What role for the European regulator in railway automation?

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Outline

- **Expectations, context and "the journey"**
- Opportunities and challenges due to railway automation
- Current ERA "tools"
- Lessons from other high risk sectors
- Conclusions

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Political Context

- "The development and phasing-in of cooperative, connected, automated/autonomous operation functions for all transport modes, and digital systems together with their connectivity should be given priority. …**Safety, fairness and efficiency need to be ensured through regulation and system validation requirements as appropriate**."

The “journey” start

- In order to better categorise the HOF work that needs to be done on automation in railways the following approach was taken:
  - bottom up approach using diverse working groups from the railway sector to better understand the HOF threats and opportunities of railway automation;
  - deliverables targeted to the appropriate audience to ensure the most impact;
  - a harmonised approach towards safety as shown by a systemic human-centred approach requiring cooperation between all stakeholders

Methodology

- Two HOF brainstorming meeting were held:
  - Amsterdam 7-8 May 2019, London 1-2 October 2019
- Diverse group including academics, experienced ERTMS train drivers, HOF experts from NSAs, RUs and IMs, trade unions and a HOF expert with experience in aviation;
- Manufacturers were invited but did not attend;
- Four Work Packages defined:
  - Awareness raising
  - Certification and supervision
  - Effects of Automation on Individual/Group/Organisation/Society
  - Management of the risks during deployment of Automation

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Opportunities of Railway Automation

- Optimisation of normal operations
- Global optimisation
- Standardisation of rules
- Reduce staffing

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Challenges of Railway Automation

- Over confidence in the capability of automation
- Inability to adapt when railway is disturbed or when automation fails
- Insufficient attention to the impact on those who operate the system
- Poor management of the risks from introducing the technology
- Incorrect level of trust and acceptance of automated operation

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Main explicit HOF Requirements

Directive 2016 798:

(5) ... Railway safety should be generally maintained and, when practicable, continuously improved, taking into account technical and scientific progress, and the development of Union and international law. Priority should be given to the prevention of accidents. ***The impact of human factors should also be taken into consideration****.*

(41) In the event that the direct cause of an accident or incident seems to be ***related to human actions****, attention should be paid to the particular circumstances and the manner in which* ***routine activities*** *are performed by staff during normal operations, including the* ***design of the man-machine interface****, the* ***suitability of procedures****,* ***conflicting objectives, workload and any other circumstance****s which may have influence on the occurrence,* ***including physical and work-related stress, fatigue or psychological fitness****.*

Article 9:
2. The safety management system … shall show how control is ensured by the management on different levels, how staff and their representatives on all levels are involved and how continuous improvement of the safety management system is ensured. There shall be a ***clear commitment to consistently apply human factors knowledge and methods****.*

Future CSM safety level and the safety performance of railway operators

Regulation EU 2020/572 – 20.04.2020 On the reporting structure to be followed for railway accident and incident investigation reports

Regulation EU 2018/762 on SMS requirements

Regulation EU 2018/761 on Supervision by NSAs

Example of HOF Implicit Requirements CSM on Risk Assessment (EU 402/2013)

2.1.2. The system definition shall address at least the following issues:
…
*(b) system functions and elements, where relevant (including **human, technical and operational elements**);*
(c) system boundary including other interacting systems;
*(d) physical (interacting systems) and **functional (functional input and output) interfaces**;*
*(e) system environment (for example energy and thermal flow, shocks, vibrations, electromagnetic interference, **operational use**);*
…
5.2. The documentation produced by the proposer under point 5.1 shall at least include:
*(a) a description of the **organisation and the experts appointed to carry out the risk assessment process**;*
…
*(d) all **assumptions** relevant for system integration, **operation or maintenance**, which were made during system definition, design and risk assessment.*

Working Environment

Human in system

Roles and responsibilities

Competence management

Annex II :
3. The assessment body shall be accredited or recognised for assessing the overall consistency of the risk management and the safe integration of the system under assessment into the railway system as a whole. This shall include competence of the assessment body in checking the following:
*(a) **organisation**, that is the arrangements necessary to ensure a coordinated approach to achieving system safety through a uniform understanding and application of risk control measures for subsystems;*
*(b) methodology, that is evaluation of the methods and **resources deployed** by various stakeholders to support safety at subsystem and system level; and*
*(c) the technical aspects necessary for assessing the relevance and **completeness of risk assessments** and the level of safety for the system as a whole*

Roles and responsibilities

Competence management

Resources

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ERA “tools” - Regulation (EU) 2016/796

- ***Article 13 - Technical support – recommendations on railway safety***
- *§5 The Agency may issue **guidelines and other non-binding documents** to facilitate the implementation of railway safety legislation*

- ***Article 39 – Communication and dissemination***
- *The Agency shall **communicate and disseminate** to relevant stakeholders information relating to the Union framework of railway law and the development of standards and guidance ….*

How?

