Safety and Productivity: Not Mutually Exclusive
The Contrast

- Conventional Wisdom:
  Improvements that reduce risk usually also reduce productivity

- Lesson Learned from Proactive Aviation Safety Information Programs:
  Risk can be reduced in a way that also results in immediate productivity improvements
Process Plus Fuel Creates A Win-Win

System Think - Process

Information From Front Lines

Improved Safety - AND - Improved Productivity
Outline
- The Context
- Importance of “System Think”
- Importance of Better Information
- 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”)

April 20, 2011

4th International HRO Conference
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
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
Current System Data Flow

Most Data Lost Forever

Currently Only a Minute Portion of Data is Collected and Analyzed
Major Source of Information: Hands-On “Front-Line” Employees

“We Knew About That Problem”

(and we knew it might hurt someone sooner or later)
Legal Concerns That Discourage Collection, Analysis, and Sharing

- Public Disclosure
- Job Sanctions and/or Enforcement
- Criminal Sanctions
- Civil Litigation
Typical “Cultural” Barrier

Middle Management

“Production First”

Front-Line Employees

“Please the Boss First… THEN Consider Safety?”

CEO

“Safety First”

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

"Eureka! More information!"

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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

Analysts

Tools and Processes

Smart Decisions
• Identify issues
• PRIORITIZE!!!
• Develop solutions
• Evaluate interventions

From Data to Useful Information
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)?]
Aviation Success Story

65% Decrease in Fatal Accident Rate, 1997 - 2007
largely because of

System Think

fueled by

Proactive Safety Information Programs

P.S. Aviation was already considered VERY SAFE in 1997!!
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)
Applicability of “System” Success:

• Entire Industry
• Company (Some or All)
• Type of Activity
• Facility
• Team
Failure: Inadequate “System Think”

- 1995 – Cali, Colombia
- Risk Factors
  - Night
  - Airport in Deep Valley
  - No Ground Radar
  - Airborne Terrain Alerting
    Limited to “Look-Down”
  - Last Minute Change in Approach
    - More rapid descent (throttles idle, spoilers)
    - Hurried reprogramming
- Navigation Radio Ambiguity
- Spoilers Do Not Retract With Power
Recommended Remedies Include:

• Operational
  – *Caution Re Last Minute Changes to the Approach*

• Aircraft/Avionics
  – Enhanced Ground Proximity Warning System
  – Spoilers That Retract With Max Power
  – Require Confirmation of Non-Obvious Changes
  – Unused or Passed Waypoints Remain In View

• Infrastructure
  – Three-Letter Navigational Radio Identifiers
  – Ground-Based Radar
  – Improved Reporting of, and Acting Upon, Safety Issues

*Note: All but one of these eight remedies address system issues*
Major Benefit: **$avings**

*Significantly More*

Than Savings From Mishaps Prevented

**OPERATIONS & MAINTENANCE**

Immediate Benefits

PREVENTION

Long-Term Benefits

ACCIDENT
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
But Then . . .

Why Are We So Jaded in the Belief That Improving Safety Will Probably Hurt the Bottom Line??
Costly Result$ Of Safety Improvements Poorly Done

<table>
<thead>
<tr>
<th>Safety Poorly Done</th>
<th>Safety Well Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Punish/re-train operator</td>
<td>Look beyond operator, also consider system issues</td>
</tr>
<tr>
<td>- Poor workforce morale</td>
<td></td>
</tr>
<tr>
<td>- Poor labor-management relations</td>
<td></td>
</tr>
<tr>
<td>- Labor reluctant to tell management what’s wrong</td>
<td></td>
</tr>
<tr>
<td>- Retraining/learning curve of new employee if “perpetrator” moved/fired</td>
<td></td>
</tr>
<tr>
<td>- Adverse impacts of equipment design ignored, problem may recur because manufacturers are not involved in improvement process</td>
<td></td>
</tr>
<tr>
<td>- Adverse impacts of procedures ignored, problem may recur because procedure originators (management and/or regulator) are not involved in improvement process</td>
<td></td>
</tr>
</tbody>
</table>
Costly Result$ Of Safety Poorly Done (con’t)

Safety **Poorly** Done

2. Management decides remedies unilaterally
   - Problem may not be fixed
   - Remedy may not be most effective, may generate other problems
   - Remedy may not be most cost effective, may reduce productivity
   - Reluctance to develop/implement remedies due to past remedy failures
   - Remedies less likely to address multiple problems

3. Remedies based upon instinct, gut feeling
   - Same costly results as No. 2, above

Safety **Well** Done

Apply “System Think,” with workers, to identify and solve problems

Remedies based upon evidence (including info from front-line workers)
### Costly Result$ Of Safety Poorly Done (con’t)

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<tr>
<td>4. Implementation is last step</td>
<td>Evaluation after implementation</td>
</tr>
<tr>
<td>- No measure of how well remedy worked (until next mishap)</td>
<td></td>
</tr>
<tr>
<td>- No measure of unintended consequences (until something else goes wrong)</td>
<td></td>
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</tbody>
</table>

**Conclusion: Is Safety Good Business?**

- Safety implemented poorly can be very costly (and ineffective)
- Safety implemented well, in addition to improving safety more effectively, can also create benefits greater than the costs
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
How The Regulator Can Help

- Emphasize 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*
Thank You!!!

Questions?