

Conducting a Root Cause on Run Away Buses

Using Data to Avert a Disaster



Grantley Martelly

Managing Director, Safety
& Security

King County Metro

KC Metro



- Multimodal Agency
 - Bus System : 1500+ buses
 - Marine Division: Water Taxi – 3 boats
 - Operates and Maintains Seattle Street Car
 - Operates and Maintains Sound Transit LINK Light Rail
 - 800 Vanpools
 - Paratransit
 - First mile-Last mile pilots

Buses

- Electric Buses – Trolleys on overhead wires – 174
 - Electric trolley buses in the city of Seattle since the 1940s. King County Metro has been operating the fully electric trolley buses for nearly 40 years.
- Hybrid Diesel Buses - 1251
- Protera All Electric - 11
- Diesel – 189
- Testing electric 40” and 60’ long range from other manufacturers – 6
 - New Flyer, Protera , BYD



Rolling Buses



- Over 4 month period
 - 4 buses rolled while re-wiring
 - 1 hybrid diesel rolled while at transit center
 - 2 others rumored but not confirmed.



Electric Trolleys - First Observation

- Operator not setting the parking brake (PP1 Valve)
- Leaves seat to reset poles at rear of coach
- Pole reset function releases brake interlock
- Bus rolls with direction of downward grade
 - 1 case passenger brings the vehicle to a stop
 - 3 cases buses stop after colliding with fixed object

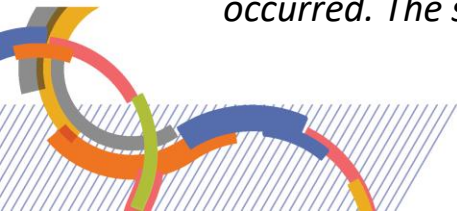
Note: Brake interlock was designed by OEM as a protection mechanism to prevent damage to overhead catenary and current collection systems to prevent damage when a de-wiring event occurred. The system was not intended to be a safety system or a means to secure the coach.

No pedestrian or bicyclist injuries.



King County
METRO

Moving forward together



Hybrid – First Observation

- Operator did not set parking brake or otherwise secure coach
- Bus rolls back into a fixed object
 - 15 sec and over 90 ft.

No pedestrian or bicyclist injuries.



Damage

- Buses
- Private vehicles
- Passenger injuries onboard
 - harsh braking
- Planter boxes
- Traffic control signal

\$80,000 property damage and medical,
excludes damage to buses.



Verification – Root Cause

- Audio on video where operators admits not setting the brake.
- Inspection by field supervisor at the scene verified that the brake was not set.
- Telemetric data verified:
 - The parking brake was not set.
 - All systems on the vehicles were working as they should be.
 - e.g. the door was open, engine in neutral, etc.



Root Cause 2

Electronic settings on the vehicle could be set to prevent vehicle from moving without someone in the seat and tapping the pedal.

Alarms could be set to remind operator to set the brake.

Operators get practical drift – periodic retraining not taking place.



Action Steps 1

- Verbal reminders over radio
- Verbal and written reminders at dispatch
- Field visits on the road by Base Chiefs
- Out House Journal Safety Reminder in restrooms
- Operator Bulletin
- Printed reminders on driver's seat and at base exits.
- Supervisors in bright T-shirts.



Action Steps 2

- Upgrade software on buses to:
 - Additional obnoxious alarm and dashboard warning when vehicle de-wires to remind to set brake;
 - Brake interlock does not disengage when poles are reset;
 - Cannot reset by reaching in the window and turning dial;
 - Operator must first press pedal before interlock disengages;
 - Set vehicle in drive.



Thank you.



King County
METRO

Moving forward together

