National Transportation Safety Board

Pipeline Integrity Management: Next Steps

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Pipeline Safety: Risk Modeling Methodologies Public Workshop
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Outline

- NTSB Safety Study: ***Integrity Management of Gas Transmission Pipelines in High Consequence Areas***
- Identifying the issues
- Prioritizing the interventions

NTSB 101

- Independent federal agency, investigate transportation mishaps, all modes
- Determine probable cause and make recommendations to prevent recurrences
- Primary product: Safety Recommendations
  - Favorable response > 80%
- ***SINGLE FOCUS IS SAFETY***
- Independence
  - Political: Findings and recommendations based upon evidence rather than politics
  - Functional: No “dog in the fight”

Safety Study: Integrity Management of Gas Transmission Pipelines in High Consequence Areas

- January 27, 2015
- Recommendations to
  - PHMSA
  - AGA
  - INGAA
  - NAPSR
  - Federal Geographic Data Committee

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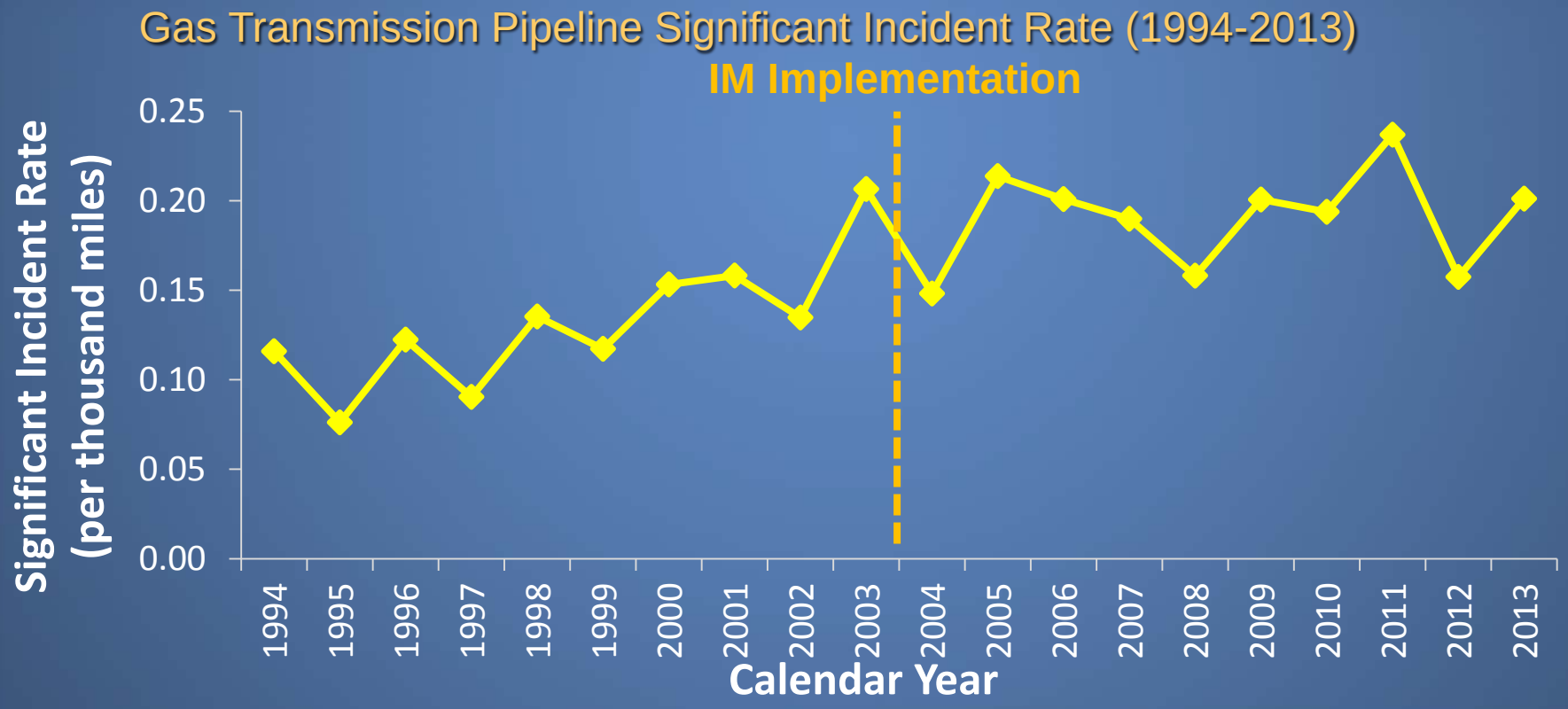
The Problem

- PHMSA Gas Pipeline Integrity Management Requirements effective 2004
- Trend since 2004 has not shown improvement



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IM Issues Addressed in Study

- HCA identification and verification
- Threat identification and risk assessment techniques
- Integrity assessment methods
- Continual assessment and data integration

