



NTSB National Transportation Safety Board

Aviation Lesson Learned:

Presentation to: DOE Nuclear
Executive Leadership Training

Name: Christopher A. Hart

Date: September 28, 2009

Two Essential HRO Ingredients

Outline

- **The Context**
- **Importance of Better Information**
- **Importance of “System Think”**
- **Safety Benefits**
- **Productivity Benefits**
- **Aviation Successes and Failures**
- **The Role of Leadership**

The Context: Increasing Complexity

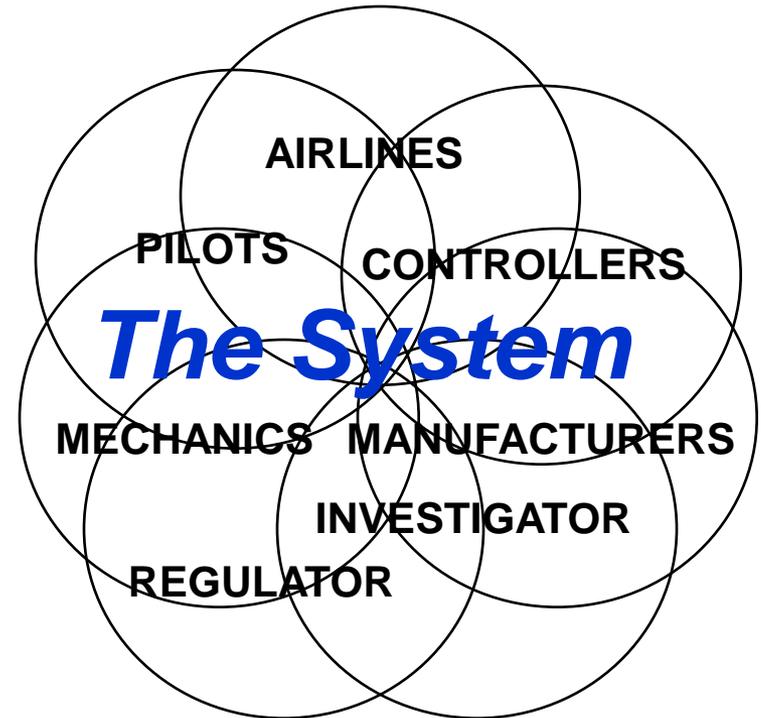
- **More System**

 - 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*



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**

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 Person/System Interactions By:

- Collecting,
 - Analyzing, and
 - Sharing
- ## Information

Aviation Success Story

65% Decrease in Fatal Accident Rate,
1997 - 2007

largely because of

Proactive

Safety Information Programs

plus

System Think

P.S. Aviation was already considered **VERY SAFE** in 1997!!

Objectives:

Make the System

***(a) Less
Error Prone***

and

***(b) More
Error Tolerant***

The Health Care Industry

To Err Is Human:

Building a Safer Health System

“The focus must shift from blaming individuals for past errors to a focus on preventing future errors by designing safety into the system.”

