Lessons learned from Belgocontrol Power Failure

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Location: Brussels
Date: 29.09.2017

Outline

- About us
- What happened?
- Who was involved?
- Found causal factors
- Lessons learned

A little bit about us … Facts and figures

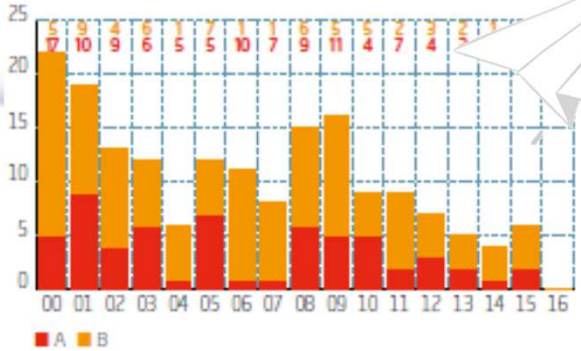
Total movements controlled by Belgocontrol

1,040,994

Number of movements in the CANAC airspace

565,573

Number of severe incidents (categories A and B) in 2016



Number of movements at Brussels National Airport

223,687

Effectiveness of Safety Management

Number of movements at Belgian regional airports

251,734

Number of trainee ATCOs and ATCOs in 2016

40+

300

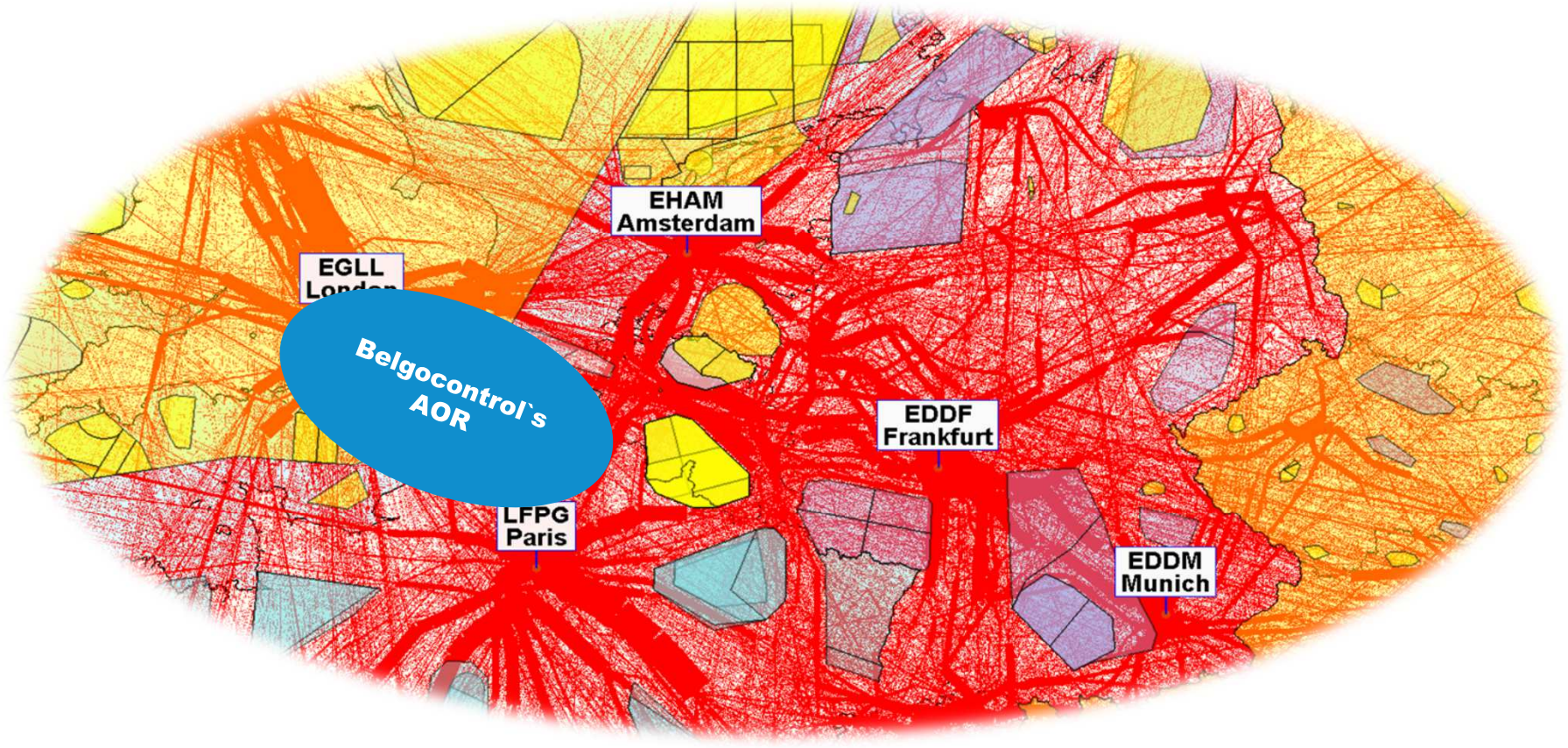
Number of employees in 2016

806

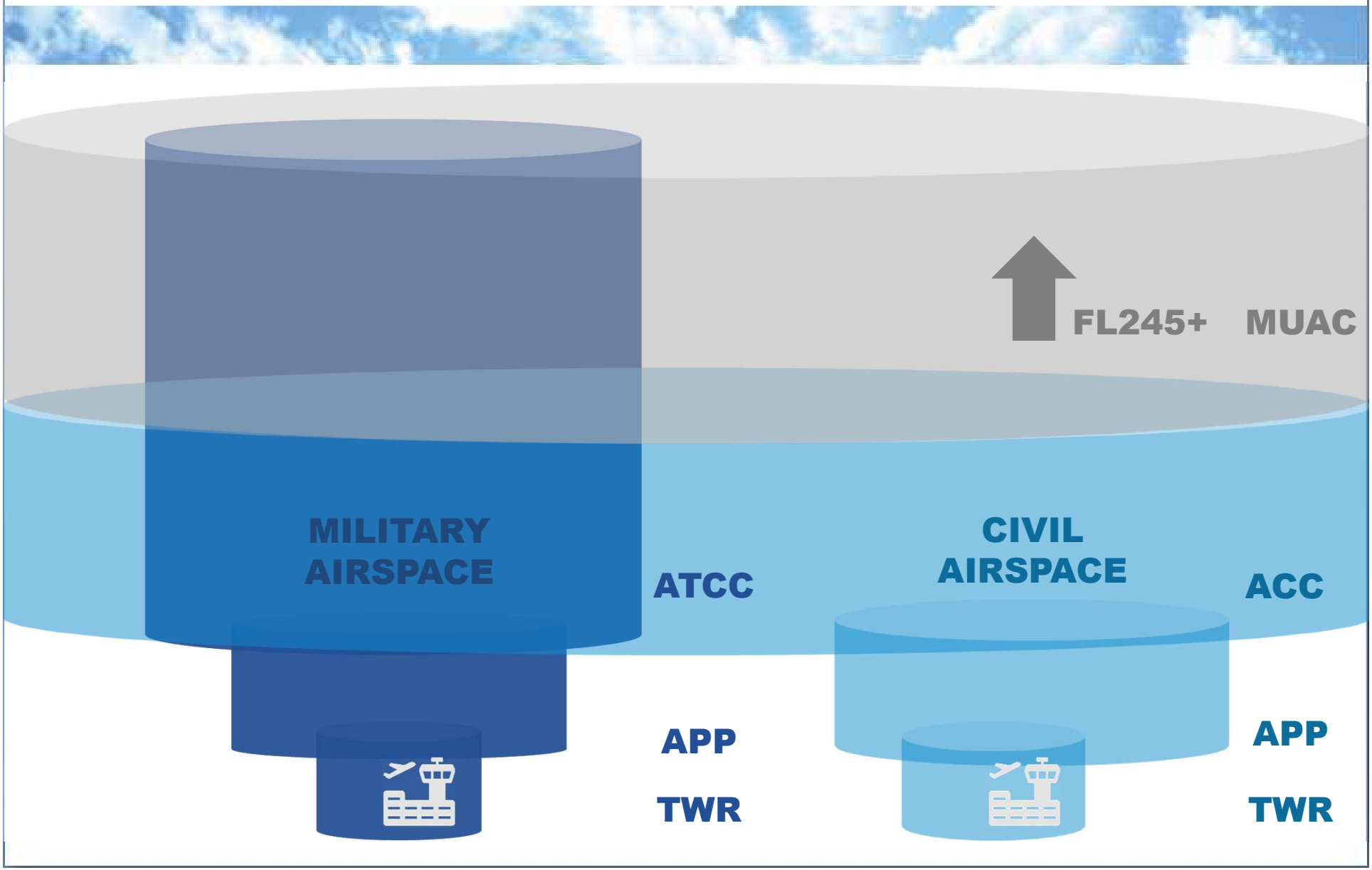
Investment

37 → 100 (2020)

