



**NTSB** National Transportation Safety Board

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# **The San Bruno Accident and Where We Go From Here**

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Board Member

8<sup>th</sup> Annual Pipeline Opportunities Conference  
April 4, 2012

# Pipeline Safety Opportunities

- Lessons learned
- Actions needed



UNITED STATES CODE, TITLE 49

## CHAPTER 11—NATIONAL TRANSPORTATION SAFETY BOARD

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### SUBCHAPTER 5—GENERAL

§1181. Definitions

Section 40102(a) of this title applies to this chapter.

### SUBCHAPTER 6—ORGANIZATION AND ADMINISTRATIVE

§1113. General organization

(a) ORGANIZATION.—The National Transportation Safety Board is an independent establishment of the Executive Branch of the Government.

(b) APPOINTMENT OF MEMBERS.—The Board is composed of 5 members appointed by the President, with the advice and consent of the Senate. Not more than 3 members may be appointed from the same political party. The members shall be appointed on the basis of technical qualification, professional standing, and demonstrated knowledge of accident reconstruction, safety engineering, human factors, transportation safety, or transportation regulation.

(c) TERMS OF OFFICE AND REMOVAL.—The term of office of each member is 7 years. An individual may be reappointed to fill a vacancy occurring before the expiration of the term for which the predecessor of that individual was appointed for the remainder of that term. When the term of office of a member ends, the President may reappoint a successor if a successor is appointed and qualified. The President may remove a member for inefficiency, neglect of duty, or other cause.

(d) CHAIRMAN AND VICE CHAIRMAN.—The President shall designate, by and with the advice and consent of the Senate, a Chairman of the Board. The President also shall designate a Vice Chairman of the Board. The terms of both the Chairman and Vice Chairman are 2 years. When the Chairman is absent or unable to perform the duties of the office, the Vice Chairman shall perform the duties of the office.

# Mission

The NTSB is charged with:

- 1) determining the probable cause of transportation accidents
- 2) making recommendations to prevent their recurrence



**The NTSB is Responsible for Investigating:**

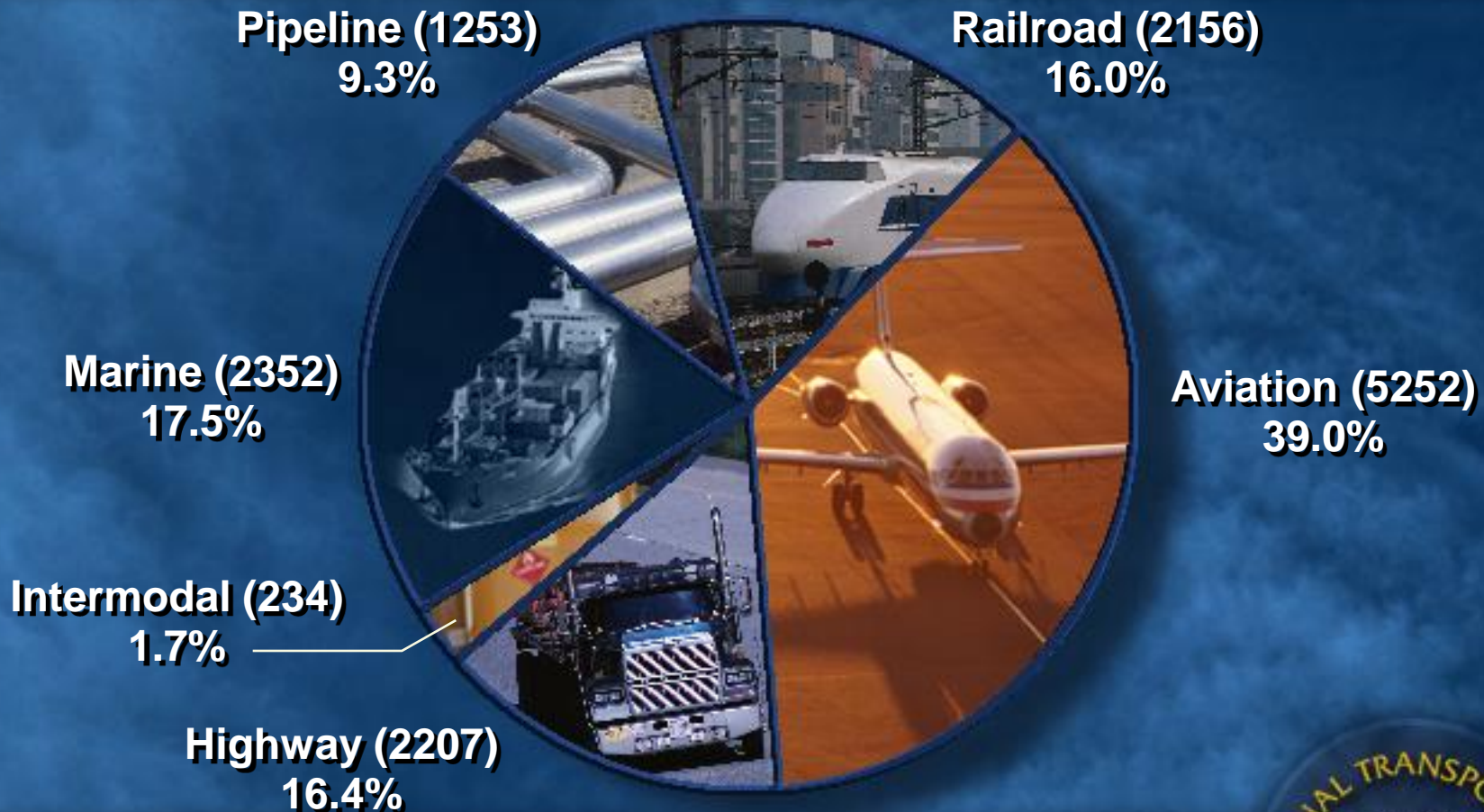
**Aviation, highway, rail, marine, pipeline,  
and hazardous material accidents**



