BLUE MED
Mediterranean FAB

Co-financed by the EU (TEN-T)

FAB SAFETY CASE

ES WS4-10
Lisbon
September 2010

Petros Stratis – WP Leader - Safety – DCA Cyprus

BLUE MED is…

…a regional ATM development project aiming towards the creation of a FAB in the Mediterranean area

It comprises four EU partner-states: Cyprus, Greece, Italy and Malta…

…three non-EU states as associate partners (Egypt, Tunisia and Albania)

…two third countries as observers (Lebanon and the Kingdom of Jordan)

…a TEN-T funded project (50% of its current budget of 5.6 million Euros)

The BLUE MED airspace

BLUE MED timeframes…

Phase 1: Feasibility Study (2006 – 2008)

Phase 2: Definition (2009 – 2011)

Phase 3: Implementation (2012+)

BLUE MED milestones…

August 2008 – Feasibility Study completed…

BLUE MED milestones…

November 2008 – Ministers' declaration – political go ahead…

February 2009 – EC funding granted for phase 2

April 2009 – Phase 2 commences

May 2010 – Approval of Strategic Action Plan by TEN-T

Governance structure

Demonstration of political will and commitment

BM Governing Body

State-level representatives

Operational strategy, monitoring and guidance

BM Programme Management Board

- ANSP – Strategic Board
- Military Coord. Group
- NSA/REG Committee

BM Advisory Group

SESAR JU, IATA, EC, other FABs

Definition of operational solutions

BM Project Execution Team

Working Packages

BM Social Forum

Staff and Professional Associations

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BLUE MED Mediterranean FAB

BLUE MED WORK PACKAGES

- WP 0 Project Management — IT
- WP 1 Operational Implementation — GR
- WP 2 Technical Implementation — IT
- WP 3 Safety — CY
- WP 4 Economic Assessment — IT
- WP 5 Legal and Institutional aspects — MA
- WP 6 Human Resources issues and Social aspects — MA
- WP 7 Environmental Impact Assessment — GR
- WP 8 Implementation Planning — CY

…around 150 persons

…meetings every two months…

www.bluemed.aero

BLUE MED – Safety WP goals and objectives

· Develop the BLUE MED FAB's **Safety Case**, arguing that the FAB can be implemented in a manner which is acceptably safe…

· Define a long-term roadmap for **common safety management**, focusing on the need for uniform and enhanced levels of safety across the whole FAB

BLUE MED – Safety WP achievements so far (half way through…)

…agreed on the safety assessment methodology to use

…performed a safety considerations exercise on initial input from the operational group and provided feedback…

…developed the main safety arguments…

…performed a FAB safety maturity survey…

…developed a strong spirit of cooperation and mutual respect…

PART 1 – Methodology and structure of the Safety Case

BLUE MED – Safety Case scope and objective…

CONTRAINTS:

…BLUE MED is primarily a consortium of ANSPs…

…there is no single BLUE MED NSA…

…some ANSPs are not binded by EU regulations…

…not all changes will happen everywhere and not at the same time…

…THEREFORE, at this stage…

…the BLUE MED Safety Case will remain high level (albeit, going into as much detail as possible)…

…it will be adapted by the national SM Units, to meet NSA and other local requirements…

Safety assessment process…
…interdependability between Work Packages

WP 1 Operational Implementation:
Airspace design and management processes, ATS procedures

WP 2 Technical Implementation:
Definition of technical solutions to operational requirements

WP 6 Human Resources issues:
definition of common staff policies on recruitment, selection, training and competence..

WP 3 Safety
Review, assessment and definition of safety requirements…

Safety assessment process…

- How ? Three main pillars to achieve and ensure FAB safety…

…Review the proposed operational + technical solutions and argue that….

…operations are safe in “normal” operations, but also in case of abnormalities (failures)…

