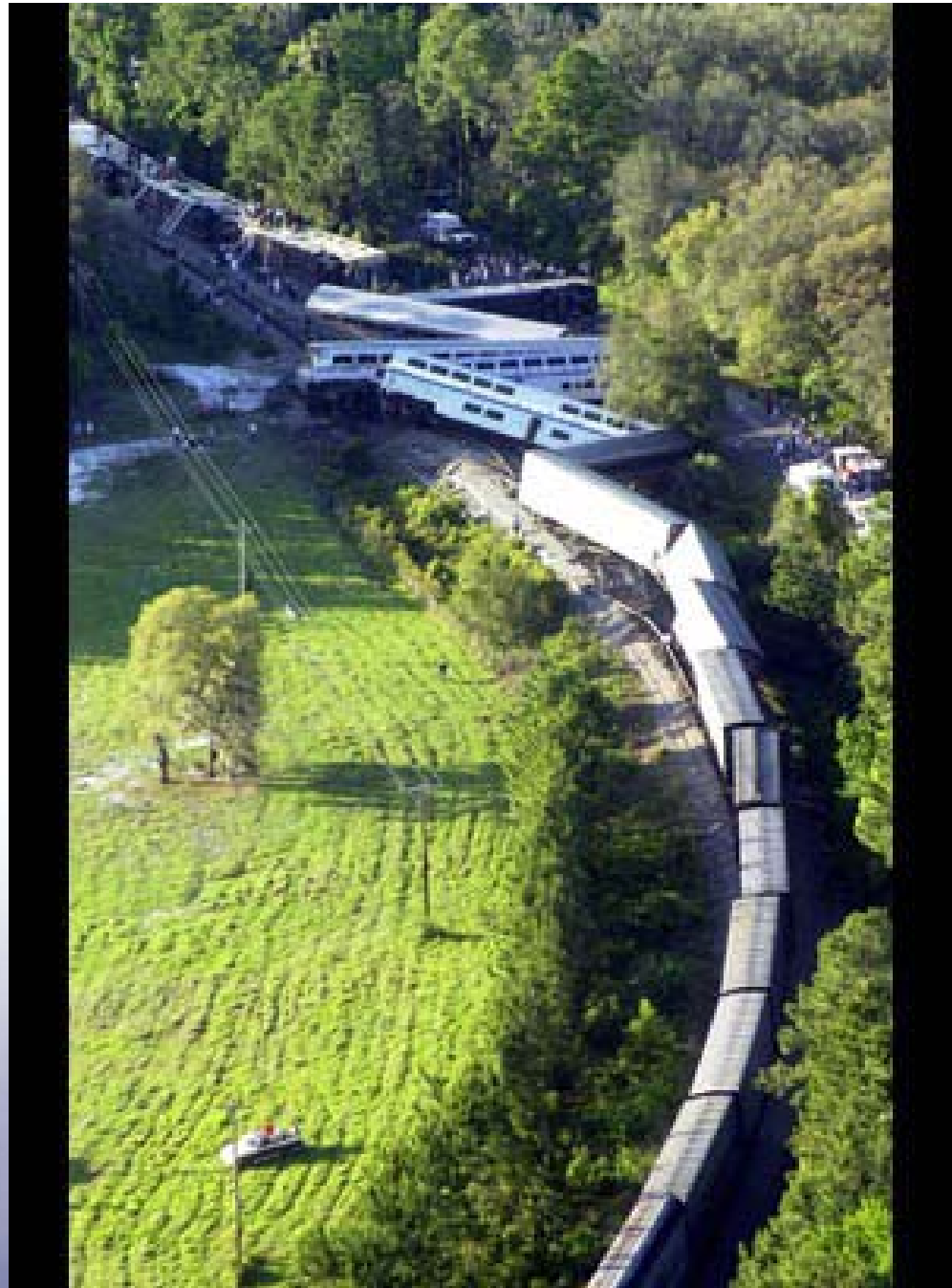


**Crescent City,  
Florida**

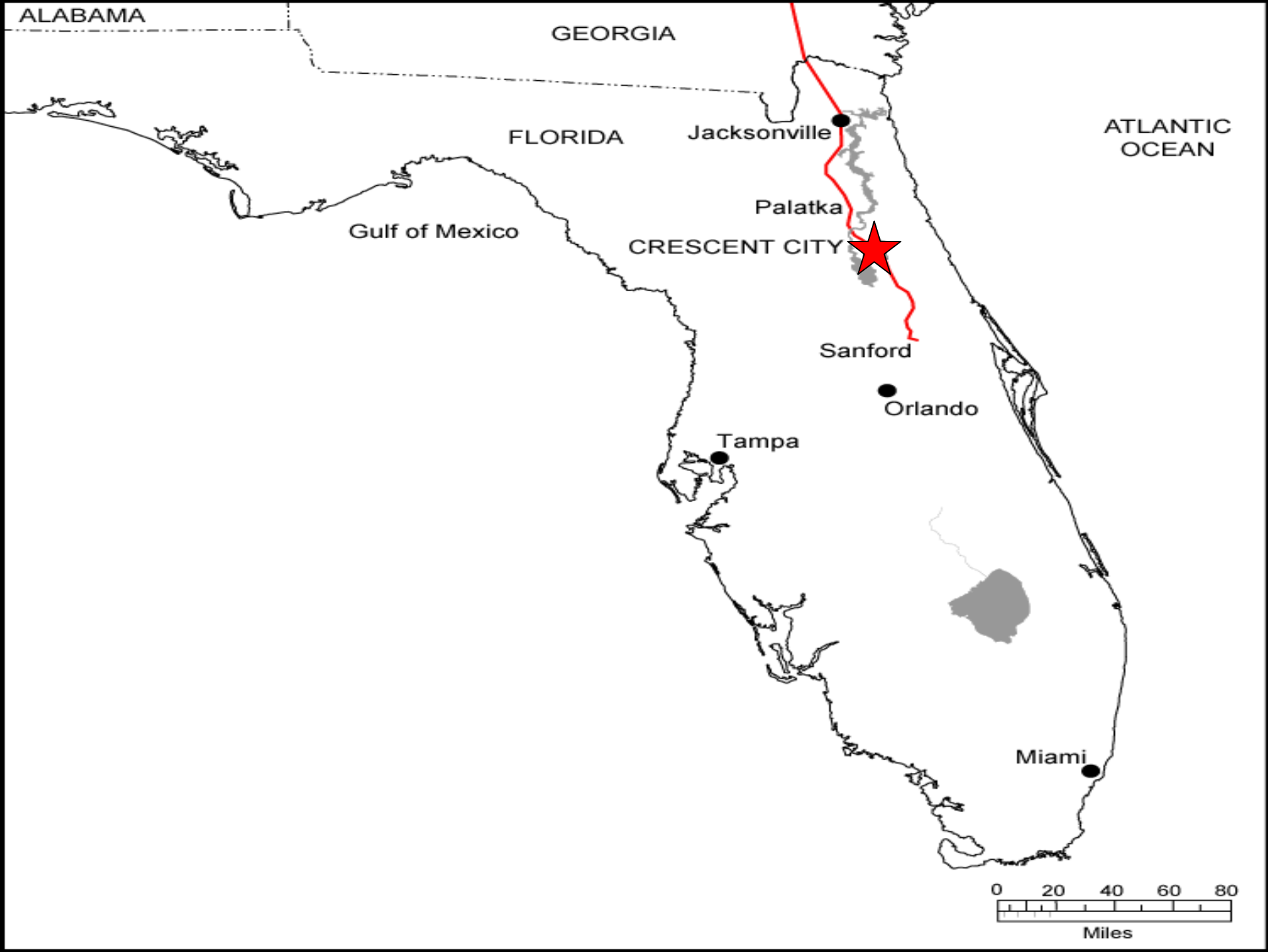
**Board**

**Presentation**



**Derailment of  
National Passenger Railroad Corporation  
(Amtrak) AutoTrain PO52-16  
Crescent City, Florida  
April 18, 2002**









