



## WP4: A report summarizing preparation and implementation of the TORC training modules (D4.1-D4.2)



Date	19/12/2016
Author(s)	Luigi Macchi
Sponsor	FonCSI, NRC, SAFERA
Project name	Safera TORC



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# 1 Introduction

## 1.1 Background

- Resilience in the context of compliance requires well considered action to adapt to variance and disturbances to work.
- A serious game is developed to train and raise insight on how to adapt resiliently

## 1.2 Pilot Goals

- To develop together with the pilot companies a concept for the TORC training based on a serious game
- To pilot TORC with operations and management and both in an integrated session
- To deliver a training format for the participating companies

## 1.3 TORC program approach

- To cooperate with research partners SINTEF, Dédale and industry partners ENI, Strukton Rail, Infrasppeed Maintenance BV and French Air Navigation Service Provider (ANSP)
- To collect and analyse scenario's with positive and negative outcomes being managed resiliently
- To explore the resilience concept in the context of safety, compliance and training policy
- To develop a working concept and prototype for a training format based on serious gaming, theories of primarily Woods and Hollnagel and explored in a mock
- To conduct pilots for: operational field and management staff.
- To evaluate in close-out session and advise on follow up for each participating company



## 2 French Pilot approach

In line with the TORC approach, a planned stepwise approach has been followed with the main steps being:

- [1] Contracting
- [2] Intake and communication
- [3] Selection of relevant people to be involved in the project
- [4] Explorative interviews and workshop
- [5] Document scan/review
- [6] Interviews with key employees
- [7] Select use cases, scenarios
- [8] In depth workshop(s) on location
- [9] Operationalizing scope of training
- [10] Prepare detailed training plan
- [11] Conduct training
- [12] Conclusions and guidance for further work

As part of this process a series of dialogues, meetings and workshops has been set up. This resulted in diverse and valuable input to both the development and piloting of the TORC concept and TORC-training prototype.

### 2.1 Goal of the pilots

The first aim was to share knowledge and experience to answer the following research issues:

- [1] To explore the dynamics on the interface of compliance and resilience when acting in a high risk environment?
- [2] To explore the contribution of serious gaming to the management of operational crises
- [3] To investigate what capabilities operations and management need to act resiliently in the context of compliance
- [4] To search for a method to strengthen these capabilities.
- [5] To experience resilience in action in a simulated environment
- [6] To learn to deploy operational resilience capabilities when coping with unexpected changes and situations
- [7] To explore and learn to apply strategies for resilient performance
- [8] To explore and to learn to deploy company resources and other resources to support adaptations during work
- [9] To experience the value and importance of relationships in or outside the team with an eye on strengthening resilient adaptations
- [10] To learn to reflect and evaluate positive and negative experience with resilience and how this can contribute to a stronger (more resilient) organisation
- [11] To review decision frameworks to (re)define and mandate space of manoeuvre.
- [12] To strengthen the relation between field staff and management in their mutual responsibility to improve operational resilience

The second aim was to co-create and cooperate in developing a training method, to test it and to evaluate it in pilot sessions as needed and to be agreed upon.



## 2.2 Adaptation of the TORC serious game to French context

The TORC serious game has been adapted for its use for the French pilot case. The standard TORC game board was modified by making explicit the barriers proposed by Rasmussen in the drift into failure model. The result of the modification is as follow:

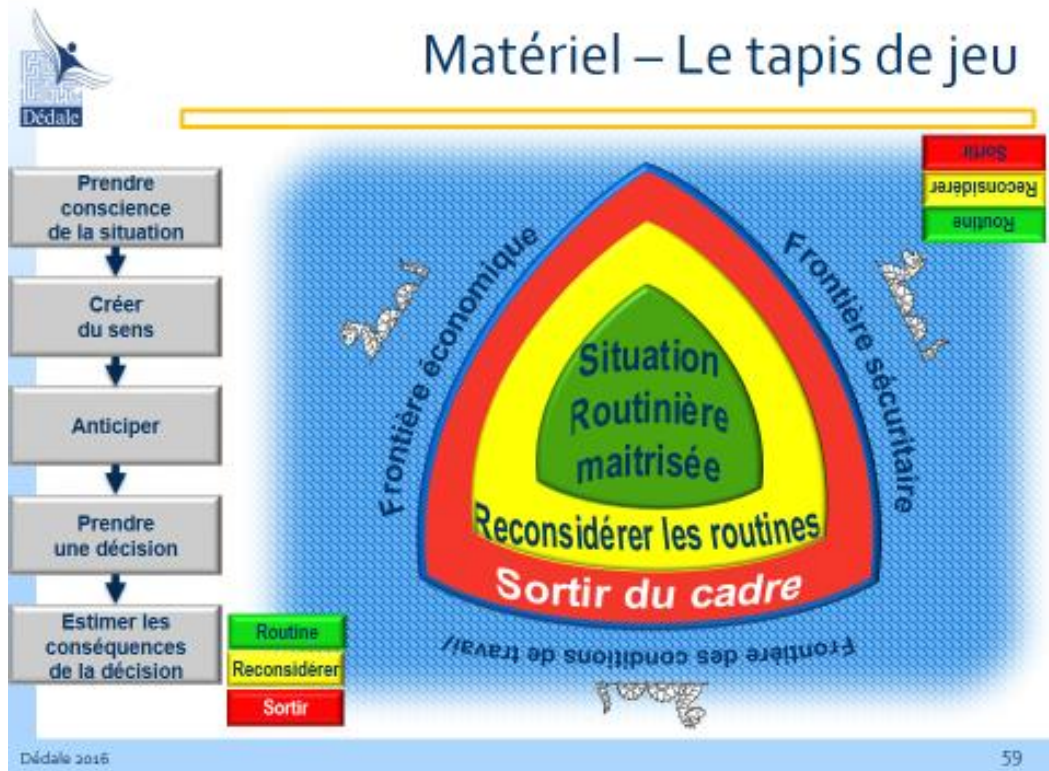


Figure 1 - TORC GAME BOARD

This modification was done with the intention to allow participants to reflect on the trade-offs they perform during the decision making process. As the gaming proceed, for each decision participant had to evaluate not only if they moved out of the "green" area, but also in which direction they "went". The degree of vicinity with one of the barrier was considered as a trade-off of that factor performed to fulfil the operational task.. This information was collected into the LOG sheet and then used for debriefing.

The resilient capacities and strategies cards were translate into French as follow:



**Capacités de TORC**

- 31 Appuyer les procédures de travail**
1. Soutenir les équipes afin qu'elles puissent continuer de travailler de manière efficace.
  2. Adopter les idées pour améliorer de surcroît l'efficacité dans la situation.
  3. Encourager les personnes à travailler ensemble et à partager leurs idées.
  4. Renforcer le leadership de travail et de communication.
  5. Encourager les personnes à prendre des initiatives.
  6. Encourager les personnes à travailler ensemble et à partager leurs idées.

- 32 Ajouter des ressources humaines**
1. Recruter de nouvelles personnes.
  2. Trouver d'autres personnes disponibles.
  3. Former les personnes disponibles pour travailler.
  4. Encourager les personnes à travailler ensemble et à partager leurs idées.
  5. Encourager les personnes à travailler ensemble et à partager leurs idées.

- 33 Prioriser**
1. Définir les tâches et les priorités.
  2. Définir les personnes disponibles pour travailler.
  3. Définir les personnes disponibles pour travailler.
  4. Définir les personnes disponibles pour travailler.
  5. Définir les personnes disponibles pour travailler.

- 34 Donner du sens au changement**
1. Donner du sens au changement.
  2. Donner du sens au changement.
  3. Donner du sens au changement.
  4. Donner du sens au changement.
  5. Donner du sens au changement.

- 35 Assister les réflexions autour des changements**
1. Assister les réflexions autour des changements.
  2. Assister les réflexions autour des changements.
  3. Assister les réflexions autour des changements.
  4. Assister les réflexions autour des changements.
  5. Assister les réflexions autour des changements.

- 36 Ré-affecter des ressources**
1. Ré-affecter des ressources.
  2. Ré-affecter des ressources.
  3. Ré-affecter des ressources.
  4. Ré-affecter des ressources.
  5. Ré-affecter des ressources.

- 37 Prendre conscience des points de vue des personnes**
1. Prendre conscience des points de vue des personnes.
  2. Prendre conscience des points de vue des personnes.
  3. Prendre conscience des points de vue des personnes.
  4. Prendre conscience des points de vue des personnes.
  5. Prendre conscience des points de vue des personnes.

- 38 Apprendre avec l'action**
1. Apprendre avec l'action.
  2. Apprendre avec l'action.
  3. Apprendre avec l'action.
  4. Apprendre avec l'action.
  5. Apprendre avec l'action.

