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NAV
NAV Portugal, E.P.E.

Agenda

Tower of Lisbon – Safety support

- What's on?
- How to address safety?
- The Unit Safety Case
  - Argument
  - Assessing "Safety"
- Experience
  - Workshops
  - Reaction of participants
  - Mailing and phoning
- The Future

What's on?

- Projects
  - A-SM
  - Tower
  - New s
  - New M
  - CDM (
  - …

_AT)

How to address safety?

What should we do to ensure we are safe?

How can we handle all these changes in a safe way and be able to demonstrate it?

Regulation

What is expected from us?

How to address safety?

How to address safety?

Perform Safety Assessment of each change?

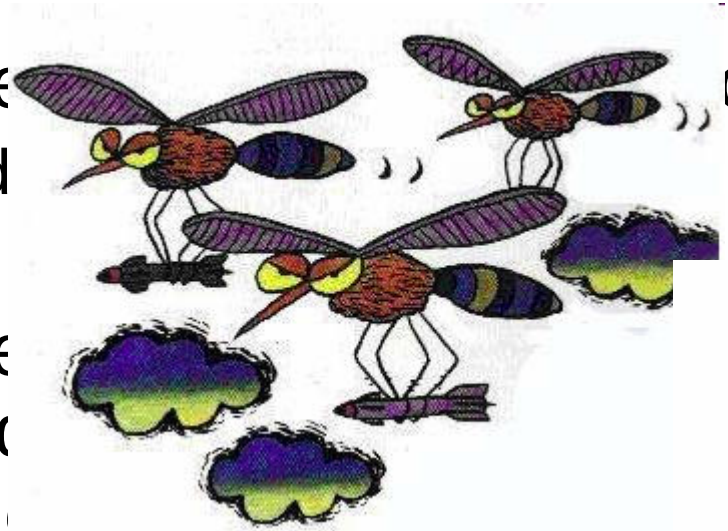
And where is the global picture?

Perform Safe changes?

And when d

Perform Safe
situation, and

Unit Safety



The Unit Safety Case

1 Introduction
1.1 Goals
1.2 Scope
1.3 Assumptions
1.4 Constraints
1.5 Glossary
1.6 References
2 System Description
2.1 Environment of Oper
2.1.1 Traffic description
2.1.2 Interfaces with adjacent areas
2.1.3 Airport Characteristics
2.1.4 Meteorological conditions

3 Argument

4 Caveats
5 Conclusions

It covers the service provided by NAV Portugal at Lisbon Tower, (…)
The geographical boundary for tower control services is (…)
The interfaces with adjacent airspace / entities (…) are also addressed.
All the enablers (**people, procedures and equipment**) necessary for the provision of these services are also covered.
The **organization** behind these services and enablers is also included as a contributing element.

The vehicles on the platform are not in the scope.

The Unit Safety Case - Argument

3 Argument

Arg 0 - Claim

eparedness for the
'S services by NAV
TWR of Lisbon is
managed so as to
ety levels

nt of operations
raph 2.1)

ervices
raph 1.2)

Safety Criteria

Cr01

Current safety level:
There are no reservations from the regulator with regards to the safety of the services provided by the tower of Lisboa, neither are there issues identified by NAV Portugal.

