EUROCONTROL

EUROCONTROL Network Manager

DNM/COO/NOM/SAF

ESP+ Programme

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SYSTEM SAFETY & HUMAN PERFORMANCE

WHY THINGS GO RIGHT

"A SYSTEMS PERSPECTIVE ON PEOPLE AND SAFETY"

26 - 27 SEPTEMBER 2013

STILLORGAN PARK HOTEL
DUBLIN

FOREWORD

“The industry’s 2012 record safety performance was the best in history. Each day approximately 100,000 flights arrive safely at their destination” according to Tony Tyler, IATA’s Director General and CEO. In 2012, close to 3 billion people flew safely on 37.5 million flights. Sadly, there were also 75 accidents in 2012, with fifteen of them having fatal consequences (414 fatalities). However, the numbers show that an accident is a rare event – the equivalent of one accident every five million flights in 2012 for global Western-built jets.

Pilots, controllers, engineers and others achieve these successes day-to-day because they are able to adjust how they work to match varying conditions. But when we try to understand safety, we tend to focus on rare cases of failure. In fact, we focus on so-called ‘human error’ and unsafety. Yet focusing on failure does not allow us to understand success because the rare failures are not typical of normal, effective system performance. Focusing on ‘human error’ does not explain why human performance practically always goes right and how it helps to meet ATM goals. Focusing on unsafety therefore does not show us which direction to take to keep the system safe.

The alternative is to focus on everyday successful work, performance variability and safety, via a systems approach. The elements (including the staff) of today’s complex ATM system are usually working effectively and successfully (i.e. meeting ATM goals). But they cannot simply work as prescribed because unforeseen situations and conditions appear everywhere, because we are constantly working in degraded modes of operation, and it is impossible to prescribe how to respond to every situation. So humans must continually adjust to current conditions and by varying their performance. As systems continue to grow in size and complexity, these adjustments become more important for successful performance and present both a challenge and an opportunity for safety and risk management.

As systems increase in complexity, we need new ways to think about system safety – considering the variability in demands, goals, resources, constraints, and performance. If we shall continue to improve safety, we need to consider how people and systems adapt, forestall failure and create safety.

This seminar is a unique opportunity to hear from three of the world’s most respected thinkers on systems safety: Professor Chris Johnson (University of Glasgow), Professor David Woods (Ohio State University), and Professor Erik Hollnagel (University of Southern Denmark). With latest theory and practical examples from industry, you will learn how people create safety in complex systems - sometimes against the odds.

The event will also strive to lead you to delve deeper in the subjects discussed. Each of the key presenters has prepared a few questions. You are asked to ponder on these questions before the event and then participate in the various Q & A and moderated sessions.

Degraded Modes of Operations

Degraded modes of interaction reflect the everyday reality of most complex systems where engineers and users find ways of “working around” failures in underlying infrastructures. These routine failures arise from many different causes including design flaws in legacy systems, variations in the configuration of new applications, from routine stochastic failures in hardware components, interventions by sub-contractors etc. In this seminar we will explain the implications of a culture of coping with degraded modes and explore how degradations lead to local adaptations. In particular, we will focus on the human factors of engineering in safety-related applications.

Key questions:

- How can we cope with everyday failures to maintain levels of service without undermining system safety?
- Can we develop rapid forms of risk assessment to identify potential dangers from degraded modes with limited resources of time and safety-management expertise?
- What are the human factors that most influence infrastructure engineering and how do they differ from the human factors of system operators?

Professor Chris Johnson

Navigating Seas of Complexity (Trade Offs)

This talk will present the story of complexity, brittleness, and resilience in human systems that perform difficult activities under pressure to be both highly productive and ultra safe.

Failure is due to brittle systems, not human error. Systems operate successfully due to sources of resilience, usually hidden or under appreciated. Explaining accidents by attributing error to one or another component, usually a human, hides the operation of the systemic factors that create brittleness or resilience. As a result of this and other simplifications, systems are more precarious than appreciated by stakeholders.

Brittleness plagues systems ironically due to new capabilities that increase interdependencies - therefore complexity is the source of the threats to safety and to organisational viability. The same factors that produce short run improvements add to complexity that sets the stage for sudden puzzling collapses when, inevitably, events challenge the performance boundaries inherent in all systems.

But surprises, though inevitable and ongoing, are handled regularly as people in various roles step into the breach to overcome adaptive shortfalls and supply extra sources of resilience. In other words, hidden by successful adaptation, people anticipate bottlenecks ahead, act to fill gaps, and forestall failure.

Stakeholders miss how their systems are precarious in the face of surprise and how sources of resilience forestall failures because they are trapped in simplifications. The urge to simplify, linearise, and compartmentalise guarantees organisations will miss, hobble, and eliminate the sources of resilience. The way out lies in exploring the factors that endow a system with the ability to outmanoeuvre complexity.