A little bit about us … The airspace we control



A little bit about us … The airspace we control



Once upon a time…

Name: *P.W. Failure*

Place of birth: *CANAC2*

Date of birth: *27/05/15*

there was a black swan…

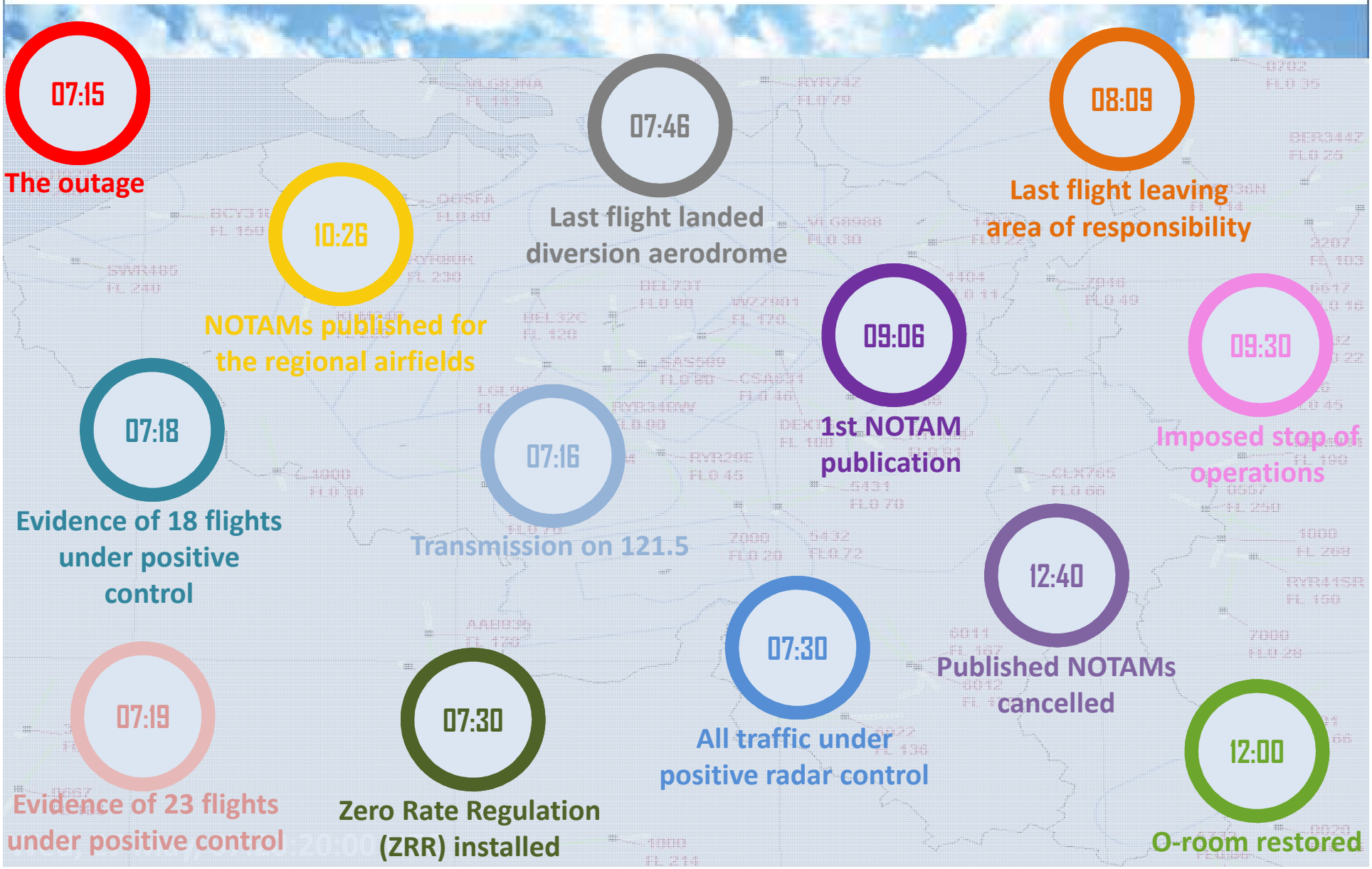
And this is what happened on that historic date…