Cr02

The SMS is efficient and mature to continuously improve safety

Arg 1
The safety culture supports the safety and improvement activities

has all elements
to discharge its

Arg 3
The ATM system adequate for the service provision and is safely managed

Figure 3 Figure 4 Figure 6

Figure 2: Top level argument

The Unit Safety Case - Argument

3.1 Argument 1 – Safety Culture

Arg 1
The safety culture supports the safety and improvement activities

Arg 1.1
The safety culture has been measured

Arg 1.2
The Safety culture level is improved or, at least, maintained

Arg 1.3
Degraded safety culture levels are identified

Arg 1.4
Changes affecting the safety culture level are assessed

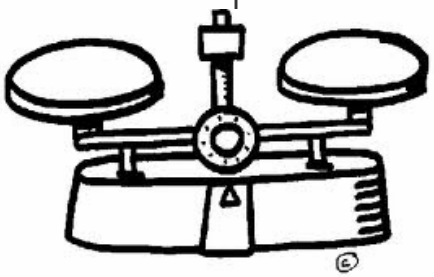


Figure 3: Argument 1 – Safety Culture

The Unit Safety Case - Argument

3.2 Argument 2 – Safety Management System

Arg 2
The SMS has all elements and properties to discharge its functions

Arg 2.1
The SMS structure and functions are complete and effective

Arg 2.2
The SMS is maintained in an adequate manner

Arg 2.3
The SMS degraded modes are identified and there are provisions to maintain safety management in the degraded modes

