



NTSB National Transportation Safety Board

NTSB Fire Investigation

2007 Annual Fire Conference

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NTSB in a nutshell

- Independent federal agency
- Investigate transportation accidents
(Aviation, Marine, Highway, Rail & Pipeline)
- Investigate using the party system
- No regulatory or enforcement authority
- Establish factual record
- Determine probable cause
- Issue safety recommendations to prevent similar accidents

NTSB Organization



- The Board consists of the Chairman and four members appointed by the president
- The Modal Offices
(Aviation Safety, Marine Safety, Highway Safety, Rail-Pipeline & Hazardous materials)
- The Office of Research and Engineering
(Materials laboratory, Recorders laboratory, Vehicle performance, Safety Studies, Fire & Explosion)

Fire & Explosion Division

- Part of the Office of Research & Engineering
- 2* staff members
- Launch to an accident when fire is believed to be causal or a major contributor to the severity of the accident



How we investigate fires

- On scene examination & documentation
- Develop factual record (with party participation and agreement)
- Develop analysis (Independently)
- Research, testing & demonstrations to backup cause and recommendations
- We will do whatever it takes with whoever we need to do it with

Trans World Airlines Flight 800

In-flight Explosion

- B-747-100 takes off from JFK airport
- Shortly after takeoff the plane explodes over the ocean
- 230 fatalities, no survivors



Initial Information

- Radar indicates in-flight break-up
- Witness reports of explosion and fireball in air
- Wreckage found floating on water

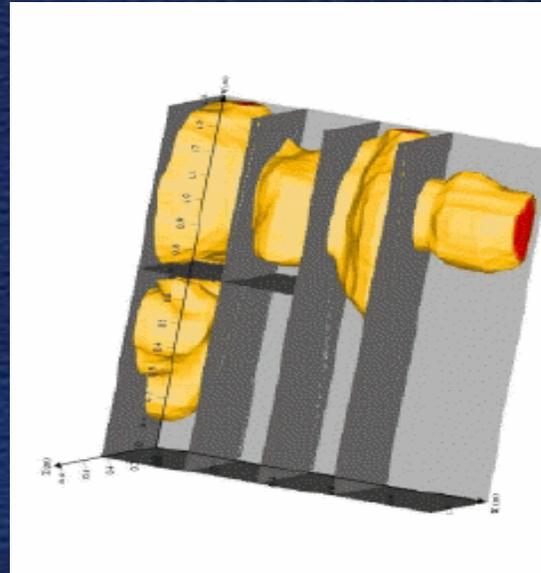
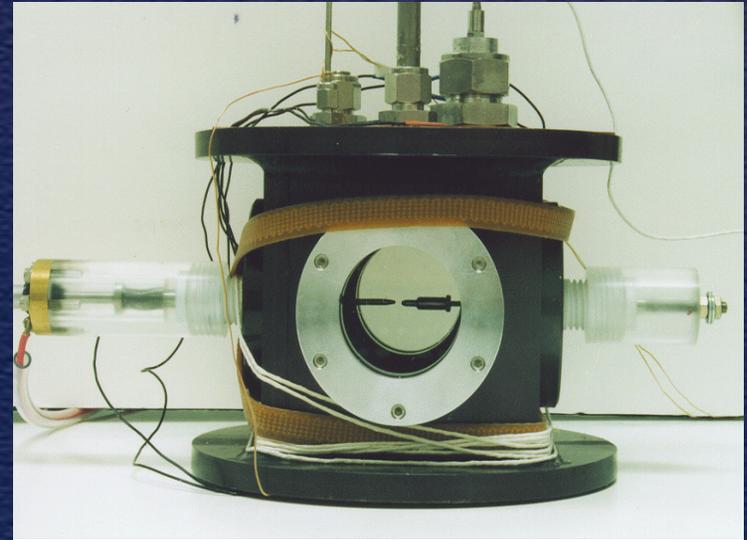
TWA 800 Reconstruction



TWA 800 Fire Research

- What are the temperature and vapor condition inside the fuel tank? Were these conditions flammable?
- How much energy does it take to ignite these flammable vapors?
- Is that energy available inside the fuel tank?
- Can an explosion of fuel vapors generate enough pressure to initiate destruction of the airplane?
- Do these pressures build up in a ventilated, multi-compartment fuel tank?