…safety will be managed in a common way in all the FAB…

…an underlying safety culture will exist in the FAB…

…risk assessment and mitigation

…use of SCDM

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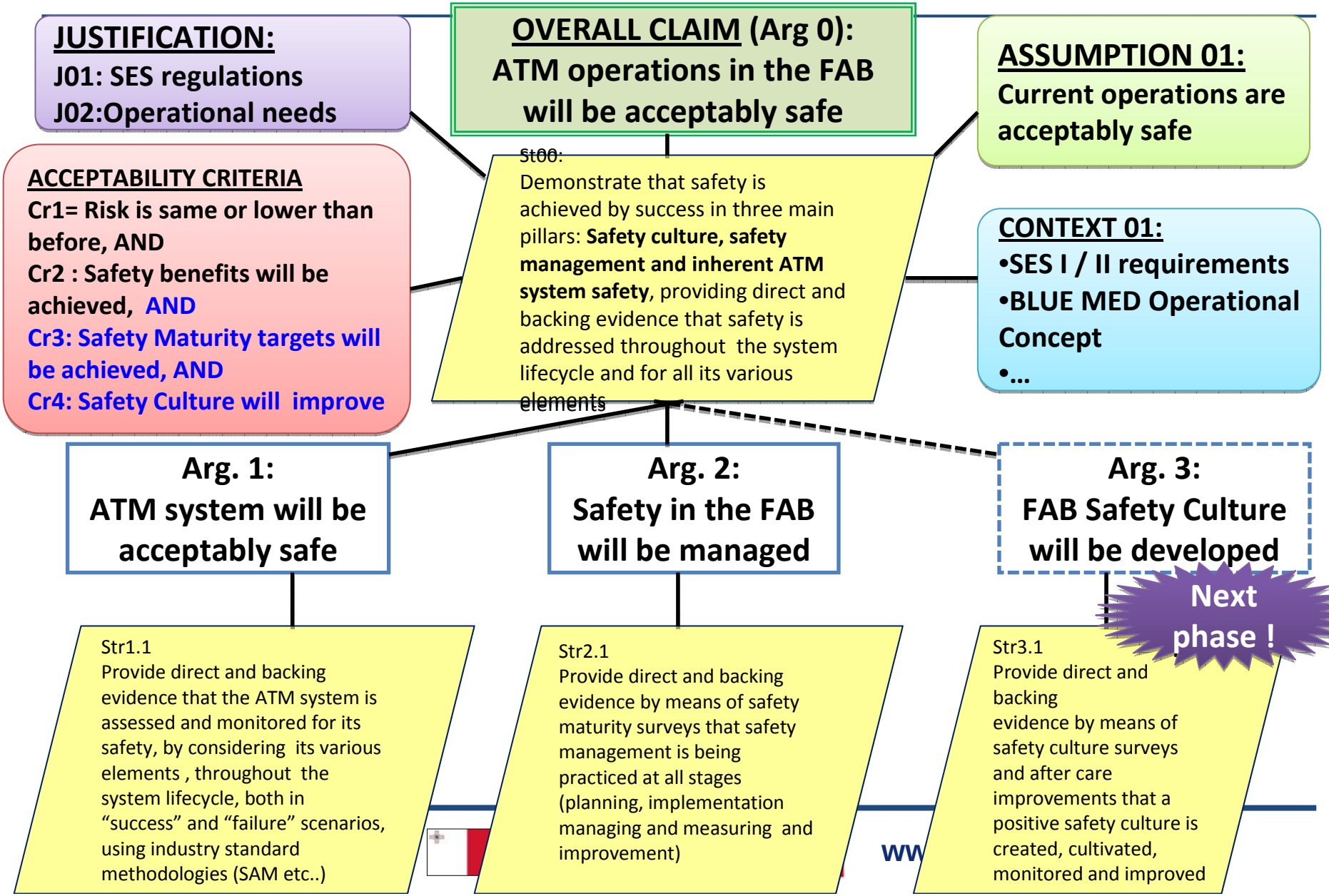
BLUE MED FAB: Initial Safety Argument



BLUE MED FAB: Initial Safety Argument

OVERALL CLAIM (Arg 0):
ATM operations in the FAB will be acceptably safe

Cr3 and 4 still under consideration

CONSTRAINT:
NO FAB RCS EXISTS

ACCEPTABILITY CRITERIA

Cr1= Risk is same or lower than before, AND
Cr2 : Safety benefits will be achieved, AND
Cr3: Safety Maturity targets will be achieved, AND
Cr4: Safety Culture will improve

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Arg. 1:
ATM system will be acceptably safe

Str1.1
Provide direct and backing evidence that the ATM system is assessed and monitored for its safety, by considering its various elements , throughout the system lifecycle, both in "success" and "failure" scenarios, using industry standard methodologies (SAM etc..)

Arg. 1.1: Human element has been assessed to be acceptably safe

Arg1.2: Technical element has been assessed to be acceptably safe

Arg1.3: ATM procedures element has been assessed to be acceptably safe

Arg1.4: Airspace element has been assessed to be acceptably safe

Arg1.5: External interfaces / services have been assessed to be acceptably safe

Arg. 1.1:
Human element has been assessed to be acceptably safe

Str1.1.1
Provide direct and backing evidence that staff **recruitment**, **selection**, **training** and **competence** have been considered with regards to their safety (in all areas: OPS, TECH and SUPPORT and in sufficient numbers)

Example of safety evidence:
FEAST, FAB Competency scheme
(under development by WP6)

Arg1.2:
Technical element has been assessed to be acceptably safe

Str1.2.1
Provide direct and backing evidence that system has been specified, designed, and implemented to meet user and regulatory requirements. Furthermore, demonstrate that transition arrangements were put in place and that system will be monitored while in operation, until decommissioning.

Example of safety evidence:

Surveillance coverage diagrams, full OLDI simulation results (planned by WP2)

Arg1.3:
ATM procedures element has been assessed to be acceptably safe

Str1.3.1
Provide direct and backing evidence that procedures have been designed to an appropriate procedural assurance level, ensuring that they are valid, complete and workable. They are acceptable to the users and they will be periodically reviewed while in operation and updated as necessary

Example of safety evidence:
Consultation with users (MoM)
Simulation results (RTS)

Arg1.4:
Airspace element has been assessed to be acceptably safe

Str1.4.1
Provide direct and backing evidence that airspace has been designed in accordance with best practices and will be managed, with regards to capacity and traffic flow, in the framework of regulation compliant civil-military coordination mechanism

Example of safety evidence:
Simulation results (FTS/RTS)
User consultation MoM

Arg1.5:
External interfaces / services have been assessed to be acceptably safe

NOT FORESEEN FOR THIS PHASE

Str1.5.1
Provide direct and backing evidence that external services have been considered with regards to their safety (in all areas: OPS, TECH and SUPPORT) from selection, to operation, until termination of their use

Example of safety evidence:

SLAs

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Arg. 2:
Safety in the FAB will be managed

Str2.1
Provide direct and backing evidence by means of safety maturity surveys that safety management is being practiced in a common way at all stages (planning, implementation, managing, measuring and improvement)

Arg 2.1

FAB SMS will have adequate organisational structure and staff

Str2.1.1
Provide direct and backing evidence that FAB SMS will by properly run and maintained

FAB safety policy, organisational structure…

Arg 2.2

Common FAB SMS essential processes exist

Str2.2.2
Provide direct and backing evidence that FAB SMS processes is able to REACT, PREVENT, PREDICT and IMPROVE.

Reporting, common safety indicators and targets etc..

PART 2 – arguing for FAB safety…

The challenge…

BLUE MED FAB will be acceptably safe because…

…ATM related risks to aviation will be equal or lower than before…

…and safety benefits will be achieved…

Criterion for acceptance: safety benefits will be achieved…

…How can this be demonstrated, given the dissimilar type of changes ?