Arg 2.4
Impact of changes to the SMS is assessed

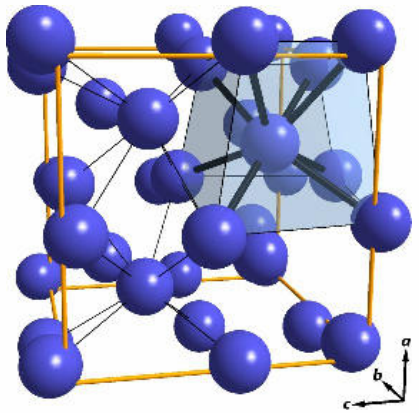


Figure 4: Argument 2 - SMS

The Unit Safety Case - Argument

3.2.1 Argument 2.1 – SMS Structure, functions and Performance

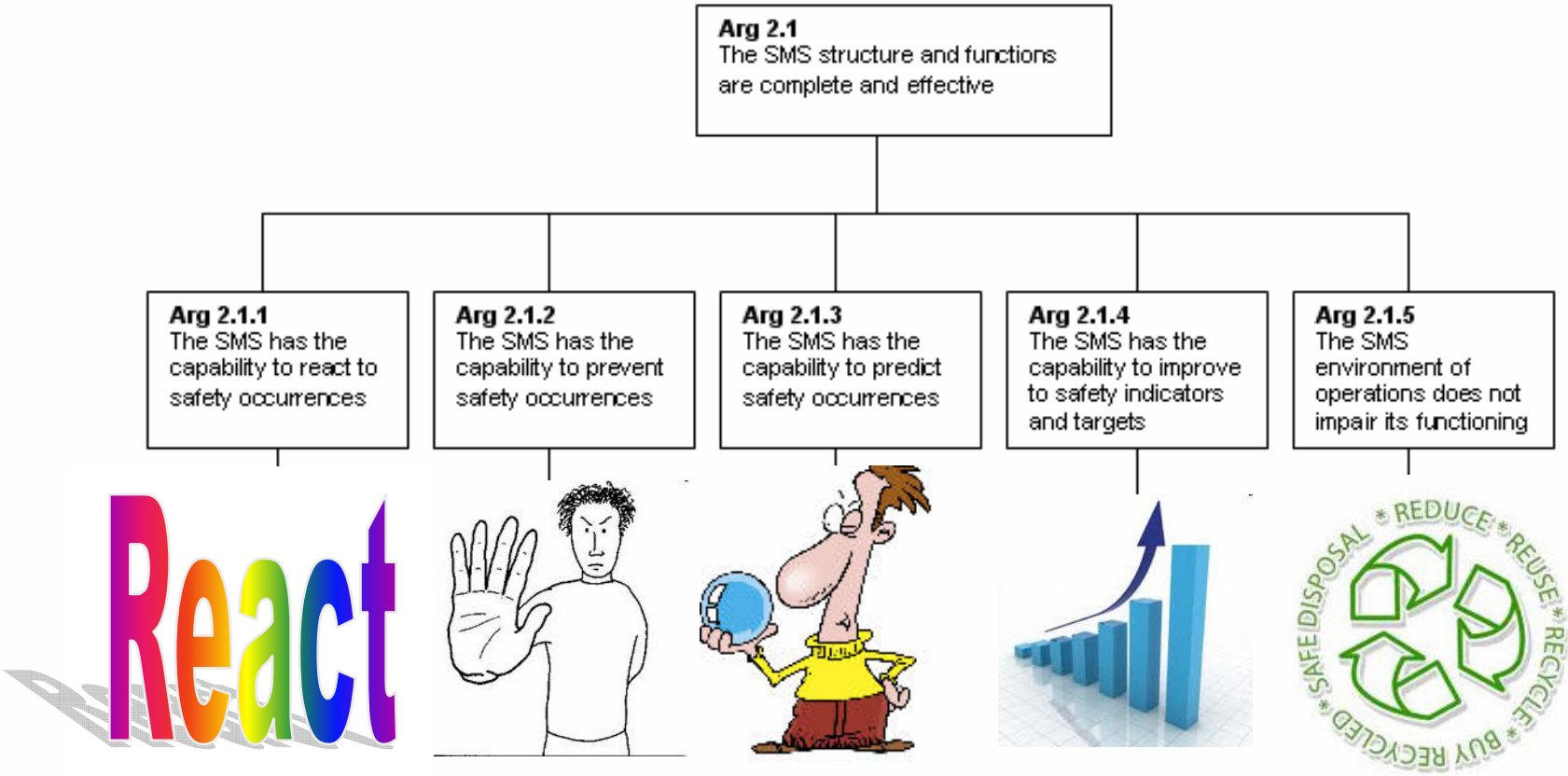


Figure 5: Argument 2.1 - SMS functions

The Unit Safety Case - Argument

3.3 Argument 3 – ATM System

Arg 3
The ATM system is adequate for the service provision and is safely managed

- The ATM system has all elements and properties required for the service provision.
- The maintenance is adequate for the required availability and performance
- The degraded modes of the ATM system have been identified
- The impact of changes to the ATM system is systematically assessed

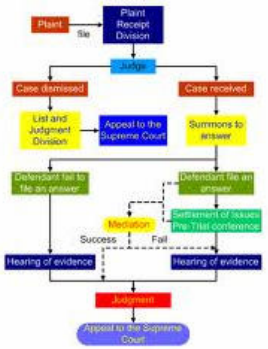
Arg 3.1
Staff is competent and in sufficient numbers to discharge their responsibilities and will

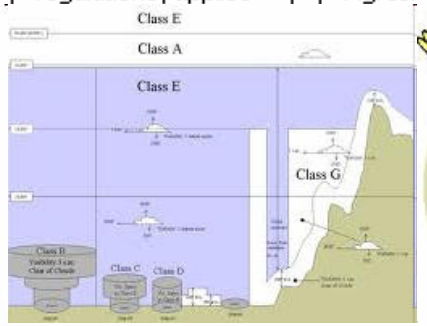
Arg 3.2
The ATC procedures are complete, correct and workable and will remain so

Arg 3.3
The equipment functionalities and performances meet the operational requirements and

Arg 3.4
The airspace design addresses users' needs, conforms to international regulations, applies

