

US Chemical Safety Board



Department of Energy/Energy Facility
Contractors Group
Joint Chemical Management Workshop



CSHIB History

- Conceived By Congress Following:
 - Series of Catastrophic Industrial Accidents in mid to late 1980
- Authorized Under 1990 Clean Air Act Amendments 42 US Code SS 7412
- Funded 1998



CSHIB Overview

- Board Consists of:
 - **5 Presidential Nominees**
Appointed for 5 Year Terms
 - Technical Qualifications
 - Professional Standing
 - Demonstrated Knowledge
- 37 Staff Positions
- 8.5 MM \$ Budget Request 2004



CSHIB Focus

- Determine Root/Contributing Cause(s)
- Issue Prevention Recommendations
- CSB is
 - Not a Regulatory Agency
 - Not an Enforcement Agency
 - But Influential in Broad Adoption of Recommendations to Prevent Recurrences



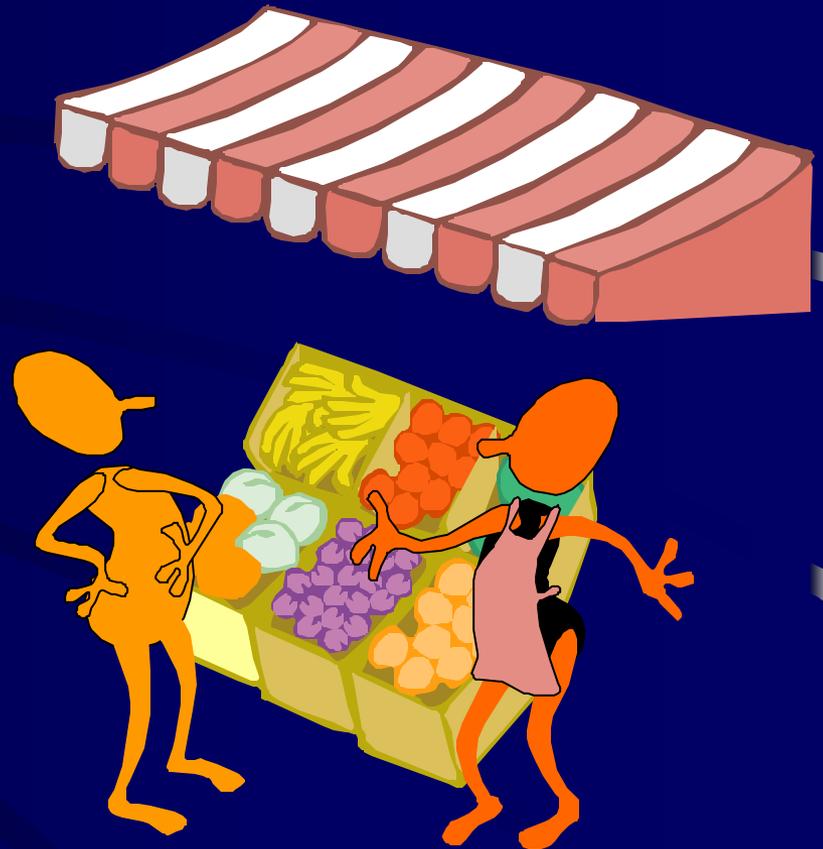
CSHIB Mission

- To *promote prevention of industrial chemical accidents* that harm employees, damage the environment and endanger the public



CSHIB Products

- Formal Reports and Recommendations
- Case Studies
- Incident Digests
- Safety Alerts
- Training Materials
- Web Page
- Presentations, Round Tables, Public Meetings





Recent Investigations

- **BLSR- Fire**
- **Kaltech – building explosion and fire**
- **First Chem- Explosion**
- **NaSH and Related Materials**
- **Toxic Sewer Gas**
- **West Pharmaceutical- Explosion**
- **CTA Acoustics- Explosion**
- **Technic- Fire**
- **Environmental Enterprises- H2S Release**
- **Catalyst Systems- Explosion**
- **Avery Dennison-Glue Release**
- **DD Williamson Explosion**
- **Honeywell-3 Separate Releases**
- **Isotech-Explosion**



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The Billion Dollar Question Is:

How Do You Prevent Unintended Events?

