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Agenda

Lisbon Tower – Measuring Safety

- The safety Case (September 2010)
- Measuring Safety
- What for?
- How? AHP/APF
    - Mindmap
    - Questionnaire
    - Weighing exercises
- Usage

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

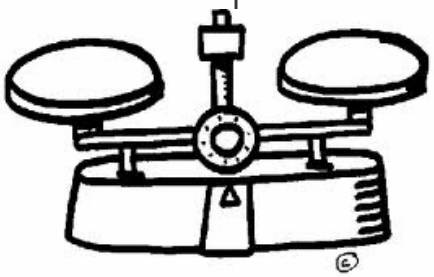
Figure 2: Top level argument

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

3.3.2.2 Argument 3.2.2 – Maintenance of procedures

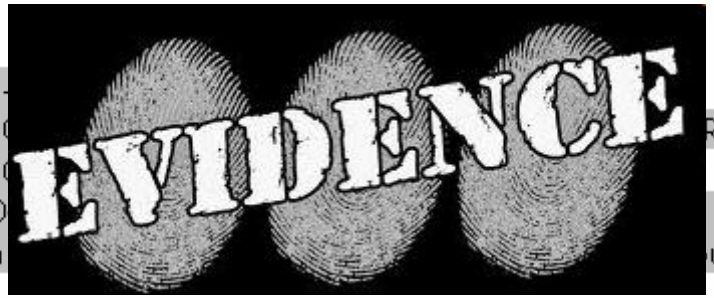
Procedures are defined according to the identified needs and reviewed when necessary.

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

However

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

Conclusion

Caveat

The Unit Safety Case - Argument

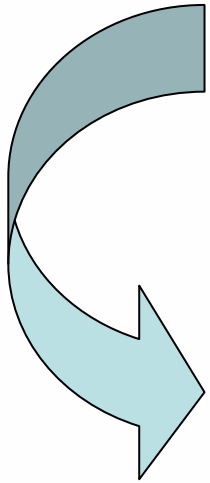
3.1.4 Argument 1.4 – Changes affecting the Safety Culture

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

Measuring Safety

The Challenge

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

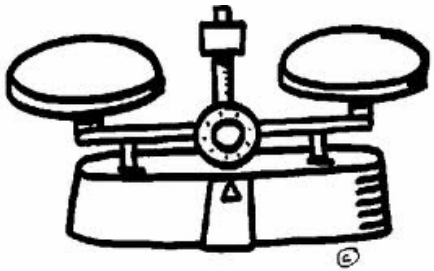
It should be like a sen
management.

Measuring Safety

Why should one measure safety?

- Do we know where we are?
- Do we have / need a value?
- How can we see if we are going on the right direction?

The safety level is measured	The safety level is improving or beeing maintained	Degraded safety levels???	Changes affecting the safety level are assessed



Measuring Safety

What should be measured?

- Safety level = credibility of the argument?
  - Attribute a value to each argument
  - Add the values
  - But, should they be added just like that?

Is a change to the SMS as relevant as the communication function?

How do we ensure that the values have the right weight?

Measuring Safety - Process

Arg. Nr.	Argument	Relevant section	Mark
0	**Claim** The level of preparedness for the provision of ATS services by NAV Portugal at the TWR of Lisboa is adequate and managed so as to improve its safety levels	3.0	
1	**Safety Culture** The safety culture supports the safety and improvement activities	3.1	3,88
1.1	**Safety Culture measurement** The safety culture has been measured	3.1.1	4,50
1.2	**Safety Culture Maintenance** The Safety culture level is improved or, at least, maintained	3.1.2	4,50
1.3	**Degraded levels of safety culture** Degraded safety culture levels are identified	3.1.3	4,50
1.4	**Changes affecting safety culture** Changes affecting the safety culture level are assessed	3.1.4	2,00
2	**SMS** The SMS has all elements and properties to discharge its functions	3.2	1,97
2.1	**SMS functions and performance** The SMS functions are complete and effective	3.2.1	2,9
2.1.1	**Reactive SMS** The SMS has the capability to react to safety occurrences	3.2.1.1	4,50
2.1.2	**Preventive SMS** The SMS has the capability to prevent safety occurrences	3.2.1.2	3,00
2.1.3	**Predictive SMS** The SMS has the capability to predict safety occurrences	3.2.1.3	3,00
2.1.4	**Improvement** The SMS has the capability to improve safety indicators and targets	3.2.1.4	3,00
2.1.5	**SMS environment of operations** The SMS environment of operations does not impair its functioning	3.2.1.5	1,00

