Functional Fault Tree as Input to Hazard Analisys Using STAMP/STPA Methodology for Remote Tower (r-TWR) in Civilian and Militar Purposes

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Introduction (1/1)

Subject relevance

- Increasing demand for air transport in recent years x Lack of investments in airports;
- New technologies (embedded and not embedded) optimized shipping routes and air space navigation;
- Ground components did not get the same evolution level and became the bottleneck in the aerospace system.

r-TWR (Remote Control Tower)

- An air traffic control tower whose purpose is to execute exactly the same tasks performed by traditional control towers, but in another physical location than the airport;
- Has been considered the best option to quickly increase small & medium sized airports capacity;
- Has been tested in several countries.
- What about the safety of this new system?

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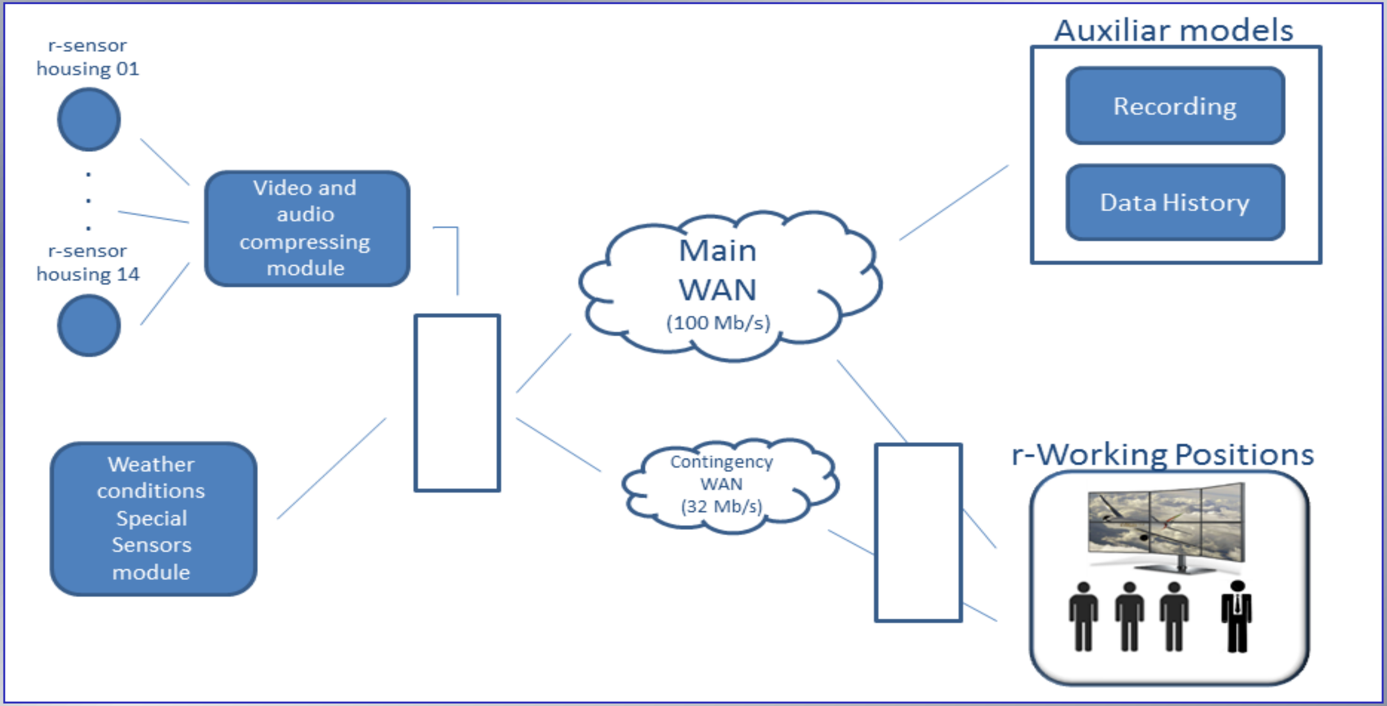
Conceptual Aspects (1/1)

Architecture used in the case study



Conceptual Aspects (2/2)

Functional Fault Tree Analisys (FTTA)

- Systematic and stylized deductive process whereby an undesired event is identified and a logical diagram is constructed showing the logical event relationships;
- It was originally developed in 1961 by H. A. Watson at Bell Telephone Laboratories;
- The person/team in charge of the construction of the FFTA, know the whole system thoroughly.