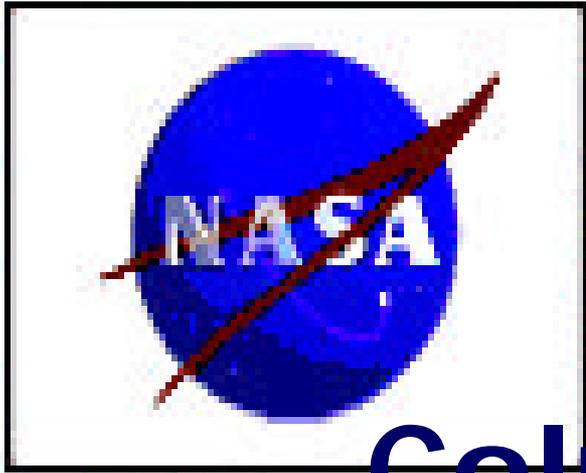


Unintended Incident Prevention Theories

- Hazard Recognition
- Engineering and Design
- Management Systems
- Human Factors
- Safety Culture



Let's look at a technical marvel but a Cultural Failure



- **Columbia Accident Investigation Board Reports Findings and Recommendations on Space Shuttle Disaster August 26th, 2003**



Accident Was Not Anomalous, Random Event



10/24/2003

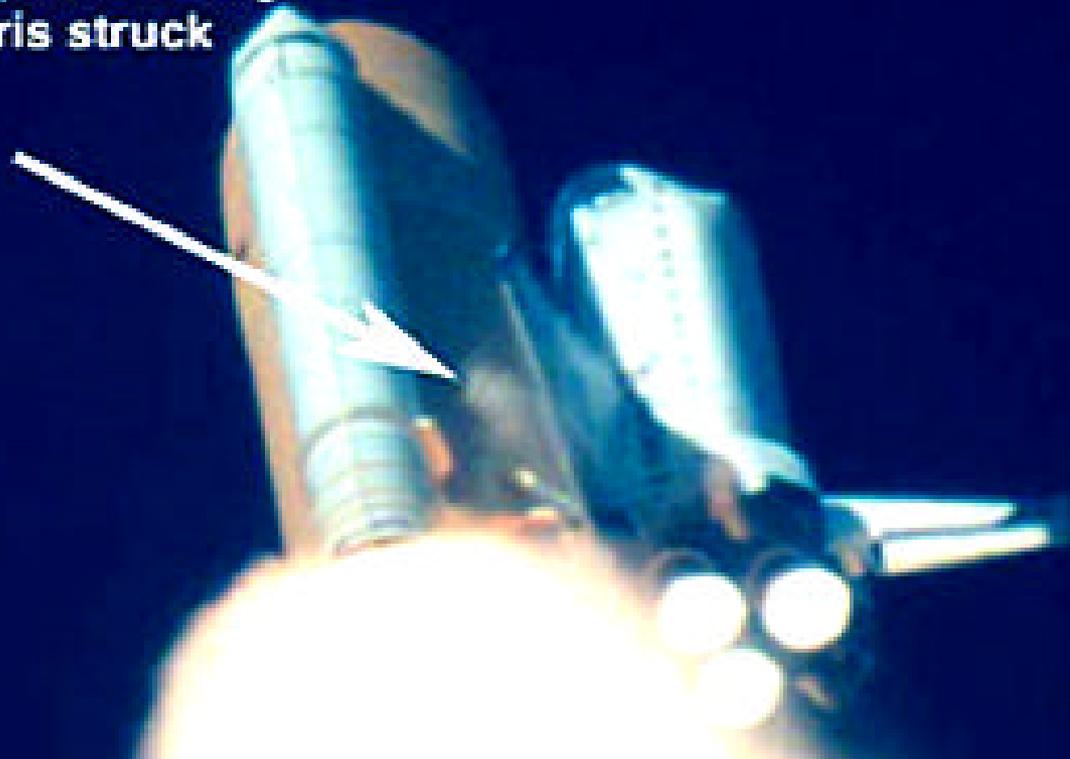
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What The Accident Investigation Board Found

Shower of particles
below (-Z) of LH wing
after debris struck
wing



CHSRP



Physical Cause



- **Breach in Left Wing Thermal Protection System 81.7 sec into flight caused by 3 lb insulating foam block hitting at 545 mph**
- **Breach allowed hot air to melt wing structure resulting in Shuttle break up and disintegration**



