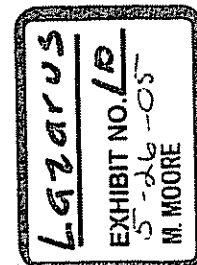
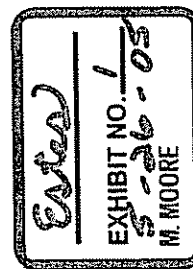
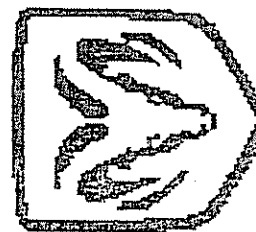


# FUEL SYSTEMS & IMPACT

Ginny Fischbach  
Manager, Truck Impact



*Lazarus Exh. 10*

# Fuel Systems & Impact

- I. Impact Department
  - A. Responsibility
  - B. Process
  - C. Relationship with Fuel Systems
- II. FMVSS 301
  - A. Current Regulations
  - B. Proposed Regulations
- III. Fuel System Design for Safety
  - A. Absolute vs Potential Failure
  - B. Design Considerations
  - C. Design Changes

# IMPACT RESPONSIBILITIES

- Coordination of impact test plan
- All full vehicle impact testing
  - FMVSS 204, 208, 212, 219, 301, 303
- Overall responsibility for impact compliance
- Knowledge of current impact regulations

## Pre-test Process

- Develop test plan
- Obtain "buy-in" from affected depts
- Order required vehicles
- Coordinate rebuilds or updates
- Fuel system purge & pressure check
- Work with test facility to assure valid, usable test

## Post-test Process

- Verify all test data
- Schedule post test static roll
- Oversee vehicle teardown and inspection
- Review test film and data
- Coordinate modifications for future tests

# Relationship with Fuel Systems

- Participation in impact development process
- Information needs to flow both ways
- Any design change must be communicated to Impact Department
- All test vehicles should be signed off for latest design level and updated if necessary

## Test Vehicles

- ALL test vehicles need correct parts
- Limited number of test vehicles
- Tests/vehicles are expensive - to test outdated parts wastes corporate manpower and resources
- Earlier test of design will allow more time for modifications

# Current FMVSS 301

## Test Modes

- Frontal
  - 30 mph, perpendicular +/- 30 degrees
- Lateral
  - 20 mph, moving barrier
- Rear
  - 30 mph, moving barrier
- Static Rollover
  - 360 degree roll in 90 degree increments
  - 1-3 minutes to reach each increment
  - hold each increment for 5 minutes



# Current FMVSS 301

## Test Conditions

- Fuel tank filled to 90-95% of capacity
- Remainder of fuel system filled to normal operating level
- Two FMVSS 208 test dummies in front
- Fuel pump is running at time of impact
- Vehicle is loaded to UVW + luggage + dummies

# Current FMVSS 301

## Test Requirements

- GWWR 10,000 pounds or less
- Fuel spillage
  - Barrier crash
    - 1 oz (by weight) during impact motion
    - 5 oz in 5 minutes after motion stopped
  - Rollover
    - 5 oz first 5 minutes of each 90 degree increment
    - 1 oz during any 1 minute period

# Proposed Legislation

- Current FMVSS 214 used in place of current lateral test
  - 33.5 mph
  - deformable, crab barrier
- 50 mph rear test
  - deformable FMVSS 214 barrier
- Rule making not expected until late

1997

# Fuel System Design for Safety

- Absolute vs potential test failure
  - design for zero leakage
  - contact with unfriendly surface is unacceptable
  - any contact with tank accessories is unacceptable
  - pinching of fuel lines, especially with sharp edges should be avoided (metal lines are more forgiving)

# Fuel System Design for Safety

- Test issues and post test inspection
  - check for secondary problem areas
  - be careful not to discount as "anomaly"
  - check for post test springback
  - inspect for any contact with the fuel system

# Fuel System Design for Safety

- Design considerations
  - Carefully check fuel line and hose routing
    - for pinch points and sharp surfaces
  - Relative motion of fuel system to body/frame
  - Fuel tanks will deform during impact
  - Shields may introduce new issues
  - Module must be tested at component level

# Design Changes

- All changes are important
- Impact Department should be notified of any change before it is put into production
- NO CHANGE IS NEGLIGIBLE!

# Summary

- Assure all test vehicles are built correctly
- Always do a thorough post test inspection
- Communicate, Communicate, Communicate