

# USING VIRTUAL REALITY SIMULATION TO REINFORCE NON-TECHNICAL SKILLS

## BETWEEN TRAIN DRIVERS AND NETWORK CONTROLLERS



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# ACKNOWLEDGMENT



**SNCF SYNAPSES  
NETWORK**

**Systems Safety  
Cluster**

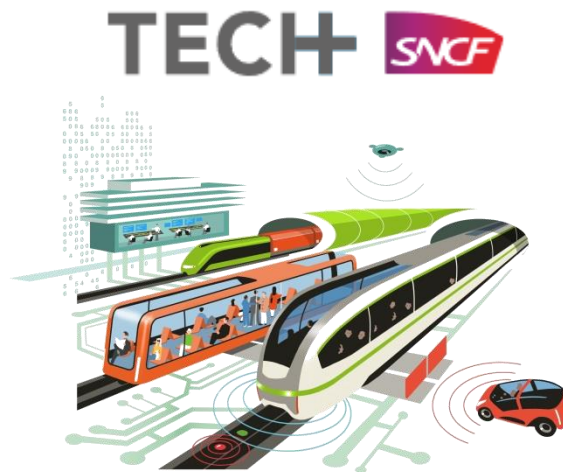


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# INTRODUCTION

## Background:

- + Our staff have an excellent command of technical skills
- + Non-technical skills (NTS) play an important role in the occurrence of incidents

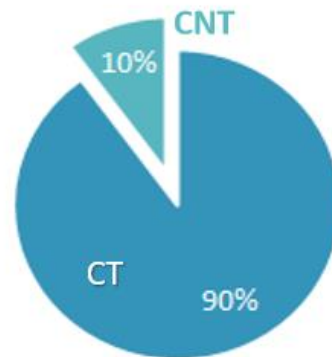
## Issues at stake:

- + Make staff more able to react to new and rare situations by developing NTS

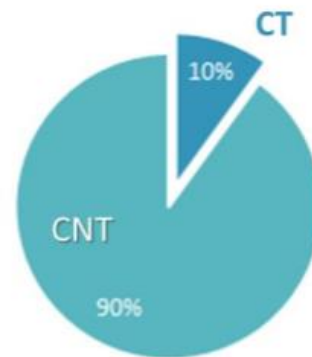
## Objectives:

- + Training and a tool adapted to non-technical skills
- + Promote inter-professional training

CNT = Non technical skills  
CT = Technical skills



Part des CNT dans la formation



Part des CNT dans l'incidentologie

*Trends analyzed by SNCF lesson learned specialists .  
They are not the results of statistical studies*

*Source: RA00660, SNCF*

# OUTLINE

1. What are non technical skills?
2. What can we learn from internal and external benchmark?
3. How to build a cross-industry training tools for non-technical skills?
4. Conclusion & Future work



# WHAT ARE NON TECHNICAL SKILLS?

# NON TECHNICAL SKILLS @ SNCF



## Definition

“Non-technical skills are the cognitive, social and personal resource skills that complement technical skills, and contribute to safe and efficient task performance”

*Rhona Flin and colleagues*

## Reference Document (RA 00660)

- + Practical guide to implementing a non-technical skills development scheme
- + Method for identifying, develop and evaluate the acquisition of NTS

## Pedagogical elements for managers

- + Use of observable behavioral markers (RSSB, Naweed et al.)

Core cognitive skills

Core social skills

Situational awareness

Workload management

Decision making and action

Conscientiousness

Communication

Working with others

Self-management

# NON TECHNICAL SKILLS @ SNCF

Toward an inter-professional training

**Ten or so themes were identified, 3 of which were selected :**

- + Train driver/Network controllers (abnormal motion)
- + Train driver/station manager/station staff/Train manager (accessibility)
- + Network controller/ (Train manoeuvring in Freight)





# WHAT CAN WE LEARN FROM INTERNAL AND EXTERNAL BENCHMARK?

# INTERNAL / EXTERNAL BENCHMARK



Maestro / Springfield



Profession ASCT



Smile



SimuRAT



Ship-in-school  
ENSM



Best, Wiener Linien

- + Most of the tools are single-trade oriented
- + Many simulators ranging from software to perfect replicas of workstations exist
- + The simulator is never used alone but within a training program
- + Simulation training can be carried out from a very rudimentary physical environment (models) to virtual reality devices
- + Few specific training program adapted to NTS
- + Cross-industry training is facilitated by the existence of a single training venue for all trades