Arg 3.5
The external services are identified and Servic… Agreem…





The Unit Safety Case - Argument

3.3.1 Argument 3.1 – Human Element

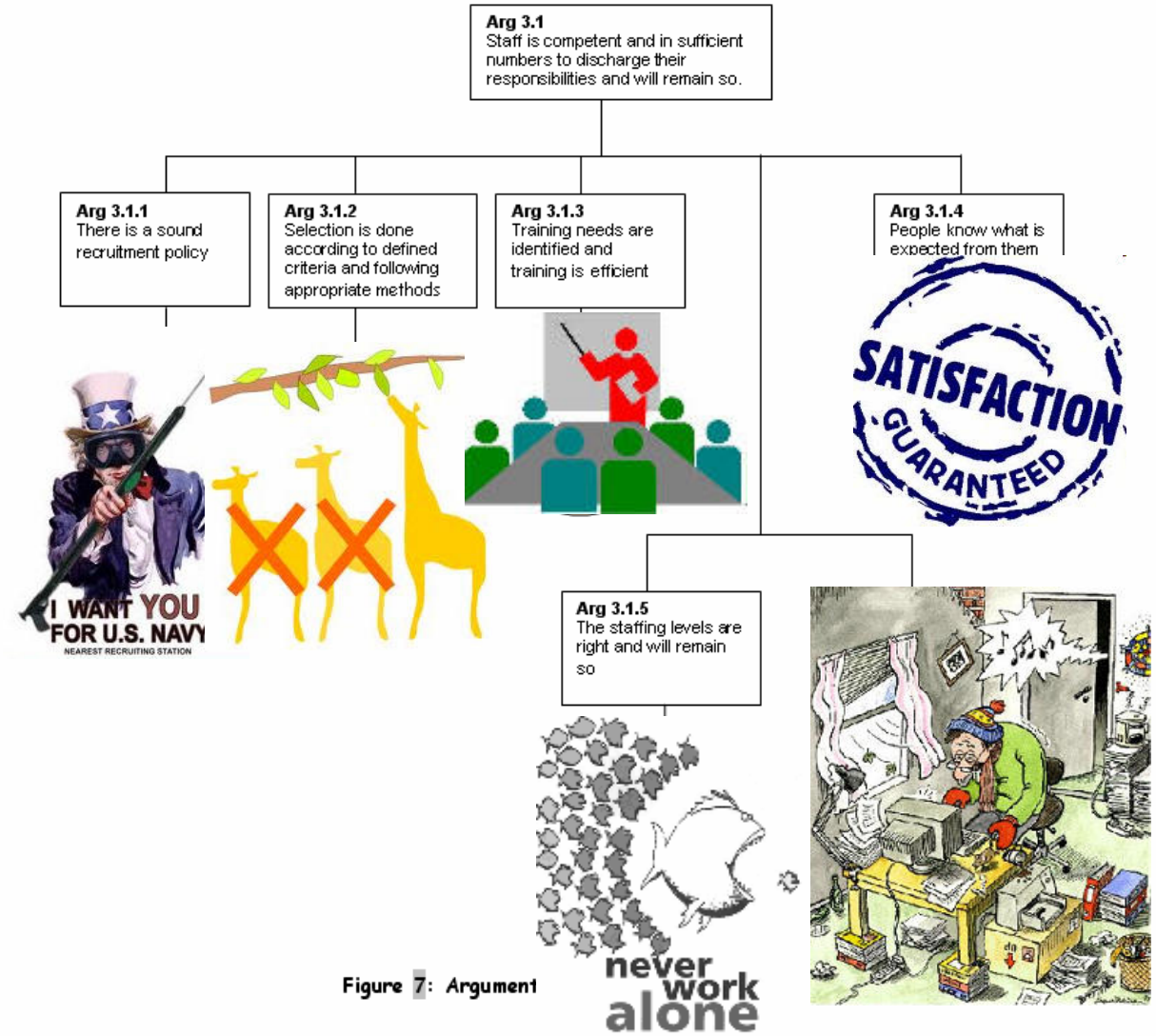


Figure 7: Argument

The Unit Safety Case - Argument

3.3.3 Argument 3.3 - Equipment

Arg 3.3
The equipment functionalities and performances meet the operational requirements and conform to established standards and will remain so



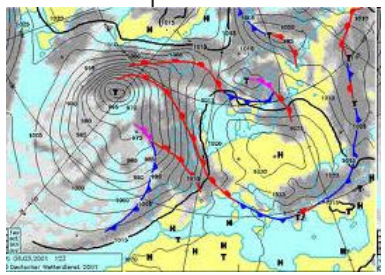



Figure 9: Argument 3.3 - Equipment

The Unit Safety Case - Argument

3.3.3.4 Argument 3.3.4 – Meteo

Arg 3.3.4
The **Meteo** function meets the operational requirements and conforms to existing standards and will remain so

Arg 3.3.4.1
The Meteo function provides the functionalities required for the Lisboa Tower service with the necessary performance

Arg 3.3.4.2
The Meteo function is maintained so as to achieve the required availability and performance

Arg 3.3.4.3
The Meteo function degraded modes are identified; their impact on operations assessed and mitigations are in place

Arg 3.3.4.4
The safety impact of changes of the Meteo function on the ATM system is assessed

$x \longrightarrow \boxed{f} \longrightarrow f(x)$

The Unit Safety Case - Argument

3 Argument

Cr01
Current safety level:
There are no reservations from the regulator with regards to the safety of the services provided by the tower of Lisboa, neither are there issues identified by NAV Portugal.