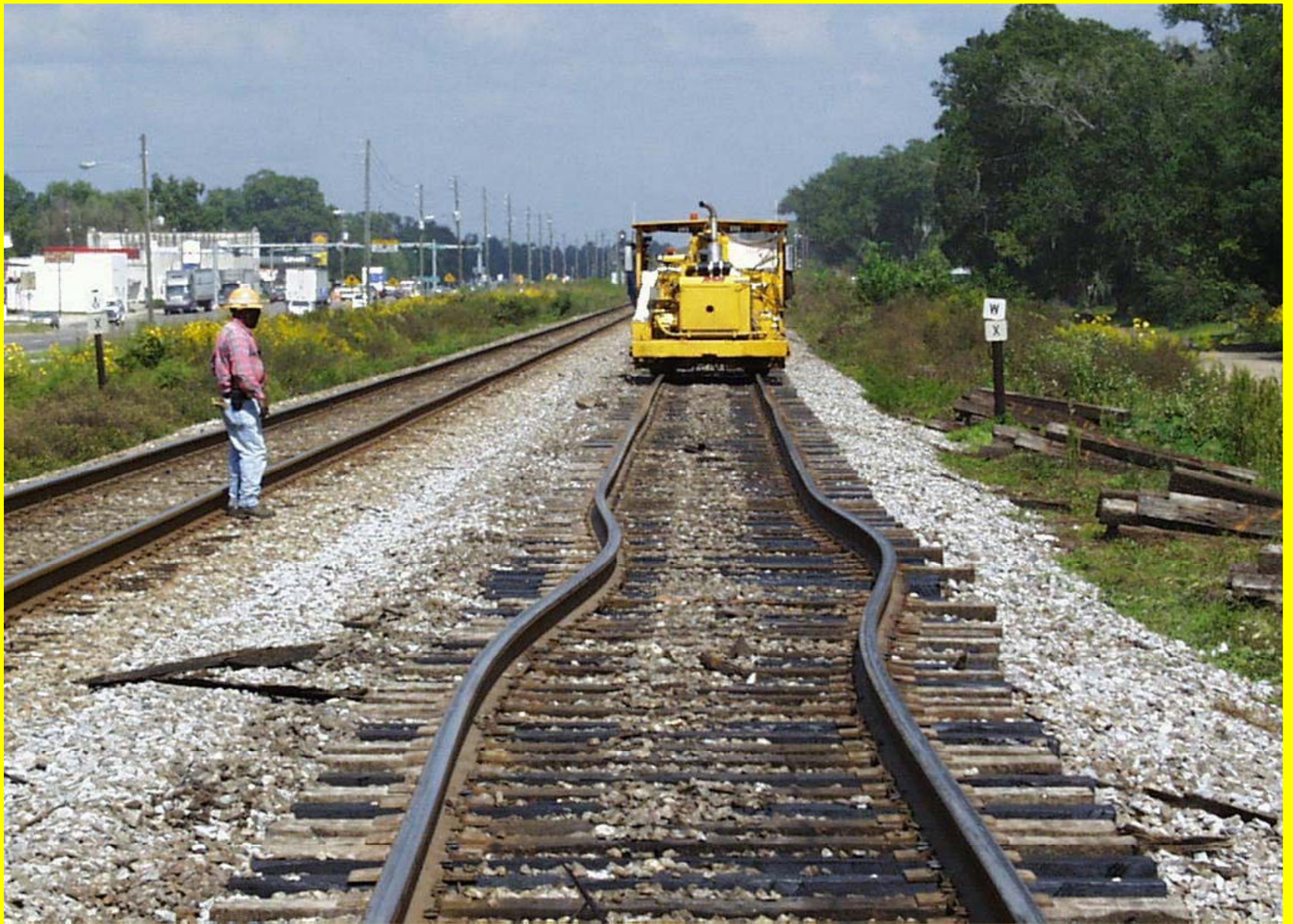
APR 19 2002





Photo Courtesy of Putnam County, Florida







Roadbed

APR 19 2002





APR 19 2002

# Launch Team

**George Black**  
**Russ Quimby**  
**Cy Gura**  
**Pat Sullivan**  
**Ron Hynes**  
**Dave Watson**  
**Miriam Kloeppe**  
**Rick Narvell**  
**Steve Jenner**  
**Joe Kris**  
**Rick Downs**  
**Donald Chupp**  
**Brian Fiffick**  
**Keith Holloway**  
**Terry Williams**

**Member On-Scene**  
**IIC**  
**Track**  
**Signals**  
**Operations**  
**Mechanical**  
**Mechanical**  
**Human Factors**  
**Human Factors**  
**Survival Factors**  
**Crashworthiness**  
**Family Affairs**  
**Family Affairs**  
**Public affairs**  
**Public affairs**



# Parties to the Investigation

**Federal Railroad Administration (FRA)**

**State of Florida Department of Transportation (FDOT)**

**Putnam County**

**CSX Transportation (CSXT)**

**National Railroad Passenger Corporation (Amtrak)**

**Brotherhood of Maintenance of Way Employees (B of M W)**

**Brotherhood of Locomotive Engineers (B of LE)**

**United Transportation Union (UTU)**



**National Transportation Safety Board**



# **Safety Issues**

**Restraint, temperature control, and maintenance procedures & standards for continuous welded rail (CWR)**

**End-of-train (EOT) device emergency braking application**

**Amtrak passenger accountability procedures**

**Securement of folding armchairs on Amtrak Superliner sleeping cars**



# *Issue 1*

## **Continuous Welded Rail (CWR)**

- **Restraint**
- **Temperature Control**
- **Maintenance Procedures & Standards**



# Track Maintenance Background

- **October 13, 2000 shoulder ballast cleaning**
- **Loss of ballast and increased superelevation**
- **January 2001 – April 2002 track resurfaced 16 times**
- **No neutral rail adjustment**





# Track Buckling Factors

- **Track Restraint**
- **Rail Temperature Control**
- **Maintenance Procedures and Standards**