Measuring Safety

What to ask?

The questionnaire shall be based on the argument.

How to weigh?

The arguments shall be weighed.

There is a technique, the Analytic Hierarchy Process (AHP) to deal with complex decisions that can be used here.

Whom?

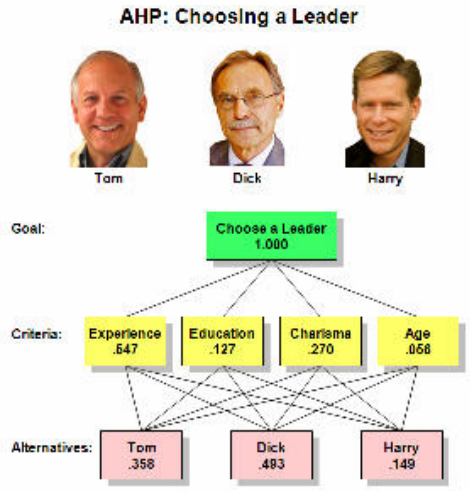
People should be involved to give their points. Wh

Measuring Safety – AHP/APF

APH - Analytic Hierarchy Process

Used for scaling importance of elements

Based on expert judgement



APF – Aerospace Performance Factor

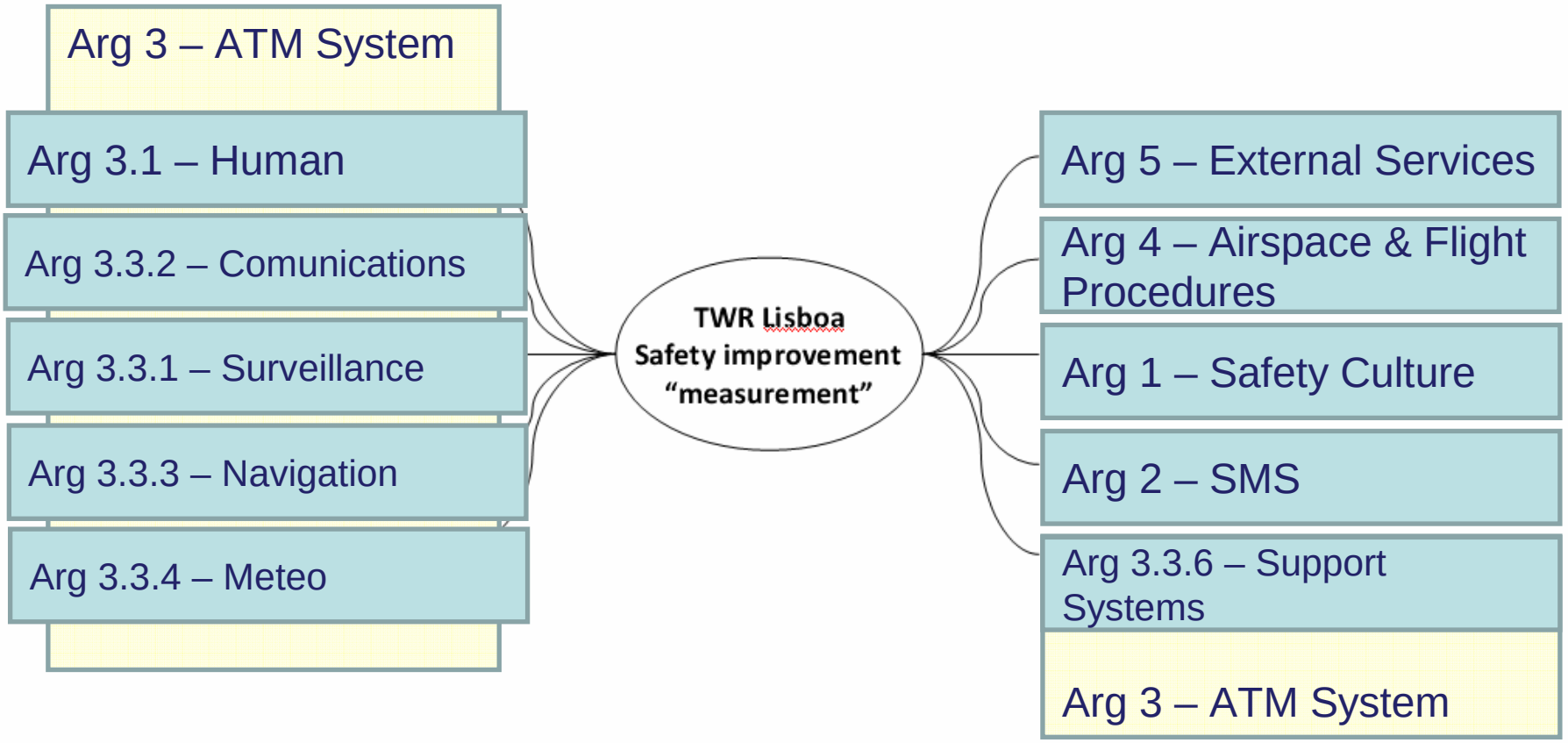
Is the application of AHP, integrating different normalised metrics.

