

Presentation to the Full Rail Safety Advisory Committee

Washington, DC,
September 10, 2009

High-Speed Passenger Rail Safety Strategy

Discussion Draft for Public Outreach
July 24, 2009

June 17, 2009 – Administrator Szabo issued a Notice of Fund Availability.

The Notice stated that Transportation Safety and Safety Planning would be used as evaluation criteria for merit consideration of proposed HSR projects and programs.

In response to the Notice, FRA developed the High Speed Passenger Rail Safety Strategy.

The High Speed Passenger Rail Safety Strategy describes how FRA will provide *specificity* and additional *safety guidance* for the development of the HSR systems.

High Speed Passenger Rail Safety Strategy Document

FRA developed the High Speed Rail Safety Strategy document on July 24, 2009 as a

Discussion Draft for Public Outreach.

FRA requested Comments by August 28, 2009

Today's Presentation will provide:

1. An Overview of the Safety Strategy
2. An Overview of the Issues the Safety Strategy Addresses
3. A Description of FRA's Proposed Strategies
4. A high level review of the types of comments the FRA has received.

In general, the High Speed Passenger Rail Safety Strategy:

1. Establishes safety standards and program guidance for HSR.
2. Applies a System Safety approach to address safety concerns on specific rail lines.
3. Ensures that railroads involved in passenger train operations can effectively and efficiently manage train emergencies.

Current FRA Safety Regulations include:

1. **TIER I** Equipment Safety Standards for trains operating up to 125 mph.
2. **TIER II** Equipment Safety Standards for high speed trains operating up to 150 mph.
3. **Track Safety Standards** that specify track geometry, cant deficiency, and car body acceleration limits for speeds up to 200 mph (FRA Classes 6 – 9).

FRA also administers additional Safety Standards that, in most cases, are speed independent.

Requirements for:

- Track
- Equipment
- Operating Rules and Practices
- Signals and Train Control
- Communications
- Emergency Preparedness
- Certification of Locomotive Engineers
- Control of Alcohol and Drug Use
- Others

Portions of these standards require updating and augmenting for HSR.

... there is more work to be done.
Going forward, FRA is:

- Reviewing Worldwide equipment standards to develop guidance for trains operating up to 220 mph.
- Advancing rules that amend the Passenger Equipment Safety Standards and Track Safety Standards for high speed train operations.
- Completing this High Speed Passenger Rail Safety Strategy!

The High Speed Rail Strategic Plan divides potential operations into four general categories:

1. **HSR – Express** – 150 mph Plus

- Population Centers 200 to 600 miles apart
- Grade Separated
- Dedicated ROW
- Intended to relieve Air and Highway capacity constraints.

2. **HSR – Regional** – 110 to 150 mph

- Population Centers 100 to 150 miles apart
- Grade Separated
- Some Dedicated and Some Shared Track using PTC
- Intended to relieve Highway and to some extent, Air capacity constraints.

The High Speed Rail Strategic Plan divides potential operations into four categories:

3. **Emerging HSR – Express** – 80 to 110 mph

- Corridors of 100 to 500 with strong potential for future Regional or Express service
- Separation or Advanced Grade Crossing Protection
- Primarily Shared Track
- Intended to develop the passenger rail market and provide some relief to other modes.

4. **Conventional Rail** – Top Speed of 79 mph

- Intercity Passenger service of more than 100 miles
- Frequency of 1 to 12 Trains per day
- Generally on Shared Track
- Intended to provide travel options and to develop the passenger rail market.

FRA intends to Use the Four Categories as the starting point ... and then consider additional factors.

For example:

- The presence or absence of freight traffic,
- The degree to which passenger equipment used on the corridor is of similar construction.
- The degree of isolation of the passenger system from other hazards (ROW incursions and security or the presence of natural hazards such as seismic events or high water),
- Other environmental and operational factors.

Through this strategy, the FRA intends to expand Tiers of rail Passenger Service described in “Appendix B”.

Tier	0	IA	IB	IC	II	III	IV	V
Description	Regional rail	Conventional	Emerging HSR	HSR Regional	HSR Mixed Operations	HSR Mixed Passenger	HSR Dedicated	HSR Express
Max. Speed mph	0-65	0-79	80-110	111-125	126-150	0-150	0-150	0-200/220
Other traffic on same track	None (or temporarily separated)	Mixed passenger and freight	Mixed passenger and freight	Mixed passenger and freight	Mixed passenger and freight	Conventional passenger only	None	None
Track class	- Class 4	- Class 4	- Class 5/6	- Class 7	- Class 8	- Class 8	- Class 8	- Class 9
Signals, train control	Traffic control	PTC	PTC; vital and perimeter protection above 90	PTC; vital and perimeter protection above 90	Per IC and ROW safety strategy integrated			
Public highway-rail grade crossings	Automated warning; supplementary measures where warranted	Automated warning; supplementary measures where warranted	Sealed corridor; evaluate need for presence detection and PTC feedback	Barriers above 110, see 213.247 Presence detection tied to PTC above 110	See IC None above 125	See IC None above 125	None at any speed	None at any speed

Tiers of rail Passenger Service described in "Appendix B".