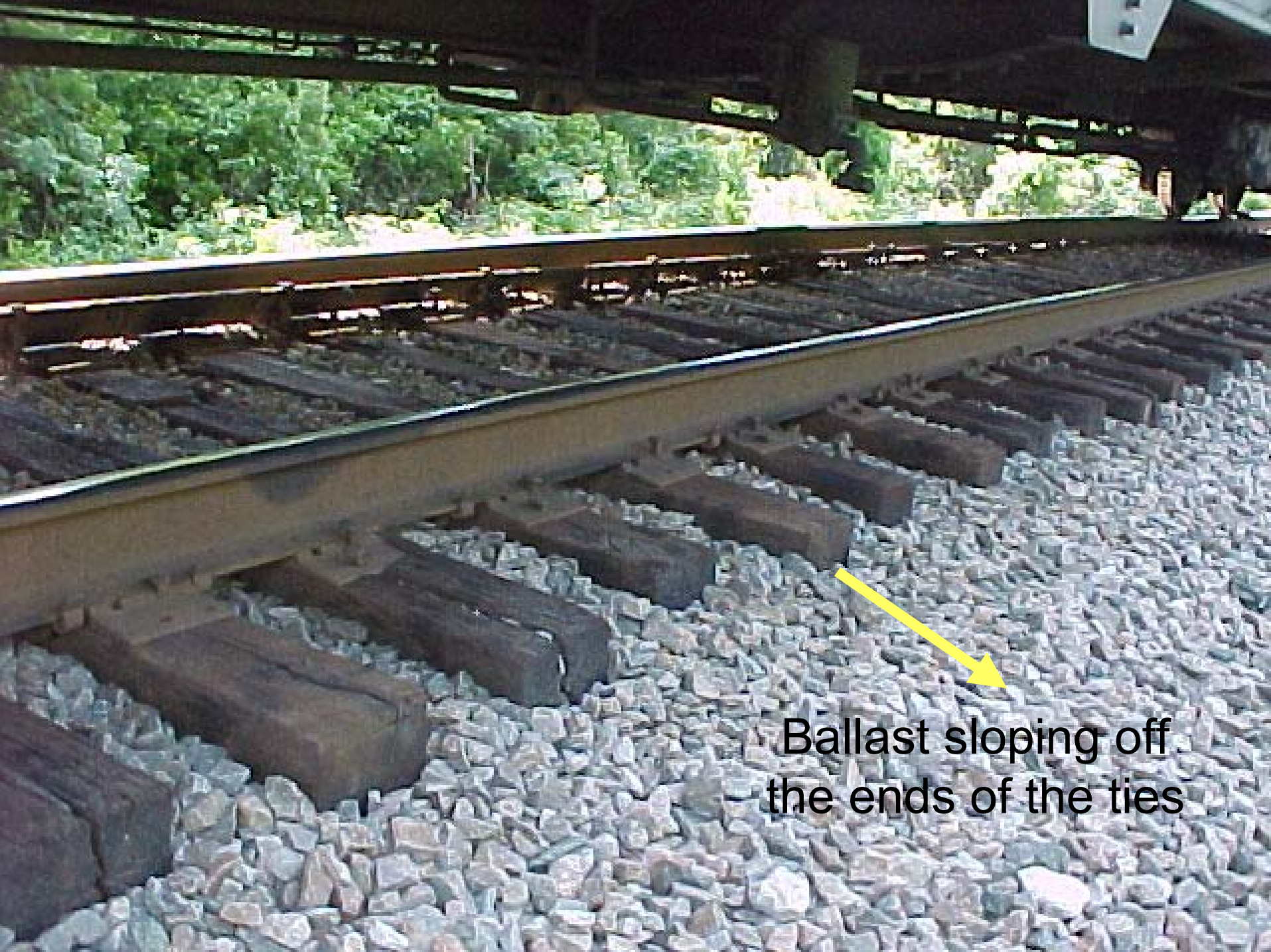




APR 20 2002







Ballast sloping off  
the ends of the ties



Gap created by  
movement of the  
tie

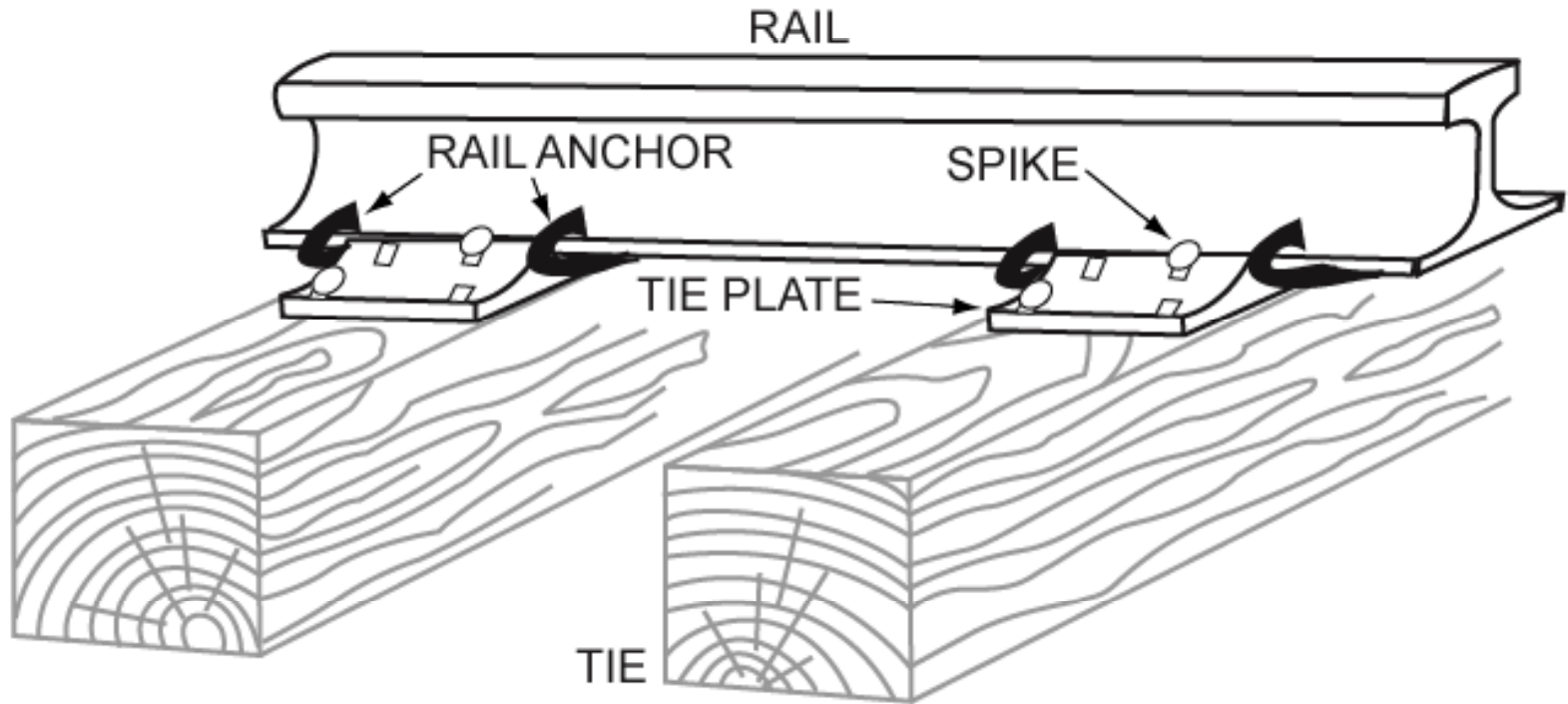
Direction of Movement

# Rail Anchors



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# Longitudinal Rail Movement





# **Rail Temperature Control and Neutral Rail Temperature**



**National Transportation Safety Board**

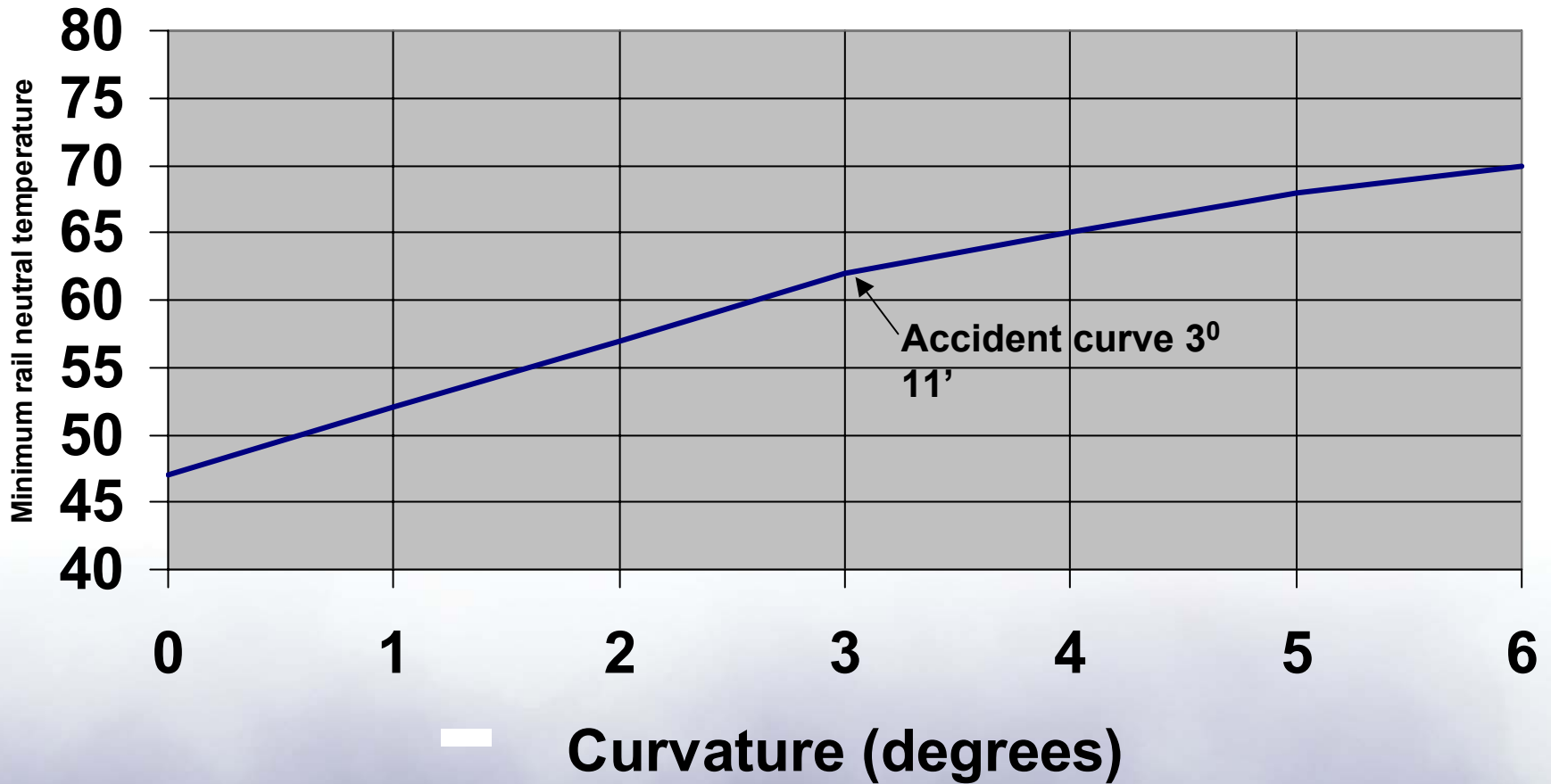
**CSXT neutral rail temperature - 100<sup>0</sup>**

**Ambient temperature – low 80's<sup>0</sup>**

**Actual rail temperature – 110<sup>0</sup> - 120<sup>0</sup>**



Minimum neutral rail temperature requirements for buckling prevention (Rail temperature = 115 °F; Class 3 line defect)