In our case, values 1 to 10 – answers to questionnaire.

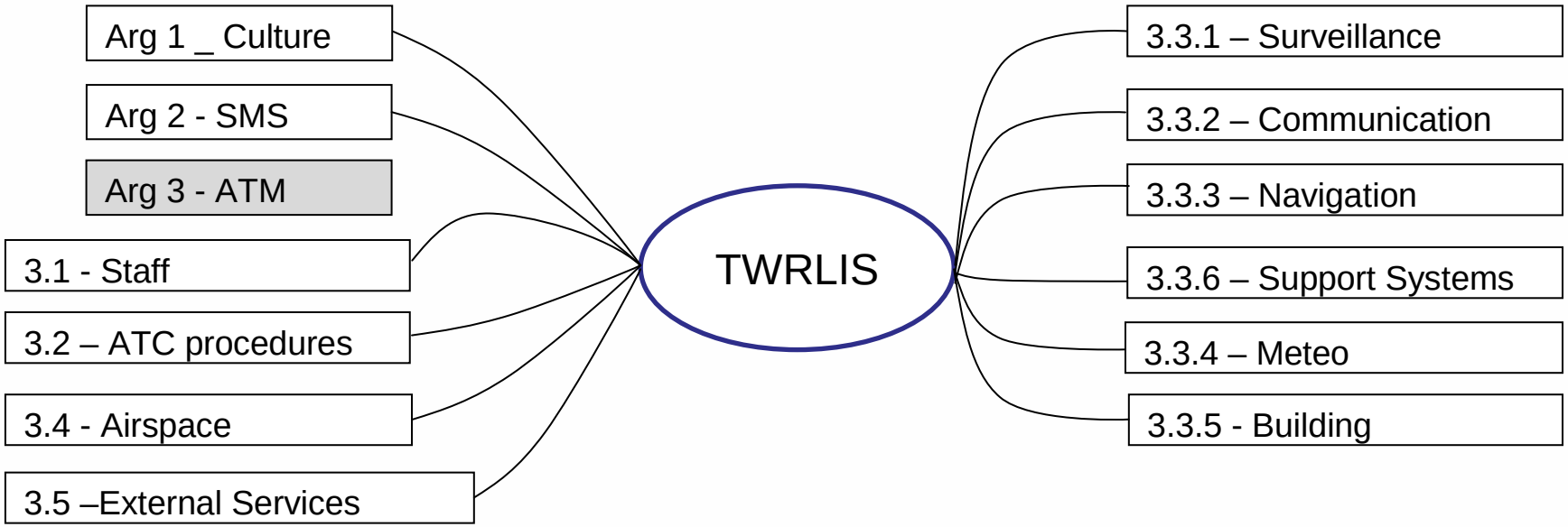
AHP requires:

