NTSB National Transportation Safety Board

Aviation SMS Process: Transferable to Pipelines?

Presentation to:

PHMSA Pipeline Safety Management System Workshop

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Date: July 2, 2014

Outline

- **NTSB's SMS Recommendation**
- **Model for Organization-Level SMS**
- **External Issues**
  - **Role of the Regulator**
  - **Role of Manufacturers**

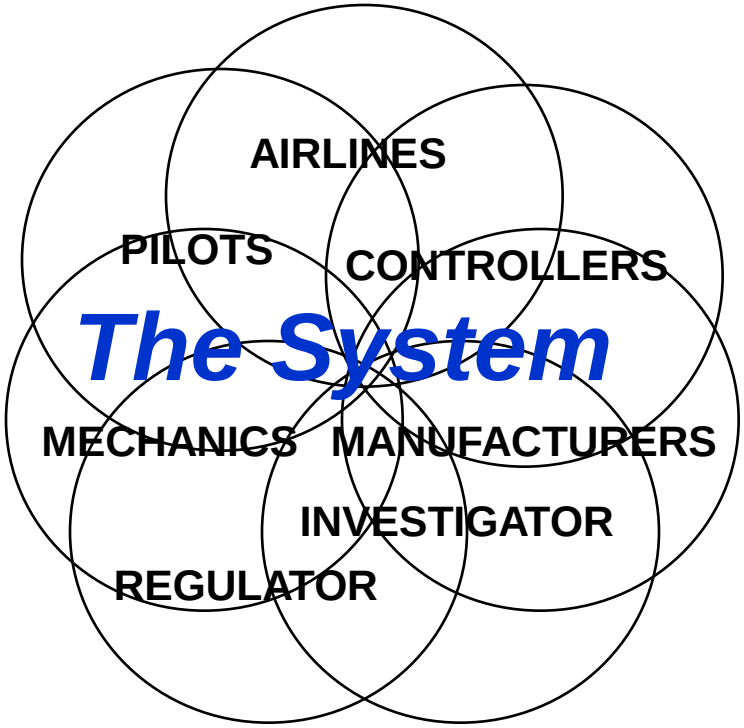
NTSB Report, Marshall, MI (2012)

- **Probable Cause: The rupture and prolonged release were made possible by *pervasive organizational failures* at . . . (Enbridge) that included the following:**
  - **Deficient integrity management procedures . . .**
  - **Inadequate training of control center personnel . . .**
  - **Insufficient public awareness and education . . .**
- **Finding No. 28. Pipeline safety would be enhanced if pipeline companies implemented safety management systems.**
- **Recommendation to API: Facilitate the development of a safety management system standard specific to the pipeline industry that is similar in scope to your Recommended Practice 750, Management of Process Hazards.**

Safety Issues in Complex Systems

- **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***



Effects of Increasing Complexity:

More "Human Error" Because

- System More Likely to be Error Prone
- Operators More Likely to Encounter Unanticipated Situations
- Operators More Likely to Encounter Situations in Which "By the Book" May Not Be Optimal ("workarounds")

The Result:

Front-Line Staff Who Are

- Highly Trained

- Competent

- Experienced,

-Trying to Do the Right Thing, and

- Proud of Doing It Well

. . . Yet They Still Commit

Inadvertent

Human Errors

The Solution: System Think

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

“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**

When Things Go Wrong

How It Is Now . . .

You are highly trained

and

If you did as trained, you would not make mistakes

so

You weren't careful enough

so

You should be PUNISHED!

How It Should Be . . .

You are human

and

Humans make mistakes

so

Let's *also* explore why the system allowed, or failed to accommodate, your mistake

and

Let's IMPROVE THE SYSTEM!

Fix the Person or the System?

Is the Person *Clumsy?*

Or Is the Problem . . .