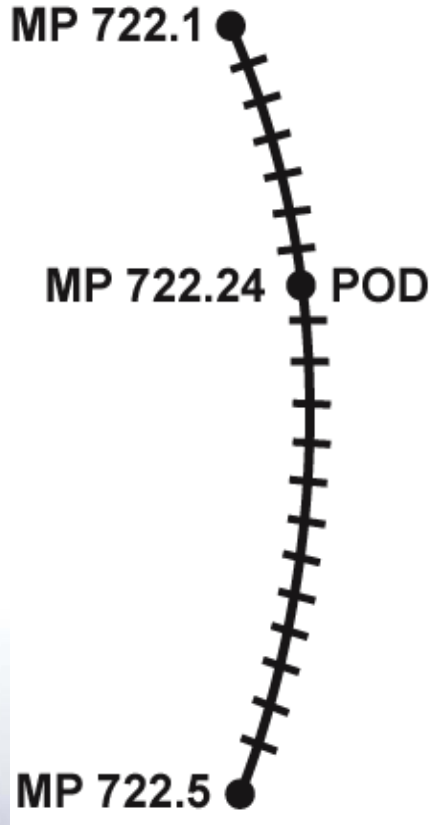


# **CSXT Maintenance Practices and Alignment**



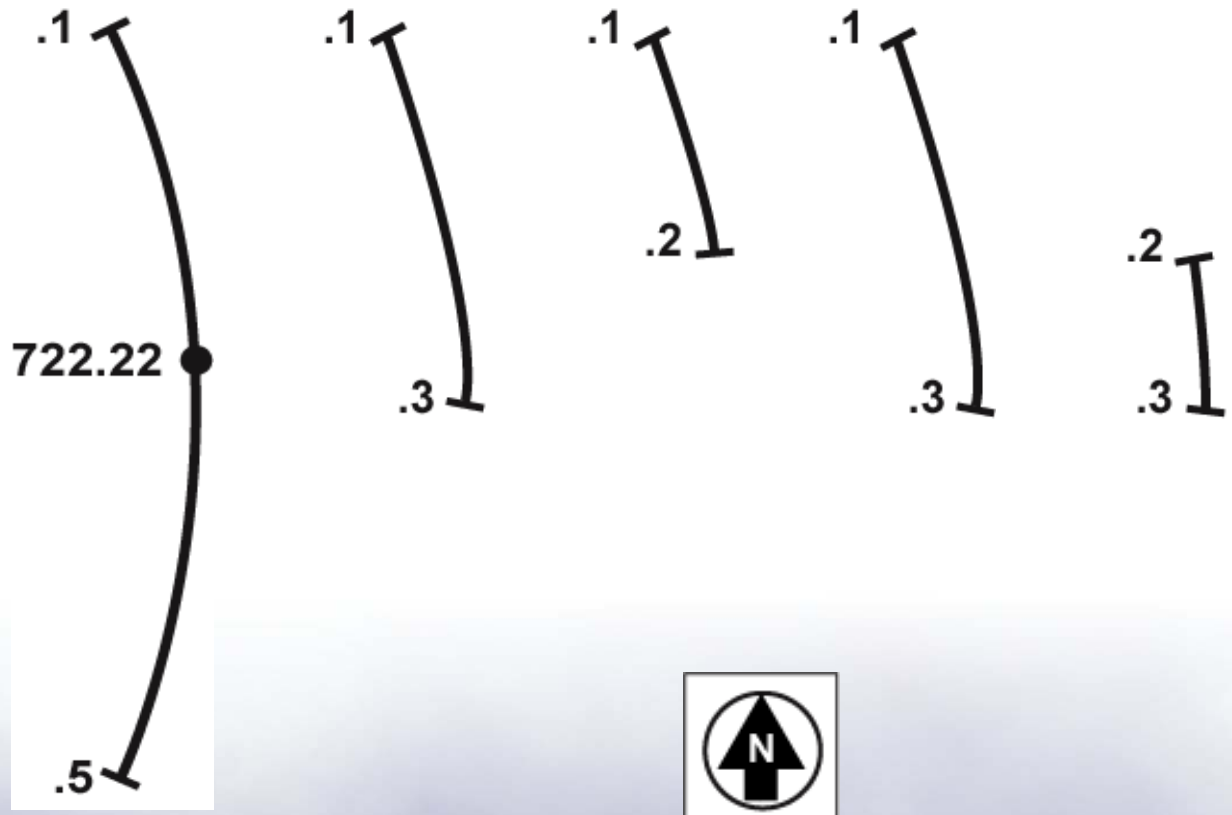


# The Accident Curve



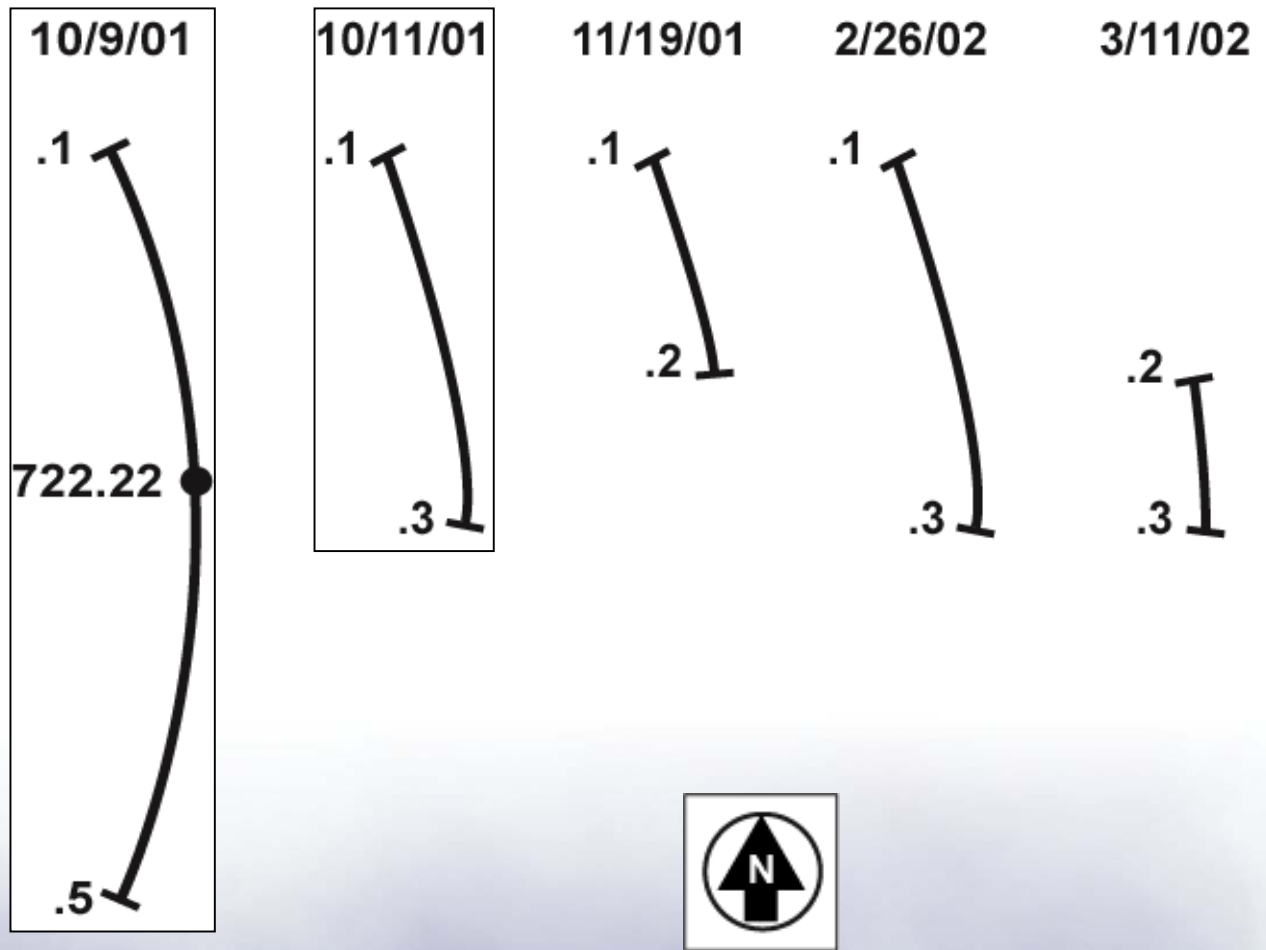
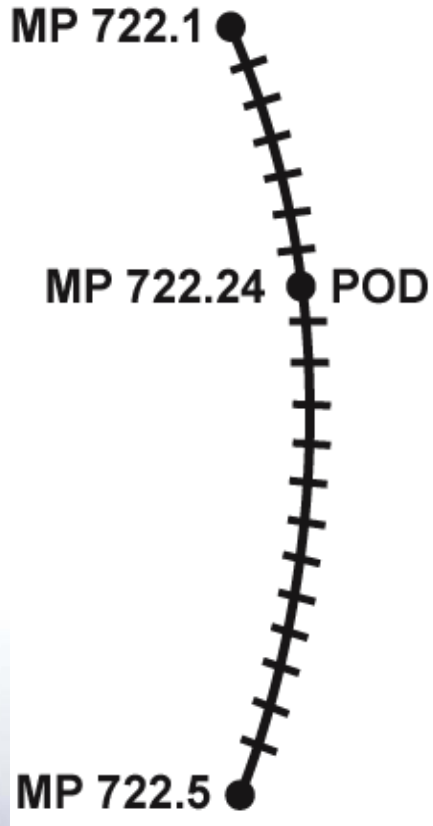
# Machine Surfacing Operations On the Accident Curve