TWA 800 Fire Research



Trans World Airlines Flight 800

Conclusions

- The condition inside the center wing tank was flammable
- Sufficient energy, via electrical malfunction, was available for ignition
- The ignition and combustion of Jet A fuel can generate sufficient pressures to break apart the center wing tank

Resulting Actions

- Changes in fuel tank design and certification - flammability reduction
- Electrical protection and inspections

Wilmer Motorcoach Fire

- During the evacuation ahead of hurricane Rita, a motorcoach carrying nursing home residence, caught on fire and burned on the side of the road
- Bystanders and nursing home staff attempted to rescue passengers, many of whom were non-ambulatory
- There were 23 fatalities



Tire Fire Tests

- Tire fires and failures leading to tire fires
- Tire fire extinguishment
- Indicators and cues to preempt a fire
- Motor vehicle construction materials flammability and burnthrough



Tire Fire Tests

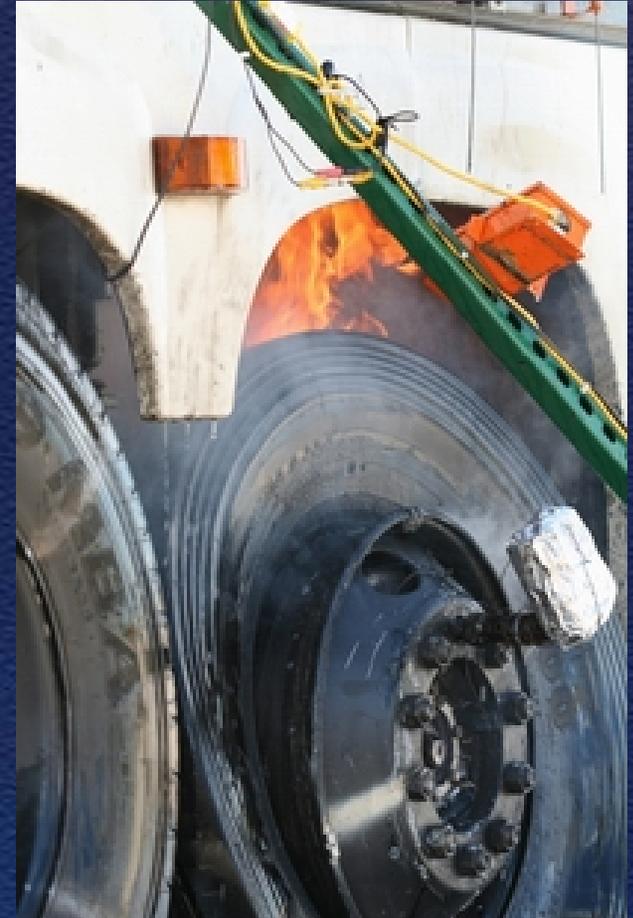


Tire fire test conclusions

- The driver receives no cues
- Hot wheel components can reignite fire
- Accessibility limits extinguisher effectiveness
- Abnormal temperature rise can be sensed in wheel components prior to ignition

Recommendations

- Develop systems to provide early warning of wheel component overheating
- Develop flammability standards for motorcoach exterior construction materials
- Develop standards for fuel system fire resistance



UPS DC-8 Cargo

- DC-8 Cargo plane experienced an in flight fire in route from Atlanta to Philadelphia
- No fatalities, total loss of the aircraft



NTSB



Successful Collaborations

- **Federal Agencies**

- Federal Aviation Administration
- National Institute of Standards and Technology
- Federal Bureau of Investigations
- Bureau of Alcohol Tobacco and Firearms
- Sandia National Laboratory

- **Academia**

- University of Maryland
- Caltech
- University of Nevada

- **Labs/Industry**

- Boeing
- Greyhound
- Christian Midelson
- Combustion Dynamics Laboratory
- Bridgestone/Firestone

Needs for future collaboration

- Every Accident is different and each requires different resources to bring the investigation to a conclusion
- We seek technical support on a case by case basis
- We will be calling on some of you for your technical expertise for future accident investigations

Contact Information

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Thank you!