

PEDESTRIAN SAFETY

A System Safety Approach to Grade Crossing Pedestrian Treatments



Ronald W. Nickle,
MBTA Chief Safety Officer

System Safety Engineering

Systems Safety Engineering

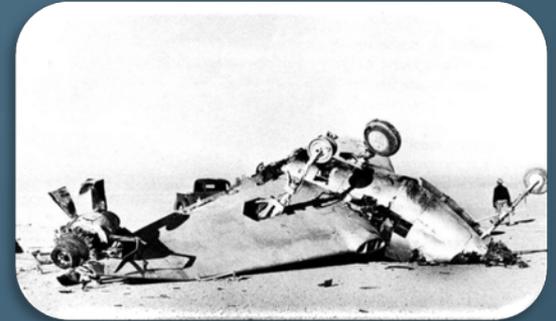
Fly - Fix - Fly



1947 to 1982

Aviation

▣ Aviation



System Safety Engineering and Management

- ▣ NASA – Challenger Disaster



Silent Safety Program



Disaster Outcomes

- ▣ Loss of life & injury
- ▣ Property damage
- ▣ System disruption
- ▣ Public outcry
- ▣ Political pressure
- ▣ Media frenzy
- ▣ > Oversight/regulatory
- ▣ Tarnished reputation
- ▣ Executive/CEO shake up
- ▣ Litigation
- ▣ Nightmare!!!! 🤔



System Safety Engineering & Management



Assuring system safety where complex systems protect life and property

- ▣ A comprehensive and systematic examination of a design, operation, or process, to:
 1. Identify safety critical hazards
 2. Determine engineering and/or management techniques to eliminate or control the consequence
 3. Verify controls are in place and adequate
 4. Monitor and modify, if necessary

Hazard Management

Design, Operation, Process and Interfaces

- Hazard analysis
 - **“Safety Critical”**
 - Preliminary hazard analysis
 - System hazard analysis
 - Subsystem hazard analysis
 - Operating hazard analysis
 - Software hazard analysis



System Safety Concepts



People

Procedures
Rules
Processes

System
Safety

Equipment
Infrastructure

Working
Environment



System Safety Hazard Analysis/Assessment



Working Environment

T
R
A
C
K



Class 4 Track Maximum Allowable Speed Passenger Rail 80 MPH

ROW Shared Corridor

- FRA Region
- FRA (D.C.)
- FRA State Partner
- UDOT State Safety Oversight
- FTA Region
- FTA Office of Safety & Security



S
O
U
N
D

B
A
R
R
I
E
R

Light Rail Operations, Union Pacific, Utah Railways, Savage

Grade Crossing



Gates and
signals

Center medians

FRA Quiet Zone

- No audible warning (Train or gates)
- Cement median
- Signage, markings
- Crossing gates



Pedestrian Crossings

- Bike lane
- Elementary, middle and high schools
- Within school zone
- Recreation Center



Pedestrian Crossings

- Sidewalk configuration
- Busy sidewalks and bike lanes



Neighborhood

H
I
G
H

T
E
E
N
A
G
E
R
S

R
E
S
I
D
E
N
T
I
A
L



Track

HIGH DENSITY FAMILY NEIGHBORHOOD

Siemens S70 Series

- Light Rail Vehicle
- Operating speed (65 MPH)
- High Acceleration Rate
- Superior Braking Rate
- 10 minute headways



June 8, 2011 Fatal Accident

- Sunny and clear
- Pre-revenue operations
- Train operator (3rd trip)
- Instructor onboard
- 15 year old pedestrian (Fatal)
- With 15 year old cousin (Stopped)
- Second train



Train Direction of Travel

- Train: WB 43 MPH
- Gates Down
- GCI flashing



Pedestrian's Path

- Pedestrian: SB 2 MPH
- Casual walk
- Texting and conversation



Pedestrian View



Train View



Accident Outcomes

- ❑ Loss of life & injury
- ❑ System disruption
- ❑ Public outcry
- ❑ Political pressure
- ❑ Media frenzy
- ❑ Oversight/regulatory
- ❑ Tarnished reputation
- ❑ Executive/CEO shake up
- ❑ Litigation



Lessons Learned - Pedestrian Treatments



Lessons Learned - Pedestrian Treatments



Lessons Learned - Pedestrian Treatments



Lessons Learned - Pedestrian Treatments



Lessons Learned - Pedestrian Treatments



Lessons Learned - Human Factor Operating Cab

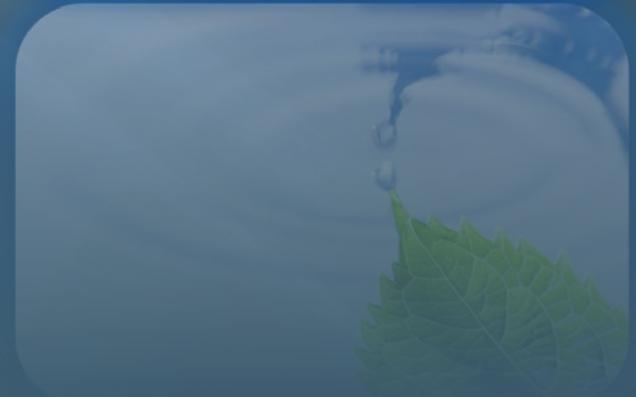




Lessons Learned

LESSONS LEARNED

- ✓ Organizational
- ✓ Planning, design, and engineering
- ✓ Construction phase
- ✓ Testing phase
- ✓ Pre-revenue phase
- ✓ Revenue phase
- ✓ Hazard management
- ✓ Ensure and monitor
- ✓ Adequate resources
- ✓ Safety stand-down
- ✓ Regulatory differences
- ✓ Safety Certification
- ✓ Inter-agency learning
- ✓ Continuous improvement



MEDIA Story



Questions????