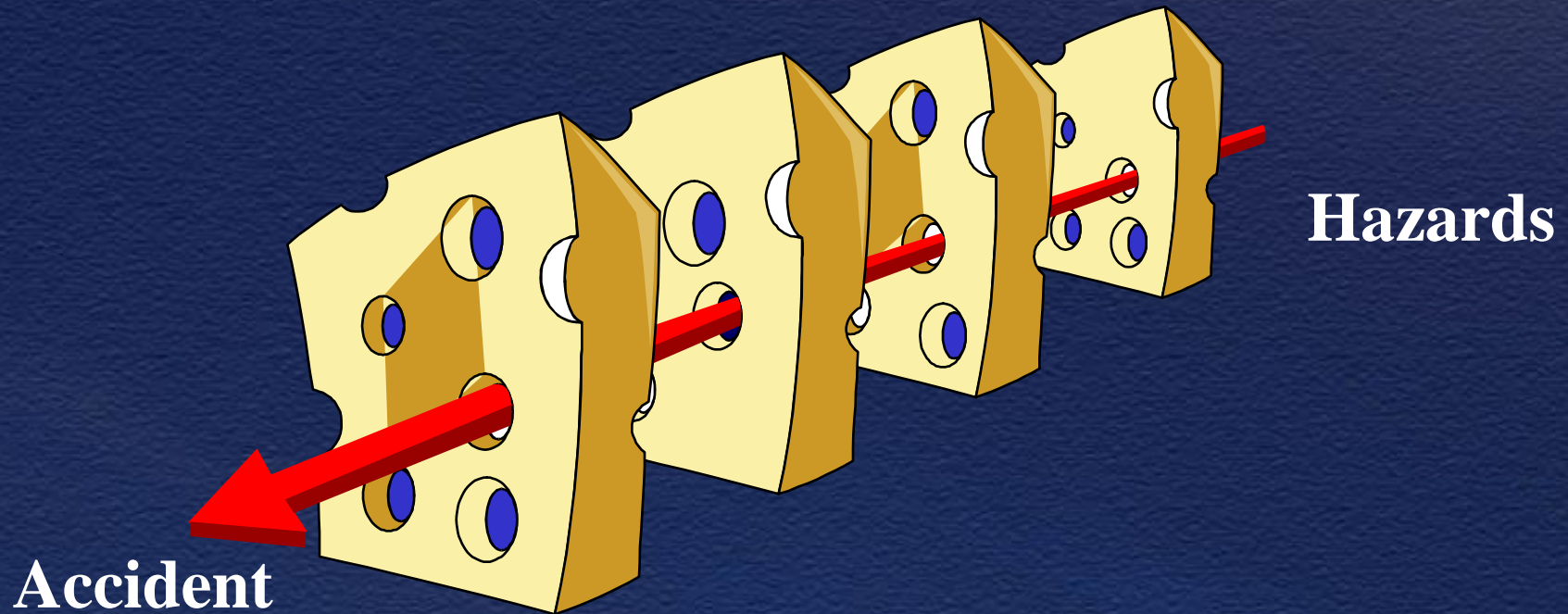


- 130,000+ accident investigations
- ~13,500 safety recommendations
  - 82% acceptance rate