- 39 Mettre une pression dirigée dans une équipe**
1. Mettre une pression dirigée dans une équipe.
  2. Mettre une pression dirigée dans une équipe.
  3. Mettre une pression dirigée dans une équipe.
  4. Mettre une pression dirigée dans une équipe.
  5. Mettre une pression dirigée dans une équipe.

- 40 Créer des relations pour atteindre des objectifs**
1. Créer des relations pour atteindre des objectifs.
  2. Créer des relations pour atteindre des objectifs.
  3. Créer des relations pour atteindre des objectifs.
  4. Créer des relations pour atteindre des objectifs.
  5. Créer des relations pour atteindre des objectifs.

- 41 Informations**
1. Informations.
  2. Informations.
  3. Informations.
  4. Informations.
  5. Informations.

- 42 Personnels**
1. Personnels.
  2. Personnels.
  3. Personnels.
  4. Personnels.
  5. Personnels.

- 43 Moyens**
1. Moyens.
  2. Moyens.
  3. Moyens.
  4. Moyens.
  5. Moyens.

- 44 Temps**
1. Temps.
  2. Temps.
  3. Temps.
  4. Temps.
  5. Temps.

- 45 Communication**
1. Communication.
  2. Communication.
  3. Communication.
  4. Communication.
  5. Communication.

Figure 2 - RESILIENT CAPACITIES AND STRATEGIES



## 3 Close-out report of TORC Pilot SNA-RP

### 3.1 Short summary

#### 3.1.1 Findings and results

- › Resilience in the context of compliance is a very relevant capability to be explored, trained and strengthened.
- › Despite the reduced number of training sessions (3) it is possible to state that they created awareness for strengths and opportunities to improve resilience and evaluate compliance policy and operational experience.
- › The open and challenging character of the TORC set up, its gaming concept and its structure with players and observers energized participants leading to a vivid exchange of experience. The game offered the opportunity for participants to reflect upon current practices, organisational resources.
- › TORC encompasses both a mental decision making loop and choices for resilient strategies. By simulating this dynamically in a serious game based on operational cases several capabilities can be trained.

#### 3.1.2 Impact of the pilot results

The deployment of the TORC training and in particular of the TORC serious game at the two SNA-RP sites allowed the:

- Identification of which roles in the existing organisations could become critical for dealing with emergencies. In particular it was possible to highlight the organisational roles which could be entitled for coordinating responses;
- Testing and experiencing the limits of available procedures for dealing with unexpected situations;
- Identification of possible shortages in organisational technical, procedural and human resources;
- Identification of communication flaws which could hinder effective emergency responses;
- Identification of specific training needs for dealing with unexpected events;

#### 3.1.3 Prospects and further developments

A few points would deserve future development for improving the effectiveness of the proposed approach:

- The importance of finding an appropriate balance in the surprises to be included in the scenarios for the serious game appears evident. This entails finding events which match the hierarchical responsibility for decision making among the participants. Events which are considered out of the scope and responsibility of the participants' role tend to be quickly dismissed as "not relevant". On the other hand events which are considered as "trivial surprises" by personnel whose job is a constant adaptation tend not to trigger resiliency responses.
- For use in highly dynamic working environment as Air Traffic Management, it is challenging to represent and include in the serious game the dynamic evolution of the operational context. Each decision taken by the participants has a direct immediate impact in the configuration of the air traffic they are dealing with. This means that without a constantly updated information about the scenario, participants tend to rapidly lose the connection between the serious game and the operational context.
- By the nature and objective of the TORC training, it appears important that its deployment is integrated in a larger organisational reflection about how to deal with



margins of manoeuvre by field staff and managers in case of emergency management. Such reflection should aim at creating a coherent and shared understanding about the strategies to use when normal operations are seriously disrupted by critical surprises.

### 3.2 Introduction

SNA-RP is part of the French Air Navigation Service Provider organisation. It is the French pilot partner in the project Training for Operational Resilience Capabilities of the SAFÉRA-TORC consortium (SINTEF, TNO and Dédale). It joined the project during the first semester of 2016. Among its responsibilities, it manages air traffic in the area of Paris and in particular the Orly and Roissy Charles de Gaulle airports.