# INTERNAL / EXTERNAL BENCHMARK

Virtual reality for training



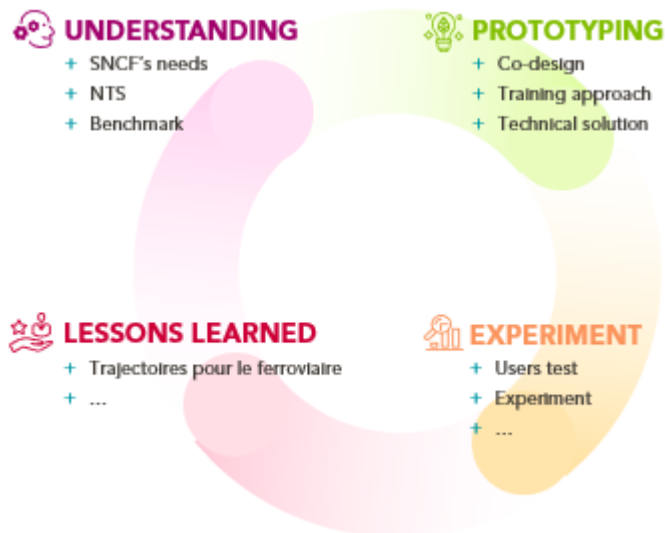
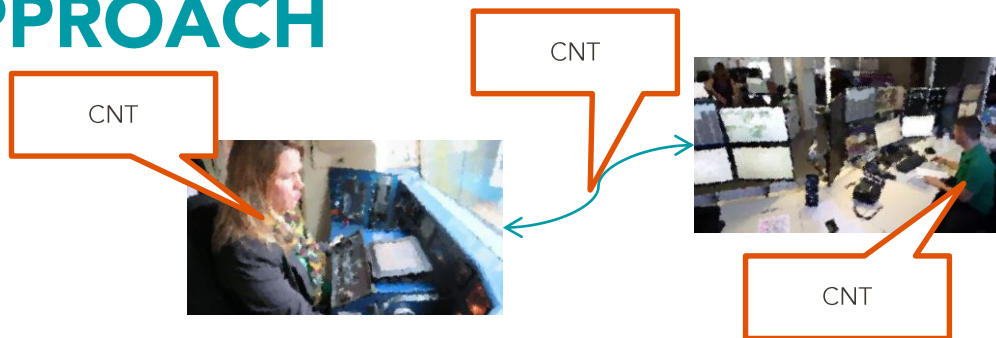
- + A way of virtually simulating or replicating an environment (*Makransky & Lilleholt, 2018*)
- + Excellent pedagogical support (*Fuch, 2018*)
- + Technology enables:
  - to train learners on two remote sites in the same scenario
  - trainers to better observe behavioural markers
- + Reduce cost and time

# HOW TO BUILD AN INTER-TRADE TRAINING TOOLS FOR NON-TECHNICAL SKILLS?

# OUR TRAINING APPROACH

## Concept

- + Role-play and simulation approach
  - Contextualise learning
- + Joint training program (inter-professional)
  - Driver
  - Network controller
- + Resolution of the scenario problem requires :
  - non-technical skills by each participant
  - non-technical skills for communication and coordination between participants



# OUR TRAINING APPROACH

Contexte	ADC TI	AC	Communication	S	Agent voie	Régulateur	RSS
Choc anormal en aval du périmètre d'action de l'AC (c'est l'AC qui expédie les trains vers le point dangereux signalé)	Ressent un choc signale à l'AC un choc anormal	Prend note selon la procédure prévue (carnet de dépêches, main courante...); Collationne les informations données par l'AdC (numéro du train, lieu, km, heure, conséquences, autres)	Communication Communication				