The *Step???*

Enhance Understanding of <u>Person/System Interactions By:</u>

- Collecting,

- Analyzing, and

- Sharing

Information

Objectives:

Make the System

(a) Less Error Prone

and

(b) More Error Tolerant

Aviation Industry-Wide Success

83% Decrease **in Fatal Accident Rate, 1997 - 2007**

largely because of

System Think

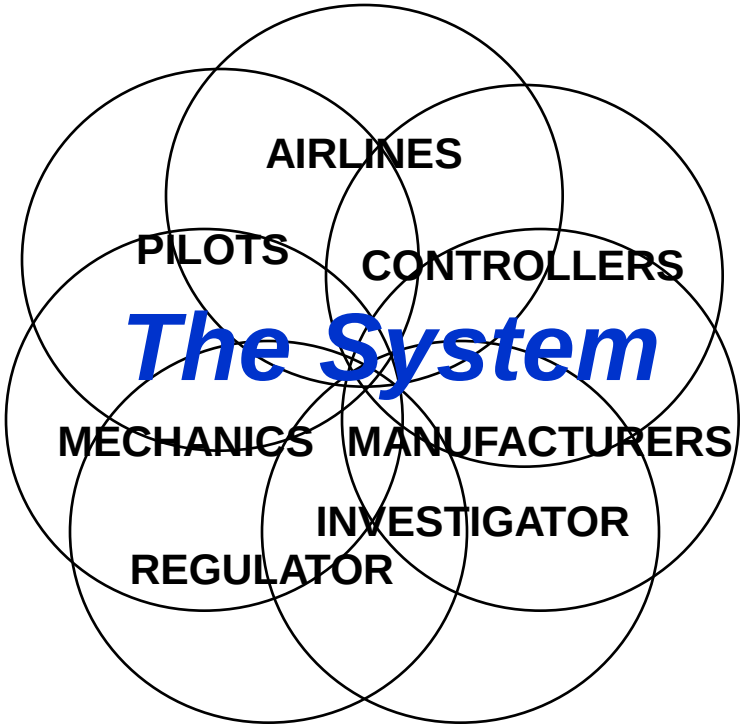
fueled by

Proactive Safety Information Programs

P.S. Not only did the process improve safety, it also improved productivity!

Aviation "System Think" Process

- **Engage *All* Participants In Identifying Problems and Developing and Evaluating Remedies**
- **Airlines**
- **Manufacturers**
  - ***With the systemwide effort***
  - ***With their own end users***
- **Air Traffic Organizations**
- **Labor**
  - ***Pilots***
  - ***Mechanics***
  - ***Air traffic controllers***
- **Regulator(s) [Query: Investigator(s)?]**



Moral of the Story

Anyone who is

involved in the *problem*

should be

involved in the *solution*

Collaboration: A Major Paradigm Shift

- **Old: Regulator identifies a problem and proposes solutions**
  - **Industry skeptical of regulator's understanding of the problem**
  - **Industry resists regulator's solutions and/or implements them begrudgingly**

- **New: Collaborative "System Think"**
  - **Industry involved in identifying problem**
  - **Industry "buy-in" re interventions because everyone had input, everyone's interests considered**
  - **Prompt and willing implementation**
  - **Interventions evaluated . . . *and tweaked as needed***
  - **Solutions probably more effective and efficient**
  - **Unintended consequences much less likely**

Challenges of Collaboration

- **Human nature: "I'm doing great . . . *the problem is everyone else"***
- **Differing and sometimes competing interests**
  - **Labor-management issues**
  - **May be potential co-defencants**
- **Regulator probably not welcome**
- **Not a democracy**
  - **Regulator must regulate**
- **Requires all to be willing, in their *enlightened self-interest,* to leave their "comfort zone" and think of the System**

System Think at Other Levels?

- **"System Think" can be successful at any macro/micro level, including**
  - **Entire industry**
  - **Company (some or all)**
  - **Type of activity**
  - **Facility**
  - **Team**
- **Persistent workplace problem?**

External Factors:
The Regulator's Role

- **Emphasize the importance of System issues *in addition to* *(not instead of)* worker issues**
- **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***

External Factors (con't): The Manufacturer's Role

Some aircraft manufacturers seek input, from the earliest design phases, from

- ***Pilots*** **(*User* Friendly)**
- ***Mechanics*** **(*Maintenance* Friendly)**
- ***Air Traffic Services*** **(*System* Friendly)**

Conclusions

- A properly structured collaborative safety improvement process includes all SMS elements
- The industry-level collaboration success provides a model for collaboration at the operator level
- The regulator plays a key role in enabling operator creation of a collaborative process
- Manufacturers can also play a role in improving an operator's collaborative process

Thank You!!!

Questions?