…Coordination and transfer (from telephone to automatic)	…vs	…Reduction of lateral separation from 10 NM to 5 NM

Criterion for acceptance: safety benefits will be achieved…

…How can this be demonstrated, given the dissimilar type of changes ?

…Novel approach is needed !

Aerospace Performance Factor (APF)

+ Analytic Hierarchical Process (AHP)

EUROCONTROL

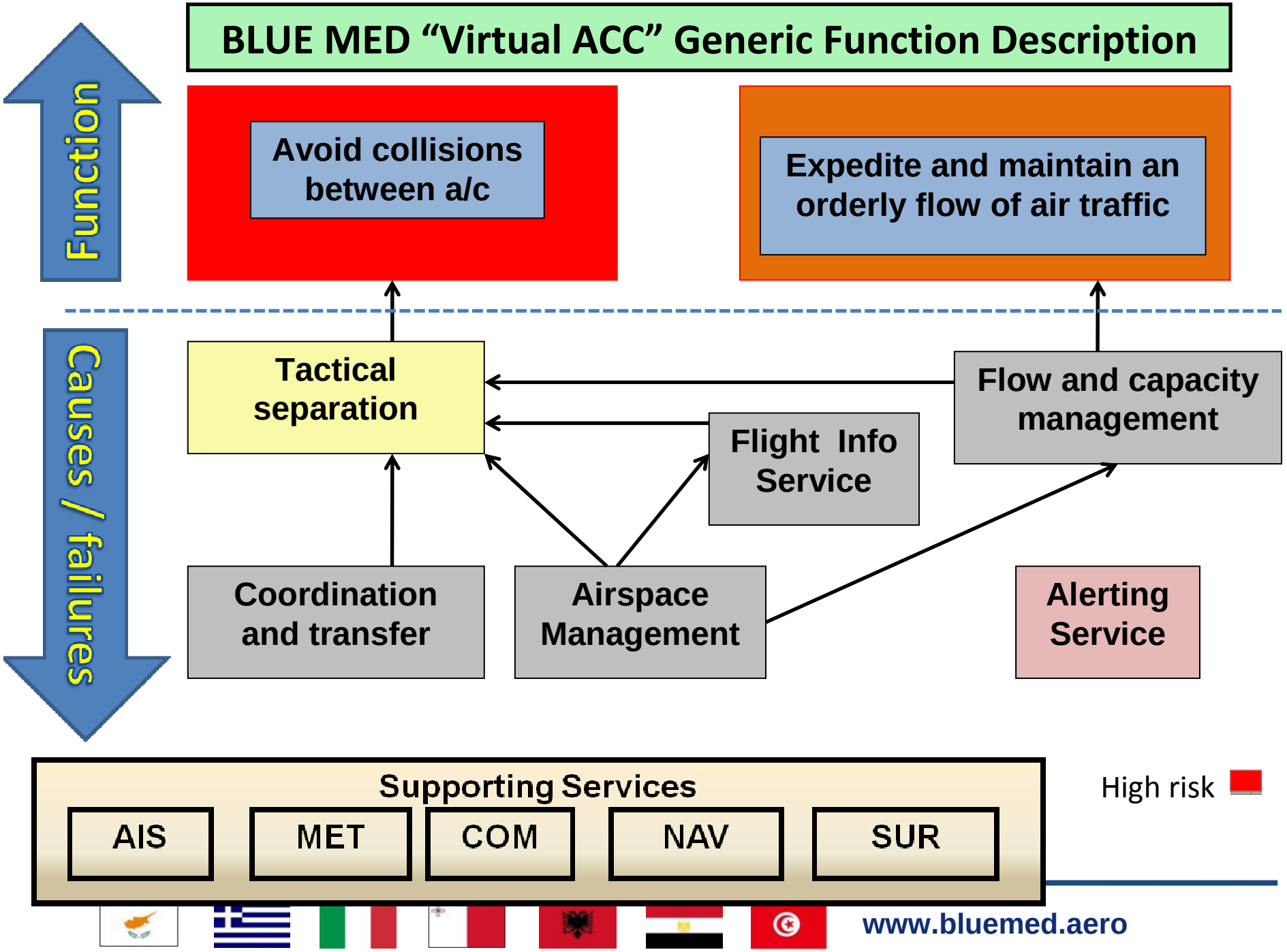
Step 1: Identify safety significant system elements (e.g. Comms, coordination etc…)

Step 2: Decide on relative safety significance, using expert judgement *e.g. what presents greater risk to ATM safety, loss of COMMS or loss of SUR ?*

Step 3: Decide on the metrics to use and set the baseline (no FAB) scenario

Step 4: Assess change to the baseline (i.e. the net safety impact, with the FAB implemented)

