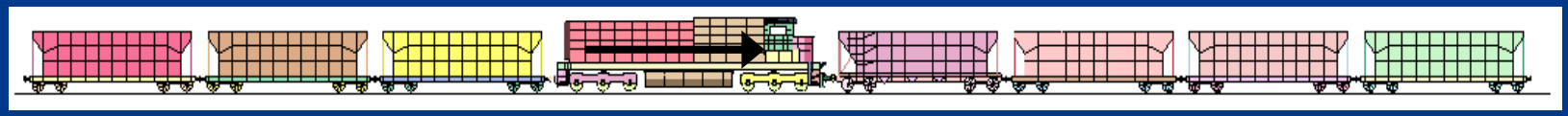
# Locomotive Collision Test #8

## Feasibility Study of Crew Protection in Locomotive Crash Scenarios Using Airbags – Airbag Design 1

# Test #8: Test Setup



3 loaded Hopper cars

Test Locomotive
(SD-45 converted
to SD-70)

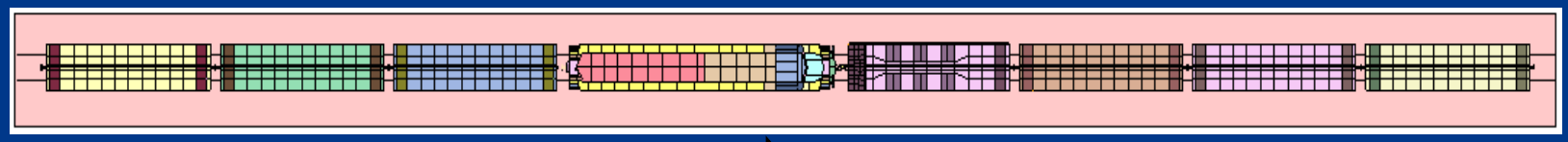
4 Loaded Hopper Cars
(Stationary)

Bullet Mass = 1,159,375 lbs

Target Mass = 943,704 lbs

Bullet Consist

Target Consist
Minimum brakes applied
to last hopper car

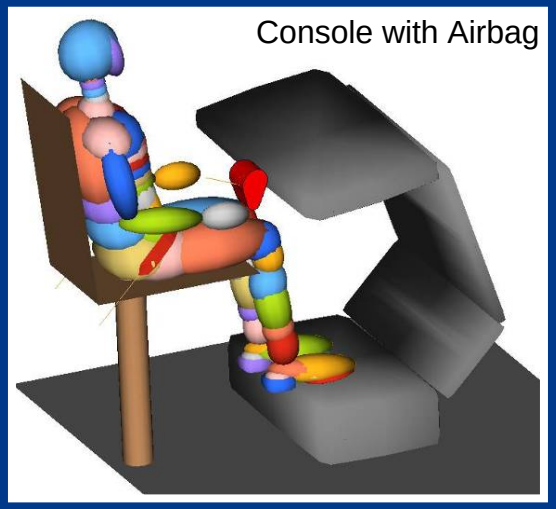


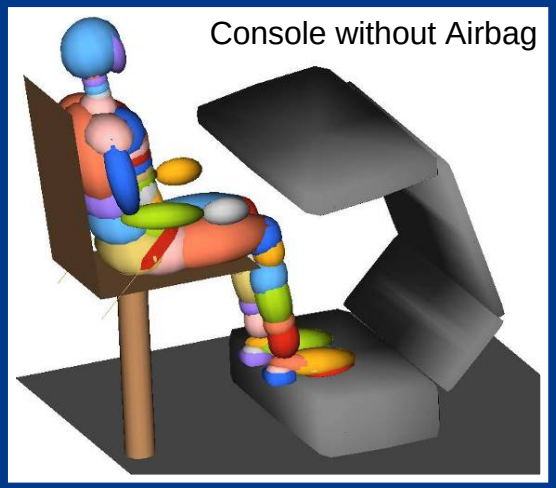
30 mph

Stationary

# Test #8: Test Setup – Airbag

- Airbag module consists of:
  - Console mounted housing
  - Igniter/inflation unit
  - Lightweight fabric airbag
- Airbag triggers at 35 ms prior to occupant moving 5 in forward (towards console)
- Airbag mounted in engineer's side desktop console
- Shape, size, inflation rate and speed are designed for locomotive application
- Occupant is belted using a lap belt
- Computer simulation is used to design airbag



