Flying Safe: What Aviation Does to Assure This – the Lessons for Medicine

SingHealth Risk Management Congress 18th August 2017
From the First Commercial Flight to today’s Commercial Flights.....
Man was never meant to fly... it defies gravity... yet we did!
It was a cost… the RISKS are still the same but the CONSEQUENCES are different!!

The first accident – 1908.

One casualty

Tenerife accident – 1977 583 casualties

And the NEWS headlines don’t help!!
The Environment is Complex
The Threats are Real

- Distractions
- Passenger events
- ATC
- Terrain
- Similar call sign
- Time pressures
- Flight diversion
- System malfunction
- Missed approach
- Automation event
- Heavy traffic
- Unfamiliar airport
- Ground Crew
- Weather
- Maintenance
- Cabin Crew
Yet, we are enjoying the safest period in aviation history!!

2.8 per million departures
How did the aviation industry get it’s accident rate so low?
It was an EVOLUTION
Accidents

Tenerife 1977

Fukoka 1996

Guam 1997

Tallahassee 2002

One too many but many good lessons.....
It started with Who or What did it?

It was either,
the PILOT
or
the AEROPLANE
or
SOMETHING ELSE
The REACTIVE phase

To find out ‘WHO or WHAT’ did it...

To Lessons Learnt
Lessons Learnt

Improvements in TECHNOLOGY
• Design
• Automation

Focus on HUMAN FACTORS / CREW RESOURCE MANAGEMENT
• Communication
• Situational Awareness
• Decision Making
• Teamwork

Introduction of REGULATION
Lessons Learnt - Technology

- Design / Systems
  - Autopilot / Autoland Capability
  - Wing Design
  - Composite Materials
  - Fly-By-Wire (FBW)
  - Flight Envelope Protection.
Lessons Learnt - Technology

✈ Design / Equipment
✈ Checklists
✈ Display Units - Glass Cockpits
✈ Traffic Collision Avoidance System (TCAS)
✈ Enhanced Ground Proximity Warning System (EGPWS)
✈ Enhanced Weather Radar Systems
✈ Flight Management Systems (FMS)
✈ Electronic Flight Bag (EFB)
✈ Engine Indication and Crew Alert System (EICAS) .
Lessons Learnt - Human Factors

Contributory Factors To The ‘Infamous CRM Accidents’

- Communication
- Monitoring
- Fixation
- Situational Awareness
- Teamwork
- Workload and Automation Management
- Complacency.

United Airlines DC-8 at Portland, 1978

Eastern Airlines 401 L-1011 at Florida Everglades, 1972

KLM/PanAm B747s at Tenerife, 1977
Lessons Learnt - Human Factors

- CREW RESOURCE MANAGEMENT
  - Communication
  - Situational Awareness
  - Decision Making
  - Teamwork
  - Workload and Automation Management
- NON-TECHNICAL SKILLS ASSESSMENT
- LOFT – Line Orientated Flight Training.
Lesson Learnt - Regulation

International Civil Aviation Organisation
ICAQ

- a UN specialized agency, established by States in 1944
- Establishes safety and operating standards for aviation for member states
- CAAS is a member state.
Lesson Learnt - Regulation

The Impact of ICAO

- ICAO Requirements
  - Accident Investigation
  - HF/CRM training
  - Operator Training
  - Safety Management System (SMS)
  - Fatigue Risk Management System (FRMS)
  - Aerodrome Standards
  - Security Protocols
  - Air Operator Certificates
  - Etc..
The Guardians of the Galaxy
But being

could only do so much
It only took care of the ‘SHARP END’
The EVOLUTION continued..
The **Reason Model**

*A look at the Organisational Error Chain*

Organisational and System Factors

Task and Environmental Conditions

Latent Conditions

Individual and Team Actions

Active Failures

Limited window/s of opportunity

Absent or Failed Defences

**ACCIDENT**

(reactive)

**PROACTIVE**

(adapted from Reason, 1990)
We need to **patch** the holes and also **find** the holes in the **SWISS CHEESE**..
IT’S NOT EASY

Accident

Serious incident

Significant event

Routine occurrence

Statistical event
- near misses

...events/occurrences NOT reported can lead to incidents and accidents!!

Mandatory Reports

Unreported

Flight Safety Foundation, 2006; Adapted with permission.
It starts here....

Severity

Reports

Accidents

Incidents

Errors

Normal activity

Looking for LATENT CONDITIONS (the HOLES)

Reporting system
A SYSTEM that creates a CULTURE
The CULTURE Onion

- Reporting Culture
- Just Culture
- Informed Culture
- Learning Culture
- Safety Culture
An Organisational Climate in which people are prepared to report their errors and near-misses.
An atmosphere of trust in which people are encouraged, even rewarded, for providing safety-related information and be clear about the line drawn between acceptable and non-acceptable behaviour.
Have current knowledge about the human, technical, organisational and environmental factors that determine the safety of the system as a whole.
The willingness and the competence to draw the right conclusions from its safety information system, and the will to implement major reforms when their need is indicated.
The way in which the organisation conducts its business and particularly in the way it manages risk.
Only then, will we have the Organisation and Individual Commitment to a...