- A mindmap
- Comparing the “entities” – Who? - Operationals
- Obtaining consistent results

Measuring Safety – Mind map



Measuring Safety – Mind map



Measuring Safety – Scoring

In order to evaluate the Lisbon Safety case argument and to be able to follow its evolution in the future, we would like to have your contribution.

What is aimed at is that you have a look at the argument included in the safety case document, and, based on that and on your perception of what is going on in the organization, score the statements.

Please consider the organization as a whole for the generic arguments and, whenever adequate, the specific case of the tower of Lisboa. You do not need to score all statements. Feel free to score only the statements referring to your area of "jurisdiction".

In order to have a harmonized scoring the following criteria is proposed.

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…

Measuring Safety - Questionnaire

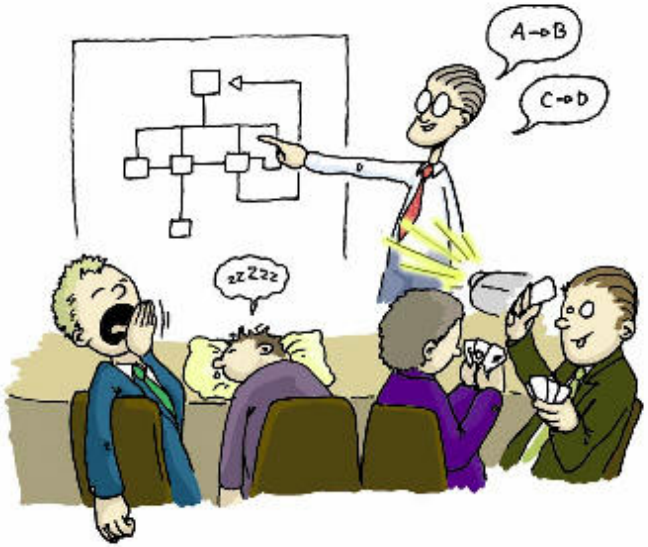
Questionnaire (59 questions)

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 occurrences	
2.1.4	The SMS has the capability to improve safety indicators and targets	
2.1.5	The SMS environment of operations does not impair its functioning	
2.2	The SMS is maintained in an adequate manner	
2.3	The SMS degraded modes are identified and there are provisions to maintain safety management in the degraded modes	
2.4	Impact of changes to the SMS is assessed	
3	The ATM system adequate for the service provision and is safely managed	
3.1	**Staff** is competent and in sufficient numbers to discharge their responsibilities and will remain so.	
3.1.1	There is a sound recruitment policy	

Measuring Safety - Questionnaire

Presenting face to face:

- The idea
- The goal
- What was required
- Estimated time to complete



Only after, send mail with questions.