# Test #8: Pre-Test Photos


Desktop console without airbag, conductor's side

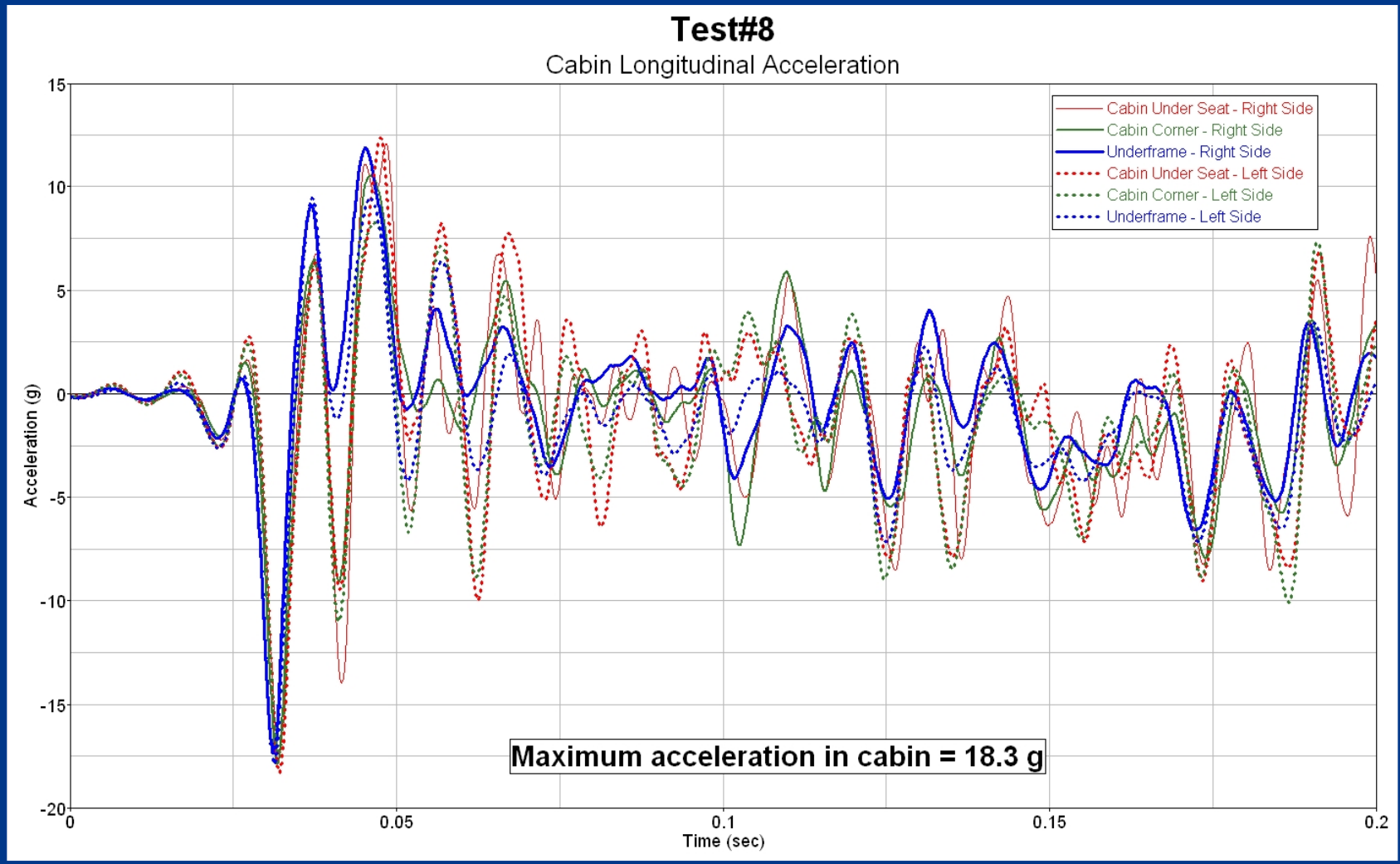
Desktop console with airbag, engineer's side