BLUE MED "Virtual ACC" Generic Function Description



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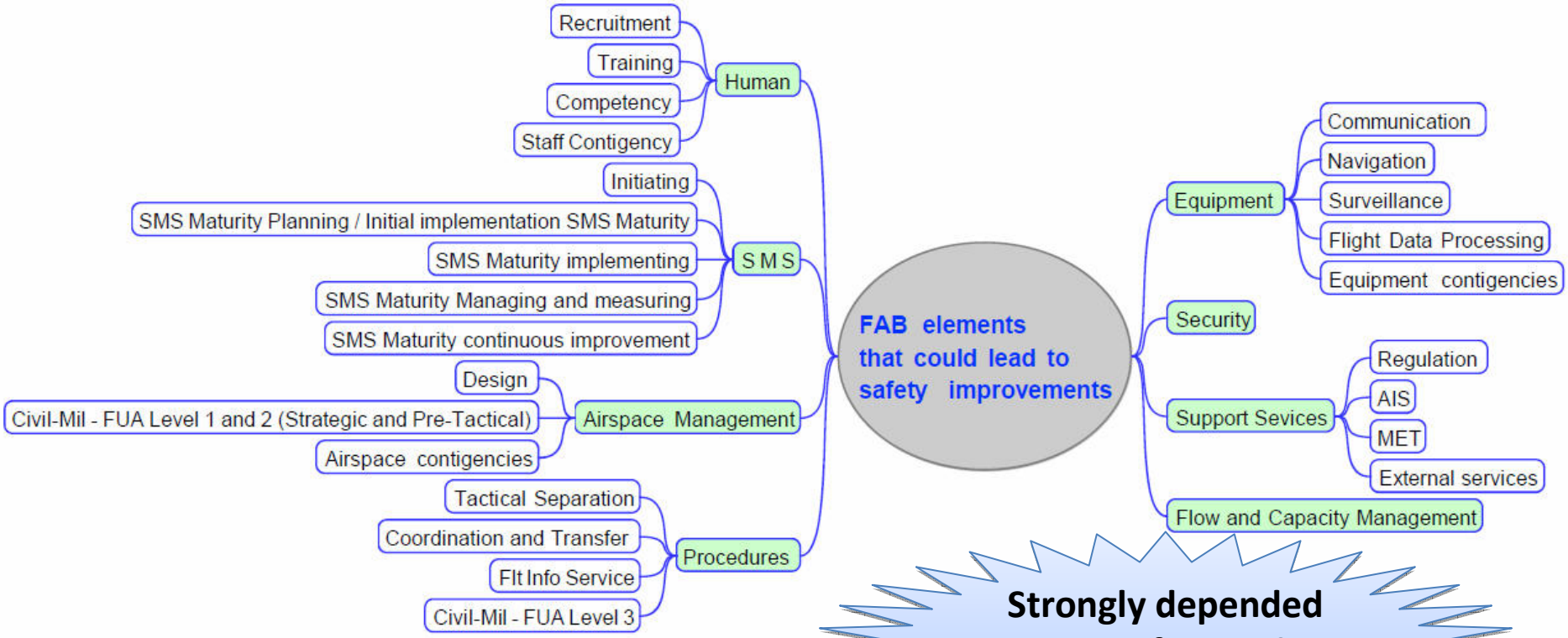
Criterion for acceptance: safety benefits will be achieved…

…How can this be demonstrated, given the dissimilar type of changes ?

Step 1: Identify safety significant system elements (or, create a Mind Map…)

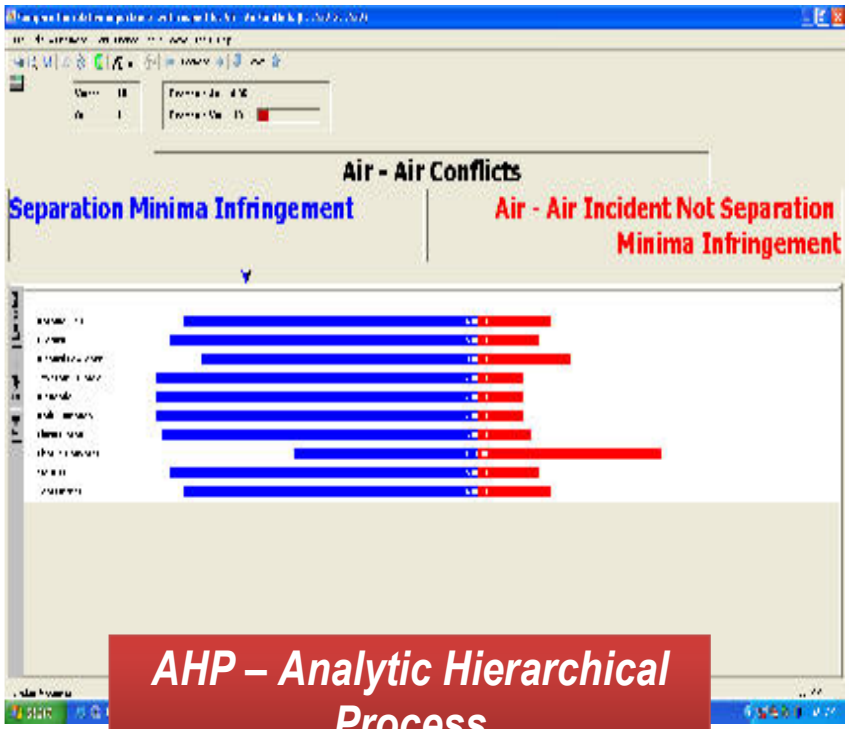


Strongly depended on input from other WPs !

Criterion for acceptance: safety benefits will be achieved…

…How can this be demonstrated, given the dissimilar type of changes ?

Step 2: Decide on relative significance, using expert judgement (*pair-wise comparison*)



AHP – Analytic Hierarchical Process

Software tools are available to help !

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Criterion for acceptance: safety benefits will be achieved…

…How can this be demonstrated, given the dissimilar type of changes ?

Steps 3 and 4: A simplified ATM example… (Draft !! Work still in progress !!!)

HAZARDS:

H1: Failure in coordination and transfer

H2: Failure to apply tactical separation

HAZARD	BASELINE (no FAB)			FAB 2012		2015
	Risk level	Weight	TOTAL	Change to risk	TOTAL	Etc…
H1	6	0.4	2.4	0.5	(2.4*0.5)=1.2	Etc…
H2	8	0.6	4.8	1.5	(4.8*1.5)=7.2	Etc…
TOTAL WEIGHTED RISK (no FAB):			7.2	NET FAB RISK:	8.4	

…Hence, a net increase in risk, therefore FAB is less safe than before !