STAMP/STPA

- STAMP (System-Theoretic Accident Model and Processes) is an accident causation model based on systems theory that treats accidents as a dynamic control problem;
- From the STAMP perspective, the right control actions applied at the right time, from the right control process to the right controlled process, avoid hazards and accidents;
- STPA (System-Theoretic Process Analysis) is used in STAMP to do the Hazard Analysis; it follows 4 steps: identify accidents and hazards; construct the control structure; identify unsafe control actions and finally identify causal factors and control flaws.

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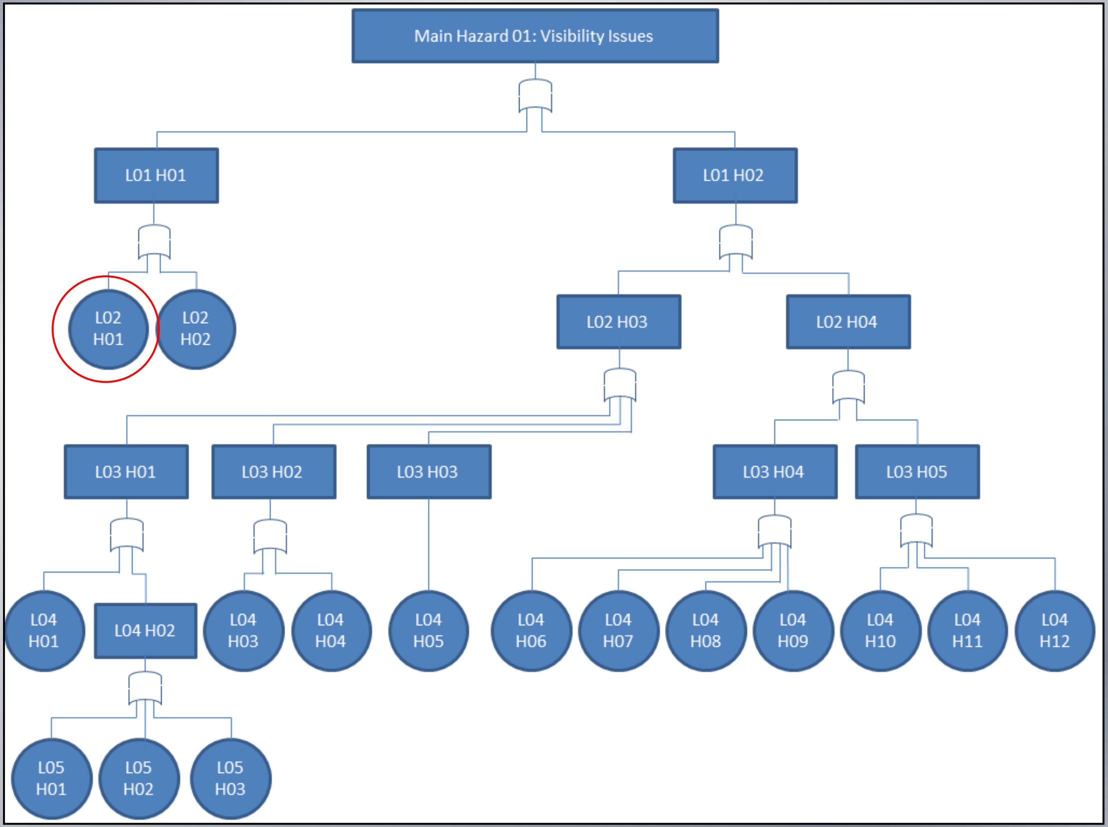
Case Study (1/3)

Functional Fault Tree Analisys as input for STAMP/STPA

- Functional Fault Tree Analisys (FFTA) will not be used to handle a fault, but a hazard.