and then there were darkness
and silence…
…except the LRS

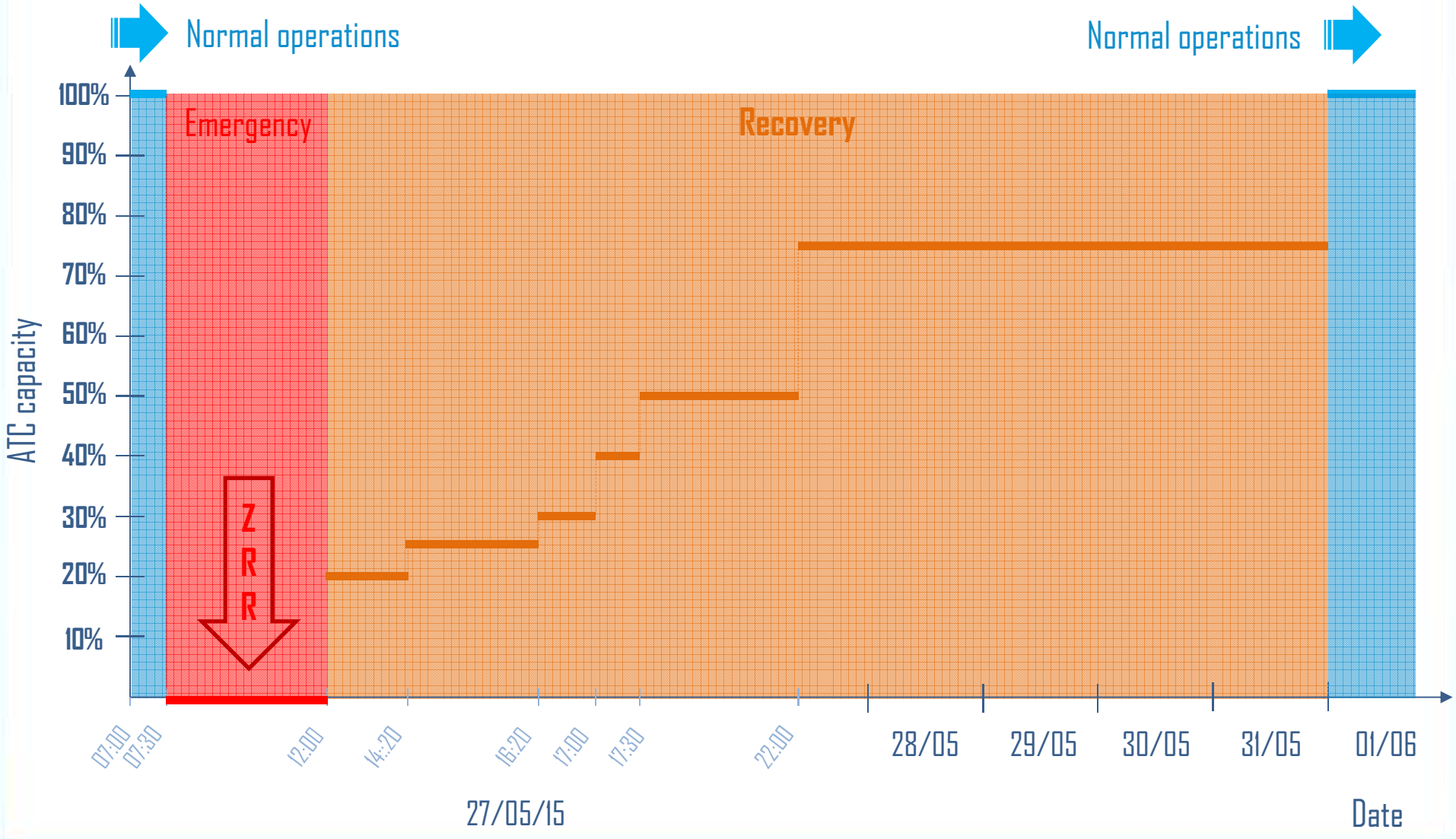
Operations as usual…

Damage found upon visual inspection

Out of sight, anxiously on mind flights

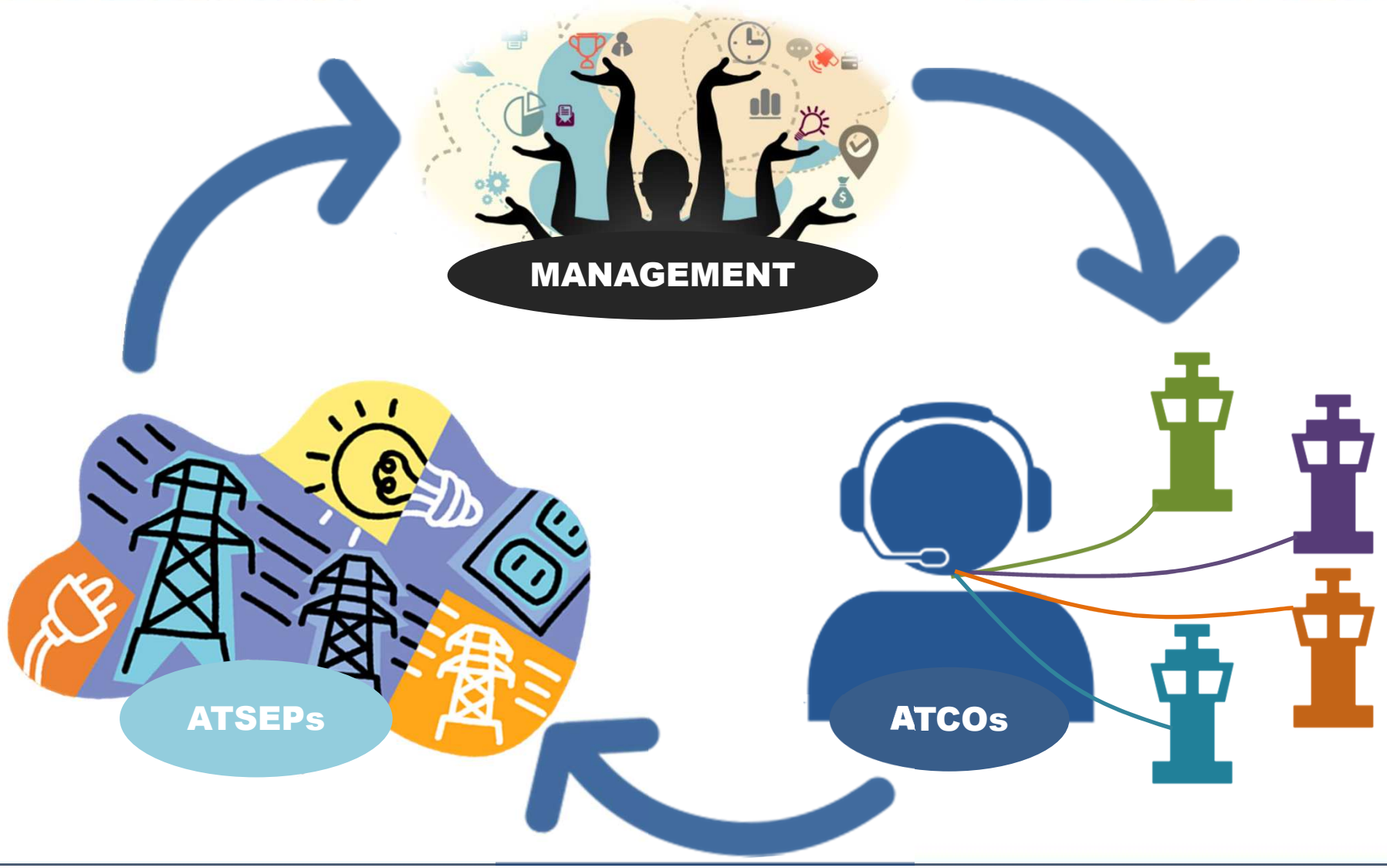


ATFM restriction timeline



Meanwhile these were inside out (re)actions…

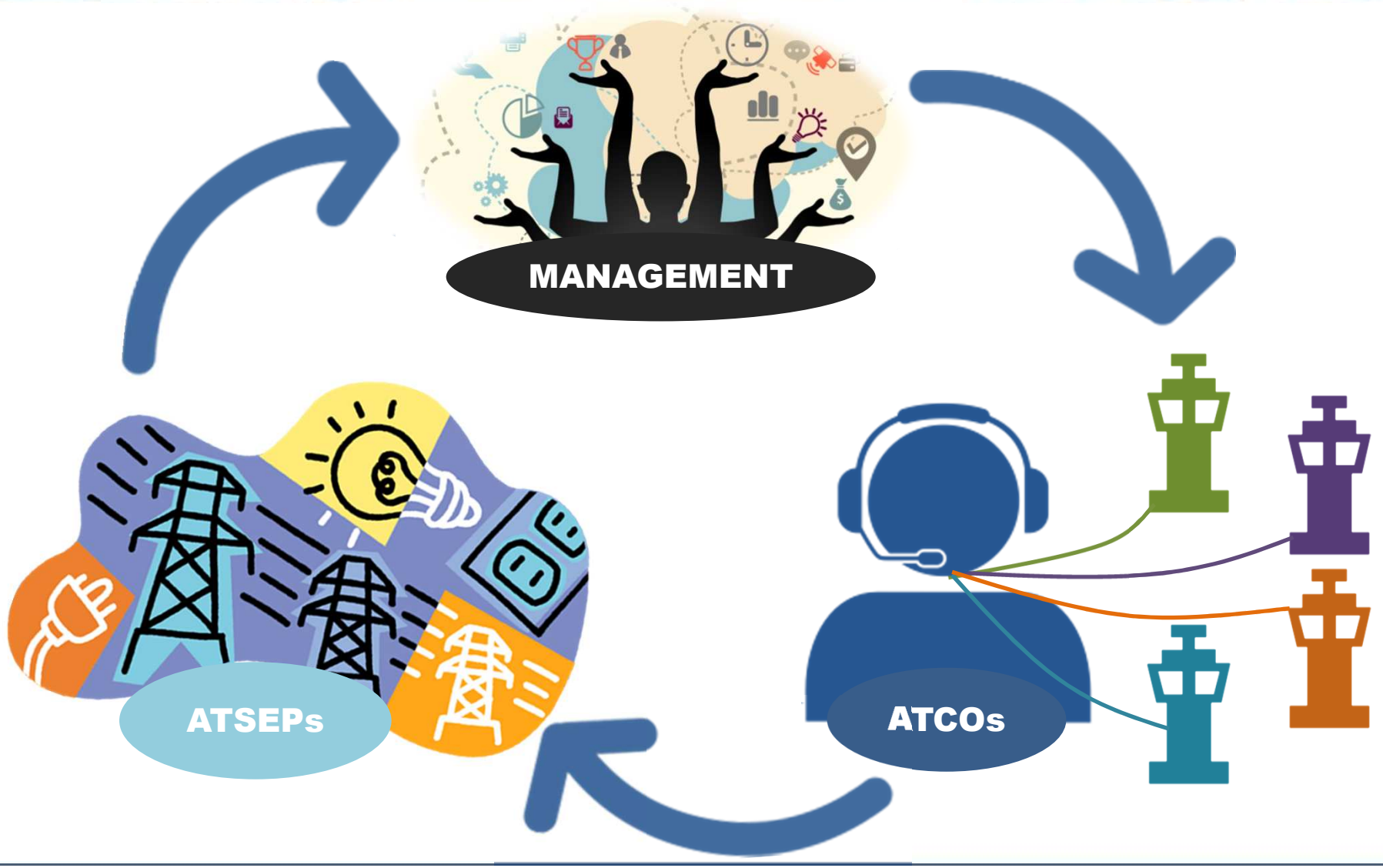
(Re)actions inside Belgocontrol…



ATCOs

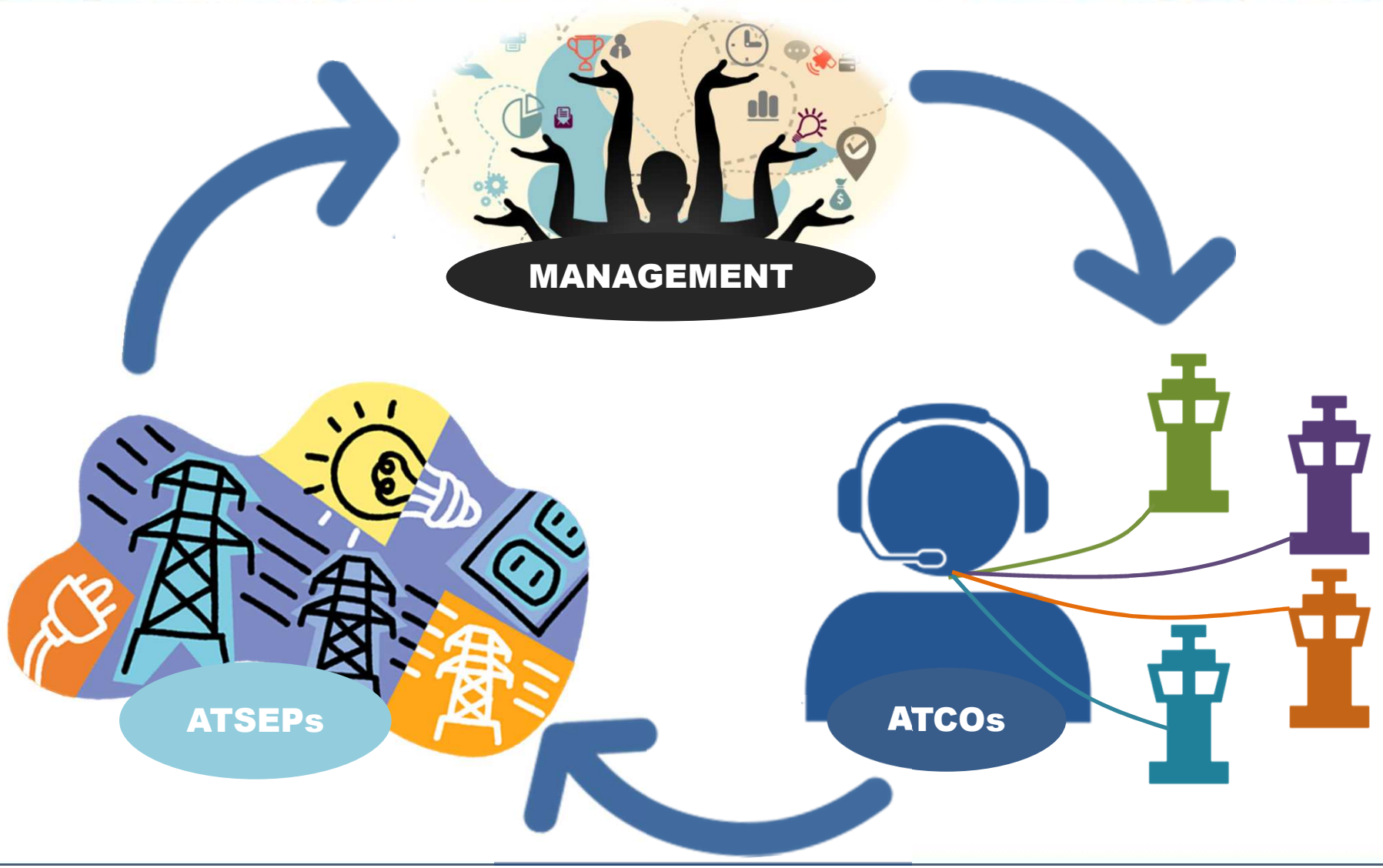
Where did they all go???