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Criterion for acceptance: safety benefits will be achieved…

DIFFERENT RISK ESTIMATES CAN BE MADE TO MATCH THE FAB DEVELOPMENT TIMELINE (AND BE PRESENTED TO THE DECISION MAKERS)

HAZARD	BASELINE (no FAB)	FAB 2012		FAB 2015		FAB 2020	
	ASSESSED RISK	Change to risk	TOTAL	Change to risk	TOTAL	Change to risk	TOTAL
H1	2.4	0.5	1.2	0.5	1.2	0.5	1.2
H2	4.8	1.5	7.2	1	4.8	0.8	3.8
H3	3.5	1	3.5	0.8	2.8	0.5	1.8
H4	5.0	1	5	0.8	4	0.5	2.5
TOTAL RISK (no FAB):	15.7	RISK (WITH FAB):	16.9	RISK (WITH FAB):	12,4	RISK (WITH FAB):	9.3

Questions ?

PART 3 – safety assessment of ATM concepts and procedures…

Arguments and evidences required…

Concept vs. ATM procedures

• A concept (of operations) is the general idea of how things will work, with only a loose reference to the human, technical and procedure systems elements

• A procedure is a series of interrelated tasks or processes which receive inputs and transform them into outputs*

• ATM procedures are a fundamental part of the system definition (or "*design*").

• They may apply both in normal and abnormal situations (e.g. contingencies)

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* EUROCONTROL – Safety Assessment of Procedures training documentation

Safety assessment of ATM procedures

- **WP3: Identify hazards at early stage of development and set safety objectives**
- **How can an ATM procedure constitute a hazard ?**

  1. Procedure is incorrect or inherently "risky" (even in normal operations)

  2. Procedure is incorrectly applied

WP3 role ?

Interact early and set expectations

Safety assessment of an ATM concept

- **How can an ATM concept constitute a hazard ?**

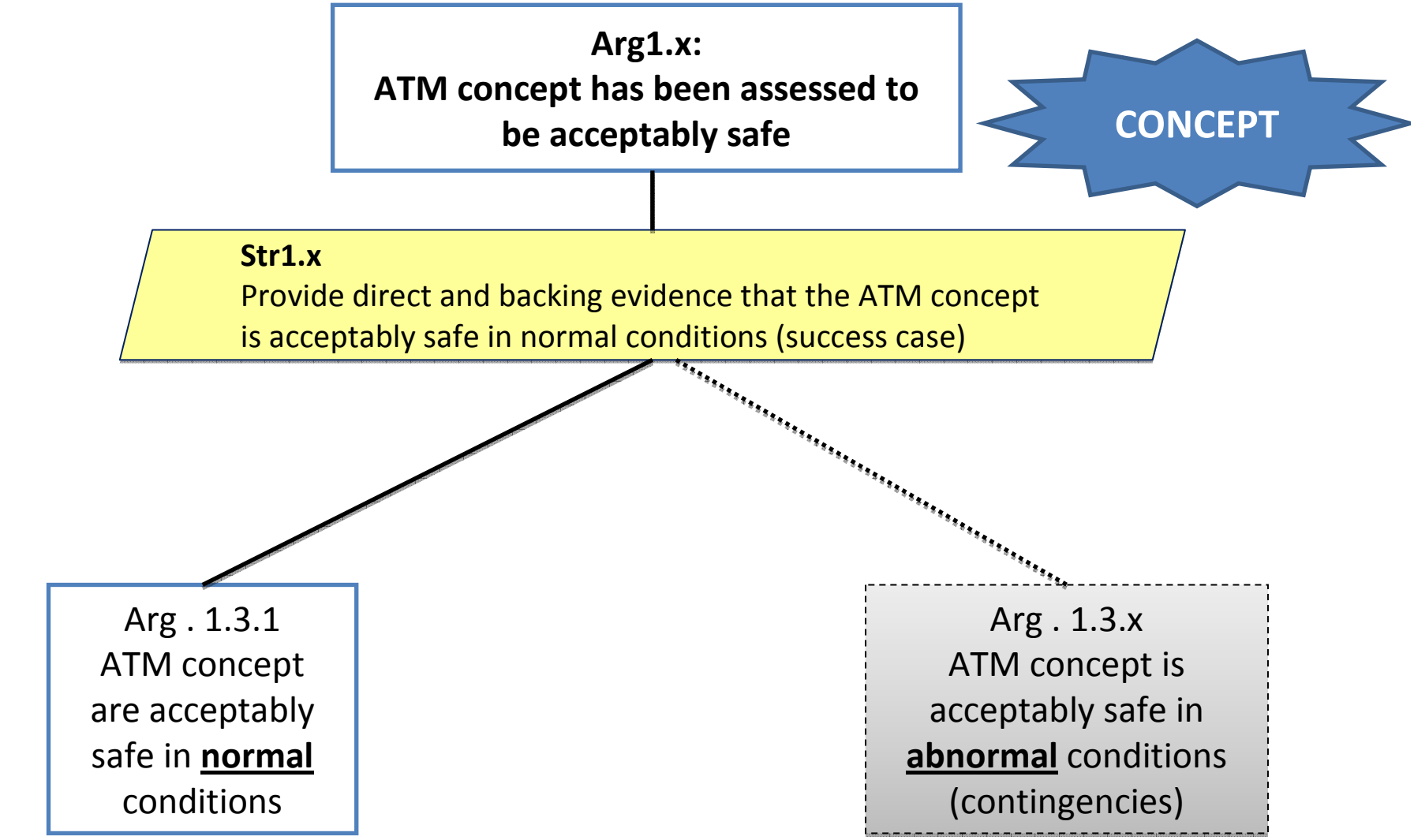
e.g. …ATC Service will be gradually evolving towards trajectory-based operational concepts…Planning and conflict detection will be trajectory based…