Private highway-rail grade crossings	Automated warning or locked gate	Automated warning or locked gate	Automated warning or locked gate and dispatch control over entry	None or as above	None above 125	None above 125	None at any speed	None at any speed
ROW safety plan	System Safety Program / Collision Hazard Analysis			SSP/CHA and specific approval process for new service similar to 236.361				
MOW safety management plan	Address within SSP framework; no separate approval required			Separate plan approval; integrate with SSP/CHA				
Equipment	CEM – end frame strength dynamic test	Present Tier I plus Cab End Frame Strength, or equivalent safety (including option for alternative to buff strength)		Present Tier II (including option for alternative to buff strength)	See Tier IA-C	Define	Define	
Occupied car forward	OK	OK		Prohibited	Up to 125 mph only	OK	Prohibited	
On-board emergency systems	Per Parts 238 and 239 (including glazing, emergency egress and rescue access, lighting, signage, etc.)							
System Safety Programs	Required; Review is for completeness; Audits for follow through			Integrate Subpart G, Part 238	Required; FRA reviews management decisions and may disapprove			

FRA's proposed strategy is
organized into four categories:

1. Prevention

- a. Vehicle Track Interaction
- b. Positive Train Control
- c. Grade Crossing Safety
- d. Maintenance of Way Safety Management
- e. Right of Way Safety
- f. Real Time System Monitoring

FRA's proposed strategy categories (continued).

2. Mitigation

- a. Structural Standards
- b. Cab Car Forward
- c. Fuel Tank

3. Emergency Management

4. System Safety Programs

1. Prevention:

a. Vehicle Track Interaction

Strategy:

- Finalize rule requiring updated Vehicle Track Interaction (VTI) standards.
- Resolve and Reconcile inconsistencies between Track and Passenger Equipment Safety Standards at various speeds.

1. Prevention:
 - a. Vehicle Track Interaction
-

FRA ACTION PLAN

FRA will issue proposed and final rules on vehicle-track interaction and other key safety issues related to track and structures as soon as possible.

1. Prevention:

b. Positive Train Control

Strategy:

- The Rail Safety Improvement Act requires implementation of PTC systems on every passenger rail main line.
- In anticipation of high speed service, FRA is considering tiered requirements for PTC systems.

1. Prevention:
 - b. Positive Train Control
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FRA ACTION PLAN

FRA will finalize standards for PTC systems by the end of October 2009.

1. Prevention:

c. Grade Crossing Safety

Strategy:

Four Proposed Safety Principles:

1. Eliminate redundant and unnecessary crossings and those that cannot be made safe.
2. Install the most sophisticated traffic control/warning devices compatible with the location for train speeds between 80 and 110 mph.
3. Protect rail movements with full width highway barriers where train speeds are between 111 and 125 mph.
4. Eliminate or grade separate all crossings where train speeds are greater than 125 mph.

1. Prevention:

c. Grade Crossing Safety

FRA ACTION PLAN

FRA will provide draft guidance to supplement existing regulations with respect to highway-rail grade crossings on HSR lines, elicit stakeholder comment and provide final guidance for use in funding HSR projects.

FRA will also review the success of safety enhancements on designated HSR corridors in Illinois, Michigan and Pennsylvania in connection with the Sealed Corridor Study and provide a report of the findings for use by those planning the details of HSR systems.

1. Prevention:

d. MOW Safety Management

Strategy:

- Emphasize the importance of providing on track safety for those inspecting and maintaining track and structures (RWP).
- Ensure that track is not disturbed ahead of trains.
- Ensure that maintenance equipment is kept clear of live tracks except when authorized to be there.
- Ensure that equipment is kept clear of passing trains.

1. Prevention:
d. MOW Safety Management

FRA ACTION PLAN

FRA will develop guidelines for MOW safety management, which will be considered in reviewing system safety programs.

1. Prevention:

e. Right of Way Safety

Strategy:

The track safety standards for train speed greater than 125 mph requires the track owner to submit for approval a ROW plan for the prevention of:

- Vandalism,
- Launching of objects from overhead bridges or structures into the path of trains.
- Intrusion of vehicles from adjacent right of ways.

1. Prevention:

e. Right of Way Safety

Challenges:

- Common corridors with freight or conventional passenger operations.
- Shared rights-of-way with interstate highways.
- Little information on how to safely integrate a highway system with a railroad system.
- Risk of a car or truck falling from an overpass and fouling the track.