Decision taking

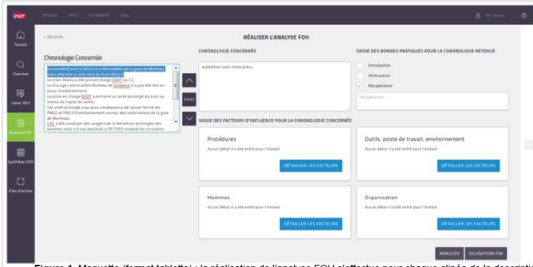


Table 8.4 Heuristics and Biases that Influence Decision-Making	
HEURISTIC/BIAS	SIMULATION TECHNIQUES
Availability heuristic	<i>Scenario design:</i> Creating a situation where the underlying problem is not the most common or likely event. <i>Metacognitive prompt:</i> Prompting trainees to consider a range of different, and unlikely, problems.
Confirmation bias	<i>Scenario design:</i> Only providing information to trainees that would confirm their initial hypothesis. <i>Metacognitive prompt:</i> Prompting trainees to identify sources of information that might indicate that their initial hypothesis might be incorrect.
Commission bias	<i>Scenario design:</i> In simulation-based training, trainees are naturally inclined to take action. Design a scenario where doing nothing is a legitimate immediate course of action. Also, a scenario where immediate action can exacerbate the situation is useful. <i>Metacognitive prompt:</i> Prompting trainees to reflect on what would have happened if they had not taken immediate action.
Search satisficing	<i>Scenario design:</i> This can easily be primed by a confederate agreeing with the first hypothesis and suggesting or commencing the logical first action given that hypothesis. <i>Metacognitive prompt:</i> As with confirmation bias, prompting trainees to identify sources of information that might indicate that their initial hypothesis might be incorrect.
Decision momentum	<i>Scenario design:</i> As above, a confederate preempting or undertaking continued actions can easily prime this bias. <i>Metacognitive prompt:</i> Prompting trainees to further consider alternative hypotheses or alternative courses of action.
Overconfidence bias	<i>Scenario design:</i> This bias can be primed by a confederate cue to subtly flatter and praise any erroneous aspects of the decision-making process, such as misdiagnosis or the suggestion of incorrect solutions. <i>Metacognitive prompt:</i> Prompting trainees to further consider alternative hypotheses or alternative courses of action and to reflect on whether they had made any errors.

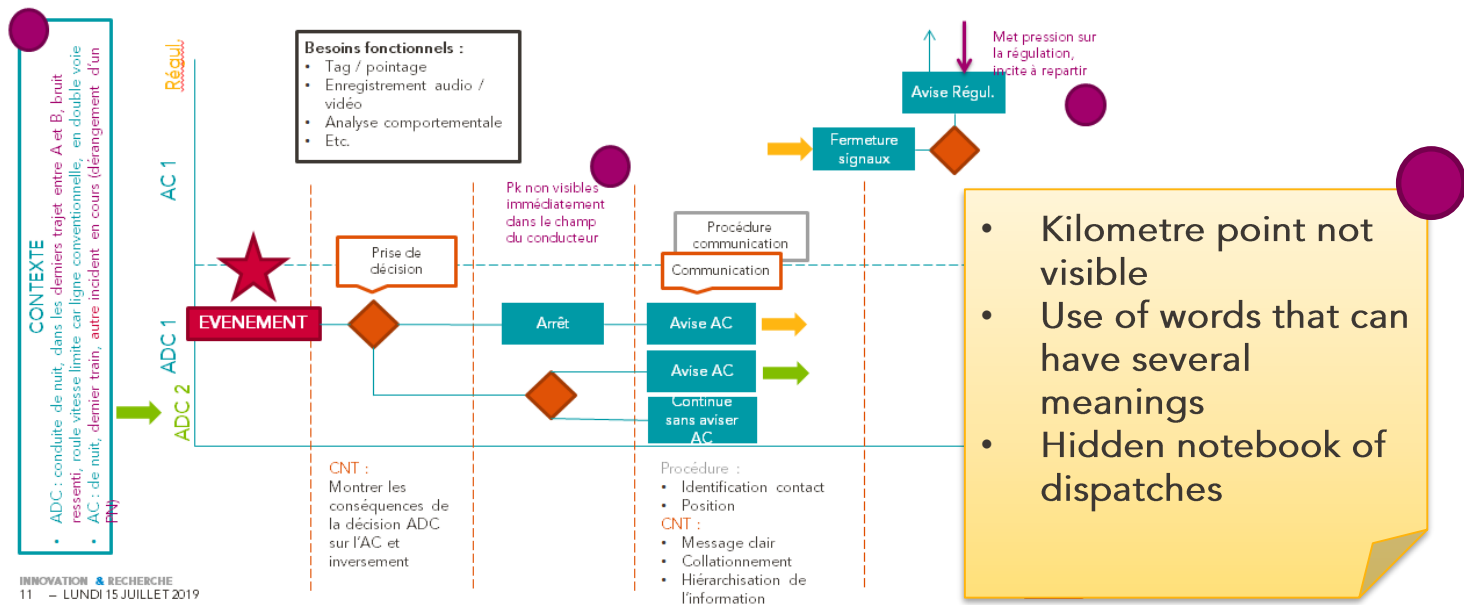
## Writing of the nominal scenario

## Finding error inducers to add to the scenario

- + Use of feedback databases
- + Categorisation: cognitive biases or heuristics
- + Replication in the virtual learning environment

# OUR TRAINING APPROACH

The training scenario including NTS



# THE TECHNICAL SYSTEM AND THE ENVIRONMENTS





# VIDEO

Please take a look at: <https://tech.sncf.com/en/virtual-reality-a-new-training-tool-for-sncf-employees/>



# CONCLUSION & FUTURE WORKS

## Conclusion

- + User tests in progress (UX)
- + Encouraging initial results:
  - Understanding of the benefits of mastering NTS
  - Cross-industry benefits : sharing vision of each profession's needs

## Future works

- + Evaluate effectiveness in reducing human error
- + Scenarios mixing technical and non-technical skills under study



# DO YOU HAVE ANY QUESTIONS?





MERCI

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