1. Concept is incorrect or inherently "risky" (even in normal operations)

~~**2. Concept is incorrectly applied (or "…failure to apply correctly")**~~

INSUFFICIENT DETAIL TO ASSESS (HUM-TEC-PROC interaction missing)

SAFETY ASSESSMENT IS MUCH SIMPLER


Arg1.x:
ATM concept has been assessed to be acceptably safe
CONCEPT
Str1.x
Provide direct and backing evidence that the ATM concept is acceptably safe in normal conditions (success case)
Arg . 1.3.1
ATM concept are acceptably safe in normal conditions
Arg . 1.3.x
ATM concept is acceptably safe in abnormal conditions (contingencies)

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Arg . 1.x.x
ATM concept
is acceptably safe in **normal** conditions

CONCEPT

Str1.x
Provide direct and backing evidence that the concept has been tried before in similar environment, and is acceptable by those who will implement it, as well as the users

Arg . 1.x.x.x
ATM concept has been implemented safely in a similar environment

Arg . 1.x.x.x
ATM concept has been accepted by the people who will apply them

Arg . 1.x.x.x
ATM concept is acceptable to the users

• evidence of implementation of concept

•validation activities / consultation with staff (operational + technical)

• evidence of consultation with users

Arg1.3:
ATM procedures have been assessed to be acceptably safe

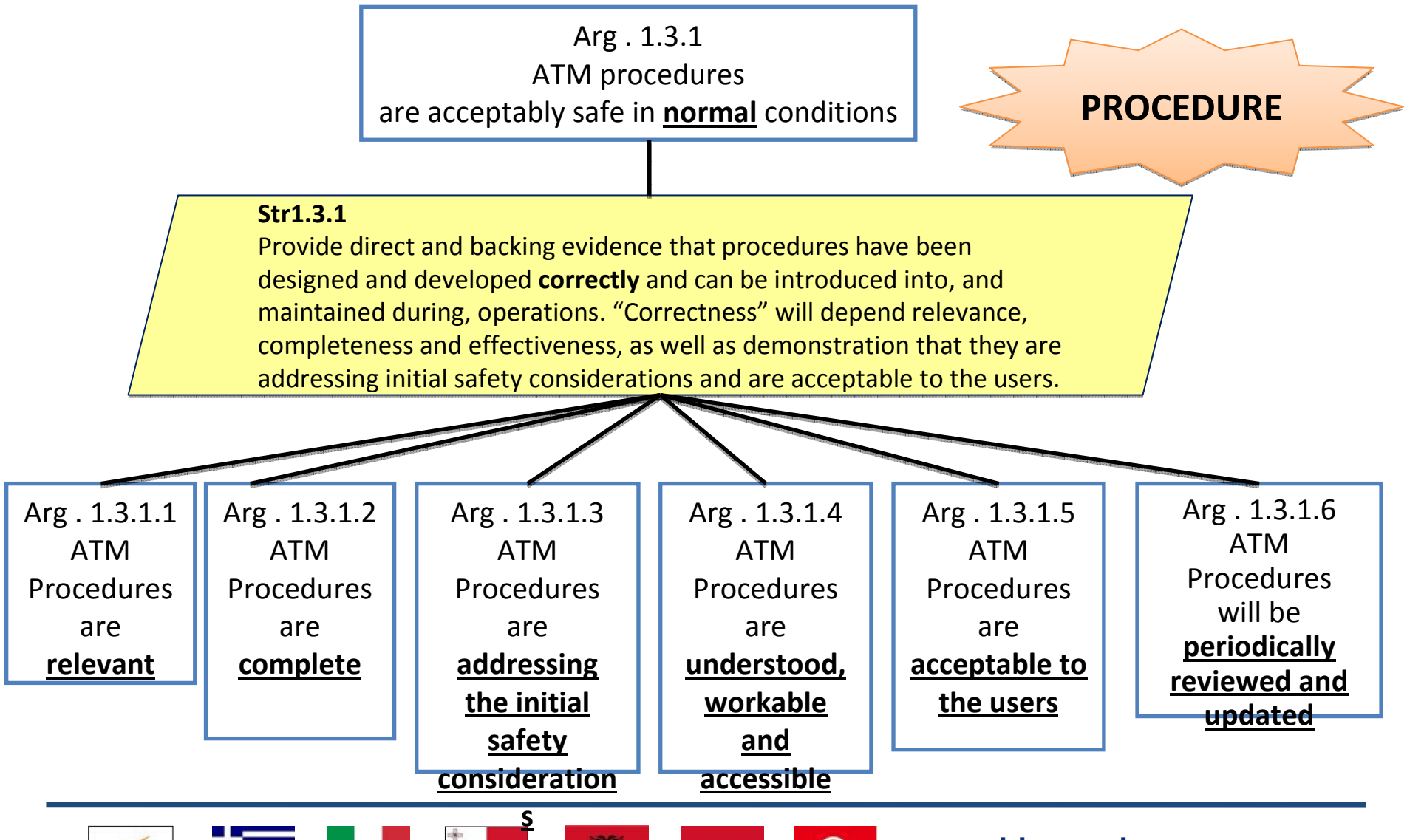
PROCEDURE

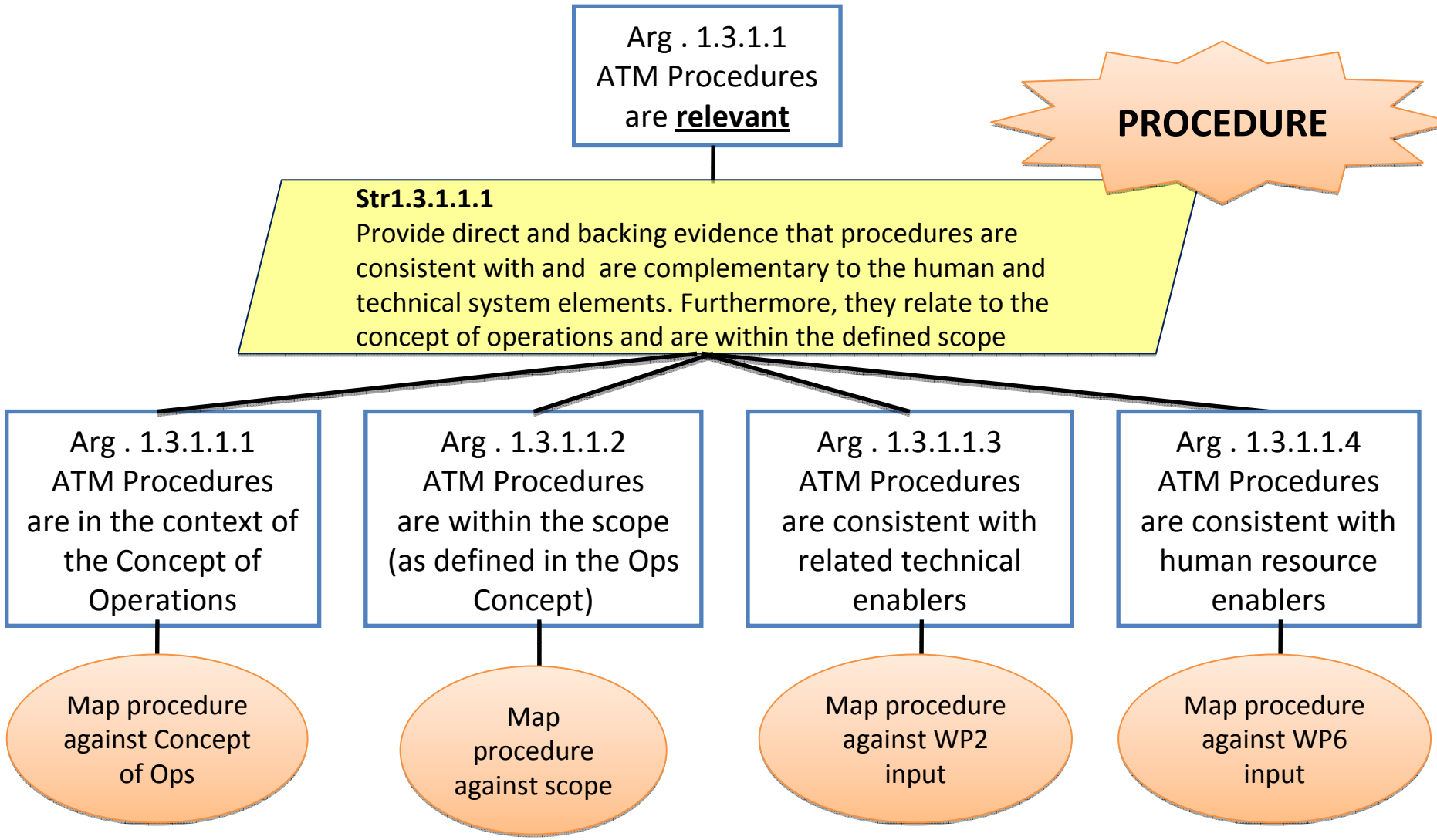
Str1.3
Provide direct and backing evidence that procedures are acceptably safe both in normal conditions (success case) and in the case of failures (to apply correctly)

Arg . 1.3.1
ATM procedures are acceptably safe in **normal** conditions

Arg . 1.3.x
ATM procedures are acceptably safe in **abnormal** conditions (contingencies)

Arg . 1.3.2
Incorrect application of ATM procedures does not cause unacceptable risk


Arg . 1.3.1
ATM procedures
are acceptably safe in **normal** conditions
PROCEDURE
Str1.3.1