10/9/01      10/11/01      11/19/01      2/26/02      3/11/02



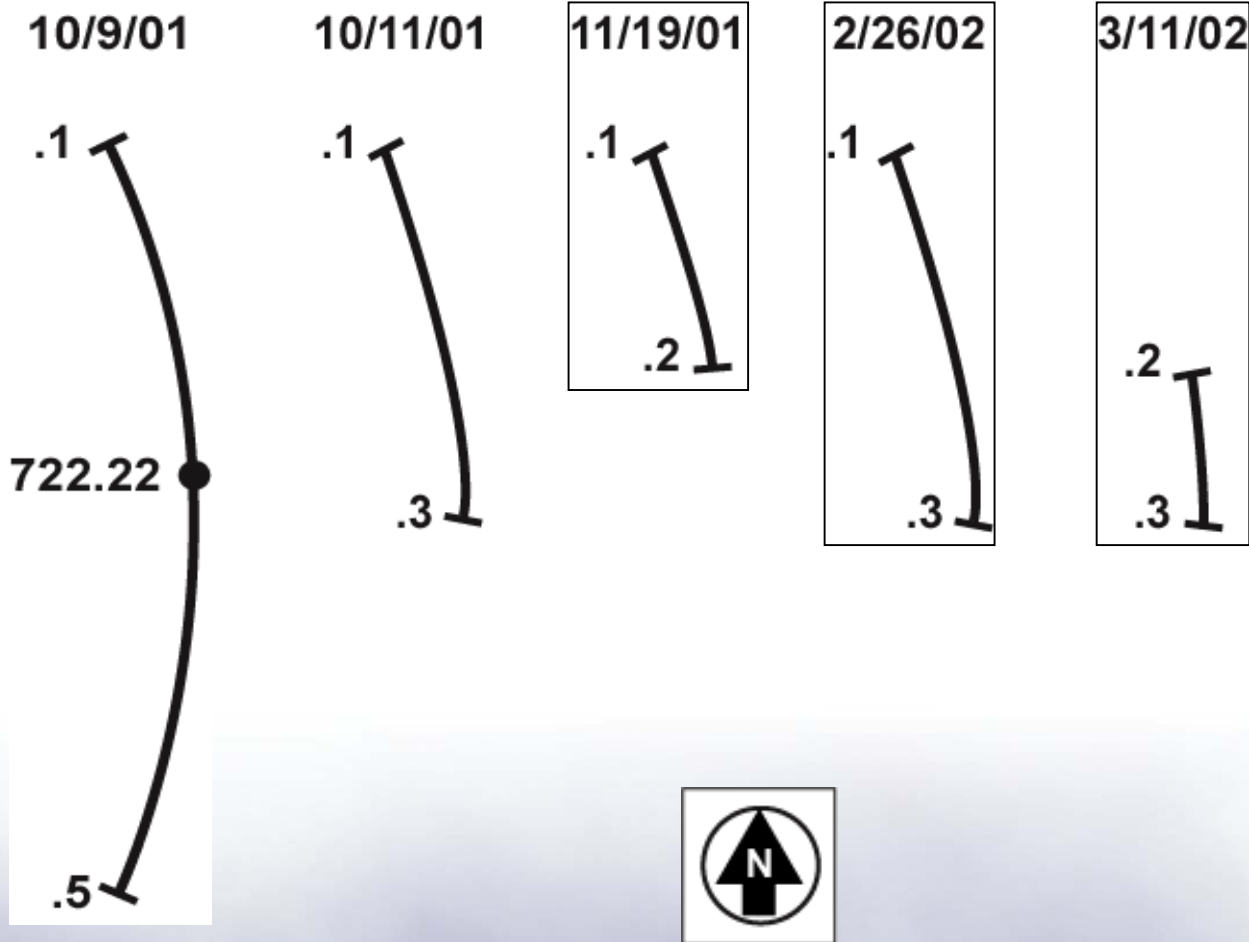
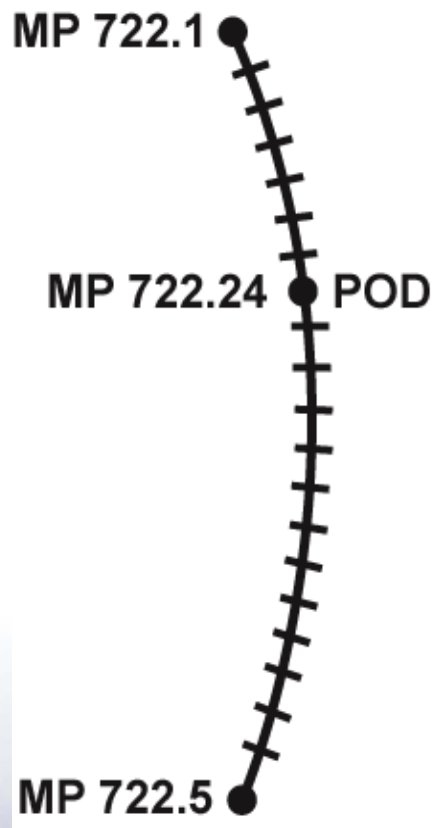
# Machine Surfacing Operations On the Accident Curve