(Re)actions inside Belgocontrol…



ATSEPs

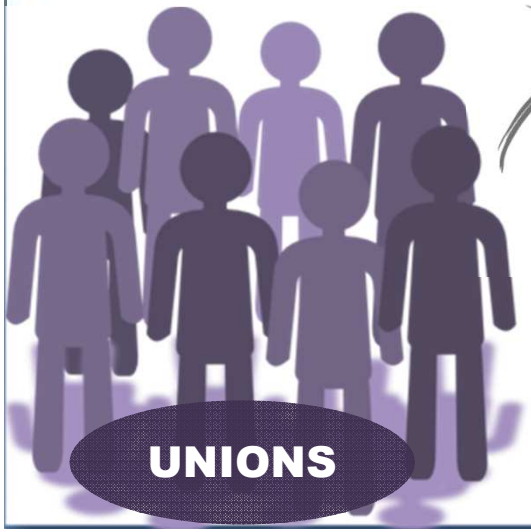
(Re)actions inside Belgocontrol…



Management

Meanwhile this is how the society (re)acted…

Belgocontrol

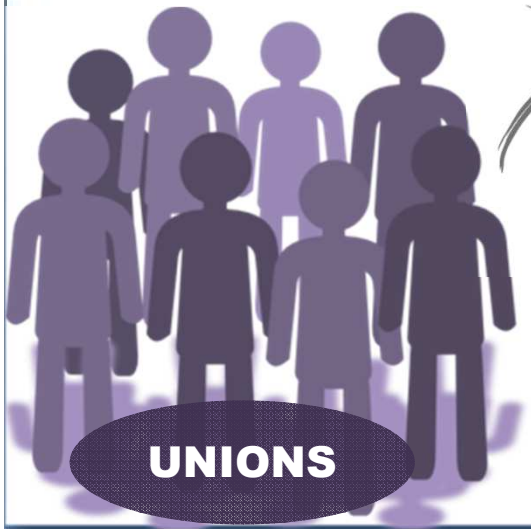


Passengers


cargo biking Moose
@MamaMoose_Be
Volgen
#belnocontrol #BelgoOutOfControl 😂😂 oh dear, no flights in or out of Brussels National Airport. They have no power. #nojoke
03:59 - 27 mei 2015

Meanwhile this is how the society (re)acted…

Belgocontrol



Media

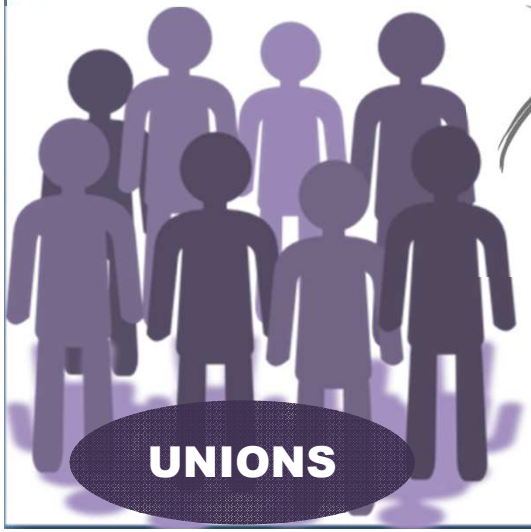

STEENOKKERZEEL
RTL INFO
PANNE ELECTRIQUE
LES AEROPORTS BELGES FERMES

Meanwhile this is how the society (re)acted…

Belgocontrol

Customers

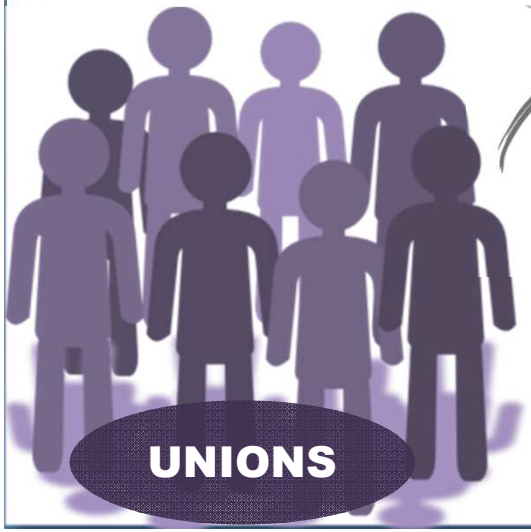
Meanwhile this is how the society (re)acted…



Unions

Meanwhile this is how the society (re)acted…

Belgocontrol



Regulators


Transport aérien
Drones
Passagers
Licences
Aéronefs
Exploitation commerciale

Meanwhile this is how the society (re)acted…

Government

The investigation

WHO carried out the investigation

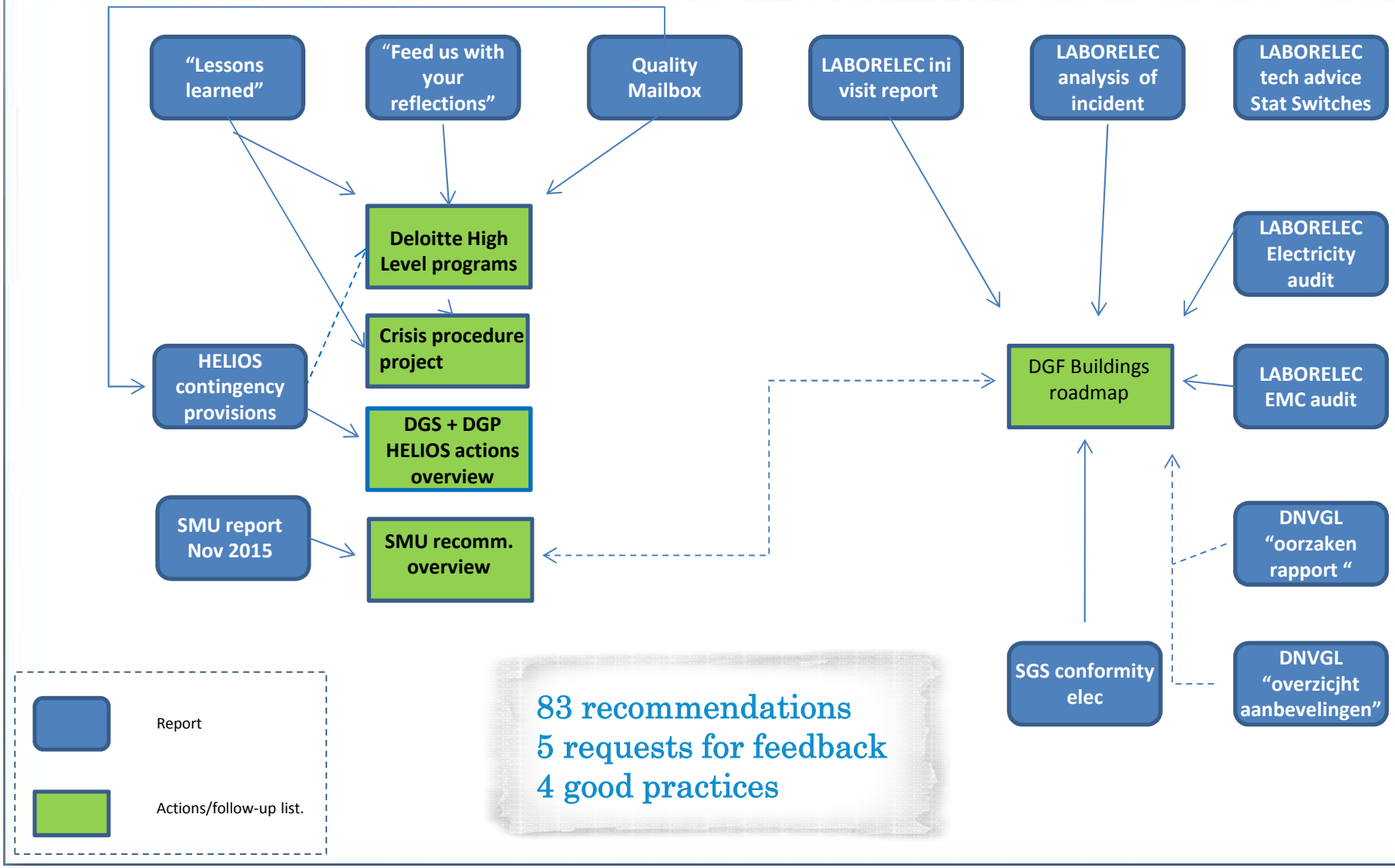
External

- AAIU
  - External independent investigation
- BSA-ANS
  - Follow-up on corrective actions
  - Oversight of the changes
  - Audit of the contingency plan
- 2 external expert consultancy for electrical matters
  - Technical safety investigation
- External expert consultancy for contingency matters
  - Survey on contingency measures
- Chris Johnson
- Eurocontrol building survey

Internal

- Safety Management Unit
  - Technical safety investigation
  - Operational safety investigation
- HR department
  - Addressing post-traumatic effects
- Internal Auditor
  - Support the risk evaluation process during the recovery
  - Investigated potential legal responsibilities
  - Participation of the 1st phase of the evaluation of the situation in regional airports

Investigation outputs

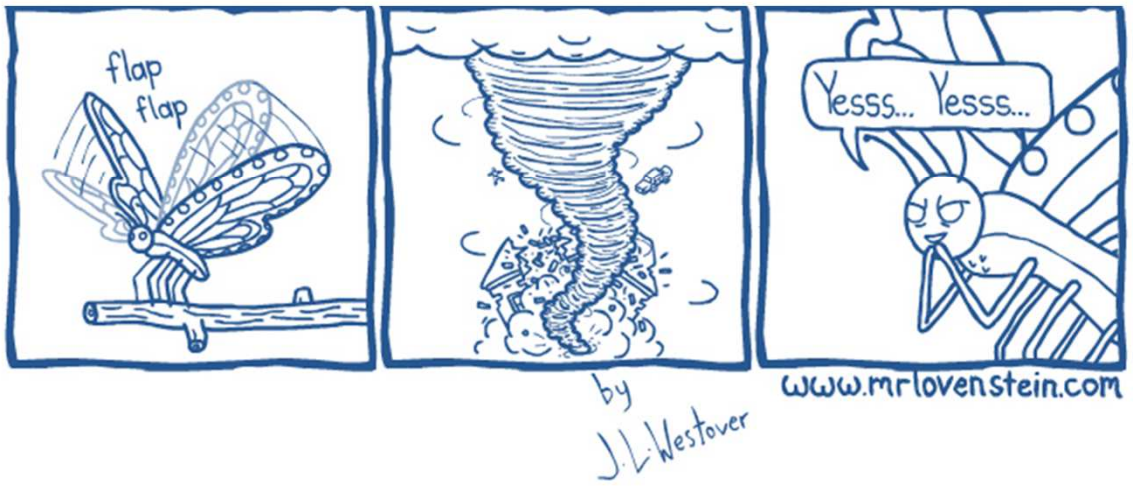


83 recommendations
5 requests for feedback
4 good practices

Methodological consideration

Cause-effect relationships

Emergent behaviour



The found clusters of causes…

Equipment

People

Organisation

External

Equipment

Static Transfer Switch (STS)

- The STS is an electrical switch, connected between the customer critical equipment (the load) and supply mains, that switches a load between two sources.
- Its function is to guarantee a continuous power supply to the load by taking energy from two sources, respecting the priority criteria.

