Mechanical

Rollback Protection
Rollback Protection

Automatic Train Control

• Automatic Train Supervision
• Automatic Train Protection
• Automatic Train Operation
  – Rollback Protection

Manual Mode Operation
Master Controller Handle
Emerg. Brake Activation Button

P5
C
B5
Rollback Protection

Engineered Safety Redundancy

• For all equipped cars in automatic and/or manual mode.

• Activation brings a train rolling backwards to a stop.

• To ensure safety and control of train movement.
Rollback Protection

Initial Confusion – WMATA reported…

- All cars equipped with a rollback subsystem when in automatic operation (but not in manual).
- Rollback protection on some cars when operated in manual mode (but not all).
- Information varied during on-scene investigation regarding which cars were equipped with rollback (in manual or automatic).

Prompted an urgent recommendation.
Rollback Protection

Operator Information/Training

- No information provided to operators regarding how railcars are equipped.

- WMATA relies on
  - Daily experience in manual mode over time.
  - Exposure to the entire range of operating conditions to improve operator skills.
WMATA Postaccident Actions

November 7, 2004, WMATA issued a memorandum to all Train Operators and Supervisors:

– Advising them there was no rollback protection in manual mode on the 1000-series cars.

– To be aware of operating conditions related to grade that would affect train handling.
WMATA Postaccident Actions

November 9, 2004, WMATA issued a supplemental memorandum to further remind operators and supervisors:

- No rollback protection in Manual mode on the 1000-series.

- “However, in Manual, your brake systems...are available and are to be used in accordance with operating conditions and consistent with your training...” and the provisions of the operating rules.
To WMATA:

Immediately revise the directions to train operators contained in your memorandums of November 7 and 9, 2004, to include specific written instructions for identifying and responding to an emergency rollback situation, and provide training to operators on the procedures to follow if such a rollback event occurs. (Urgent).
November 23 and 24th WMATA Issued Bulletins to Train Operators stating:

1st - In manual mode, a rollback is to be stopped by application of the train brakes.

2nd - Should a rollback of greater than 5 seconds occur, apply maximum service brake in B-4 position.

3rd - Should the train not stop within another 4 seconds apply the emergency brakes.

Lastly, notify the Operations Control Center.
Safety Board’s Reply to WMATA

• Asked WMATA to include a discussion of speed in its written instructions for identifying and responding to a rollback situation.

• Asked that these instructions be incorporated in WMATA’s Initial Train Operator’s Course and in its operator recertification training procedures.

WMATA’s February 16, 2006, response to R-04-9:

- Disagree with the Safety Board’s position.

- When to stop rollback is better based on time rather than speed.

- Belief that time-based criterion was best:
  - because it is simple and easily explained to, and understood by, the Train Operators.
Investigative Findings

• Train Operators generally stop a rollback by first moving the master controller to a low power setting (P-1 or P-2), then adding more power as the situation warrants.

• Safety Board simulation testing showed that without rollback protection, after train speed exceeded 2 mph then even full power (P-5) would not slow or stop the train.
Recommendation on Rollback Protection

- Without the rollback protection feature, the train’s speed determines whether a power application can arrest the rollback or whether brakes must be applied to stop the train.

- WMATA does not include any discussion of rollback speed in the written instructions or training it provides to its train operators.