- Seminars
- ERA website
- Internal/external presentations
- Guidance for SSC assessors (ERA/NSA)
- HOF “toolkit”

ERA “tools” - Regulation (EU) 2016/796 (continued)

- ***Article 43 - Assistance to Member States, candidate countries and stakeholders***
- *At the request of the Commission, Member States, candidate countries or the networks referred to in Article 38, the Agency shall engage in **training and other appropriate activities** concerning the application and explanation of railway safety and interoperability legislation and related products of the Agency such as registers, implementation guides and recommendations.*

Planned trainings 2021-2022

- HOF in SMS (SSC assessors and the sector)
- HOF for accident investigators
- HOF “basics”
- HOF for “experts”

Examples of HOF in standards

A TSI can make the compliance with a standard mandatory or it can include it in a guide in which case it is not mandatory:

- For Example
- CENELEC 50126 Railway applications – Specification and demonstration of Reliability, Availability, Maintenance and Safety included in Annex 10 to guide for the application of the CCS TSI

Example of EN 50126
Railway applications – Specification and demonstration of Reliability, Availability, Maintenance and Safety

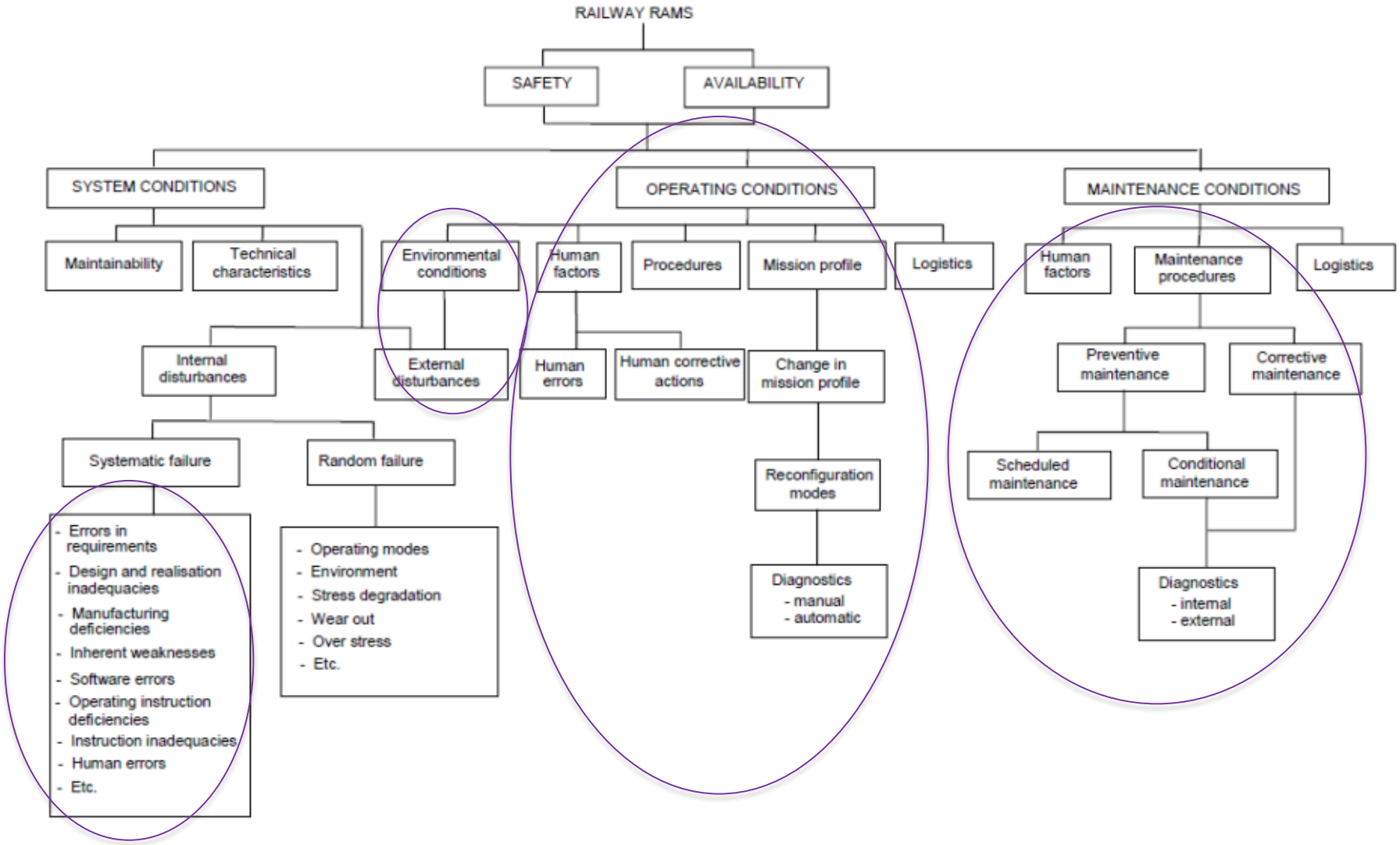

Figure 4 — Factors Influencing Railway RAMS

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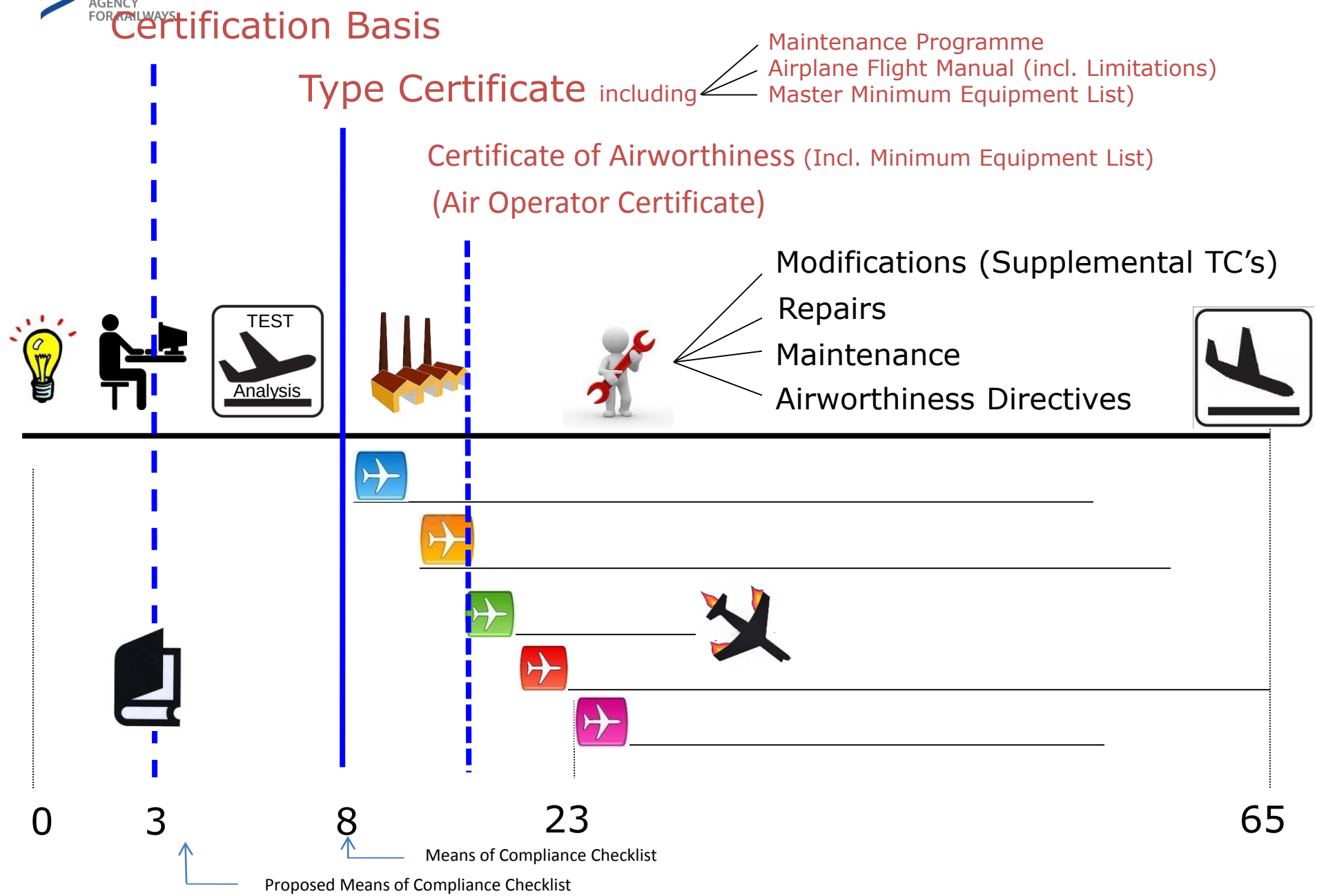
Aircraft Certification and continued airworthiness



However….

- "**Technical design flaws, faulty assumptions about pilot responses, and management failures** by both The Boeing Company (Boeing) and the Federal Aviation Administration (FAA) played instrumental and causative roles in the chain of errors that led to the crashes of Lion Air flight 610 in October 2018,1 and Ethiopian Airlines flight 302 in March 2019,2 that resulted in the tragic and preventable deaths of 346 people. Both crashes involved Boeing 737 MAX airplanes."

- "They were the horrific culmination of a series of faulty technical assumptions by Boeing's engineers, a lack of transparency on the part of Boeing's management, and grossly **insufficient oversight by the FAA**—the pernicious result of **regulatory capture** on the part of the FAA with respect to its responsibilities to perform robust oversight of Boeing and to ensure the safety of the flying public."

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In conclusion – some food for thought

- *"…However, the crucial element in determining an action is not regulation but how one perceives, interprets and evaluates the situation."*

- *"In the end, culture will trump rules, standards and control strategies every single time, and achieving a vastly safer NHS will depend far more on major cultural change than on a new regulatory regime."*

- *What are the expectations for the EU rail regulator to ensure integration of HOF in railway automation?*

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