Risk Modeling: Key Component of Gas Transmission Integrity Management

- Determines schedule for integrity assessments
- Helps determine which preventive and mitigative measures should be used
- In short, determines how resources are allocated toward risk reduction

Beyond Scope of the Study

- Different ways to identify the most effective interventions regarding *high consequence* events, as compared with *high frequency* events
- Challenges regarding prioritizing interventions

Identifying Issues For

- Low Frequency High Consequence Events
  - Effects often widespread, long-lasting, and very costly to remedy
  - Insiders surprised – rarely, if ever, seen it before
  - Exhaustive investigation, may take year or more
  - NTSB investigates, with collaboration from parties

Identifying Issues For

- High Frequency (Hopefully Low Consequence) Events
  - Frequently long-standing, stubbornly resist numerous improvement efforts
  - If longstanding, probably indicates process problems, rather than people problems
  - Generally more efficient to address trends than individual events
  - Suggest voluntary collaborative effort
  - In aviation, Commercial Aviation Safety Team (CAST)

Importance of Collaboration

Everyone who is involved in the problem should be involved in the solution

Key Ingredients for Collaboration

- Information
  - The more the better
  - Quality/accuracy is essential
- Sharing
  - Airlines freely share safety information because they do not compete on safety

High Consequence Events

- Several that the NTSB investigated are described in the Study
- Facts: NTSB used collaborative "party" process for developing the facts
- Analysis: NTSB invited analysis from parties and the public, for inclusion in public docket, but NTSB was the sole author of the official analysis

High Frequency Events

- Suggest voluntary collaborative process regarding trends
- Commercial aviation industry collaboration success story: Commercial Aviation Safety Team (CAST)

The Challenge: Increasing Complexity

- More system interdependencies
  - Large, complex, interactive system
  - Often tightly coupled
  - Hi-tech components
  - Continuous innovation
  - Ongoing evolution
- Safety issues are more likely to involve interactions between parts of the system

The Solution: System Think

Understanding how a change in one subsystem in a complex system may affect other subsystems within that system

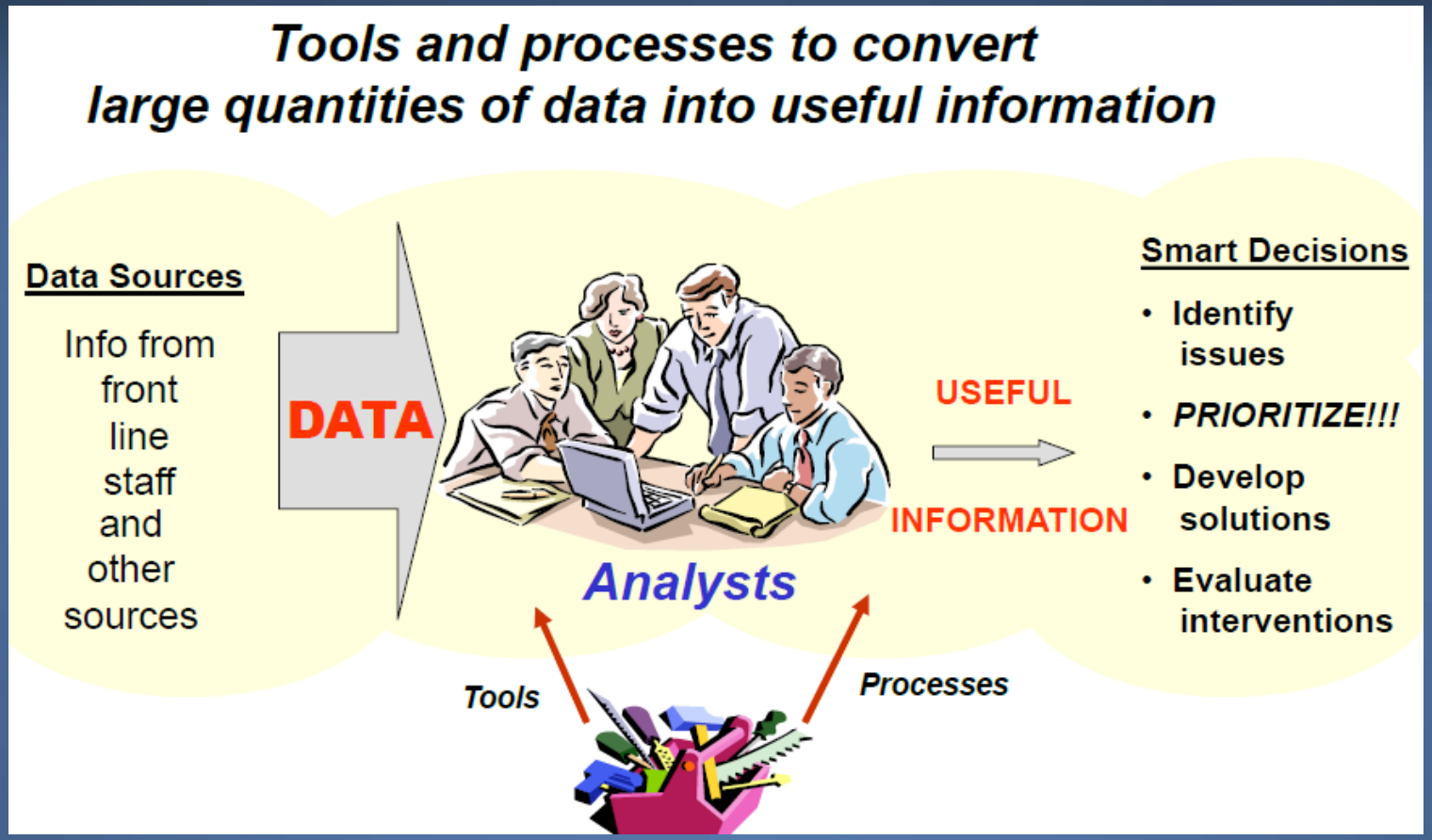
in other words . . .