# 13,454 Safety Recommendations issued since 1967

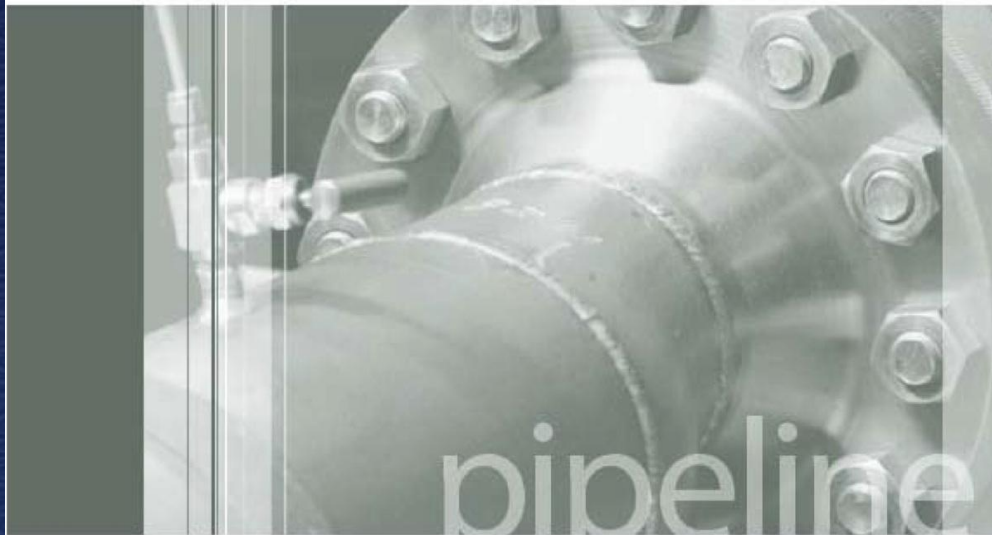


# “Swiss Cheese” Model (Reason)



Successive layers of defenses, barriers, and safeguards

Pacific Gas and Electric Company  
Natural Gas Transmission Pipeline Rupture and Fire  
San Bruno, California  
September 9, 2010



**Accident Report**

NTSB/PAR-11/01  
PB2011-916501



**National  
Transportation  
Safety Board**

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# Factual Information

- September 9, 2010 at about 6:11 p.m. (PDT)
- 30-inch-diameter segment of an intrastate natural gas transmission pipeline ruptured
- rupture produced 72 ft long by 26 ft wide crater
- ruptured pipe: 28 feet long, ~3,000 pounds, found 100 feet south of the crater
- estimated 47.6 million standard cubic feet of natural gas was released

# Ruptured Pipe



# PG&E/San Bruno Gas Pipeline Explosion

- 8 fatalities
- 10 serious injuries
- 48 minor injuries



- 108 homes affected
  - 38 destroyed
  - 17 sev - mod damage
  - 53 minor damage