Provide direct and backing evidence that procedures have been designed and developed **correctly** and can be introduced into, and maintained during, operations. "Correctness" will depend relevance, completeness and effectiveness, as well as demonstration that they are addressing initial safety considerations and are acceptable to the users.
Arg . 1.3.1.1 ATM Procedures are **relevant**
Arg . 1.3.1.2 ATM Procedures are **complete**
Arg . 1.3.1.3 ATM Procedures are **addressing the initial safety considerations**
Arg . 1.3.1.4 ATM Procedures are **understood, workable and accessible**
Arg . 1.3.1.5 ATM Procedures are **acceptable to the users**
Arg . 1.3.1.6 ATM Procedures will be **periodically reviewed and updated**


Arg . 1.3.1.1
ATM Procedures
are relevant
PROCEDURE
Str1.3.1.1.1
Provide direct and backing evidence that procedures are consistent with and are complementary to the human and technical system elements. Furthermore, they relate to the concept of operations and are within the defined scope
Arg . 1.3.1.1.1
ATM Procedures
are in the context of
the Concept of
Operations
Arg . 1.3.1.1.2
ATM Procedures
are within the scope
(as defined in the Ops
Concept)
Arg . 1.3.1.1.3
ATM Procedures
are consistent with
related technical
enablers
Arg . 1.3.1.1.4
ATM Procedures
are consistent with
human resource
enablers
Map procedure
against Concept
of Ops
Map
procedure
against scope
Map procedure
against WP2
input
Map procedure
against WP6
input

PROCEDURE

Arg . 1.3.1.2 ATM Procedures are **complete**

Verification that the procedure details its inputs and outputs, as well as the "what" , "who", "when" , "where" and "how"

PROCEDURE

Arg . 1.3.1.3
ATM Procedures
are **addressing the initial safety considerations**

Map procedure against relevant safety considerations

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Arg . 1.3.1.4
ATM Procedures
are **understood, workable and accessible**

Str1.3.1.4
Provide direct and backing evidence that procedures are properly documented , and have been validated and accepted by the people who will apply them