Safety Culture
BUT WHY
Because.....

- SAFETY lies in the ORGANISATION CULTURE, not in the BARRIERS

It’s that CULTURE, when the ORGANISATION know that their operators are;

DOING THE RIGHT THING WHEN NO ONE IS WATCHING
That SAFETY CULTURE

- is a product of INDIVIDUAL and GROUP values, attitudes, perceptions, competencies and patterns of BEHAVIOUR that determine the commitment to, and the style and proficiency of, an organisation’s health and SAFETY management.
And it matters because..

Culture influences
- how juniors relate to their seniors
- Reporting of events
- how information is shared
- attitudes regarding stress and personal capabilities
- adherence to rules
- interaction with computers and technology.
THERE IS
A
METHOD
TO ALL
THE
MADNESS
A METHOD TO THE MADNESS

SAFETY MANAGEMENT SYSTEM

A *systematic approach* to managing safety, including the necessary *organizational structures, accountabilities, policies and procedures*. 
The 4 Pillars

1. SAFETY POLICY & OBJECTIVES
   - 1. Management Commitment
   - 2. Accountabilities & Key Personnel
   - 3. Emergency Response Planning

2. SAFETY RISK MANAGEMENT
   - 4. Hazard Identification
   - 5. Risk Assessment
   - 6. Risk Mitigation
   - 7. Management of Change

3. SAFETY PROMOTION
   - 8. Training & Education
   - 9. Safety Communication

4. SAFETY ASSURANCE
   - 10. Performance Monitoring
   - 11. Audit & Continual Improvement
   - 12. Documentation

The systematic, explicit & proactive approach to any SMS is guided by the framework that comprises of 4 main pillars & 12 elements.
1. Safety Policy & Objectives

1. Management Commitment
   • Safety policies, objectives and goals

2. Accountabilities & Key Personnel
   • Organisational Structure
   • Air Safety Committee
   • Safety Action Group

3. Emergency Response Planning
The Aviation World As It Is Today...
The Influencers

Global Warming
Climate Change
Unpredictability

Health Issues
Fatigue
Physical
Mental
Operational Climate
Labour Issues

New World Order
Security Concerns
Joint Ventures
Outsourcing
Low Cost Operations
Millenials
Increased Traffic

Technology
Drones
Data Overload
Constant
Connectivity
Ultra Long Haul

BUSINESS MODEL
The Threats
– Old & New

Weather
Maintenance
Ground Crew
Cabin Crew
Passenger events
ATC
Terrain
Similar call sign
Time pressures
Heavy traffic
Unfamiliar airport
Automation event
Missed approach
Flight diversion
System malfunction
Distractions
New Threats
New Risks !!
2. Safety Risk Management

The key component of SMS.

4. Hazard Identification

5. Risk Assessment

6. Risk Mitigation

7. Management of Change
3. Safety Promotion

8. Training & Education

9. Safety Communication
4. Safety Assurance

10. Performance Monitoring

11. Audit & Continual Improvement

12. Documentation
The PREDICTIVE phase

IATA Operations Safety Audit

Line Operations Safety Audit

Safety Attitude Survey

Flight Data Analysis Program

Flight Data Quality Assurance
So WHY am I here?
We are quite similar in our operating domains and are exposed to quite the same risks.

It’s in the spirit of sharing that we learn.
We are alike...

Physical Environment

Aviation System Influences

Organizational / Professional Cultures

Support Activities

Flight Crew

Aircraft

Physical Environment

Medical System Influences

Organizational / Professional Cultures

Support Staff

Nurses / Doctors

Patient
Aviation – Medicine

Similarities

- Safety focused
- Dynamic and complex environment
  - High information load
  - Concurrent task demands
- Variable workload (hours of boredom, moments of terror)
- Multi-disciplinary, team situation
- Increasing interaction with technology and automation.
Our Lessons at the SHARP END

• **Being REACTIVE could only do so much**
  ✷ We cannot eliminate human error
  ✷ Error is not deterministic but probabilistic

• **Human Factors remain the Weakest Link.**
  ✷ Recognise Human Performance Limitations
  ✷ Humans are unique yet fallible

• **Change is a Constant**
  ✷ Focus on human behaviour for teamwork
  ✷ Invest in Human Factors knowledge and training.
Our Lessons on the BACK END

- The Human Factor penetrates the SYSTEM
  - Instill a Safety Culture
  - Make the system resilient to Threats and Errors
  - Create a PROACTIVE Risk Management System
- Engage in activities directed at improving safety:
  - Technology
  - Research
  - Standard Operations
  - Training and Evaluation
  - Regulation.
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Thank You