San Bruno, CA

09/11/2010 14:13



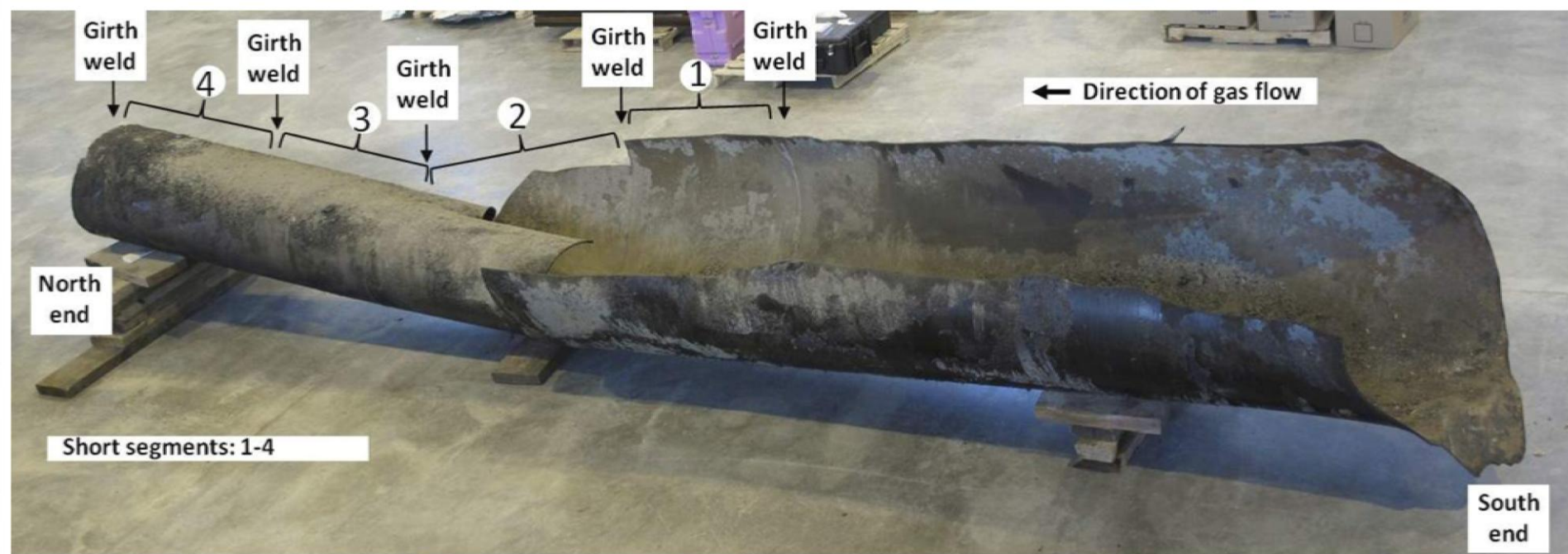
San Bruno, CA



# Probable Cause: PG&E

- (1) inadequate quality assurance and quality control in 1956 relocation project
  - allowed the installation of a substandard and poorly welded pipe section
  - with a visible seam weld flaw
  - over time grew to a critical size
  - causing the pipeline to rupture during a pressure increase
  - stemming from poorly planned electrical work

# Ruptured Pipe



Photograph of the 28-foot-long ruptured section of pipeline

# Probable Cause: PG&E

(2) inadequate pipeline integrity management program, which failed to detect and repair or remove the defective pipe section



# Contributing Factors

- CPUC and DOT exemptions of existing pipelines from regulatory requirement for pressure testing
  - likely would have detected the installation defects
- CPUC's failure to detect the inadequacies of PG&E's pipeline integrity management program

# Contributing to Accident Severity

- lack of either automatic shutoff valves or remote control valves on the line and PG&E's flawed emergency response procedures and delay in isolating the rupture to stop the flow of gas

— 95 minutes to shutoff gas flow —

# Safety Recommendations: 39

- PHMSA (16)
- PG&E (12)
- CPUC (5)
- U.S. Secretary of Transportation (4)
- INGAA and AGA (1)
- Governor of California (1)

# Beyond San Bruno . . .

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# Action Areas

- Aging infrastructure
  - records
  - testing
- Leak: timely/correct response
  - leak identification/location
  - shutoff (ACV/RCSV)
  - EM plan/response
- Safety regs/integrity management
  - reactive → proactive

# Aging Infrastructure: Records



San Bruno, CA

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# Testing and Inspection



DuBois pipe failure



DuBois



DuBois house destruction

DuBois, PA

# Leak Identification and Location



Marshall, MI



# Timely Response: ASV/RCSV

- NTSB recommendations for 40 years
  - 1972 (P-72-014 ):

“institute main line valve changes or modifications needed to reduce substantially the amount of time required to completely block off and isolate a failed pipeline section. Consideration should be given to the use of automatically operated valves, remotely operated valves”

# Timely Response: ASV/RCSV



Rancho Cordova: 2 hrs 47 mins

Rancho Cordova Damaged 1



San Bruno: 95 mins

©2010 Google  
©2010 Europa Technologies



Carmichael: 2 hrs

3 1401



San Francisco: 9+ hrs (1981)

# Leak: Timely/Correct Response

- Emergency response
  - response plans/scenarios/practice
  - local first responders informed
    - (location, substance, called)
  - coordination: company/emergency responders
  - community education
    - (early warning system; emergency action)
  - post-action evaluation/improvement

# Safety Regs/Integrity Management

- Safety regulations = minimum standard
- Integrity management programs
  - 10 years old, time to evaluate
  - address strengths and limitations
- Reactive  $\longrightarrow$  proactive

# Action Areas = Safety Opportunities

- Aging infrastructure
  - records
  - testing
- Leak: timely/correct response
  - leak identification/location
  - shutoff (ACV/RCSV)
  - EM plan/response
- Safety regs/integrity management
  - reactive → proactive

# Changing Safety Culture

Safety goal . . .

→ 0



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