## The Accident Curve

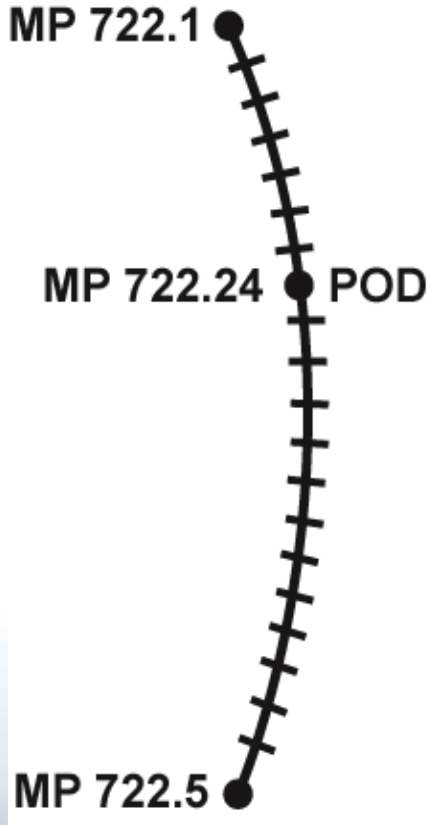


## Machine Surfacing Operations On the Accident Curve

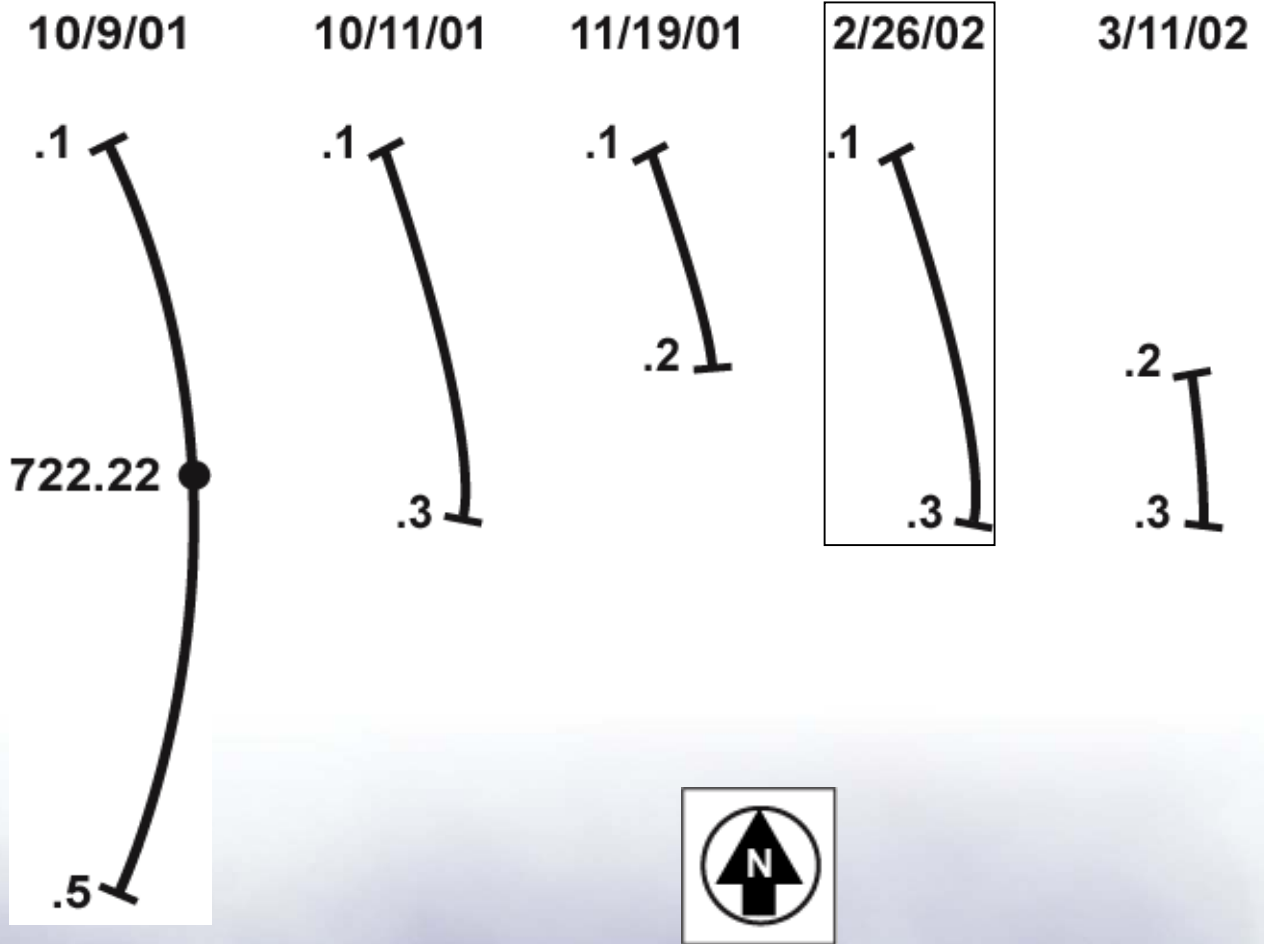
### The Accident Curve



# The Accident Curve



# Machine Surfacing Operations On the Accident Curve



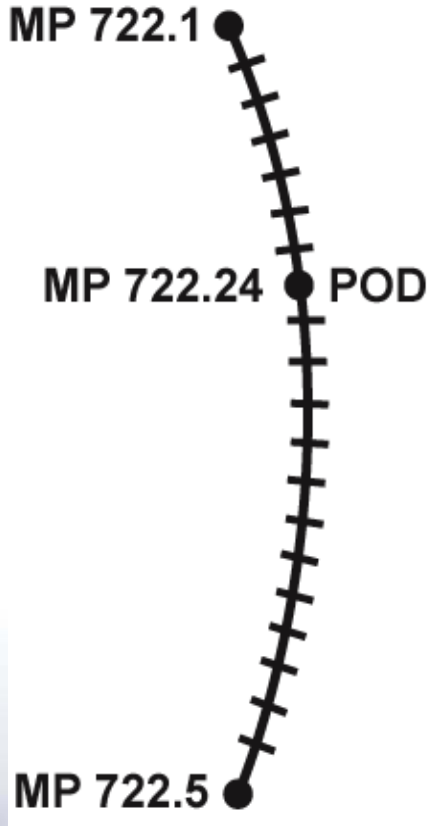


# Surfacing and Post-surfacing Temperatures

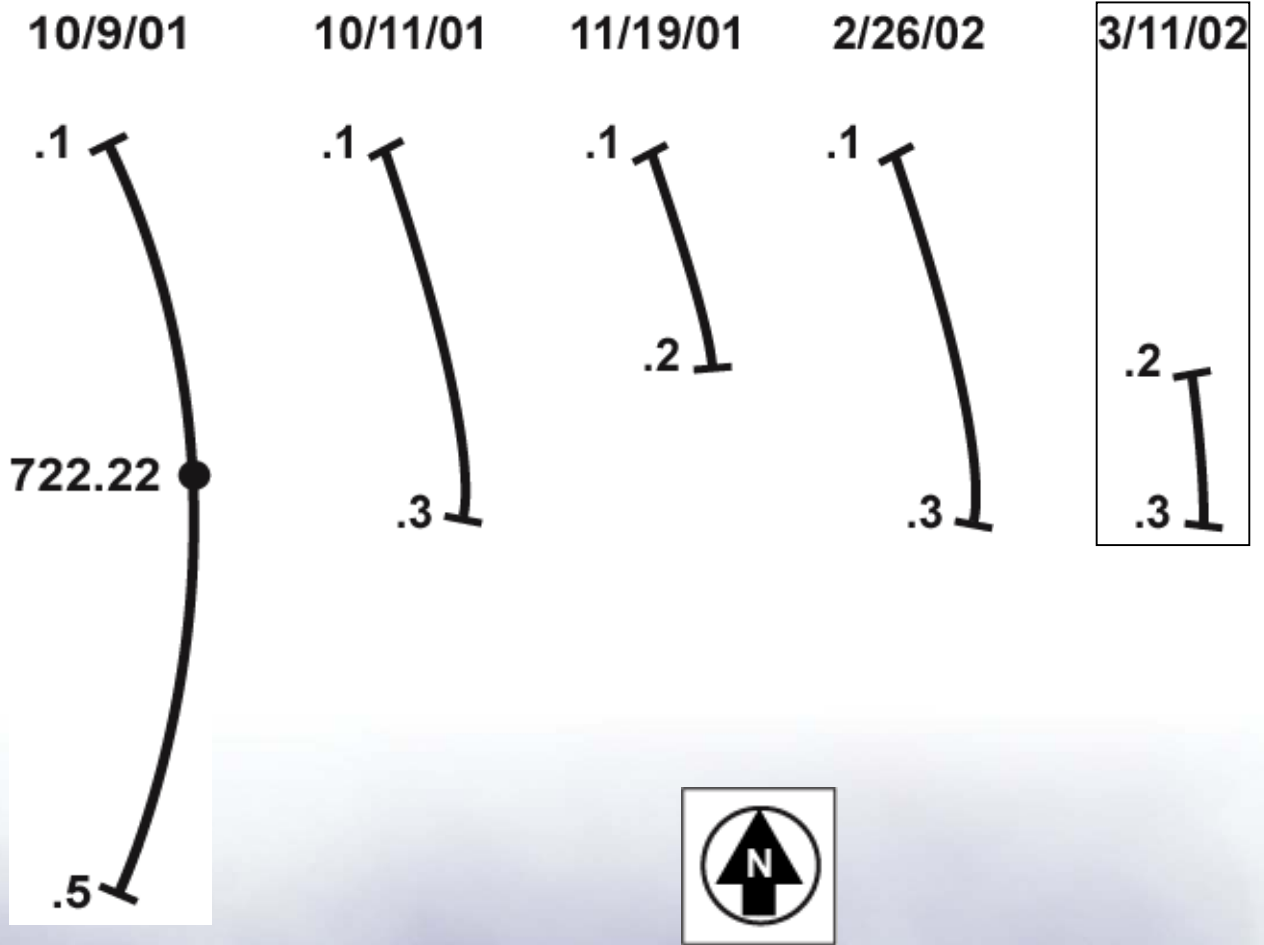
| Date               | High         | Low          |
|--------------------|--------------|--------------|
| <b>February 26</b> | <b>75° F</b> | <b>45° F</b> |
| <b>February 27</b> | <b>68° F</b> | <b>36° F</b> |
| <b>February 28</b> | <b>55° F</b> | <b>36° F</b> |
| <b>March 1</b>     | <b>66° F</b> | <b>48° F</b> |



# The Accident Curve



# Machine Surfacing Operations On the Accident Curve



# Track Instability

- Roadbed
- Ballast
- Anchoring
- Temperature Control
- Surfacing Operations





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# Emergency Braking

- The engineer saw the track defect and initiated braking action.
- Due to being jolted in the cab, the engineer placed the train into emergency a few seconds later.
- The brakes on the rear cars did not go into emergency until 7 seconds after the emergency application was initiated.



# Two-Way EOT

- The Auto Train was equipped with a two-way EOT (end-of-train) device.
- A Two-Way EOT has the capability of receiving a radio signal from the lead locomotive to initiate an emergency application of the brakes from the rear of the train.



# Emergency Braking

Event recorder data indicated that the engineer activated the emergency feature of the two-way EOT 15 seconds after placing the train in emergency.





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# Two-Way EOT Device

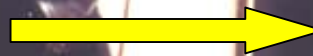
- On long trains, the radio signal to the EOT travels faster than the pneumatic signal through the trainline.
- During a derailment, the pneumatic signal may be blocked by a kinked or damaged trainline.



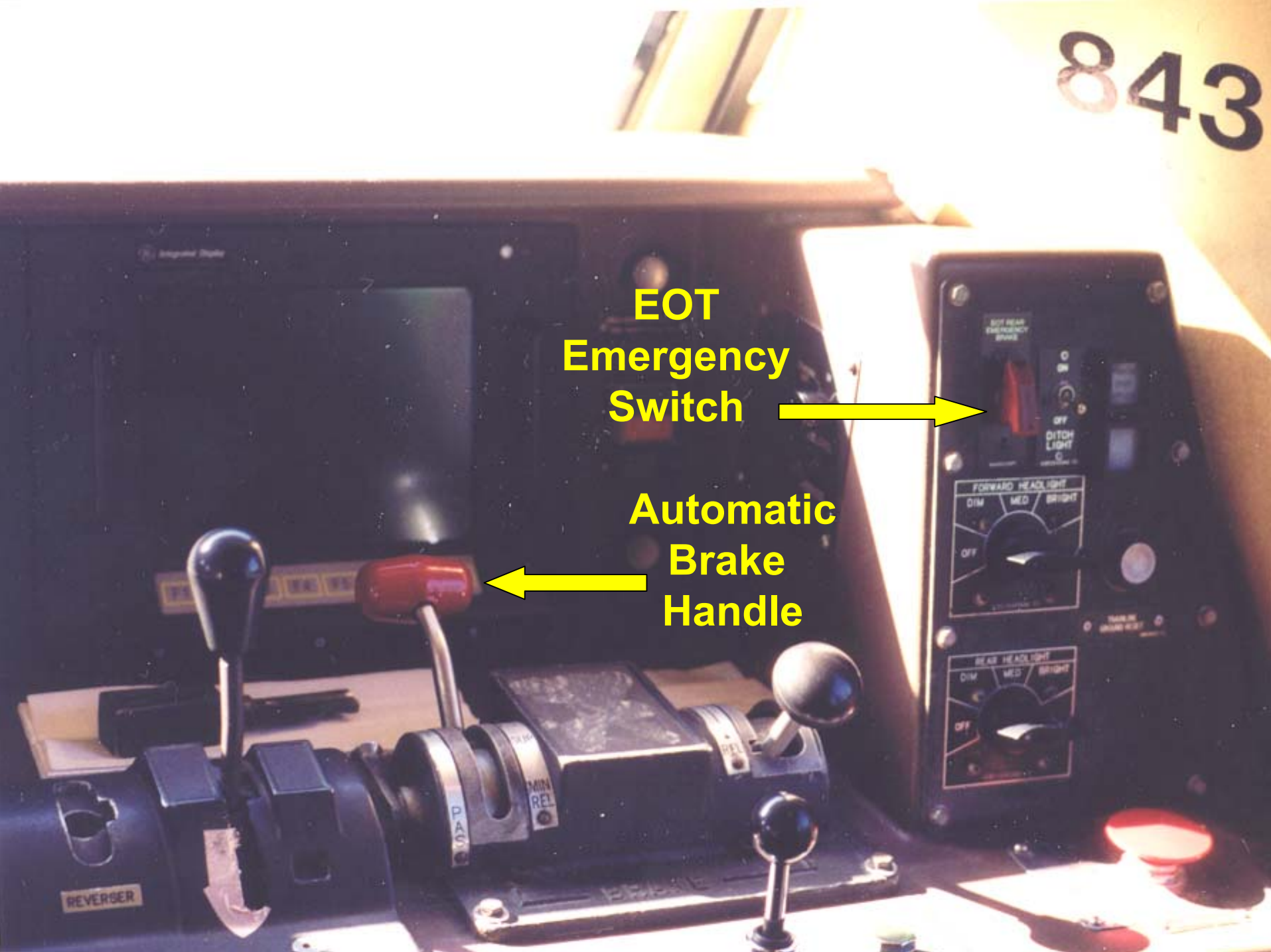
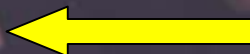


843

**EOT  
Emergency  
Switch**



**Automatic  
Brake  
Handle**



# Delay of Brake Application

- Trainline obstruction prevented the emergency signal from reaching the rear of the train.
- After additional equipment derailed, the trainline was parted by derailment forces and the rear cars went into emergency.



