Safety Management Systems
Introduction

• Captain Nicholas Seemel, Jazz Aviation

• Mr. Don Arendt, Senior Technical Advisor Safety Management, Federal Aviation Administration
Safety Management

Something you **do**...

...not some **thing** you have.

Presented By: Don Arendt, PhD, ATP
Senior Technical Advisor for Safety Management
FAA Flight Standards Service
Start with “Why”

*Credit to Simon Sinek
Why are we doing this?

• [System safety is] the application of special technical and managerial [processes] to the systematic, forward-looking control of hazards…

• One system, two aspects:
  – Technical
  – Managerial

• People - a problem to control or a resource to harness?

Roland and Moriarty (1990); Sidney Dekker (2015)
Decision Making Balance

Safety

Mission

Decision Making

Money
Safety

“Safety is the state in which the risk of harm to persons or property is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and risk management”

ICAO Doc 9859
Safety: Operational Definition

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Operationally defined…

“Safety” is How well risk is managed
So where do we go from here?

For every complex question there’s a solution that’s clear, simple…

…and wrong.

H. L. Mencken
SMS Components ("Pillars")

- Policy
- Safety Risk Management
- Safety Assurance
- Safety Promotion
Accountability: What do we mean?

- Blame?
- A scapegoat?
- That’s “backward accountability”
- We want “forward looking accountability”
- Taking responsibility for reporting
- Willingness to admit mistakes
- Taking responsibility for change
Safety Risk Management (SRM) and Safety Assurance (SA)

SRM Diagram:
- System Description
- Hazard Ident
- Risk Analysis
- Risk Assmt
- Risk Control

SA Diagram:
- System Operation
- Data Acquisition & Process
- Analysis
- Perf. Assmt
- Corrective Action

Flow:
- Design
- Performance

Steps:
- Getting Facts
- Making Sense
- Making Decisions
- Action: Problem Resolution
- Description & Context

Information Flow:
Levels of Risk Management

In-Depth
- Policy/Procedures
- Task Analysis
- Training Design
- Development of Personal Practices
  - SMS: SRM

Deliberate
- Task/Job Planning
- Dispatch/Operational Control
- Pre-Shift/Pre-Task briefings
  - SMS: SA (Monitor)

Real Time/Time Critical
- Builds on others levels
- Mission/Situation events in real time
  - SMS: Operation

Time Available for Planning

Mission/Task Success

Situation Awareness
- Monitor
- Evaluate
- Anticipate
- Decision
- Action

Adapted from U.S. Navy OPNAVINST 3500.39C/U.S. Air Force AFI 90-802
SRM in a Nutshell
14 CFR Part 5, Subpart C

5.53(a) & (b)
Responsibilities
5.23(a)(2)(i)
5.25(c)(2)
Process
5.53(c)
Responsibility
5.25(c)(2)
Process
5.55(a)
Responsibility
5.23(a)(2)(i)
Authority
5.23(b)
Process
5.55(b)
Process; Procedures, Controls
5.55(c) & (d)

Risk Management
System Analysis
- Operation?
- Conditions?
Hazard Identification
- What could go wrong?
- Source/Conditions?
- Possible result?
Risk Analysis
- How Bad?
- How Likely?
Risk Assessment
- Acceptable risk?
Risk Control
- Control action?

Process, Procedures, Controls
5.55(c) & (d)

Controls
5.53(b)(1)
5.53(b)(2)
5.53(b)(3)

5.55(c) & (d)
Process Measurement (Subpart D)
Safety Assurance

SRM in a Nutshell
14 CFR Part 5, Subpart C

Interfaces
Potential Outcomes
Good
Bad
Ugly

...potential system failures or errors, possibly resulting in an accident

Operating Environment
Procedures
Personnel, Equipment, Facilities

Operational Function
Immediate Outcomes (Errors/Failures)
Control Effectiveness

Proactive Controls
Reactive Controls

Ultimate Outcome (Accidents)
Safety Performance Measures : Challenges

Everything that counts can’t [always] be counted...

...everything that can be counted doesn’t [necessarily] count.

Albert Einstein
Informed Decision Making

Analysis, Assessment, & Decision

- Continuous Monitoring:
  - Day to day, flight by flight
  - Job by job – supervise!

- Internal/External Audits:
  - Go out and look

- Employee Reporting:
  - Listen the front line

- Investigation:
  - Learn from error

- Preventive/Corrective Action:
  - Getting back on track

- Design/Re-design
  - Changes
  - Failures

- Back to SRM

- Affirmed:
  - Expectations met

- Internal Evaluation

Safety Management

Federal Aviation Administration
Traits of a Healthy Culture: High Reliability Organizations (HROs)

- Preoccupation with failure (track small failures)
- Reluctance to (over)simplify
- Sensitivity to operations
- Commitment to resilience (ability to recover)
- Deference to expertise

Weick & Sutcliffe
Fostering Cultural Maturation

Increasing Cultural/System Maturity

- **Proactive**: Internally Motivated, Organized
- **Bureaucratic**: Organized, Externally Motivated
- **Reactive**: Externally Motivated

Initiating

Continuous Improvement

Prof. Patrick Hudson; ECAST
*Original per Prof. Ron Westrum*
“Carelessness and overconfidence are more dangerous than deliberately accepted risk”
Wilbur Wright, 1901

Contact:
Don Arendt, Ph.D. ATP, CFI
(703) 338-7746 (Cell)
don.arendt@faa.gov

Wilbur Wright gliding, 1901
Photographs: Library of Congress
Backup Slides
Conditions that could result in unsafe states...
...potentially causing...
Conditions that could cause or contribute to an accident = “Hazards” (§ 5.53(c))