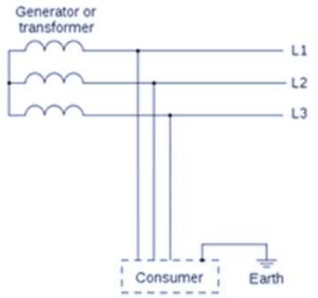
STS 1Ph

STS 3Ph

Equipment

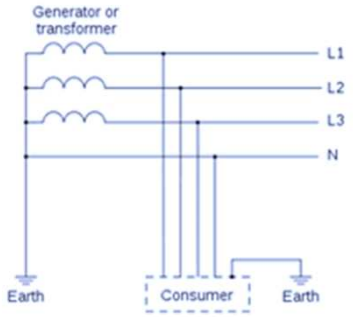
Electrical Network

(1) Unearthed System: IT System



(2) Earthed System

- **TT**
- **TN**



The first letter defines the neutral point in relation to earth:

- T = directly earthed neutral (from the French word Terre)
- I =unearthed or high impedance-earthed neutral (e.g. 2,000 Ω)

The second letter defines the exposed conductive parts of the electrical installation in relation to earth:

- T =directly earthed exposed conductive parts
- N =exposed conductive parts directly connected to the neutral conductor

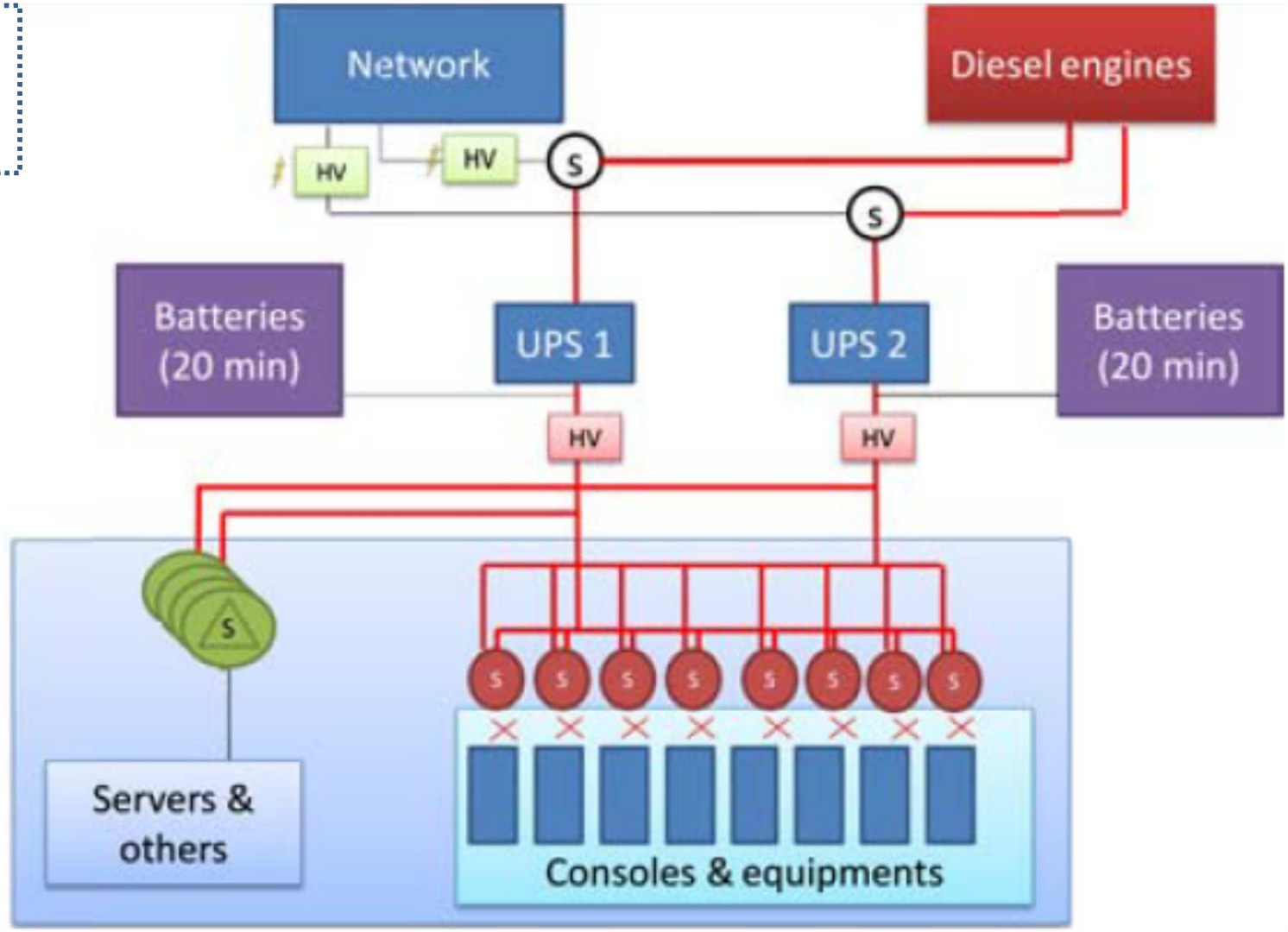
Generator room

Equipment

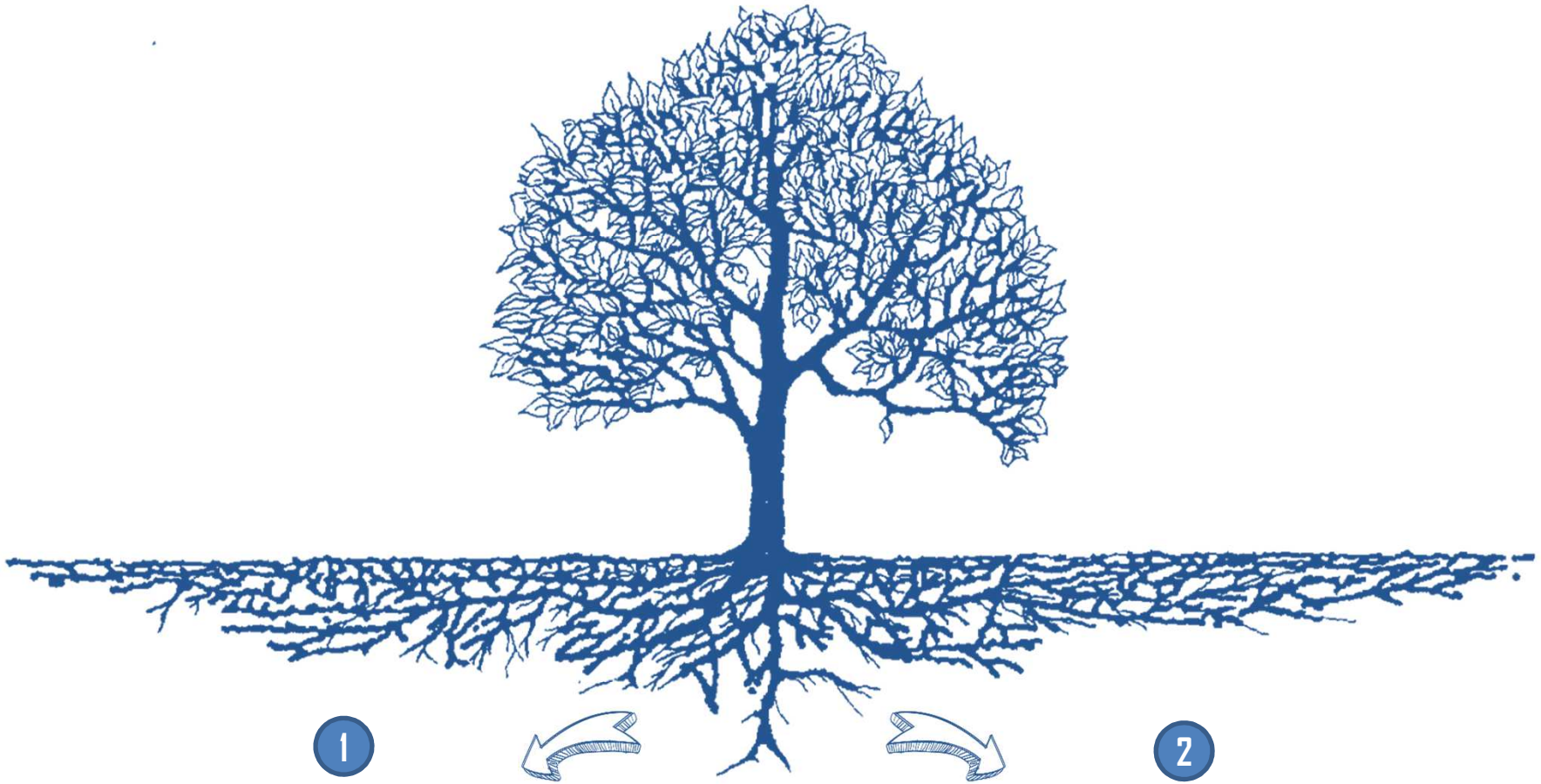
Cooling installation

Power distribution network

07:15
Power
failure



Found technical root causes



1

Absence of connection between the neutral conductor of the emergency generators and earth (diesel generators).