# Delay of Brake Application

- While the cars at the head-end of the train were derailling, the rear of the train continued forward for 7 seconds without any braking.
- These unbraked cars moved into the forward cars which were braking and stopping rapidly due to the derailment.



# EOT Activation

- Engineer could have immediately activated the two-way end of train device.
- Automatic operation of the device.



# Automatic Activation

Systems have been developed that will cause the two-way EOT to be activated automatically by the locomotive brake system.





# Conclusion

Had the two-way end-of-train device been activated when the Auto Train's air brakes were put into emergency, the severity of the injuries resulting from the derailment might have been lessened, because the continued forward momentum of the majority of the train's cars into the stopped passenger cars would have been reduced.





**National Transportation Safety Board**

**Safety Issue:**

# **Amtrak's Passenger and Crew Accountability Procedures**



**National Transportation Safety Board**





Photo courtesy of Putnam County Department of Emergency Services



**National Transportation Safety Board**

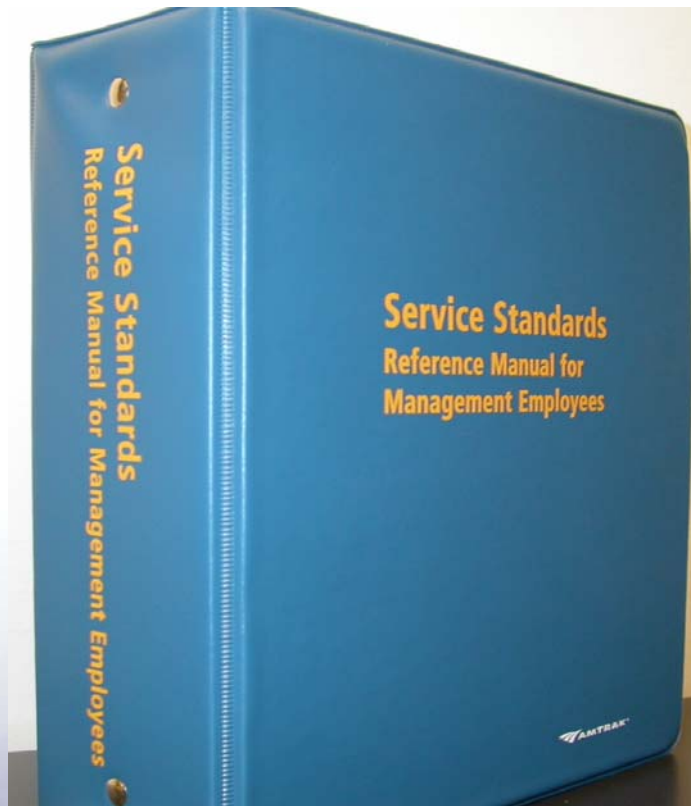
# Passenger and Crew Accountability Timeline

- Incident Commander first told 467
- Shortly thereafter number revised to 468
- Conductor provided Incident Commander two different lists
- At NTSB org. mtg., Amtrak reported 452
- **5 months** after accident = 446 persons





# Amtrak's Accountability Procedures



- Passenger on-board record system
- All long-distance, overnight, and reserved trains



# Amtrak's Accountability Procedures

- Conductor picks up manifest / Passenger Name List before train departs.
- List updated by collection of tickets
- Paper form completed for unticketed passengers.
- Passenger information is then manually updated in Amtrak's reservation system.



# Amtrak Trains Using Passenger Accountability Procedures

- Sunset Limited
- Southwest Chief
- Texas Eagle
- City of New Orleans
- Silver Meteor
- Empire Service
- California Zephyr
- Auto Train
- Capitol Limited
- Empire Builder
- Coast Starlight
- Crescent
- Cardinal
- Silver Palm
- Silver Star
- Lake Shore Limited
- Three Rivers
- All Acela Express Trains
- All Metroliner Trains



# Amtrak Trains Using Passenger Accountability Procedures

- **Sunset Limited - 1993**
- Southwest Chief
- Texas Eagle
- City of New Orleans
- Silver Meteor
- Empire Service
- California Zephyr
- Auto Train
- Capitol Limited
- Empire Builder
- Coast Starlight
- Crescent
- Cardinal
- Silver Palm
- Silver Star
- Lake Shore Limited
- Three Rivers
- All Acela Express Trains
- All Metroliner Trains



# Amtrak Trains Using Passenger Accountability Procedures

- **Sunset Limited - 1993**
- **Southwest Chief – 1997 & 2000**
- Texas Eagle
- City of New Orleans
- Silver Meteor
- Empire Service
- California Zephyr
- Auto Train
- Capitol Limited
- Empire Builder
- Coast Starlight
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- All Acela Express Trains
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# Amtrak Trains Using Passenger Accountability Procedures

- **Sunset Limited - 1993**
- **Southwest Chief – 1997 & 2000**
- **Texas Eagle - 1998**
- City of New Orleans
- Silver Meteor
- Empire Service
- California Zephyr
- Auto Train
- Capitol Limited
- Empire Builder
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# Amtrak Trains Using Passenger Accountability Procedures

- **Sunset Limited - 1993**
- **Southwest Chief – 1997 & 2000**
- **Texas Eagle - 1998**
- **City of New Orleans - 1999**
- Silver Meteor
- Empire Service
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# Amtrak Trains Using Passenger Accountability Procedures

- **Sunset Limited - 1993**
- **Southwest Chief – 1997 & 2000**
- **Texas Eagle - 1998**
- **City of New Orleans - 1999**
- **Silver Meteor - 2000**
- Empire Service
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- Auto Train
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- Empire Builder
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- Cardinal
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# Amtrak Trains Using Passenger Accountability Procedures

- **Sunset Limited - 1993**
- **Southwest Chief – 1997 & 2000**
- **Texas Eagle - 1998**
- **City of New Orleans - 1999**
- **Silver Meteor - 2000**
- **Empire Service - 2001**
- California Zephyr
- Auto Train
- Capitol Limited
- Empire Builder
- Coast Starlight
- Crescent
- Cardinal
- Silver Palm
- Silver Star
- Lake Shore Limited
- Three Rivers
- All Acela Express Trains
- All Metroliner Trains



# Amtrak Trains Using Passenger Accountability Procedures

- **Sunset Limited - 1993**
- **Southwest Chief – 1997 & 2000**
- **Texas Eagle - 1998**
- **City of New Orleans - 1999**
- **Silver Meteor - 2000**
- **Empire Service - 2001**
- **California Zephyr - 2001**
- Auto Train
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# Amtrak Trains Using Passenger Accountability Procedures

- **Sunset Limited - 1993**
- **Southwest Chief – 1997 & 2000**
- **Texas Eagle - 1998**
- **City of New Orleans - 1999**
- **Silver Meteor - 2000**
- **Empire Service - 2001**
- **California Zephyr - 2001**
- **Auto Train - 2002**
- Capitol Limited
- Empire Builder
- Coast Starlight
- Crescent
- Cardinal
- Silver Palm
- Silver Star
- Lake Shore Limited
- Three Rivers
- All Acela Express Trains
- All Metroliner Trains



# Amtrak Trains Using Passenger Accountability Procedures

- **Sunset Limited - 1993**
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- **Texas Eagle - 1998**
- **City of New Orleans - 1999**
- **Silver Meteor - 2000**
- **Empire Service - 2001**
- **California Zephyr - 2001**
- **Auto Train - 2002**
- **Capitol Limited - 2002**
- Empire Builder
- Coast Starlight
- Crescent
- Cardinal
- Silver Palm
- Silver Star
- Lake Shore Limited
- Three Rivers
- All Acela Express Trains
- All Metroliner Trains



# Previous Safety Board Recommendations

- *Sunset Limited* – 1993
  - R-94-7 : Develop and implement procedures to provide adequate passenger and crew lists to local authorities with minimum delay in emergencies.



# Previous Safety Board Recommendations

- *Southwest Chief* – 1997
  - R-98-58 : Expedite the development and implementation of a passenger and crew accountability system on reserved trains.