Achieving the intended consequences without any unintended consequences

“System Think” via Collaboration

- Bringing all parts of a complex system together to collaboratively
  - Identify potential issues
  - Prioritize the issues
  - Develop solutions for the prioritized issues
  - Evaluate whether the solutions are:
    - Accomplishing the desired result, and
    - Not creating unintended consequences

From Data to Useful Information



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Aviation Success Story

- 83% decrease in fatal accident rate, 1998-2007
  - Largely because of “System Think,” fueled by proactive safety information programs
  - Impossible challenge: Accident rate was already very low in 1998

Icing on the Cake

- Improved not only safety, but productivity
  - Contrary to conventional wisdom
  - Sustainable
- Unintended consequences are rare
- Process generated no new regulations

How the Regulator Can Help

- Encourage and participate in industry-wide "System Think"
- Facilitate collection and analysis of information
  - Clarify and announce policies for protecting information and those who provide it
  - Encourage other industry participants to do the same
- Recognize that *compliance* is very important, but the mission is *reducing systemic risk*

Success Transferable?

- The CAST collaboration success is industry-wide
- Other aviation collaborative success stories at other levels, not so broad
- Suggest trying collaboration at any level, macro or micro, at which you have persistent problem

Prioritization Challenges

- A prioritization process can never be perfect because it is based largely upon predictions and expert judgment, especially in high-tech or otherwise continually evolving operations

- A robust prioritization process may help predict the *worst* or *most frequent* adverse events (user option), but probably not *every* adverse event*

* Thus, the continuing occurrence of adverse events does not necessarily indicate that the prioritization process is not working

Prioritization Challenges (con't)

- A prioritization process may face an uphill battle to the extent it directs resources toward the *worst* or *most frequent* adverse events, rather than toward the *most recent* adverse event
  - May be difficult to pursue long-term strategies due to being "whipsawed" by political and media pressures to prioritize response to the most recent mishap *("accident du jour")*

Examples

Was the issue not adequately considered, or was it considered but not given the highest priority, when:

- NASA responded inadequately to previous events of separated foam that struck the orbiter during launch
- Concorde manufacturer and operators responded inadequately to previous tire disintegrations during takeoff
- Ford and Firestone responded inadequately to previous tire failures and rollovers in Ford Explorers
- The intelligence community responded inadequately to reports about people who wanted to learn to fly – but not how to land – in an airliner flight simulator

Missing Element – The Harsh Glare of Hindsight

True, but Not Helpful

"Look at how much *LESS* it would have cost if we had addressed this hazard *BEFORE* it caused a mishap!"

and a variation on that theme . . .

"If you think managing this risk is expensive, wait until you see how much a mishap costs!"

Not Helpful Because . . .

You will probably identify *more potential concerns* than you have resources to address

Cost to address potential concern 1
+ Cost to address potential concern 2
+ Cost to address potential concern 3
+ . . .
+ . . .
+ . . .
+ Cost to address potential concern "n"

Total: Much more than available resources

So . . . how to decide what to fix first –
WITHOUT the benefit of 20-20 hindsight???

Factors to Consider

- Severity and likelihood – past, present, and future
- Cost of remedy
- Synergies of concern with other concerns?
- Synergies of remedy with other concerns/remedies?
- Other?
- Process question: First in, first out?

Future Prioritization Challenges

- IT advances enable collection and analysis of more data
- Industry is getting better at spotting pre-cursors before a mishap
- More potential problems to prioritize
- Risk management resources not likely to increase
- Difficulty of prioritizing potential mishaps that *have not yet occurred* over mishaps that *have already occurred*

Source of Improvements

Past

Future

(In aviation: "Fly, Fix, Fly")

Legend – Improvement Ideas From:

- Mishaps that *have already occurred*
- Mishaps that *could occur*

Prioritization Process Should Be:

- Robust
- Objective
- Repeatable
- Sustainable
- Affordable
- Understandable

Conclusion

- The challenges are significant
- We must all work together, with a collaborative focus on the big picture, in order to address them effectively

Thank You!!

Questions?