



**NTSB** National Transportation Safety Board

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*Office of Railroad, Pipeline and  
Hazardous Materials Safety*

# **DOT-111 Tank Car Design**

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# Previous Investigations

- 1991 Safety Study
- 1992 Superior, Wisconsin
- 2003 Tamaroa, Illinois
- 2006 New Brighton, Pennsylvania
- High incidence of tank failure

# Need for Better Tank Cars

- 69% of tank cars are DOT-111
- Transports wide spectrum of hazmat commodities
- 40,000 DOT-111's used to transport denatured fuel ethanol
- Ethanol is the most frequently transported hazardous material





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# Top Fittings Protection

- DOT-111 housings not effective in preventing impact damage



# Post Accident AAR Actions

- All new DOT-111 for ethanol and crude oil service beginning October 1, 2011:
  - Increase head and shell thickness
  - Normalized steel
  - 1/2-inch thick head shield
  - Top fitting protection



# Hazmat Unit Train Operations

- Certain hazardous materials are transported by unit train
- Virtual pipeline
- Risks are greater because of high concentration of hazardous materials
- Increasing number of unit train shipments

# Existing Tank Cars Not Addressed

- AAR actions do not address existing fleet
- Impediments to retrofitting or phase out
- Long service life
- Safety benefits not realized if old and new tank cars are commingled



# DOT-111 Design Inadequacies

- Tank head and shell puncture resistance systems and increased materials thickness may have reduced the severity of the accident
- Housings for protection of DOT-111 top fittings are inadequate to withstand the forces of a derailment

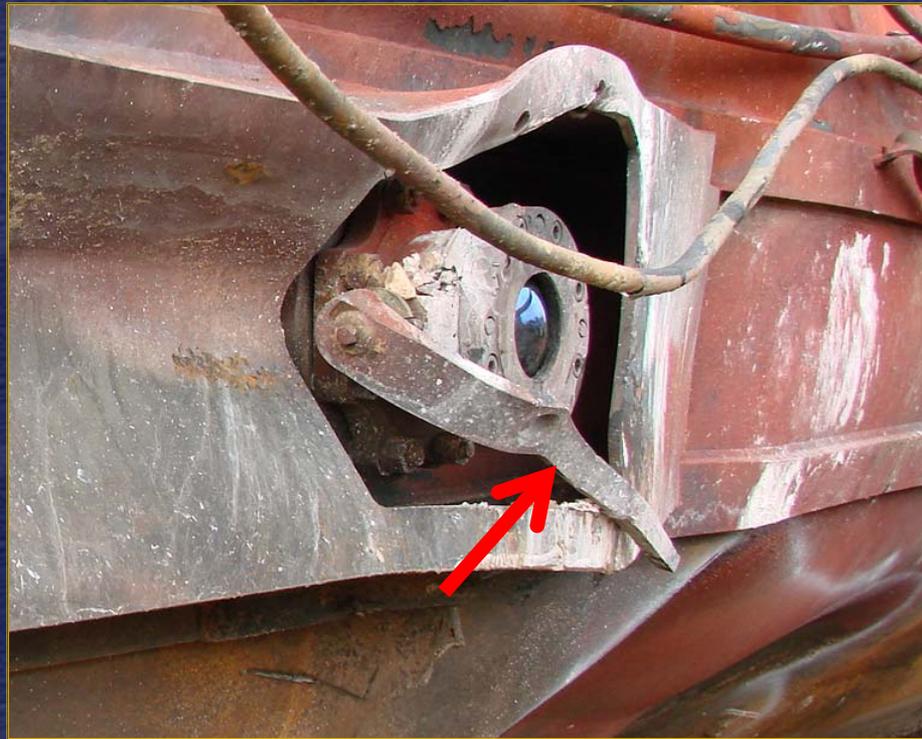


# Bottom Outlet Valves

- 3 bottom outlet valves opened and released product
- Handles supposed to remain closed during transit and break free in an accident
- Alternatively handles can be located above the skid structure



# Operating Handle Failures



CIT Configuration



GE/Trinity Configuration

# Operating Handle Failures (Cont.)

- Valve operating mechanisms compliant with current design requirements
- Handles became caught by objects and debris and caused valves to open
- Operating handles too robust and did not break free on impact
- Existing standards and regulations insufficient to ensure that bottom outlet valves remain closed during accidents





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