Jousting with Dragons: A Resilience Engineering approach to managing Safety Management Systems (SMS) in the transport sector

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My personal experience with Safety Management Systems

- **First day of flight school**
- **Four different fighter squadrons each with highly advanced Safety Management Systems**
  - 8 fatal aircraft accidents
  - 14 pilot fatalities
- **Each of those squadrons were safety award winners prior to the accidents**
Why am I here?

"The art of measuring nothing: The paradox of measuring safety in a changing civil aviation industry using traditional safety metrics" (Lofquist, 2010)

• What is safety?
• How do you define safety?
• How can you measure safety?
What to measure?

• Normal accident theory
  • Tight and loose coupling
• Organizational accident theory
  • Complexity and human interactions
  • Latent conditions
• High Reliability Organizations
  • Sensemaking
  • Mindfulness
"The paradoxes of almost totally safe transportation systems" (Amalberti, 2001).

• As Safety Management Systems become more effective as we reach ultra-safe levels of performance
  • Nothing to measure
  • Subjective metrics
  • Impossible to predict the next event
  • Most undesired events come as surprises
    • Or do they?
Safety Management Systems

Organizational processes model
(Socio-technical)

System Design  System Operations  System Outcomes

Proactive Phase  Interactive Phase  Reactive Phase

Organizational culture
Environment

Time
Jousting with Dragons

• Crossing operational boundaries that lead to surprise
  • Undesired outcomes
  • Unexpected
  • Unpredicted
• How can we predict the next undesired event?
Resilience Engineering

- A multi-disciplinary, theoretical approach to designing and managing complex, dynamic-adaptive socio-technical systems
- Bounded rationality
- Safety I vs. Safety II
Resilience

• "The ability of a system to adjust its functioning prior to, during, or following disturbances so that it can sustain required operations under expected and unexpected conditions" (Hollnagel, Braithwaite, & Wears, 2013. p. xxv.)

• “How to make high-risk, socio-technical systems more adaptive to internal and external threats and disruptions to system functioning through the quality of resilience” (Hollnagel, Woods, & Levesen, 2006).
How can we achieve better effectiveness of current Safety Management Systems?

• Engineer resilience into SMS that can capture the faint signals of drift into surprise
  • Structural
  • Psychological
  • Social
• Engage the "man-in-the-loop "
How can we do this?

- Leadership and culture
  - Understand the nature of complex, dynamic-adaptive environments
  - Limitations of static rules, regulations, procedures, checklists, etc.
  - Control-based (compliance) vs. relationship-based leadership
  - Empower individuals at the sharp end
    - Sensemaking/mindfulness/Just culture
- Capture the signals of drift (soft metrics)
- Reporting mechanisms that enable action