Institute of Medicine, Committee on Quality of Health Care in America, 1999

Major Source of Information: Hands-On “Front-Line” Employees

**“We Knew About
That Problem”**

***(and we knew it might hurt
someone sooner or later)***

Next Challenge



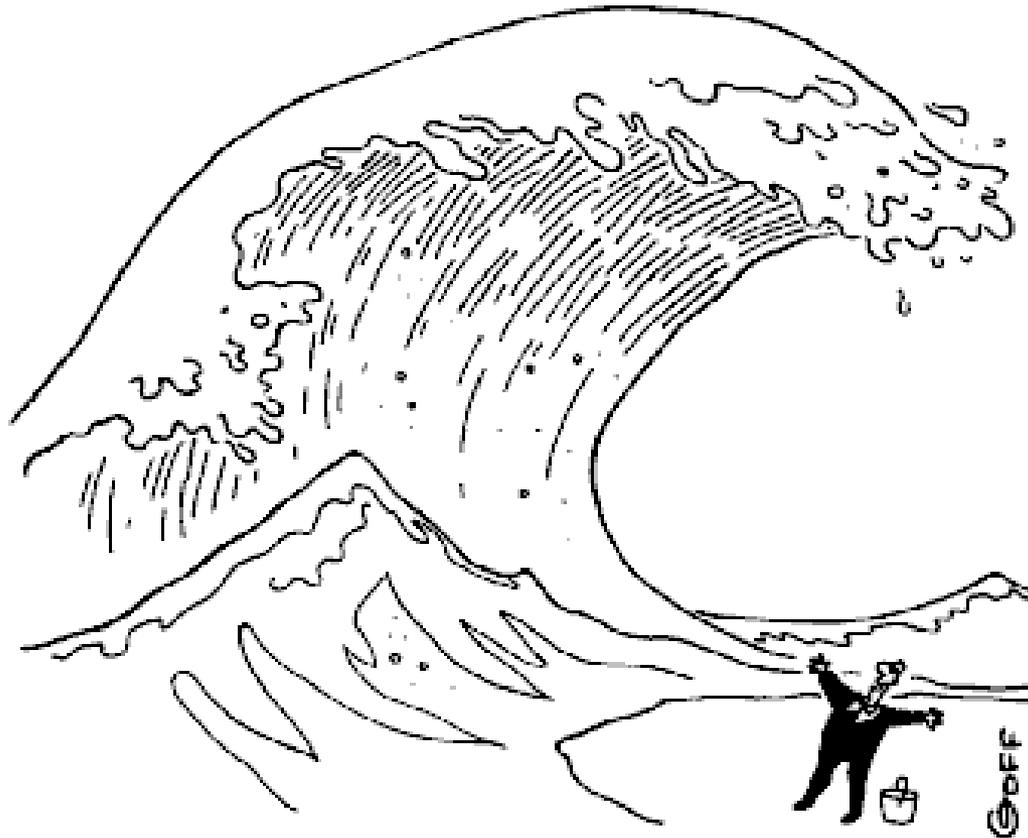
Legal/Cultural Issues

Improved Analytical Tools

As we begin to get over the first hurdle, we must start working on the next one . . .

Information Overload

© 1996 Ted Goff



"EUREKA! MORE INFORMATION!"

From Data to Information

Tools and processes to convert large quantities of data into useful information

Data Sources

Info from front line staff and other sources

DATA



Analysts

USEFUL

INFORMATION

Smart Decisions

- Identify issues
- **PRIORITIZE!!!**
- Develop solutions
- Evaluate interventions

Tools

Processes



Analytical Challenges

Analytical Tools Must Support Development of --

- Interventions that address **SYSTEM** issues, not just **OPERATOR** issues, and
- System interventions that
 - Are **SYSTEM-WIDE** in scope, and
 - Focus more effectively on **HUMAN FACTORS**

The (Very Challenging) Solution

Prioritization – Considering Factors Such As:

- **Severity – Past, Present, and Future**
- **Likelihood – Past, Present, and Future**
- **Cost of Remedy**
- **Synergies of Concern With Other Concerns**
- **Synergies of Remedy With Other Concerns/Remedies**

Ultimately, it will ALWAYS come down to a judgment call!

Sample Prioritization Queries

How Many *Other Pressing Issues* (If Any) Were Being Addressed When:

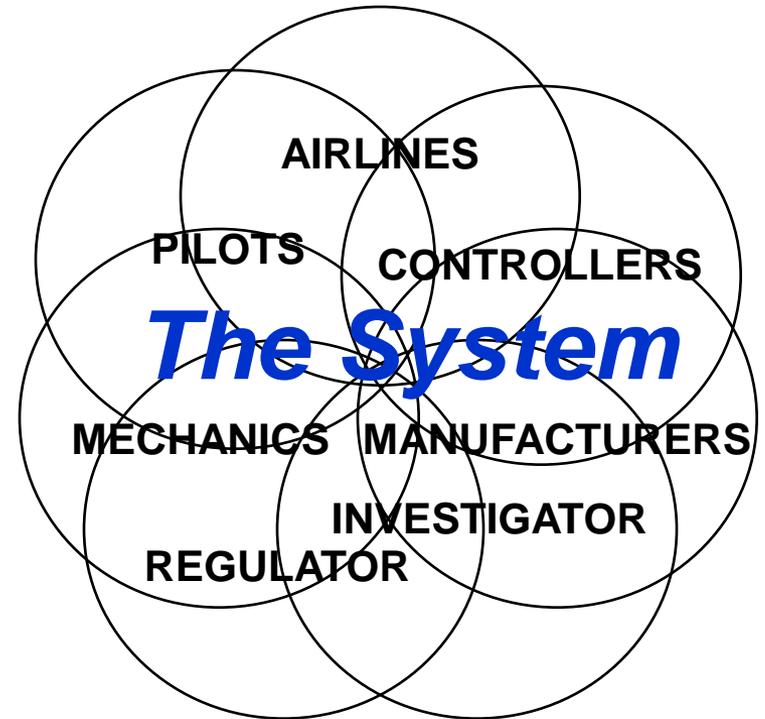
- **NASA** responded inadequately to previous events of separated foam that struck the orbiter during launch
- **Concorde** manufacturer and operators responded inadequately to previous tire disintegrations during takeoff
- **Ford and Firestone** responded inadequately to previous tire failures and rollovers 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

Aviation “System Think” Success

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)?]



Manufacturer “System Think” Success

Aircraft Manufacturers are Increasingly Seeking Input, Throughout the Design Process, From

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

Process Plus Fuel Can Produce An Amazing Win-Win



Not Only Improved Safety, But Improved Productivity, Too

- **Ground Proximity Warning System**
 - **S: *Reduced warning system complacency***
 - **P: *Reduced unnecessary missed approaches, saved workload, time, and fuel***
- **Flap Overspeed**
 - **S: *No more potentially compromised airplanes***
 - **P: *Significantly reduced need to take airplanes off line for **VERY EXPENSIVE (!!) disassembly, inspection, repair, and reassembly*****

The Role of Leadership

- Demonstrate Safety Commitment . . .

But Acknowledge That Mistakes Will Happen

- Include “Us” (e.g., System) Issues,
Not Just “You” (e.g., Training) Issues

- **Make Safety a Middle Management Metric**

- Engage Labor Early

- Include the **System** --

Manufacturers, Operators, Regulator(s), and Others

- Encourage and Facilitate Reporting

- Provide **Feedback**

- Provide Adequate **Resources**

- **Follow Through** With Action

Thank You!!!



Questions?