- The purposes of using FFTA technique are to formalize the hazards and their main raisers and to make sure all potential raisers are tracked.

- Having the result of the FFTA as an input to STAMP/STPA is to complement – and do not replace – the hazards found by the specialists in the hazard analysis phase.



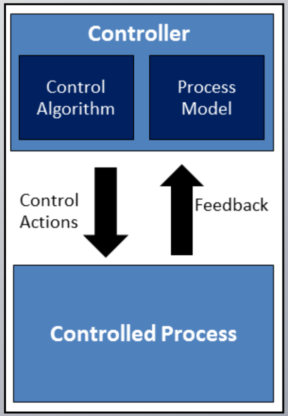
Case Study (2/3)

Functional Fault Tree Analisys as input for STAMP/STPA

- The STPA Hazard Analysis follows 4 steps: identify accidents and hazards; construct the control structure; identify unsafe control actions and finally identify causal factors and control flaws.

- Once a hazard has been identified by the specialists, the next STPA phase is to build a control structure for that hazard.

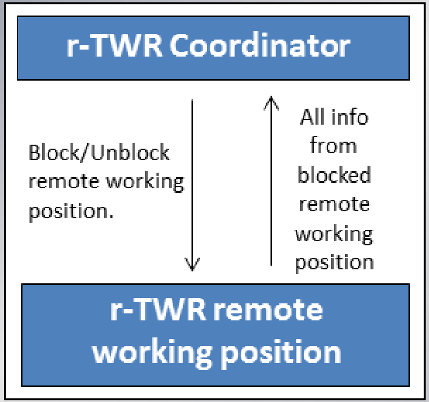
- The event handled here is the L02 H01: Intentional. Basically, the possibility of an operator intentionally taking actions that may lead to the main Hazard is treated.



Case Study (3/3)

Functional Fault Tree Analisys as input for STAMP/STPA

- Control structure designed for the condition/event L02 H01.



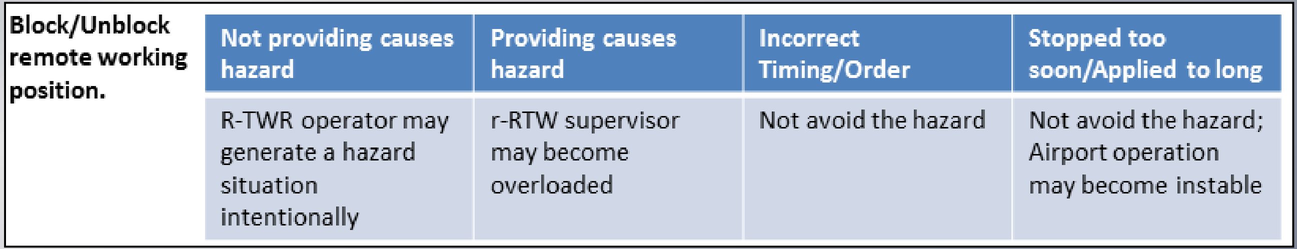
r-TWR Coordinator

Block/Unblock remote working position.

All info from blocked remote working position

r-TWR remote working position

- Unsafe control actions checking .



Block/Unblock remote working position.	Not providing causes hazard	Providing causes hazard	Incorrect Timing/Order	Stopped too soon/Applied to long
	R-TWR operator may generate a hazard situation intentionally	r-RTW supervisor may become overloaded	Not avoid the hazard	Not avoid the hazard; Airport operation may become instable

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Conclusion (1/1)

Applying this approach we found:

- Formalize and document which aspects were considered for a particular hazard when starting the control process construction.

- Due this documentation, new people in the project can fully understand what was done and quickly start contributing with the project team.

- Changes are a constant in a project. Having this documentation is a great asset when needing to handle with changes.

Dziekujemy

KIITOS Vielen Dank

Terima kasih

Täname teid Gracias Grazie

Thank You

Dankie

Paldies Tak Obrigado

Merci DÈKOJAME

DEKUJEME VÁM Bedankt

Köszönjük

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