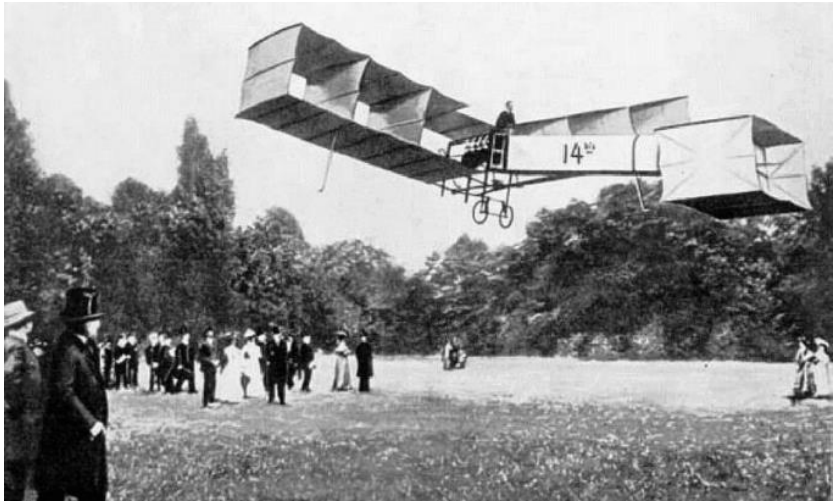
IRSC 2017
Hong-Kong

Introduction

- Innovation has not always been framed by safety and regulation
- In other times, risky experimentation was the only way to « proof a concept »
- Nowadays, the key point is to avoid decreasing the global current level of safety
- If there is not any reference system to be compared with, explicit analysis of risk is necessary



Introduction

- NSA / Autorisation intervenes at the end of the development process
- NSA's aim is to assess if the level of safety won't be decreased when authorizing a new system or actor but can not check all safety studies (components level): confidence and competencies are key points
- NSA France must work with the european regulation framework
- There is no specific framework to deal with disruptive innovation
- → EU Commission has to be seized before deploying any innovation that is not in the field of this framework (article 10 of STI LOC&PAS)

Innovations in railway

- **Disruptive innovation are not numerous in the european railway network:**
  - ERTMS
  - Automatic metro and tramway
  - IoT (just beginning)
  - Hyperloop (if it's considered as railway !)
  - Virtual tests & numerical simulation

Since 2006, EPSF has not being asked to approve significative innovations

- **Example: Autonomous train is a real innovation**
  - Another way to monitor a train (no driver, long distance monitoring)
  - New operation rules to create
  - Interfaces with infrastructure
  - Put driver's 5 senses into a machine

Innovations in railway

- How to authorize such technologies ?
- How to validate safety demonstration that can't be based on previous experiences ?
- RAMS can not be applied systematically and easily
- In Europe, common safety method proposes explicit demonstration but is not enough because of:
  - ➔ A lack of application clues
  - ➔ Some significantly different levels of demonstation between sub-systems in the regulation (LOC/PAS vs CCS)

TIPS & PROPOSALS

- To have a step-by-step and pro-active approach
- To be open regarding the experiences of other fields of activities
- To allow « concept lines », that is, scale 1 laboratories on the railway network. A specific regulatory framework to be invented ?
- To reduce and adapt maintenance & monitoring time frames to feed the return of experience

What about autonomous train ?

- What about test scenarios ?
- How to assess & validate Artificial Intelligence ?
- How to deal with heterogeneity in the network ?
- Loss of competencies of drivers ?
- Impact on SMS ? (organisation, rules, training, emergency management, etc.)
- Developers & NSA need to work closely on risk identification and covering at the very early steps of the « V » cycle (which is not the classical role of NSA in EU)
- All fields are concerned: rolling stock, infrastructure, driving, operation, etc.)

What about autonomous train ?

- SNCF has contacted EPSF at the beginning of the project
- Every 3 months, a meeting is organized with the future applicant (SNCF), research bodies, entities in charge of tests, and EPSF
- Discussion are at a very early stage:

  → **Exemples:**

  - Theoritical discussions on AI
  - First hazard analysis and debates
  - Deployment of projects and key steps & schedules
  - Identification of regulation brakes
- First tests on the network expected from end of 2018

Challenges

- **How to deal with the responsibility of AI ?**

- **What about cybersecurity ?**
  - In France, cybersecurity aspects belong to another governmental body (contacts needed)

- **Human factors**
  - The human factor situations are completely different depending on each level of autonomy and technical solutions
  - A key question is to know if technology can face « black swan » events

- **Wide open railway system**
  - Changes drastically the risk associated with no driver

- **Identification of the position of the train (not only in emergency situations):** equipment of infrastructures ? GNSS ?

RoE

- Roll back in Serqueux (France, 2015)
- Shock of a passenger regional train with 2 cows
- Loss of all brakes / no train control anymore (no electrical power)
- Emergency button out of order
- The train starts to run down a slope without any brake during 19 km (12 miles) reaching 100 km/h
- The driver anticipates where and when the geographical gradient will be reversed
- He prepares himself, jumps out of the train at the very moment and puts some wedges under the wheels in front of the train in order to stop it.

OTHER INNOVATIONS

- **Composite bolster**
  - First contact in 2014
  - First test expected end of 2017 on a train with passengers

- **Increase of numerical simulation into safety demonstrations**
  - NSA initiative with the stakeholders (including reseach bodies)
  - Goal: to analyse how to allow safety proofs mainly based on simulation

Thank You