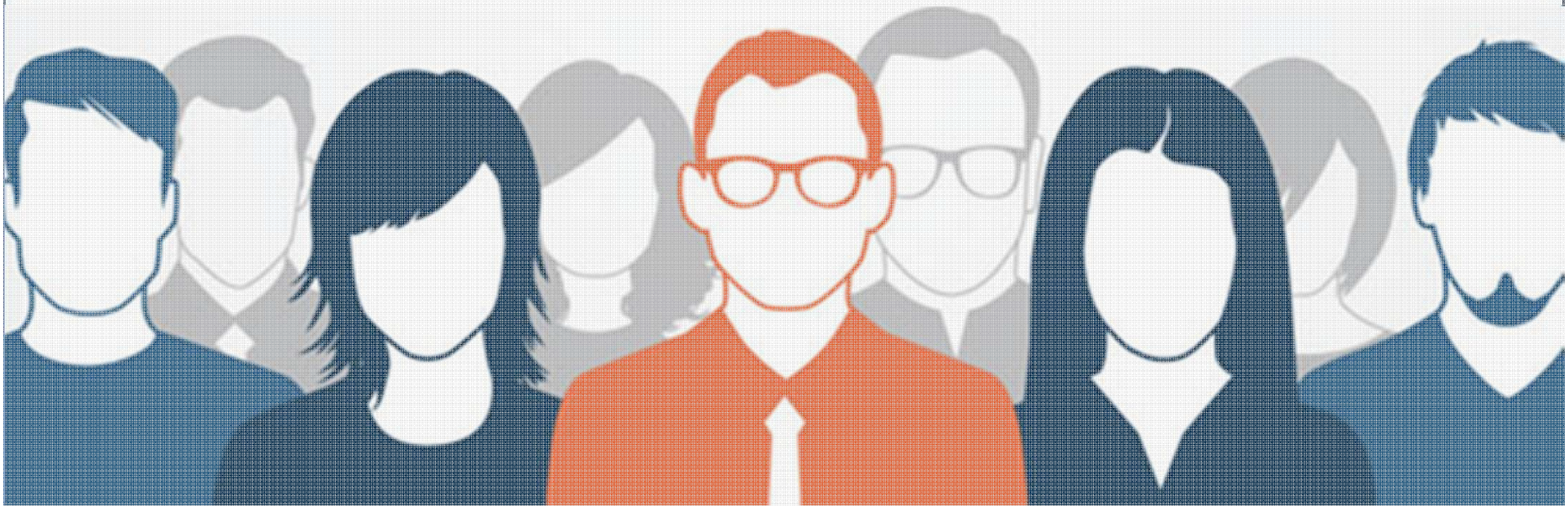
2

The occurrence of a coincidental fault on one of the loads (motor of the cooling installation).

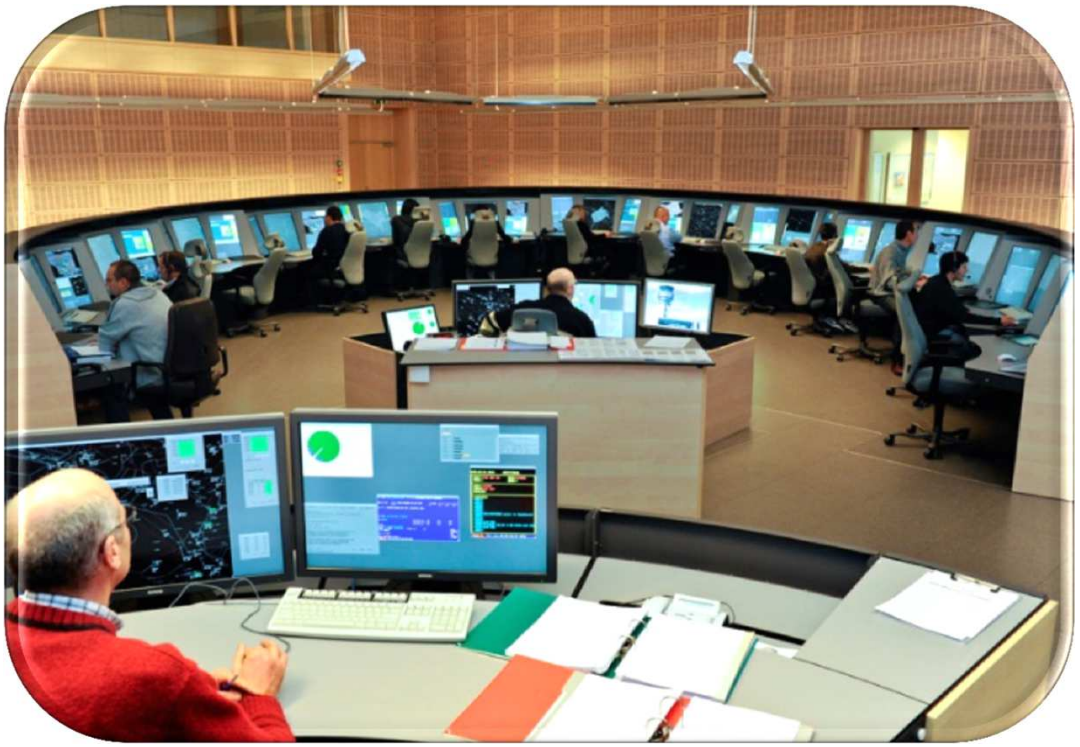
Your turn…

Given the described circumstances:

- **How would you had known whether the generator had had actually been grounded?**
- **Would you have detected the fault on the cooling system and how?**



People



Knowledge od dynamic interactions in the system

"I would estimate that only a hand-full of people in Belgocontrol really understood the power distribution system in detail" .

Prof. C. Johnson

However...

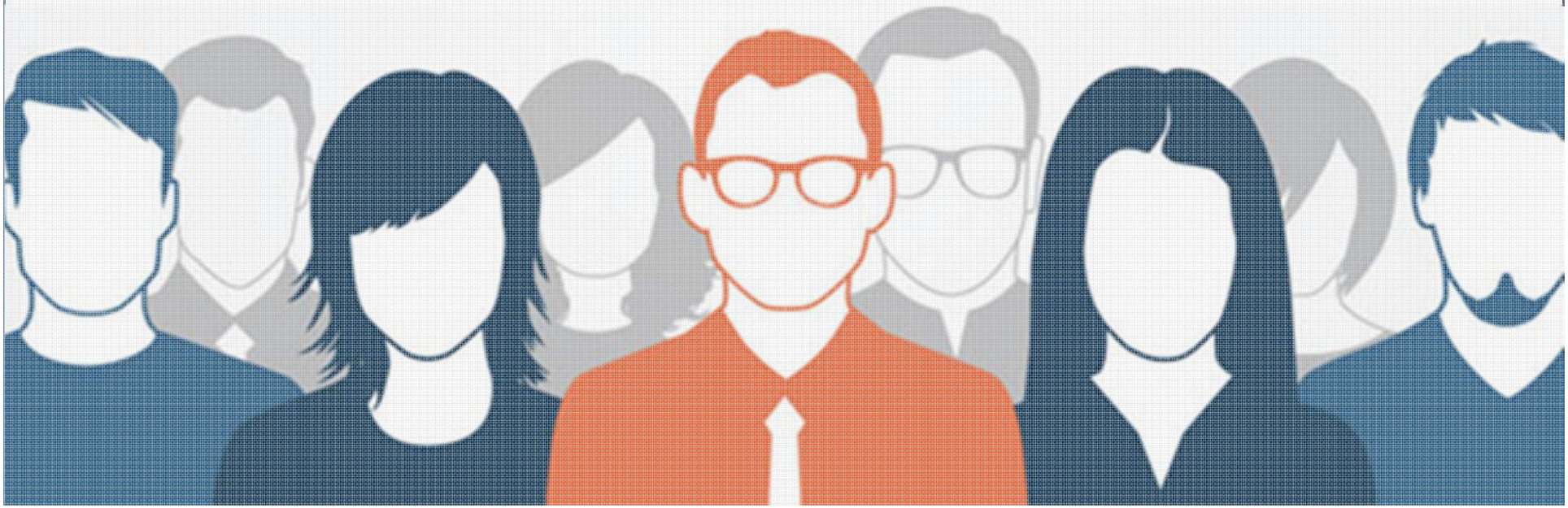
"I was impressed at the risk-based decisions that were taken but these were based on individual insights and flexible group work… They diagnosed and tested their ideas on the cause – they gradually introduced power into a single petal etc."

Prof. C. Johnson

Your turn…

Given the described circumstances, how do you think your staff would have acted?

What level of confidence you have that they would have made a right decision?



Organisation

Inadequate contingency facilities

"It is totally clear to me that the operational contingency centre was never intended to be used but only to meet a regulatory obligation. It is inaccessible and unknown to most operational staff".

Prof. C. Johnson

BUT…

"In this case, your engineer made the right judgement in repairing the primary systems but they must have been under extreme pressure knowing that the contingency center was so feeble".

Prof. C. Johnson

Your turn…

What are your contingency facilities like?