Arg . 1.3.1.4.1
ATM Procedures
have been properly documented and are accessible

- Ops/tech manuals, Maps, LoAs
- endorsement (signage)
- availability on site

Arg . 1.3.1.4.2
ATM Procedures
have been validated and accepted by the people who will apply them

- Training plan and records
- Simulation results
- Staff feedback

Arg . 1.3.1.5
ATM Procedures
are **acceptable to the users**

PROCEDURE

Str1.3.1.5
Provide direct and backing evidence that procedures have been reviewed by the users affected by the procedure and have expressed a positive response

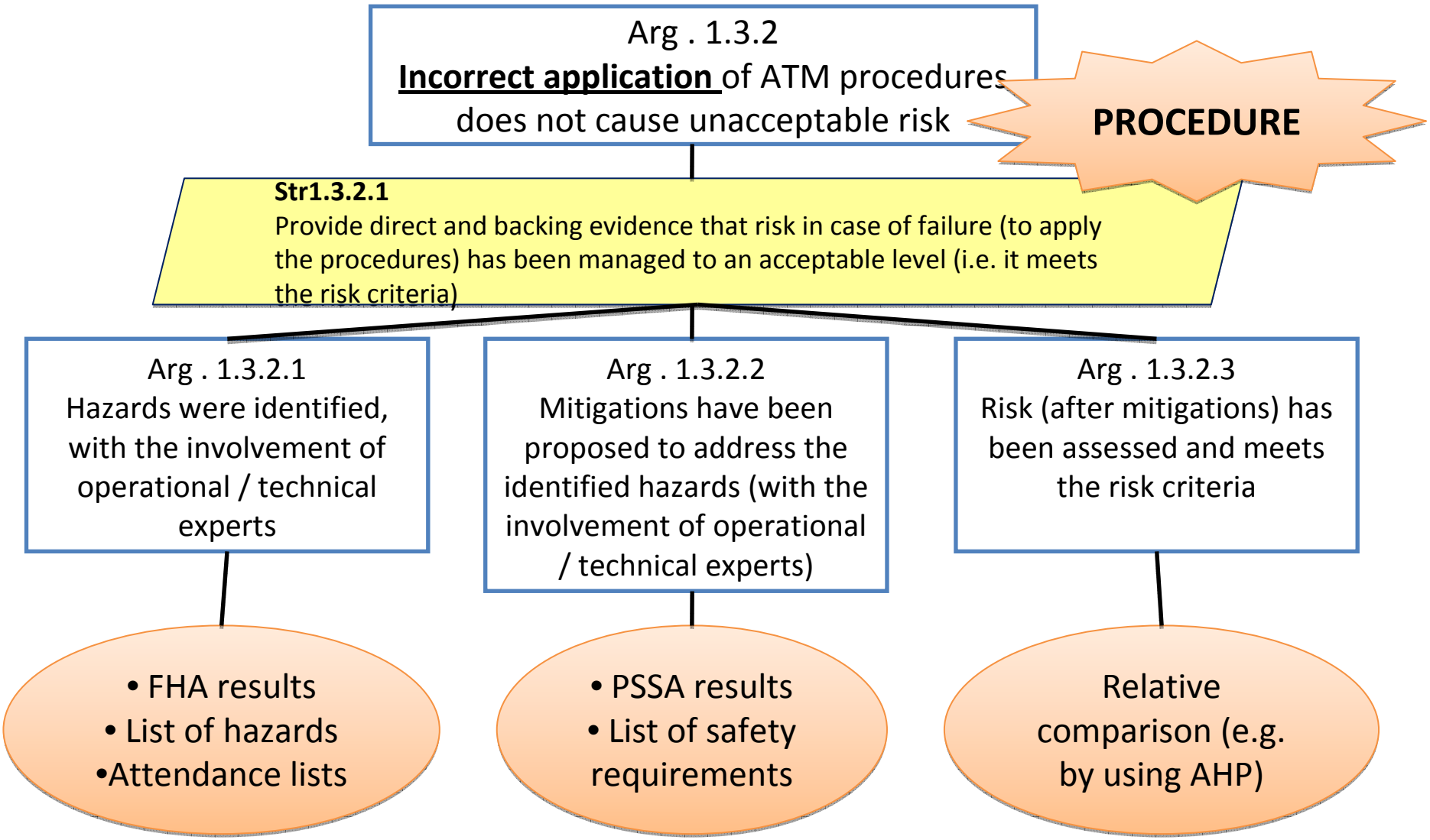
- **Evidence of consultation with users (e.g. Stakeholder forums MoM)**

Arg . 1.3.1.6
ATM Procedures
will be **periodically reviewed and updated**

PROCEDURE

Str1.3.1.6
Produce a safety plan to demonstrate that procedures will be periodically reviewed or surveyed to validate assumptions , hazards and the effectiveness of mitigations. An ad hoc reporting mechanism will be defined if/when deemed necessary

- **Safety Plan**
- **Reporting mechanism**


Arg . 1.3.2
Incorrect application of ATM procedures does not cause unacceptable risk
PROCEDURE
Str1.3.2.1
Provide direct and backing evidence that risk in case of failure (to apply the procedures) has been managed to an acceptable level (i.e. it meets the risk criteria)
Arg . 1.3.2.1
Hazards were identified, with the involvement of operational / technical experts
Arg . 1.3.2.2
Mitigations have been proposed to address the identified hazards (with the involvement of operational / technical experts)
Arg . 1.3.2.3
Risk (after mitigations) has been assessed and meets the risk criteria
• FHA results
• List of hazards
•Attendance lists
• PSSA results
• List of safety requirements
Relative comparison (e.g. by using AHP)

Thank you

Questions ?

Contact…

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More info @…

http://www.bluemed.aero