Cr02
The SMS is efficient and mature to continuously improve safety

Cr03
The NAV Portugal's Safety Culture supports the SMS

Arg 0 - Claim
The level of preparedness for the provision of ATS services by NAV Portugal at the TWR of Lisbon is adequate and managed so as to improve its safety levels

Environment of operations
(See paragraph 2.1)

Provided Services
(See paragraph 1.2)

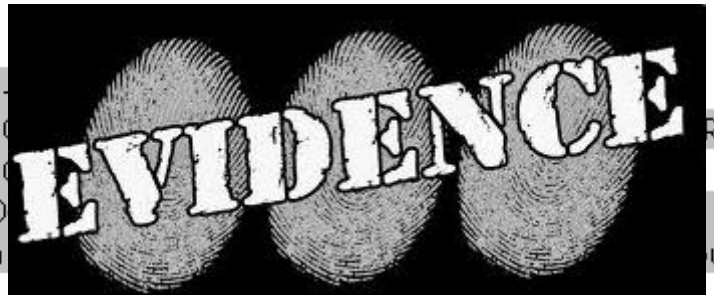
The Unit Safety Case - Argument

3.3.2.2 Argument 3.2.2 – Maintenance of procedures

Procedures are defined according to the identified needs and reviewed when necessary.
Changes to procedures are communicated via internal documents to the concerned staff, via Boletim Informativo - Software application used to distribute information (Ref. [43]).
The process to maintain existing procedures is defined.

Evidence:

- POP 16 -
- MO-16.
- MO-16.
- PO-17.0
- Boletim



RLIS (Preface) (Ref. [8])

DP) (Ref. [10])

ute informa

The documents where procedures are defined are kept up to date

Conclusion

However

R7. The time for approval of new editions is considered too long.

Caveat

The Unit Safety Case - Argument

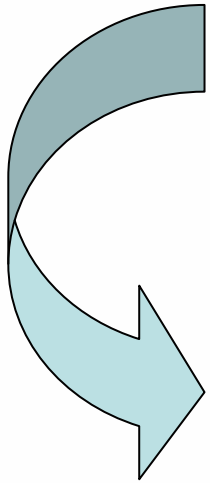
3.1.4 Argument 1.4 – Changes affecting the Safety Culture

The staff transfers to the tower of Lisboa are controlled, not allowing big groups of new comers. Taking into account the safety culture measurements and the controlled changes to staff, it is not expectable to have significant changes in the safety culture affecting the tower of Lisboa.

In case of detection of changes to the safety culture, a plan of mitigation actions shall be put in place.

There are no expected changes (apart from those resulting from improvement actions) to the safety culture at Lisboa TWR

R3. There is need to define a mitigation plan to cope with unexpected changes of the safety culture.



4 Caveats

All identified problems or areas in need of improvement have been marked with an orange box. The following table recalls the identified issues:

R1	Communication with Sintra is not available yet, but required.
R2	Taxiways parallel to runway 21 would avoid its crossing.
R3	There is need to define a mitigation plan to cope with unexpected changes of the safety culture.
R4	Audio/video recordings analysis should be adopted and implemented in Lisboa Tower, as a predictive survey tool, similarly to what was done at Faro, Funchal and Porto Santo Towers.
R5	There is need to improve high level management understanding of safety issues

The Unit Safety Case - Argument

3.3.3.5.2 Argument 3.3.5.2 - Building maintenance (Procedures-Staff-equipment)

The maintenance staff levels are considered adequate. Currently there are 5 electricians, 2 mechanics and 2 electro mechanics (for AVAC systems) trained to maintain the power and AVAC systems. This team is also performing the maintenance of all sites in the Lisboa FIR. Staff is available on call 24h per day, and should be at the TWR in less than 1h.