The story explains how operations become more brittle and therefore more risky than any stakeholders desires; how people in various roles step into the breach to overcome adaptive shortfalls and supply extra sources of resilience. The patterns of complexity, brittleness and resilience are revealed in how people anticipate bottlenecks ahead, act to fill gaps, and forestall failure. This story provides a deep picture of the general principles and even laws that capture how complex adaptive systems that serve human purposes work.

Key questions:

- Describe a situation/event where there were hidden surprises and gaps, where the system was brittle but somehow something extra was injected to keep going
- How was the event handled?
- How were the gaps bridged?
- Were there hidden interconnections or interdependencies, and how were they noticed/identified?

Professor David Woods

From Safety I to Safety II

Safety management that follows, rather than leads, developments runs a significant risk of lagging behind and becoming reduced to uncoordinated fire-fighting. In order to prevent this, safety management must look ahead not just to avoid things going wrong, but also to ensure that they go right. Proactive safety management must focus on how everyday performance usually succeeds rather than on why it occasionally fails, and actively try to improve the former rather than simply preventing the latter.

From a control theory point of view, managing safety is like managing anything else and can therefore be done in two fundamentally different ways. The first is to manage by keeping an eye on what happens and to make the necessary adjustments if it turns out that either the direction or the speed of developments are different from what they should be. This is called ‘reactive’ or ‘feedback’ control, because it is based on information that is fed back to the process. The second is to manage by adjustments based on the prediction that something is going to happen, but before it actually happens. This is called ‘proactive’ or ‘feedforward’ control.

Reactive safety management focuses on things that go wrong or could go wrong, such as near misses, incidents, and accidents. This corresponds to a definition of Safety-I as situations where little or nothing goes wrong. Proactive safety management focuses on how to adjust performance both to avoid risky situations and to facilitate everyday work. In order to achieve this, safety management must look ahead and not only try to avoid things going wrong, but also try to ensure that they go right. This corresponds to a definition of Safety-II as situations of everyday work where things go right. Safety-II can be achieved by facilitating the performance adjustments that are necessary for everyday work to succeed, hence by being proactive.

Key questions:

- Does your organisation look into what goes right to learn from what succeeds as well as from what fails?
- Things go well because people make sensible adjustments according to the demands of the situation. Does your organisation find out what these adjustments are and try to learn from them?
- Does your organisation have a culture to allocate resources, especially time – to reflect, to share experiences, and to learn?
- What is the basis for learning and improvement? Are events selected because of their severity or because of their frequency?

Professor Erik Hollnagel

PROGRAMME

Day 1 – 26th September 2013	
08:30	**Registration**
09:00	**Welcome and introduction** **IAA and EUROCONTROL**
09:15	**Session 1: Setting the scene – Why Human Performance, Why now and Why Another Perspective** *SHP SG Co-chairs – Jörg Leonhardt, DFS and Tony Licu EUROCONTROL*
09.45	**Session 2: Human Performance in Degraded Modes** *Prof. Chris Johnson – University of Glasgow*
10.30	***Coffee break***
11.00	**Session 3: Human Performance in Degraded Modes cont'd** *Prof. Chris Johnson – University of Glasgow*
12:00	**Session 4: Practical Examples of Degraded Modes from industries** **Network Failure at Dublin International Airport.** *Irish Aviation Authority*
12.30	***Lunch Break***
13:45	**Session 5: Navigating Seas of Complexity (Trade Offs)** *Prof. David Woods – Ohio State University*
15.15	***Coffee break***
15.45	**Session 6: Practical Examples of Trade Offs from industries** **Compliant Final Approach** *Regulatory perspective – André Vernay and Henri Arribart, DGAC/DSAC* *ANSP view – Loic de Rancourt, DGAC/DSNA*
16.45	**Session 7 - Moderator: - Conclusions of Day 1** *- Where did we come from?* *- Where are we going?*
17.30	**End of Day 1**
19.30	**Dinner**

Day 2 – 27th September 2013	
09.00	**Session 8 : From Safety I to Safety II** *Prof. Erik Hollnagel – University of Southern Denmark*
10.45	***Coffee break***
11:15	**Session 9: Practical Examples of Safety II from industries** **Proactive Safety – Looking for things that go right** *Christoph Peters DFS*
11.45	**Session 10: Panel and interactive session with Prof Johnson, Prof Woods and Prof Hollnagel** *Moderated session*
13.15	**Conclusions and Closure**
13:30	***Lunch***

ADDITONAL INFORMATION

Should you like to discuss this event further, please do not hesitate to contact:

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