

Title: Resilience Engineering: why, what and how and the art of connecting theory to practice

Resilience is defined as “the intrinsic ability of a system to adjust its functioning prior to, during, or following changes and disturbances, so that it can sustain required operations under both expected and unexpected conditions”¹. Since its inception, Resilience Engineering (RE) scope has been into developed theories, methods, and tools to deliberately manage the adaptive ability of organizations and systems in order to function effectively and safely².

Aim of the course, take away and form:

More than ten years has passed since the introduction of RE, the term resilience has become extremely popular³. This course will give participants a better understanding of the big picture of Resilience Engineering (RE) concepts and current methods, concepts and practices so they can start finding ways to develop further and to apply these concepts, practices, and tools in their work.

Specific stories, practical examples, and resilience topics will be presented to the participants.

Example of stories:

- Everyday successful operations to investigate how complex socio-technical systems work, to achieve a better understanding the operational capability in terms of abilities to monitor, anticipate, respond (including readiness to respond) and learn;
- Extreme situations such as disasters e.g. natural or man made where demands increase to explore hidden interdependencies, cascade effects and the ability to sustain operations and its capacity of maneuver;
- Introduction of new technologies e.g. aviation or other domains and automation surprises to investigate benefits and new vulnerabilities.

Resilience engineering basic concepts and methods will be presented as a baseline for discovery. It will include, amongst others, resilience abilities, adaptive capacity, fundamentals of resilience engineering, leading indicators, early warnings, weak signals, managing trade-offs (e.g. efficiency-thoroughness, flexibility-stiffness); cross-scale interactions (how systems/organizations can be well adapted locally, but maladapted globally). Based on work produced by Resilience Engineering scientists and practitioners.

The course will be highly participatory using innovation games⁴. Power point presentations are kept to a minimum. At the course, the participants will explore and discover resilience topics related to different degrees of performance using specific practical examples. The task aims to explore and discover ways to enhance resilience. This is expected to be a joining activity between practitioners from the industry and academia.

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¹ E. Hollnagel, Safety-I and Safety-II. The past and the future of safety management: Ashgate, 2014

² Nemeth, C, Herrera, I. Building change: Resilience Engineering after ten years. In Reliability Engineering and System Safety. Special Isssuen on Resilience Engineering. 2015. Journal of Reliability Engineering and System Safety

³ Woods, D.D. Four concepts for resilience and the implications for the future of resilience engineering Special Issue on Resilience Engineering. 2015. . Journal of Reliability Engineering and System Safety

⁴ Gray, D. et al. (2010). Gamestorming: A playbook for innovators, rulebreakers, and changemakers. Sebastopol, CA: O'Reilly Media.

management and safety analyses for the aviation and petroleum industry. Dr. Herrera currently leads a European Project financed by the European Commission within the H2020 programme DARWIN “Expecting the unexpected and Know how to respond” dealing with operationalization of resilience concepts for crisis management. She is involved in several projects dealing with Resilience Engineering. Ivonne is currently member of Clean Sky 2 Scientific Committee. She has been invited as a reviewer for different journal such as Reliability Engineering and System Safety, International Journal of Applied Aviation Studies, Information and Software Technology and Theoretical Issues in Ergonomics Science. She is currently guest editor to the widely read and respected journal Reliability Engineering & System Safety with the Sep 2015 publication of a special issue on Resilience Engineering.