The organisational context in which the TORC training has been applied can be characterised as follow:

- The core task of air traffic management is to apply separation rules to keep aircraft at a safe distance from each other in their area of responsibility
- Air Traffic Controllers interact with each other's and with pilots in a highly dynamic environment
- ATM is a highly regulated domain in which front line operators (ATCOs) are autonomous in their decision makings and problem solving
- Adaptation to surprises is perceived as part of ATCOs daily job (they are trained for flexibility)

Pilot sessions were conducted on late summer 2016. 15 people were trained with the TORC program. One session was held at Roissy Charles de Gaulle and two sessions were run at Orly.

### 3.3 Company specific game setup and game play

The pilot study conducted at the SNA-RP followed to different setups.

In one case, the TORC training conducted at Orly control centre adopted the standard TORC setup, i.e. first a traditional training on the theoretical pillars underlying the TORC approach, and then the application of the TORC serious game with the participants gathered around the game board. The TORC training was coupled with the official recurrent and mandatory SNA training on "unexpected events".

In the second application of the TORC training, a different setup was installed. In order to enhance the realism of the serious game it was decided that the participants would sit in separate rooms and their communication and decision making process would take place over the phone (as it would be in the reality of their daily job). Such decision entailed two main consequences. The first one is of practical matters. In order to keep trace of the discussions and of the decisions taken an observer was coupled to each participant for the entire duration of the game. The second consequence is directly related to the previous one. The phase of evaluation of how much the decision taken pushed the organisation from the green central area of routines to the red peripheral area of stretched practices was done collectively once the game was over (rather than done after each turn of the game).

The two applications shared a similar scenario. The differences between the two cases were related to the details of the two settings (two different airports, two different operational setups etc.) The following case was used.

**Case: Suspicion of explosion in one of the airport's terminal.**





The scenario started in a busy summer morning. The operational staff is ready to take morning shift. One of the runway of the airport is closed for maintenance and weather conditions are degraded.

Starting from this situation, the following surprises occur:

- 1- One of the members of the morning shift calls to report he will be late due to personal reasons. This implies that not all the control positions could be filled in. A reorganisation is needed to ensure service.
- 2- At 07:45 am, one of the Instrument Landing System (ILS) breaks down. This calls for the application of specific procedures and an assessment of risks
- 3- At 08:15 am, due to a further degradation of weather conditions, the Low Visibility Conditions Procedures (LVP) have to be applied. This impacts the operational capacity of the airport and demands for the application of specific procedures
- 4- At 08:30am, a pilot, while being pushed back from its parking at one of the terminal, reports to the control tower about a suspicion of explosion in the terminal hall. The only information he reports is that he sees the windows being blown.
- 5- Few minutes later the explosion at the terminal is confirmed by the police.

### **3.4 Findings**

The TORC project has made it possible to adapt the real work circumstances and dilemmas that are recognisable for all participants of the training. The game elicited dynamics in and strategies for increasing resilience which partly differed and was partly consistent among participants. The log poster proved to be a useful aid to compare debrief on resilience responses and strategies. Despite the reduced number of sessions run within the SNA-RP the organisation expressed interest in the possibilities for training offered by the TORC approach.

The participants were intrigued by the training and the game play. They were after the introduction, without any exception, directly immersed by the presented case, the team interaction and the process steps in each round. The resilience resources and strategies used by the team were input for debrief and debate. Furthermore, the assessment and effect after each round on workload, efficiency and safety provided insight into the impact on both the operation and organization.

Nevertheless they expressed mixed-feelings about the scenario. On the one hand the first surprises were considered rather trivial and they did not pose main challenges to the participants. They all reacted to them by deploying well known strategies. On the other hand, the main disruptive surprise (the suspicion of explosion) was by some of the participants considered out of their range of responsibility. They therefore reacted to it in a passive manner saying that in such scenario they would wait for instruction by management and/or competent authorities. Only a reduced number of participants proactively questioned their role and responsibility to deal with such an out of the ordinary event, and planned for future actions.

The debriefings based on the LOG of the game illustrate how participants tend to sacrifice productivity and workload over safety. This can be explained by the profiles of the participants (they perceive their mission as to ensure safety).

Resilience in the context of compliance is a very relevant capability to be explored, trained and strengthened. This is also related to the domain.

The sessions created awareness for strengths and opportunities to improve resilience and evaluate compliance policy and operational experience.



The open and challenging character of the TORC game set up, its gaming concept and its structure with players and observers energized participants leading to a vivid exchange of experiences, peer review and outlook for concrete follow up in operations and for training purposes.

TORC encompasses both a mental decision making loop and choices for resilient strategies. By simulating this dynamically in a serious game based on a variety of company cases several capabilities can be trained.