1. Prevention:

e. Right of Way Safety

FRA ACTION PLAN

FRA will develop vehicle intrusion standards and standards for sharing rail/rail and highway/rail corridors for incorporation into regulations and/or funding guidance. FRA will detail additional hazards that must be evaluated and mitigated based on corridor-specific risks.

1. Prevention:

f. Real Time System Monitoring

Strategy:

- A variety of technologies are now available to monitor the health and performance of the railroad operating system in real time.
 - On board sensors
 - Wayside detection devices
 - Autonomous track geometry systems
- These technologies should be evaluated for suitability in light of total residual risk as determined in system safety program planning.

1. Prevention:

f. Real Time System Monitoring

FRA ACTION PLAN

FRA will develop an evaluation method to prompt thorough hazard analysis and mitigation planning for HSR systems.

2. Mitigation:

a. Structural Standards

Strategy:

FRA proposes to explore the possibility of describing a new tiered series of standards for the entire operating system, *including equipment*, in lieu of the current two-tiered structure that focuses on equipment only.

2. Mitigation:

a. Structural Standards

Strategy (continued):

New tiered standards would describe a range of operating environments and, for each such environments, would specify—

- Basic end strength and CEM performance.
- Side strength and roof strength as a function of weight.
- Fixture securement.
- Acceptable occupant accelerations and restraint strategies.

2. Mitigation:

a. Structural Standards

FRA ACTION PLAN

FRA will finalize the pending cab end strength rule and then will define additional options for compliance with tiered passenger car safety standards.

2. Mitigation:

b. Cab Car Forward

Strategy:

- New standards would also address circumstances under which the use of passenger-occupied lead units may or may not be acceptable.

(FRA's regulations for Tier II operations, which covers passenger trains that operate up to 150 mph, requires that the power cars at the ends of the train exclude passengers.)

2. Mitigation: b. Cab Car Forward

FRA ACTION PLAN

FRA will conduct further research into the relationship between occupied power cars and the number of injuries and fatalities that might occur in a collision or derailment as part of this review.

2. Mitigation: c. Fuel Tank Integrity

Strategy:

FRA's current fuel tank standards are derived from freight standards. Arguments have been advanced that a more flexible approach should be taken for tanks positioned in such a way as to be better protected.

2. Mitigation: c. Fuel Tank Integrity

FRA ACTION PLAN

FRA will complete research into adaptation of fuel tank safety standards for self-powered diesel DMU rail cars and propose tailored standards if warranted.

3. Emergency Management:

Strategy:

Current strategy is to reduce the magnitude and severity of casualties in railroad operations by ensuring that railroads involved in passenger train operations can effectively and efficiently manage passenger train emergencies.

3. Emergency Management:

FRA ACTION

FRA will publish a second NPRM based on RSAC recommendations concerning refinement of requirements for onboard emergency systems and finalize the rulemaking as soon as possible.

4. System Safety Programs:

Strategy:

FRA is drafting a proposed rule that will require each HSR, intercity, and commuter passenger railroad, together with any other railroads engaged in joint operations, to develop and implement a documented SSP.

System safety programs integrate the process of identifying safety needs and managing them over time.

4. System Safety Programs:

Strategy (continued):

The proposal would require the SSP to:

- Be defined and documented through a written System Safety Program Plan.
- Include hazard management processes designed to proactively identify, assess and mitigate hazards
- Be fully implemented by the passenger railroad.
- Be audited for compliance by the FRA.

4. System Safety Programs:

FRA ACTION PLAN

FRA will propose to require that scheduled passenger operations establish and maintain SSPs and will include FRA review and approval of management decisions for HSR systems where it is necessary to determine an appropriate level of safety.

Summary of FRA Actions

- FRA will address
 - prevention,
 - mitigation,
 - emergency management, and
 - system safety integration.
- FRA will structure a new tiered approach to passenger operations, taking into account
 - maximum operating speeds
 - right-of-way characteristics,
 - safety technology,
 - planning requirements, and
 - the presence or absence of less-compatible rail traffic.
- FRA will continue to evaluate and act on
 - petitions for rules of particular applicability, and
 - waivers.

Public Comments

FRA received comments from 19 organizations covering:

- High Speed Passenger Rail Safety Strategy
- Highway – Rail Grade Crossing Guidelines for High Speed Passenger Rail

This presentation will only summarize comments received for the Safety Strategy Document.

Comments on the Safety Strategy: General

- Most submissions congratulated FRA for creating the Safety Strategy document and recognized the need for a comprehensive approach.

Comments on the Safety Strategy: General

- Some commenters provided information about HSR world wide best practices that could be applied to handle issues mentioned in the strategy including:
 - VTI,
 - PTC,
 - Grade Crossing Safety
 - MOW,
 - Right of Way Securement,
 - Structural Standards, and
 - System Safety.