Looking For Root Cause

- "...the accident was probably not an anomalous, random event, but rather likely rooted to some degree in NASA's history and human spaceflight program culture." *CAI Board Report*



"Safety Culture" Breakdowns

- Program and design compromises to gain approval
- Fluctuating priorities
- Resource constraints, budget cuts, downsizing
- Scheduling pressures
- Mischaracterization of Shuttle Flights as Operational not Developmental
- Reliance on past success not sound engineering practices



"Safety Culture" Breakdowns

- Failure to evaluate signs of trouble-*Normal Abnormalities*
- Barriers to communication of safety risk information
- Stovepipe management structure and lack of departmental integration
- Informal chain of command



Facts That Cemented Tragedy

- Engineering expressed concerns over wing damage but confirming video was blurry, not available, or denied
- Management denied engineering requests for further damage evaluations
- Columbia had no provisions for EV activities or rescue
- Another Shuttle could have been ready for high risk rescue flight with volunteer crew if management had recognized problem and acted quickly
- Columbia could have flown for 3.5 weeks after launch



CAIB

Recommendations

- Address physical and 1 organizational cause of accident before return to flight....
 - Loss of foam
 - Lack of action to damage reports
 - Improved imaging of Shuttle from liftoff to Separation of External Tanks
 - In orbit inspection and repair of the Thermal Protection Panels
 - *Develop **independent** engineering and safety offices*



CAIB Recommendations

- Address organizational cause required in a long term "continuing to fly" program ...
 - Adopt Shuttle flight schedule consistent with resources
 - Implement expanded training beyond launch and ascent
 - Technical Engineering Authority have no connection or responsibility to schedule or program costs
 - Reorganize Space Shuttle Integration Office
 - Develop recertification program for Shuttle beyond 2010
 - Fund and update Shuttle engineering drawing system



Unintended Incident Prevention Requirements

- Hazard Recognition
- Engineering and Design
- Management Systems
- Human Factors
- Safety Culture



Some Recent CSHI Board Investigation and Cultural Findings





CL2 Release

- Emergency Shutdown System Failed
- Emergency Equipment Unusable
- Emergency Response Plan Unworkable





Chemical Refiner

- Knowledge of Decomposition Reaction Hazard Not Communicated
- Failure to React to Alarms and Instrumentation Warnings
- No Critical Process Failure Procedures
- Maintenance of Critical Equipment Failures





Gas Field Waste Handling-3 Killed

- Failure to Identify Material Hazards
- No Hazards Training
- Labeling and Language Issues
- No Safety Oversight Or Procedures



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Specialty Rubber Fabricator – 6 killed

- Hazard of Flammable Dust Unknown
- MSDS Warnings Missed
- Dust Ventilation Design Lacking







Acoustical Insulation Manufacturer-7 Killed

- Fail to Recognize Dust Hazard
- Frequent Fires Routine
- Critical Maintenance Delayed
- Scheduling Pressures





Refinery Fire 4 killed

- Hazard evaluation not done on emergency maintenance
- Safety oversight inadequate
- MOC Procedures not followed
- Known corrosion issues not addressed





Uncontrolled Reaction 3 Killed

- Common Safety Procedures Not Followed
- Decomposition Reaction Hazard Not Understood
- Hazard Evaluation Incomplete
- Engineering of Pressure Relief Inadequate
- Non-routine Operating Procedures Inadequate





Mixed Use Tank Explodes 1 Killed-8 Injured

- Management and Safety oversight inadequate
- Procedures shortcuts
- Engineering recommendations ignored
- Known maintenance or tank life issues not addressed
- Contents hazard not managed





CSHIB Work

- **Investigations...**
 - Incidents
 - Potential Hazards
- **Recommendations**
 - Incident Prevention
 - Hazard Identification
 - Regulatory Requirements
- **Incident Prevention Outreach**



**Accident
Prevention
In This
Phase of
Operation
is Too
Late!**



Contact Us!

- WWW.CSB.gov
- Leave Card for CSB Info Packet
- Auto Mail sign up
- Attend CSB Public Meetings
- Visit DC K st Office