# Test #8: Post Test Photos

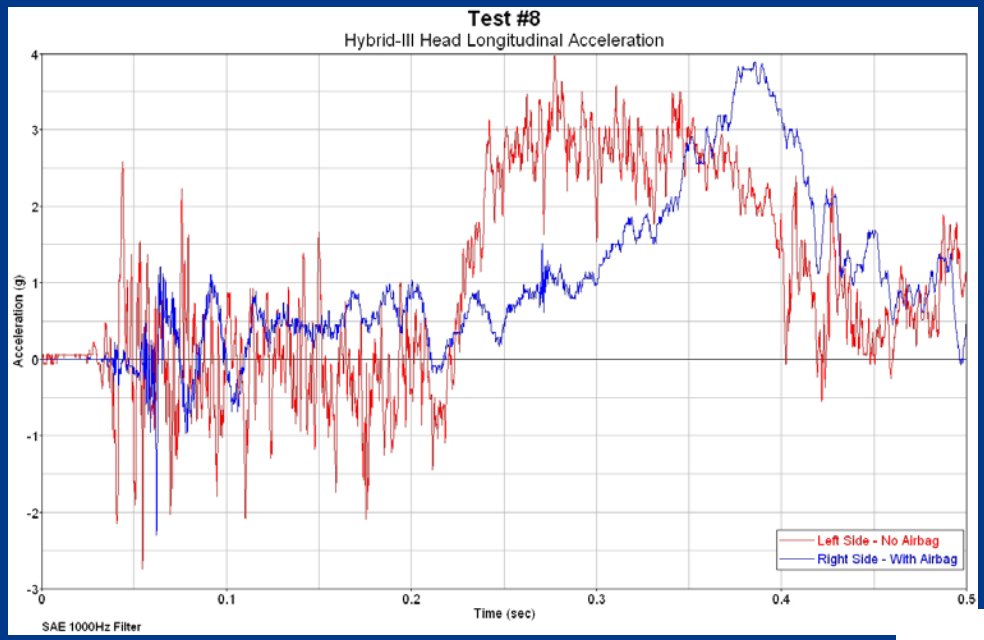


# Test #8: Post Test Photos

# Test #8: Locomotive Acceleration Data

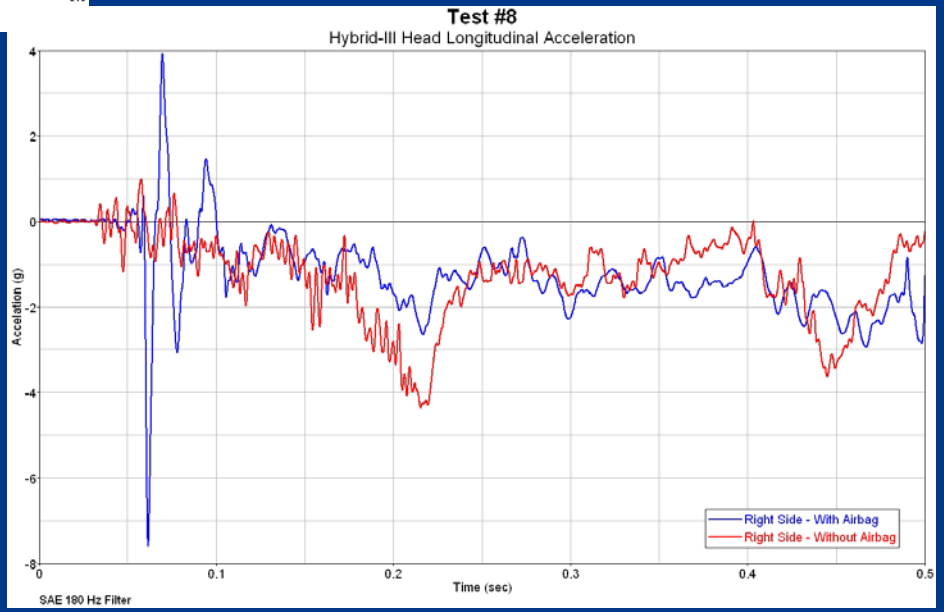


# Test #8: ATD Data

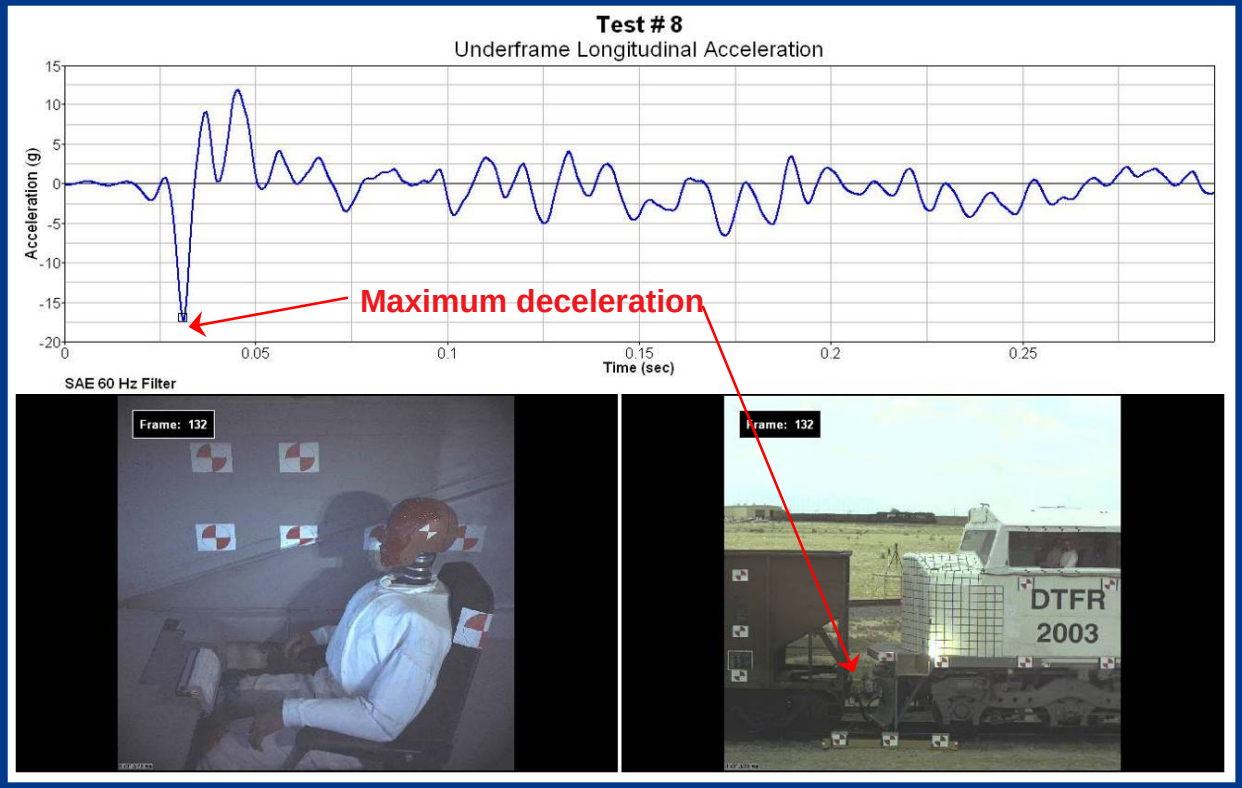



Chest Acceleration Comparison

Head Acceleration Comparison

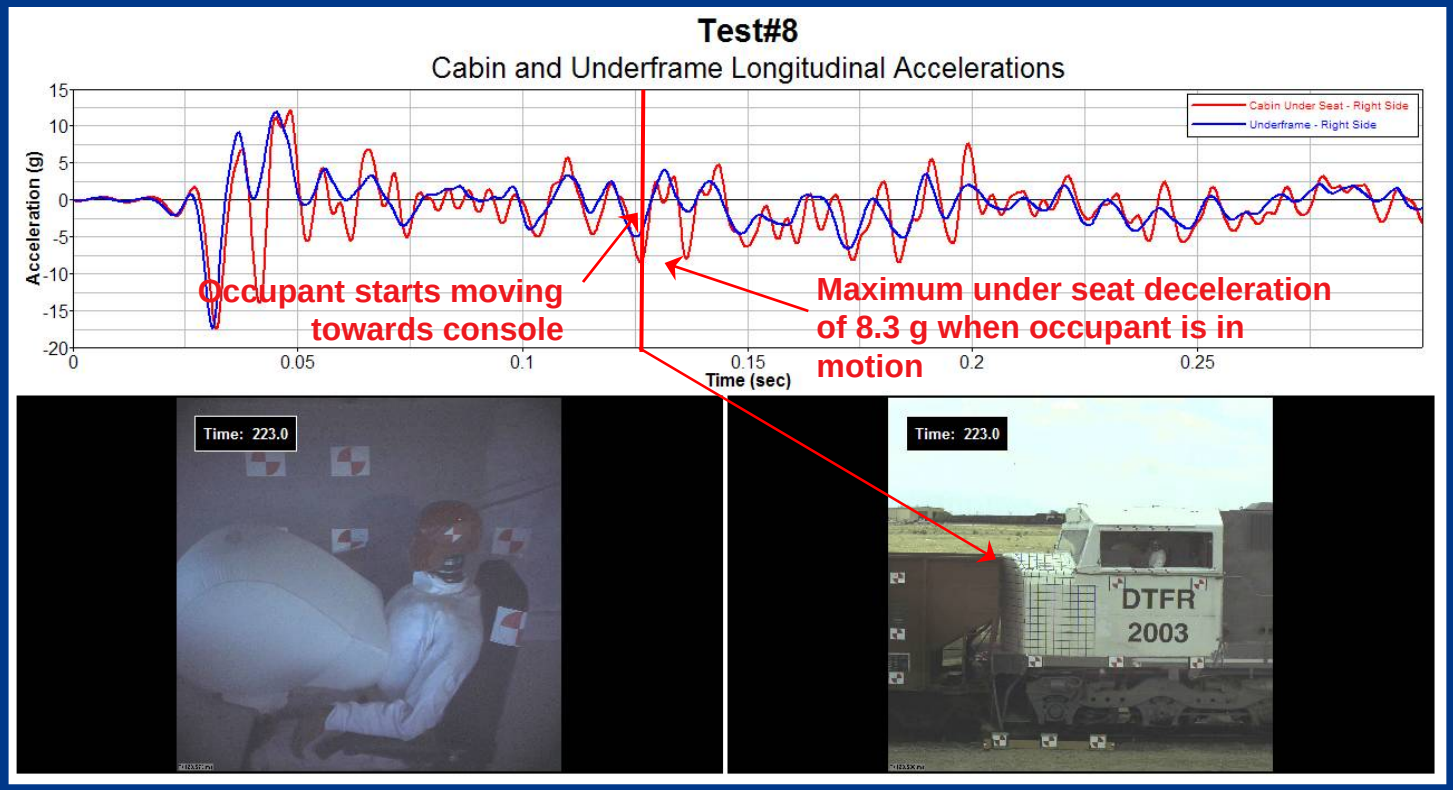


# Test #8: Data Analysis




- Maximum deceleration of 18.3 g for a duration of 7 milliseconds occurs at contact of bullet and target couplers
- The maximum initial acceleration occurs for a small duration (7 ms) to which the Hybrid-III ATD does not respond

# Test #8: Data Analysis




- Occupant starts moving towards console when hood of bullet locomotive contacts top of target hopper car
- Occupant longitudinal motion begins 89 milliseconds after the coupler contact with a maximum deceleration of 8.5 g during motion

# Test #8: Outcome

- What did we learn from this test?
  - Maximum peak deceleration is of a very short duration (7 ms) to which the occupant does not responds to
  - The occupant responses to a subsequent maximum of 8.3 g that initiates motion
  - The lower torso of Hybrid-III is inherently stiff and dummy's movement is further controlled by the lap belt
  - Due to low decelerations (when ATD is in motion), lap belt prevents the occupant from contacting the console
  - At higher decelerations the ATD would violently contact the console causing sever injuries. At these levels of decelerations, the airbag will greatly help in reducing the injuries