External


OUTSOURCING
COMMUNICATION
CUSTOMER
SERVICES
FUNCTION
PAYMENT
QUALITY OF SERVICE
SATISFACTION
STRATEGY
FINANCE
ASSESSMENT
PROCESS
SKILLS
TECHNOLOGY
COST
TRANSFERRING
CONTRACT
EXPERTISE
RELATIONSHIP
SUPPLIER
BUSINESS
SERVICES
THIRD PARTY
MANAGEMENT
FEEDBACK
COMMUNICATION
SATISFACTION
QUALITY OF SERVICE
CUSTOMER
RELATIONSHIP

External suppliers

- The investigation results brought into question the validation/certification provided by external suppliers.
- In parallel with the growing complexity of the ATM system, the ANSPs become more and more dependent on the support from third parties.
- Therefore, ANSPs must ensure that the Supplier Safety Assurance System maintains the same pace of change as its environment.

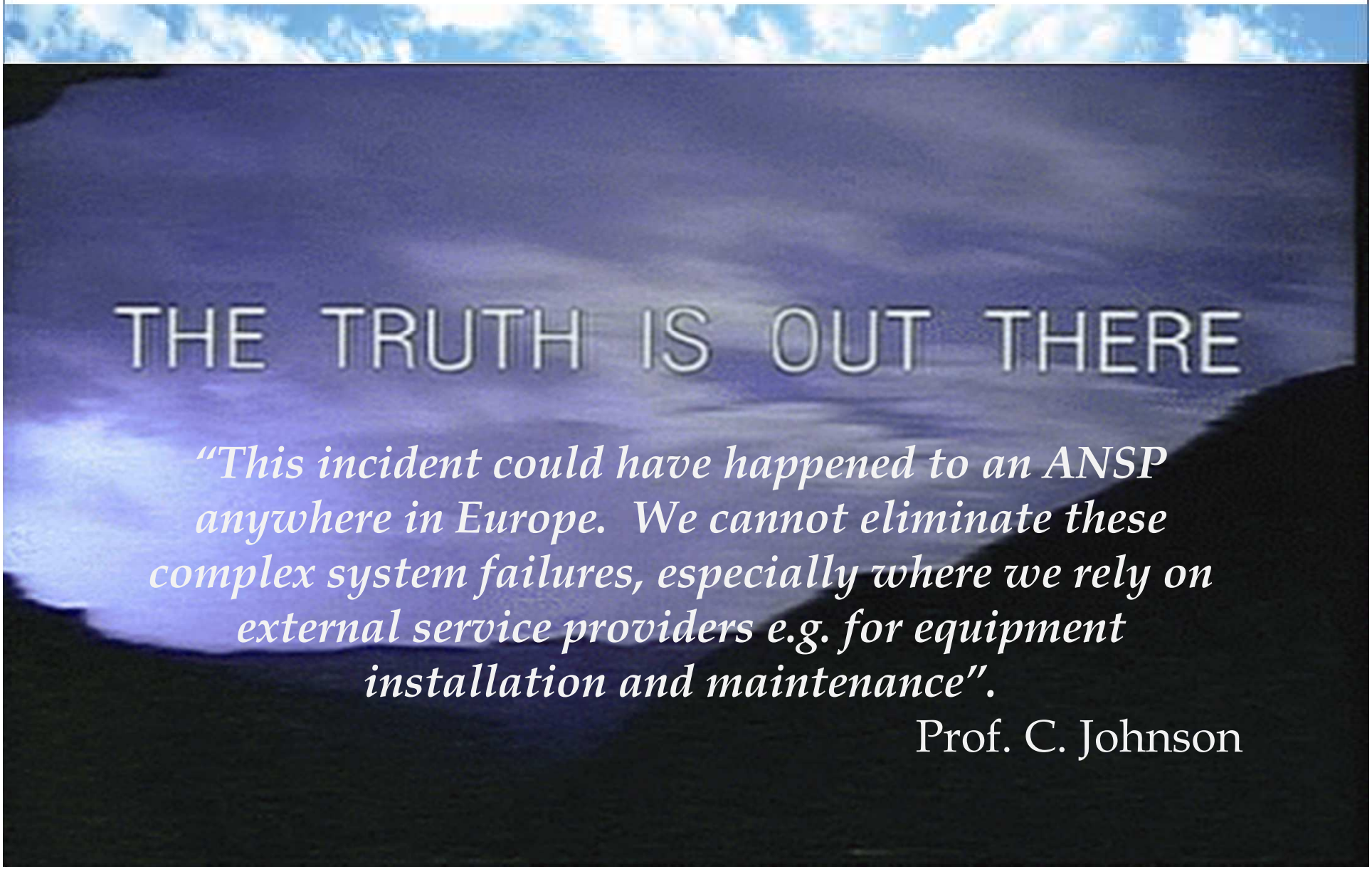
Your turn…

Do you have a Supplier Safety Assurance System in place?

How effective is it?

On the basis of what do you measure its effectiveness?

Not invented here…



"This incident could have happened to an ANSP anywhere in Europe. We cannot eliminate these complex system failures, especially where we rely on external service providers e.g. for equipment installation and maintenance".

Prof. C. Johnson

Lessons learned

Lessons… Not invented here…

Staff is expected to comply with procedures

- But what if there are no procedures? Or incomplete, inefficient?
- Now, what if the staff improvises?
- Our staff managed to find a solution. But what if this solution was a negative one?

The human … link

Lessons... Not invented here…

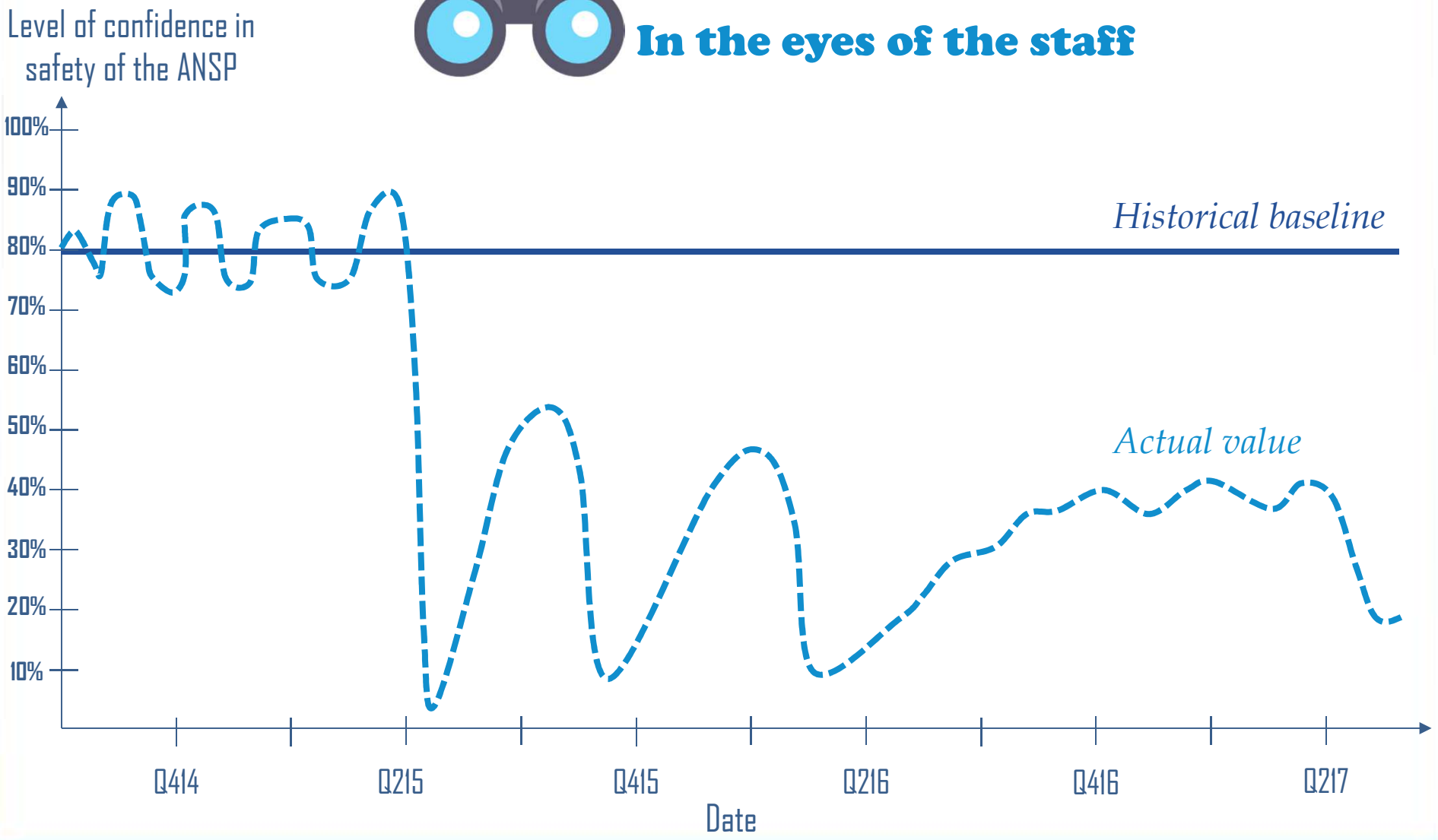
Teamwork

All involved showed an extraordinary level of commitment, resilience and positive focus.

