ROLLING STOCK REFLECTORIZATION

OFFICE OF SAFETY
FEDERAL RAILROAD ADMINISTRATION

Washington, DC

US Department of Transportation

Background

- Grade-crossing collisions are one of the leading causes of rail-related deaths and injuries, accounting for roughly half of all fatalities in rail operations.

- The prevention of these collisions is one of FRA's highest priorities.

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Background

- A 1981 FRA study examined the potential use of reflectors on rail cars to reduce accidents. The study concluded that the use of reflective material had merit, but did not recommend rulemaking due to material deficiencies at the time.

- Improvements in the brightness, durability, and adhesive properties of reflective material have been achieved.

- A new material (microprismatic corner cube,retrorefelctor) has been introduced to the market.

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1999 DOT Report

- The Volpe National Transportation Systems Center's researched the feasibility of freight car reflectorization.

- The 1999 report concluded that enhancing the visibility of freight train cars with reflective material could prevent collisions involving highway vehicles and that the new, low-cost, retro-reflective material can withstand harsh operating environments.

- Report provided significant information, including cost estimates and data on the performance of equipped fleets in actual service environments.

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For e-copy of the report go to *www.volpe.dot.gov/frand/rndpubs.htm*

1999 Workshop

- FRA held a workshop in Washington, D.C., on July 28, 1999.
- The reflectorization issue was addressed and a briefing of the report was provided.
- Attendees included representatives from AAR, reflector suppliers, the National Transportation Safety Board, and others in the railroad industry.

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Rail Car Conspicuity Docket FRA-1999-6689

- The docket was established on January 14, 2000 and currently contains 53 submissions. It can accessed via the internet at http://dms.dot.gov.

  - Click on the simple search button on top left of page.

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Please omit the agency and year from a docket number.
For reflectors, enter 6689 instead of “FRA-1999-6689"

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Rail Car Conspicuity Docket FRA-1999-6689

- The docket contains several submissions from DOT including:
  - the transcript from the 1999 workshop on reflectorization
  - an analysis of Signal Detection Theory
  - FRA's benefit/cost analysis on railcar reflectorization
  - technical reports from NHTSA and VOLPE

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Benefit – Cost Analysis

- In order to estimate the cost of reflectorization, FRA made assumptions regarding a hypothetical proposed rule.

- Analysis takes into consideration that about one-quarter of freight car fleet and a substantial portion of the locomotive fleet are already equipped

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Hypothetical Proposed Rule

- Apply to all freight cars used for revenue service or company operations.
- Highly durable material applied in 4”x36” and 4”x18” strips placed vertically every 10’ as can be best fit.
- Apply to new and repainted cars.
- Retrofit of cars when in repair shop as required by existing interchange rules.

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Hopper Car at Night

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Hypothetical Proposed Rule

- To be applied on a fleet basis, so that each fleet segment is brought into compliance within the first ten years.
- Visual inspection for presence and condition of reflective material (at 8/ 5 year interval).
- Assume material will be required to renewed after 10 years from the time of installation.

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Benefit – Cost Analysis

- Total 10 year costs (discounted) are estimated at $48 - 50 million.

- Total 10 year benefits (discounted) are estimated at $78 – 106 million, depending on which of three different methodologies are used.

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BENEFIT METHODOLOGIES

- Signal Detection Model : Uses quantitative estimates to characterize the probability distributions of risks both with and without reflectorization.

- Expert Estimates : FRA internal grade crossing experts provided estimates for the effectiveness of reflectorization under various conditions.

- NHTSA Study : 'The Effectiveness of Retroreflective Tape on Heavy Trailers' which determined effectiveness rates were determined for crashes that occurred during 'dark' conditions. 'Dark' conditions include: 'dark-not-lighted', 'dark-lighted', 'dawn', and 'dusk'.

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Benefit Summary

Methodology:	Estimated benefits (rounded):
Signal Detection Model	$78 Million
Grade Crossing Experts	$103 Million
NHTSA study (average of effectiveness rates)	$106 million

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Docket –Comment Summary

- The majority of the comments have been in favor of reflectorization. Those who support the idea include:
  - Municipalities
  - Trade organizations such as the American Trucking Association
  - Public watchdog organizations such as the American Automobile Association and the American Highway Users Alliance
  - BMWE
  - Suppliers of reflective material such as 3M and Reflexite
  - All comments from individual members of the public have been very much in favor of reflectorization.

Docket –Comment Summary

- Those raising concerns about mandated reflectorization include:
  - Trade organizations such as the American Association of Railroads and the North American Freight Car Association
  - The Railway Progress Institute
  - Smaller railroads.

The FRA is happy to see the many comments, and appreciates the information presented.

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FRA Current status

Reviewing differing cost estimates

- Considering critiques of benefit estimates

- Preparing proposed rule for issuance contingent upon successful resolution of cost and benefit issues

- Key appears to be providing flexibility for implementation

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Placement of Reflective Material on the Ends of Rail Cars

FRA wondered whether retroreflective material might have utility to reduce casualties studied by Switching Operations Fatality Analysis (SOFA) task force.

FRA R&D and SOFA members took a quick look at the detectability of rail cars in switching operations.

- The reflective material evaluated for use on the sides of rail cars is a retroreflector. (Light is reflected from the material to the source of the light.) The same material was evaluated for use on the ends of rail cars.

Placement of Reflective Material on the Ends of Rail Cars

- In two SOFA scenarios that were evaluated, no benefit was found from the retroreflective material.
  - Three lanterns and a conventional flashlight were evaluated.
  - Because a retroreflector reflects light back to the source, holding a lantern at waist level does not reflect enough light back to the eyes to allow for detection.
- There did appear to be some benefit possible to prevent rear-end and raking collisions where no marker is present.
  - In two scenarios where the train headlight was the source of illumination, the reflective material could improve the detectability of rail cars for the locomotive engineer.
- In summary, no SOFA benefits were established. The collision-avoidance benefits are not sufficiently well developed to be included in the current rulemaking, but may warrant further study.