Good feedback – everyone answered

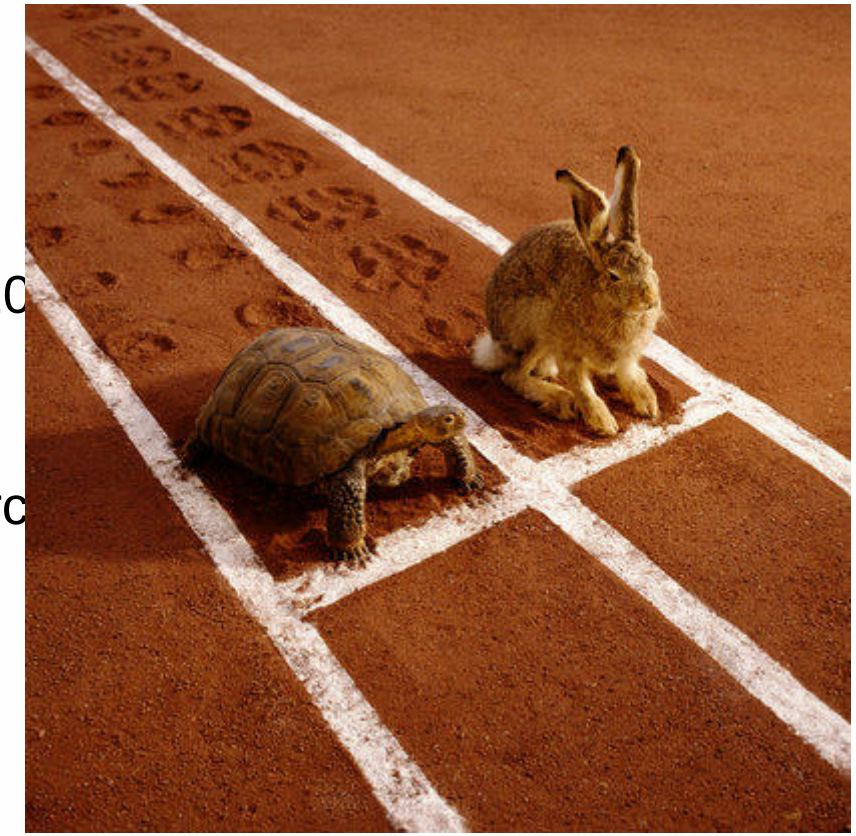
Measuring Safety – Dates

Mail for AHP: 2010-09-06 13:09
Your contributions are expected until the 13th of September (inclusive)

Finished: 1010-09-28
Results: Some inconsistencies
Review meeting: 2010-10-27

Mail for new session AHP session: 20
Session: 2 to 6 November 2010
Finished: 2010-12-13
Results: Will be analysed in 25th Marc

New session???



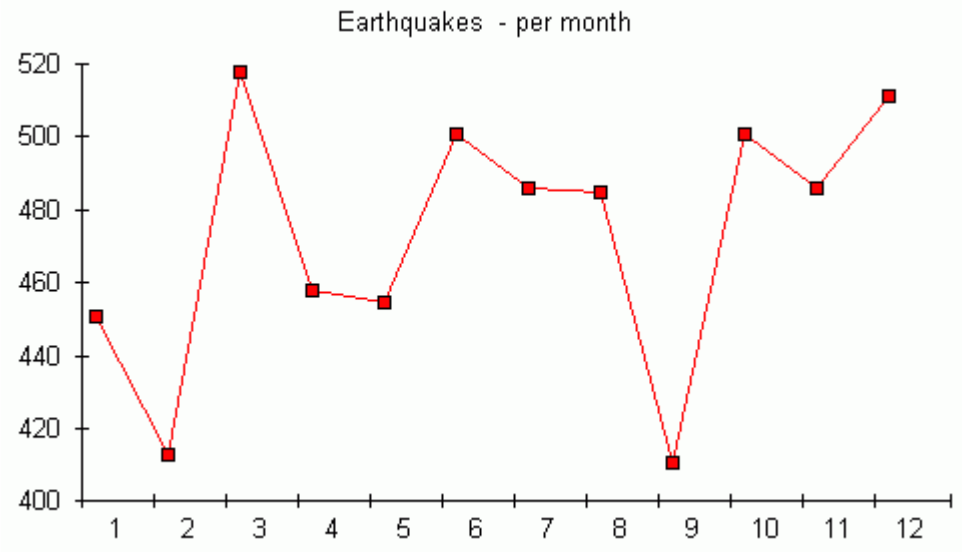
Safety Level - Bonus

Funds are limited, where should we invest?

What brings the highest value (safety) for money?

Can one use the impact on the safety level to help answer these questions?

Is this method adequate?



The End