Lessons… Not invented here…

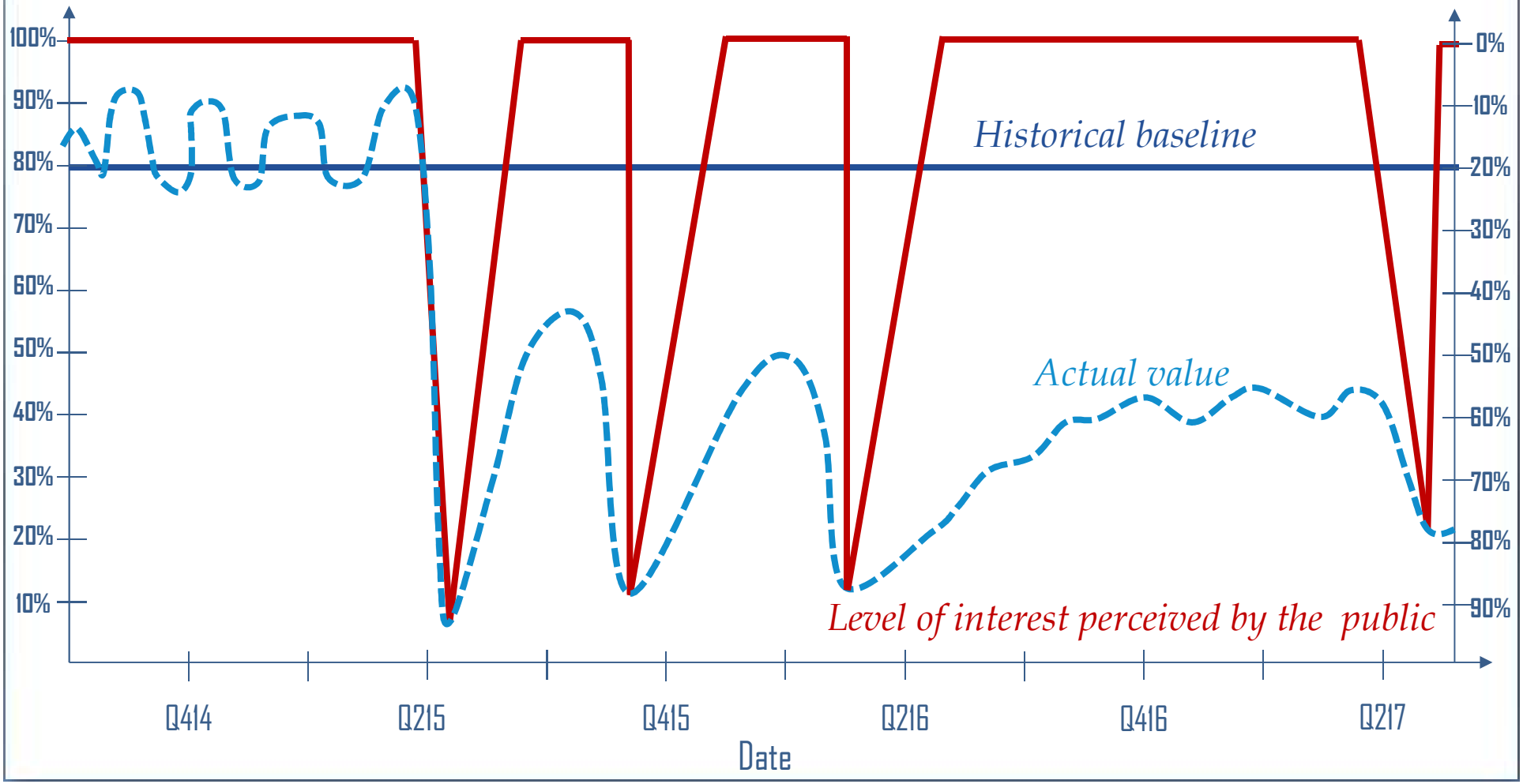
Inside Out Perception of Belgocontrol

In the eyes of the staff



Inside Out Perception of Belgocontrol

In the eyes of the public



Headlines…

© Photo News

The big stream of Belgocontrol last year? Problem has existed for more than 10 years

The big flood of May 27, 2015 in the Belgocontrol air traffic control center in Steenokkerzeel had already taken place much earlier. The diesel generator at the base of the panne had not been earthed since the installation of the electrical system of the center. This is stated in the Air Accident Investigation Unit's Air Mobility Investigation Unit's Final Report for Air Accident Investigation.

New Failure at Belgocontrol: Pilots worry about air safety

On 7 June 2017, following a new failure at Belgocontrol, the Belgian Cockpit Association published a Press Release urging Belgocontrol to immediately take all appropriate measures to ensure air safety. Download Press Release (in French and Dutch).

Bruxelles, le 7 juin 2017

Nouvelle panne à Belgocontrol : les pilotes s'inquiètent pour la sécurité

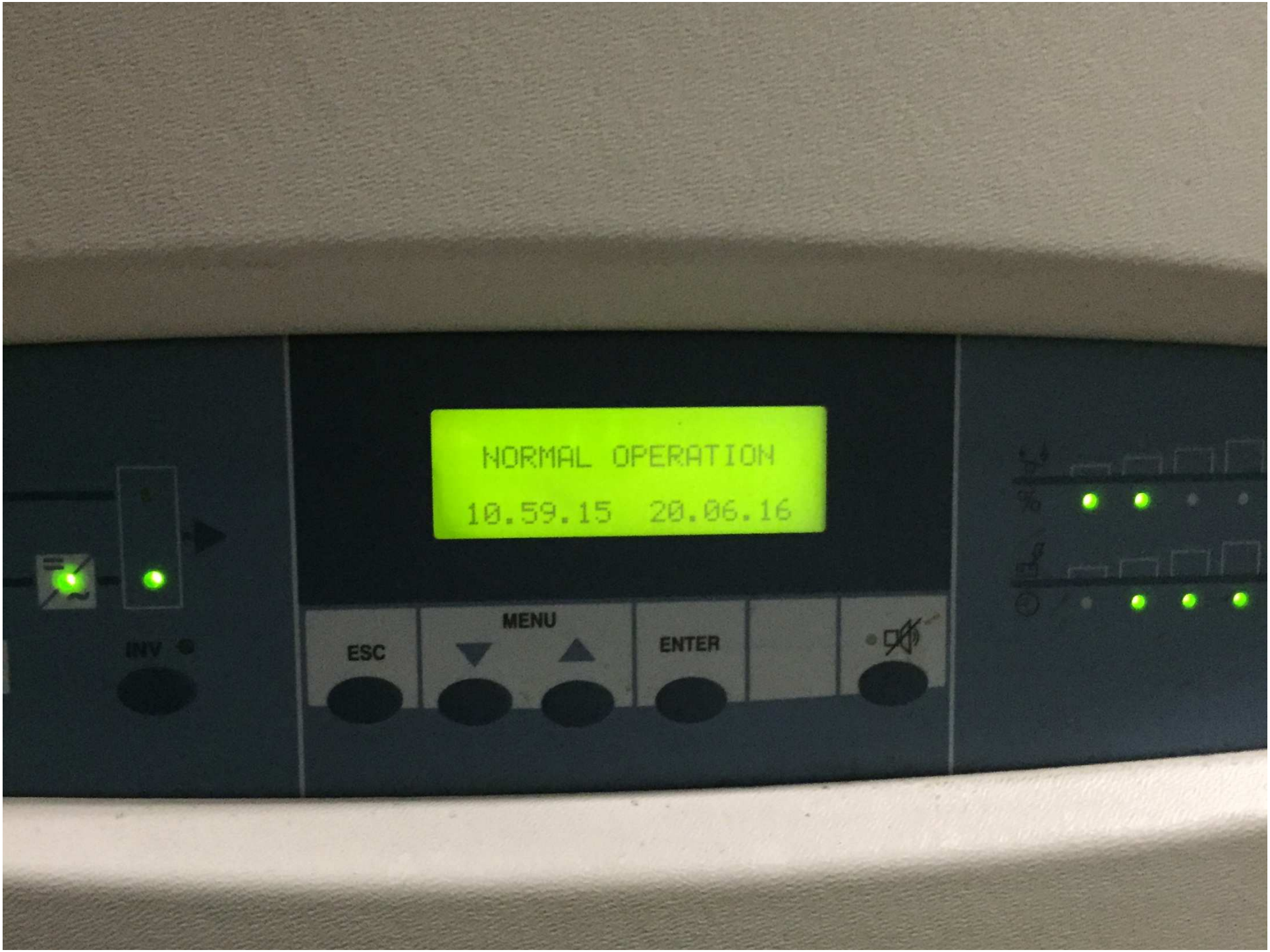
Le 6 juin 2017, Belgocontrol, l'agence chargée du contrôle aérien en Belgique, a de nouveau subi une panne technique. Il s'agit du troisième incident en deux ans. Heureusement, grâce au professionnalisme des contrôleurs aériens et au système de backup, aucun incident majeur n'est à déplorer. Cependant, la BeCA s'inquiète de cette situation et exhorte Belgocontrol à prendre les mesures nécessaires pour remédier aux problèmes récurrents qui menacent la sécurité aérienne et la pérennité du contrôle aérien en Belgique.

Selon les informations dont nous disposons, le mardi 6 juin 2017, à la suite du débranchement par erreur d'un câble, tous les écrans radars du système primaire, ainsi que le système secondaire de backup se sont éteints pendant une dizaine de minutes. Les contrôleurs aériens ont dès lors été contraints de travailler sur le troisième et dernier système de secours (fallback system), qui n'a donc pas toutes les fonctionnalités du système habituel. Il s'agit du troisième incident en deux ans. En effet, le 27 mai 2015, Belgocontrol avait subi une panne électrique qui avait paralysé l'espace aérien belge pendant plusieurs heures, entraînant l'annulation et le retard de nombreux vols. Le 12 avril 2016, l'espace aérien belge a de nouveau dû être fermé en raison d'un manque de contrôleurs aériens pour assurer le service.

Cette situation est inacceptable et pose de nombreuses questions quant à la sécurité et à la pérennité du contrôle aérien belge. Comme la BeCA l'a déjà souligné à plusieurs reprises dans un

Lessons… Not invented here…

Where is our P.W. now?


NORMAL OPERATION
10.59.15 20.06.16
INV
ESC
MENU
ENTER