# Previous Safety Board Recommendations

- Amtrak invested \$24 million to develop an automated system
- Hand-held electronic device
- Recommendation R-98-58 “Closed Acceptable Action”





# Amtrak's Actions Since Recommendation was Closed

- No accurate passenger count in last four Amtrak accidents
- Not pursuing computerized system
- Continued use of the paper record
- Inability to provide accurate list to emergency responders



# Conclusion

- The paper record passenger accountability system in use for long-distance, overnight, and reserved trains on the Amtrak system cannot be relied upon to provide an accurate and timely passenger manifest in case of emergency.





**National Transportation Safety Board**

# Passenger Railcar Crashworthiness

## **Unsecured Folding Armchairs in Deluxe Bedrooms of Amtrak Superliner Sleeper Cars**

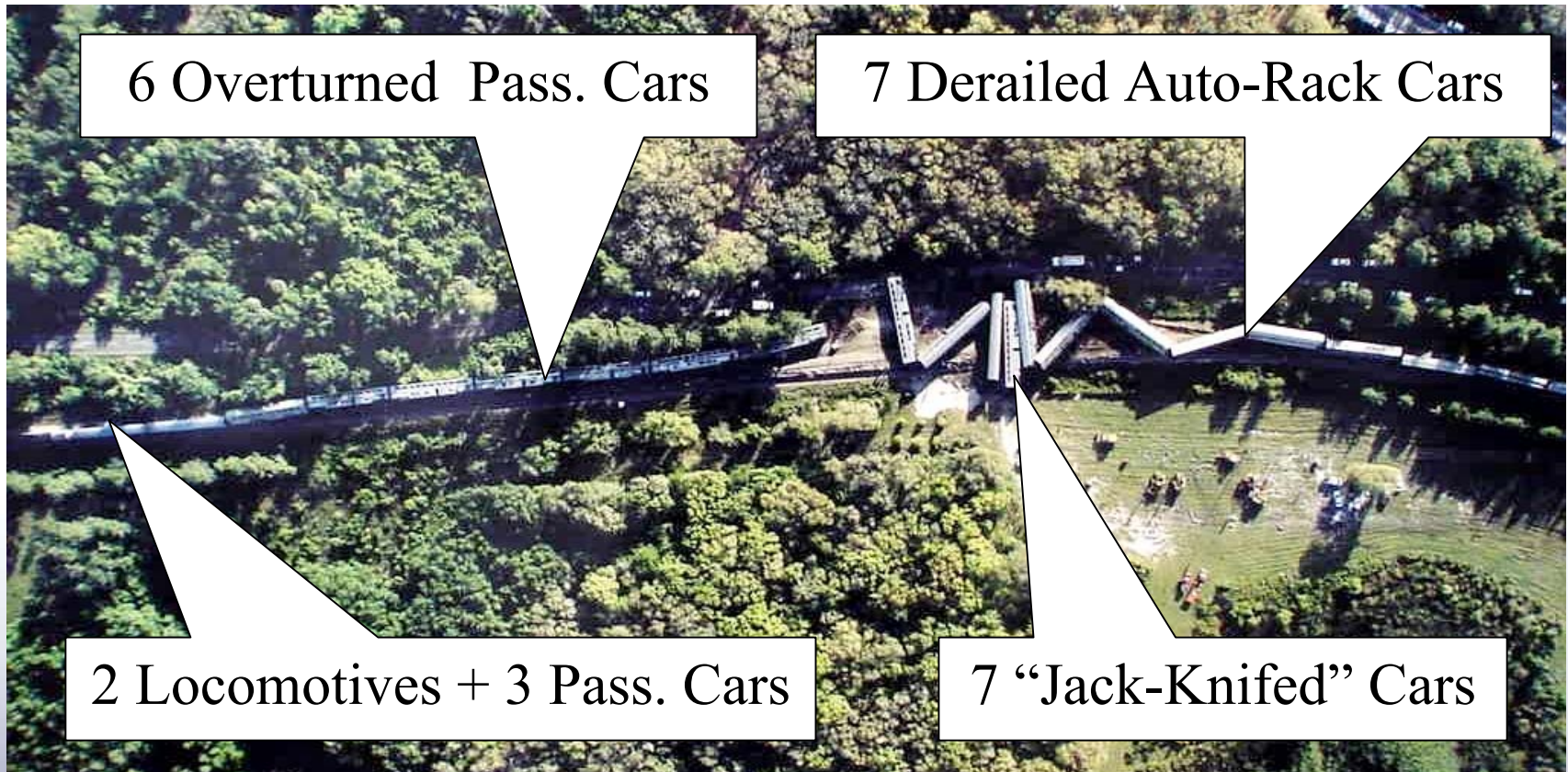


# Aerial View of the Derailment Site



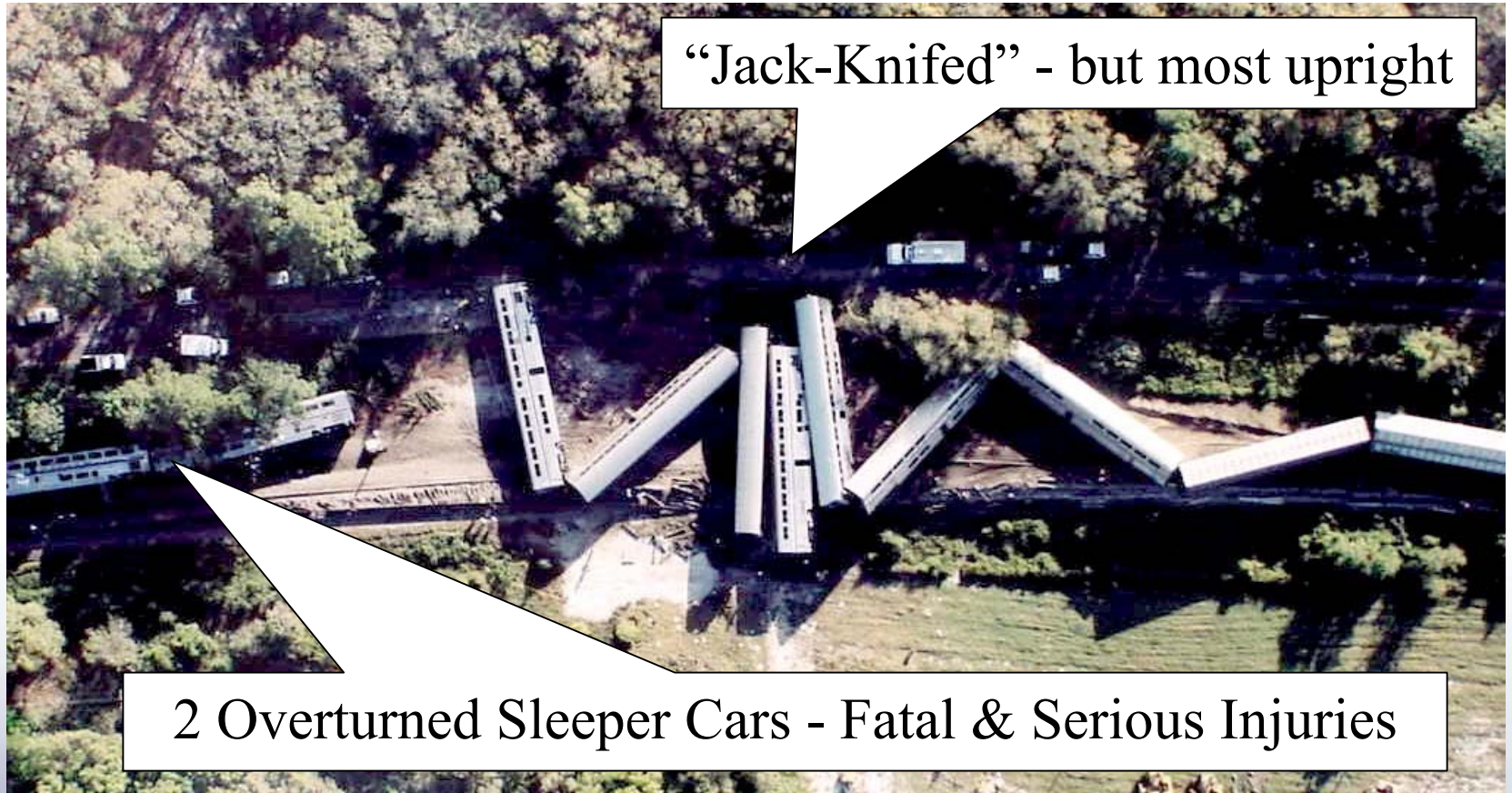


# Derailment Configuration





# Wreckage Detail





# Overturned Sleeper Railcar



# Overturned Bedroom Compartment







# Exemplar Unsecured Folding Armchair





# ***49 CFR 238.233***

## ***Interior Fittings and Surfaces***

- Passenger seats must be securely fastened to the carbody
- Ordered on or after Sept 8, 2000, or placed in service for the first time on or after Sept 9, 2002
- All passenger railcars in this accident were placed in service prior to September 2000



# Potential Remedy

- Amtrak Received a Proposal for an Anchorage Device
- Provided Summary Documentation
- Working Model Not Available



# Conclusion

In its present unsecured configuration, the folding armchair on Amtrak's Superliner sleeper cars constitutes an unwarranted hazard.





**National Transportation Safety Board**