Thank you for forwarding me copies of the National Transportation Safety Board's Safety Recommendation R-82-85.

I have routed copies to several staff members and we will publish the information contained in your recommendation in Fire Service Today which reaches 32,000 fire service subscribers.

Very truly yours,

A handwritten signature in black ink that reads "Robert W. Grant".

Robert W. Grant  
President

RWG/jo

CC: A.R. O'Neill  
J.M. Redden

EXECUTIVE OFFICE BATTERYMARCH PARK QUINCY, MASSACHUSETTS U S A 02269 • TELEPHONE (617) 328 9200 • TELEX 94-0720

The non-profit technical and educational organization: To promote the science and improve the methods of fire protection and prevention, to obtain and circulate information on these subjects and to secure the co-operation of its members and the public in establishing proper safeguards against loss of life and property by fire