HVAC is maintained according to the maintenance plan.

X7. Fire detection system is checked yearly. It is automatically reporting any anomaly to a central system at the security desk.

[illegible] fi[illegible]inguishers are placed around [illegible] building and [illegible] of differe[illegible]ds. They are [illegible]

X13. The powe[illegible] via the airport. T[illegible] provided by two red[illegible] from the Lisboa Airport.

In case of power supply interruption the service is guaranteed by two redundant UPS with 1h autonomy. Communication equipment is connected to batteries, having two chargers, with 10h autonomy.

X14. The escape chute is tested every year by an external company.

The building is maintained to a large extent through external contracts

R15. It remains to be established whether external contractors are (adequately) covered by SLAs and coordination procedures for intervention on concerned equipment

External servives

Assessment

ID	Service	Safety impact	Supplier	SLA Evidence
X1	Communication equipment used in the vehicles	H	Xxx	Protocol
X2	Lights, stop bars, PAPIS and RWY identification	H	Xxx	Protocol
X3	Flight checks	M	Xxx	Contract
X4	LVSS software maintenance	M	Xxx	Contract
…	…	…	…	…

The Unit Safety Case - Extras

Annex I – Traceability (Evidence -> Argument)

9350.FHA.001 - A-SMGCS Functional Hazard Assessment

> Argument 2.1.3 - Predictive SMS, 29
> Argument 3.3.1.3 - Surveillance degraded modes, 44
> Argument 3.3.7.3 - ATM HMI and support functions degraded modes, 65
> Argument 3.3.7.4 - Changes to the ATM HMI & support functions, 65

AE/CTA - Acordo de Empresa (for ATCO)

> Argument 3.1.2 - Selection, 33
> Argument 3.1.3 - Training, 33
> Argument 3.1.6 - Staff Management, 35

AIP - Aeronautical Information Publication (Lisboa) (AIRAC AMDT 005/10)

> Argument 3.2.1 - Current procedures, 36
> Argument 3.4.1 - Current Area of jurisdiction, 66

The Unit Safety Case - Assessing

The Challenge

Create a SC measure
and that can be used t
achievement of the CL
compare versions and
improving.

It should be like a sem
management.

The Unit Safety Case - Assessing

Why should it be evaluated?

- How do we know where we are?
- How can we see we are going on the right direction?

What should be evaluated?

- Safety, via the credibility of the argument.

How to ensure a credible evaluation?

- Defining a criteria.
- Using a correct model
- Involving a wide range of people
  (Management, Operations, Maintenance, Projects, Safety)

The Unit Safety Case - Assessing

Criteria

Score	Criteria
10	High confidence, no issues
7	High confidence, and can be improved
5	Confidence, with no identified issues
3	Confidence, with issues
1	Low confidence

High confidence: The argument is sound and there are no reasons to believe it will no be so in the near future

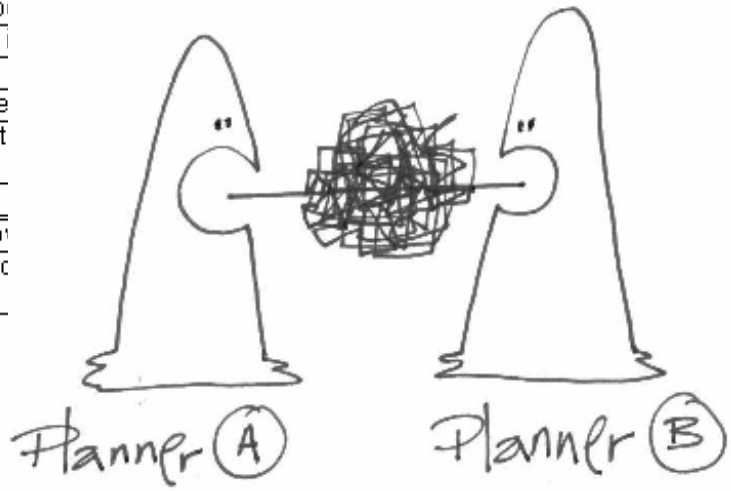
Confidence: The argument lacks history, evidence. The processes are defined but still not mastered.