Comments on the Safety Strategy: General

- We also received comments from a number of organizations that not all pertinent safety issues were included in the safety strategy. Suggested additions included:
 - Fire Safety Issues
 - Pedestrian Crossing Issues
 - Bike and Pedestrian Pathways Adjacent to ROW
 - Station Design Standards to handle conventional and HSR trains (including HS pass-throughs).
 - Guidelines for shared utilities along the ROW
 - Guidelines to define or prescribe barrier treatments.

Comments on the Safety Strategy: VTI – Track Safety Standards

- Several commenters felt that it was inappropriate to retain Class 9 track in the Track Safety Standards – especially since:
 - validated vehicle models do not exist, and
 - the VTI RSAC committee recommended that it be deleted.

Comments on the Safety Strategy: VTI – Track Safety Standards

- Some commenters felt that a Rule of Particular Applicability was a better way to handle Class 9 track issues because it allows flexibility.

The HSR system would be viewed as a system and specific requirements could be applied based on the type of operation and the operating environment.

Comments on the Safety Strategy: Grade Crossing Safety

- One commenter recommended changes to the Four proposed Safety Principles for Grade Crossings including:
 - More specific requirements for protecting train operations between 80 and 110 mph.
 - Eliminate or Grade separate all grade crossings where train speeds would exceed 110 mph (rather than 125 mph).

Comments on the Safety Strategy: HSR Categories/Tiers

- Some commenters pointed out inconsistencies in the speed ranges used in:
 - the Four HSR categories,
 - the Tier Structure proposed in Appendix B,
 - the current requirements for advanced signal systems, and
 - the requirements for PTC in the Rail Safety Act.

Comments on the Safety Strategy: HSR Categories/Tiers

- One commenter recommended that different requirements be applied when HSR equipment operates at lower than maximum speed. The commenter suggested that Tier IV and Tier V trains should be able to operate at lower speeds over existing non-dedicated lines and through grade crossings.
- For example, should a 150 mph train set be allowed to operate at 100 mph on a line segment with grade crossings?

Comments on the Safety Strategy: Right of Way Safety

- One commenter concurred intrusion standards for sharing rail/rail and highway/rail corridors were important items.

The commenter went on to recommend that FRA fully assess the cost / safety benefit of intrusion detection and mitigation prior to finalizing any requirements to assure adequate safety is achievable at a cost that is not prohibitive.

Comments on the Safety Strategy: Cab Car Forward

- Several commenters asked for the rationale of allowing passengers in lead cars for Tier IV systems and forbidding passengers in the lead cars of Tier V systems.
- One commenter pointed out that European HSR operations were moving away from power cars on later generations of HSR and using EMU s with passengers in the lead cars.

Comments on the Safety Strategy: Cab Car Forward

- Another commenter questioned the existence of supporting data that indicated that operation of passenger occupied lead cars was an unsafe practice.

Comments on the Safety Strategy: Structural Standards

- Carbuilders warned against changing rolling stock structural standards to the point where axle loads would substantially increase or HSR train sets would lose their energy efficiency advantage due to increased weight.

Comments on the Safety Strategy: System Safety

- A commenter stated that FRA may have difficulty establishing universal codes and standards for all types of operations. The commenter recommend that each project be required to establish sufficient safety by scientific method, such as quantitative risk assessment (hazard analysis), to review worst case scenarios.

Comments on the Safety Strategy: Funding

- One commenter was concerned with the source of funding for enhanced grade crossing protection and intrusion prevention. Who pays for these requirements?
 - The States?
 - The Federal Government?
 - The Railroads?

Comments on the Safety Strategy: Freight Railroad Concerns

Freight railroads commented about a variety of topics that may impact sharing their corridors with passenger rail including:

- The implied scope of Intrusion Detection and Perimeter Protection
- How will FRA interconnect MW equipment and personnel into PTC to provide a safe environment?
- Impact on a freight railroads' ability to serve future customers on shared corridor or shared track operations.
- Increased liability, inspection, and maintenance requirements to allow passenger rail to share freight track.

Comments on the Safety Strategy: Freight Railroad Concerns

Freight railroads are also concerned about the following issues:

- The ability of freight railroads to maintain track when in close proximity to HSR passenger trains.
- Adequate distance between HSR lines and freight lines to allow for maintenance or overall safety.
- The freight railroad's role versus the passenger railroad's role in developing and maintaining a "right of way plan."
- The application of sealed corridor requirements regardless of speed.

Comments on the Safety Strategy: Freight Railroad Concerns

Freight railroads are also concerned about:

- using shared track.

The freight industry expects passenger railroads to operate on separate tracks at speeds above 90 mph.

- the implications to freight railroads for Real Time System Monitoring systems – What requirements will apply to freight equipment and infrastructure?

Questions?