Low confidence: It is starting...

The Unit Safety Case - Assessing

Questionnaire (59 questions)

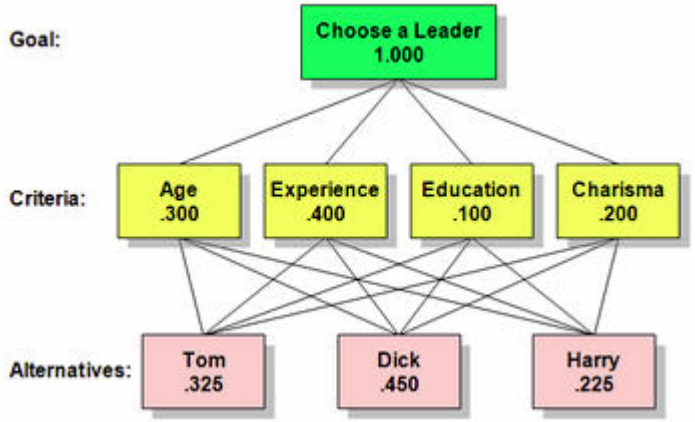
ID	*Statement*	*Score*
1	The **safety culture** supports the safety and improvement activities	
1.1	The safety culture has been measured	
1.2	The Safety culture level is improved or, at least, maintained	
1.3	Degraded safety culture levels are identified	
1.4	Changes affecting the safety culture level are assessed	
2	The **SMS** has all elements and properties to discharge its functions	
2.1	The SMS structure and functions are complete and effective	
2.1.1	The SMS has the capability to react to safety occurrences	
2.1.2	The SMS has the capability to prevent safety occurrences	
2.1.3	The SMS has the capability to predict safety o	
2.1.4	The SMS has the capability to improve safety	
2.1.5	The SMS environment of operations does not	
2.2	The SMS is maintained in an adequate manne	
2.3	The SMS degraded modes are identified and t safety management in the degraded modes	
2.4	Impact of changes to the SMS is assessed	
3	The ATM system adequate for the service pro	
3.1	**Staff** is competent and in sufficient numbers to and will remain so.	
3.1.1	There is a sound recruitment policy	



Presenting face to face

The Unit Safety Case - Assessing

Model (AHP)

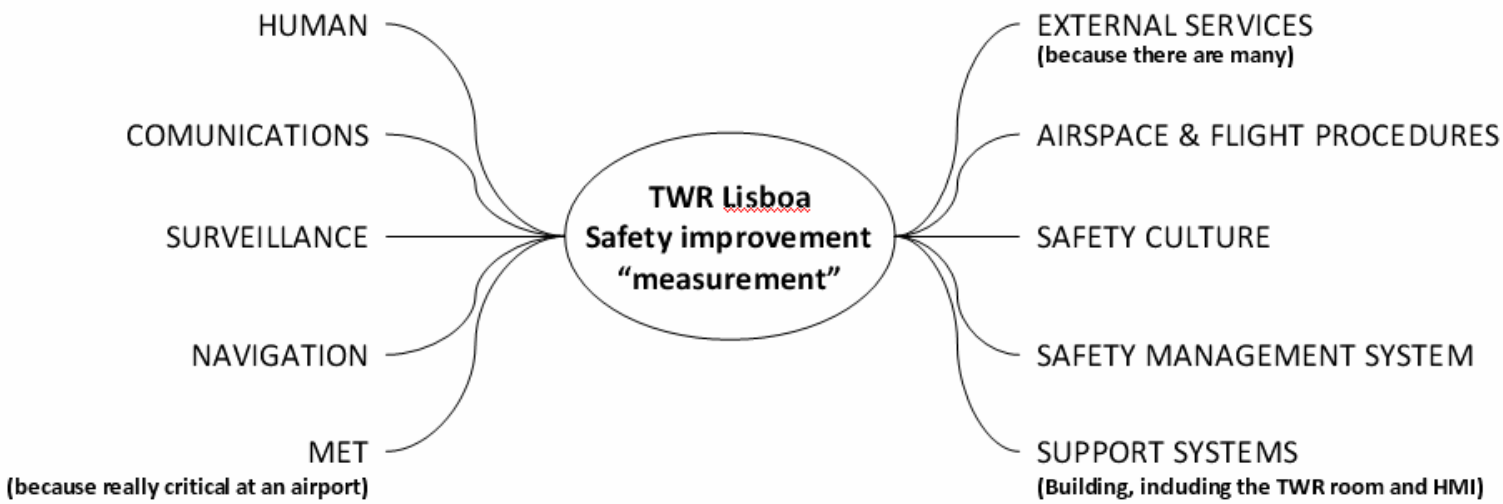


Used for scaling importance of elements
Based on expert judgement (operational)

Details coming in a later presentation

The Unit Safety Case - Assessing

Mind map



The Unit Safety Case – Experience

- Workshop 1 *(23rd to 25th March 2010)*

TWR Lisboa USC - tasks

Nr.	Argument	Task description	Goal or evidence	Task allocation & contributors
1.	Arg0 Claim	Define scope – area, services Get environment description		SISQUA, TWRLIS, NASO
2.	Arg1 Safety Culture	QMS – PGS 67		SEGNA
3.	Arg 1.1 Safety Culture measurement	Describe existing measures Summarise reports on Safety Culture	Results of safety culture measurements	SEGNA
4.	Arg 1.2 Safety Culture Maintenance	Follow-up actions from Safety Culture reports	Safety culture is maintained or improved	SEGNA
5.	Arg 1.3 Degraded levels of safety culture	Find, describe, address, ...		SEGNA
6.	Arg 1.4 Changes affecting safety culture	Find, describe, address, ...		SEGNA
7.	Arg 2 SMS capability to continually improve safety levels	QMS – PGS 67		
8.	Arg 2.1 SMS functions and performance	QMS – PGS 67		
9.	Arg 2.1.1 Reactive SMS	Describe existing measures	Indicators of reporting Provisions to encourage reporting Investigation organization	SEGNA
10.	Arg 2.1.2 Preventive SMS	Refer existing surveys Refer provisions for surveys (plans, ...)	Results of Safety Surveys Safety survey implementation	SEGNA
11.	Arg 2.1.3 Predictive SMS	Refer existing assessments Refer provisions for assessments Link between assessments and occurrences	Safety assessments	NASO, SISQUA
12.	Arg 2.1.4 Improvement	Refer improvement provisions Refer existing indicators and targets	Indicators and targets	SEGNA
13.	Arg 2.1.5 SMS environment of operations	Refer management, just culture provisions, relations with judicial system		SEGNA (NAPATM)
14.	Arg 2.2 SMS Maintenance	Refer existing provisions Describe, define		SEGNA

The Unit Safety Case – Experience

- Workshop 2, 3 *(28th and 29th April + 26th and 27th Mai)*
  - –Participants only when needed (do not bore them…)
  - –Write document on the fly – Show and correct
  - –After each WS distribute results (SC document)

Effort: 25 md

- In between
  - –Receive contributions
  - –Consolidate document
  - –Find the way ahead

Effort: 20 md

  - –Review document
  - –Answer questions
  - –Assess

Effort: 20 md

The Unit Safety Case – Experience

- Building Safety Survey

Effort: 12 md

- Total effort estimate: 114 md

The Unit Safety Case – Experience

- Reaction of participants
  - –Good feedback!
  - –Triggered discussions
- Mailing and phoning
  - –Not alone, good discussions, …

The Unit Safety Case – Experience

- The Future
  - –Review Unit Safety Case yearly
    - How, is still a big question…
    - Thinking about it – responsibilities, point of contact, focal point
  - –Build unit safety case for other towers (Max one per year)
  - –Build unit safety case for Lisbon ACC
  - –Build unit safety case for Santa Maria OACC
- What can be the use of USC?
  - –Regularly assess the evolution
  - –Predict safety impact of changes

The end

Any questions ?