



Turning research into real systems

The role of Validation and the E-OCVM

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Overview

- Overview of European R&D structure
- Overview of European R&D Validation methodology
- Key areas that R&D needs to address in order to turn research into reality

- Scope is ATM Research & Development
- Its about ensuring that research supports procurement
- Its about using research to answer the stakeholders question

‘Are we building the right system’

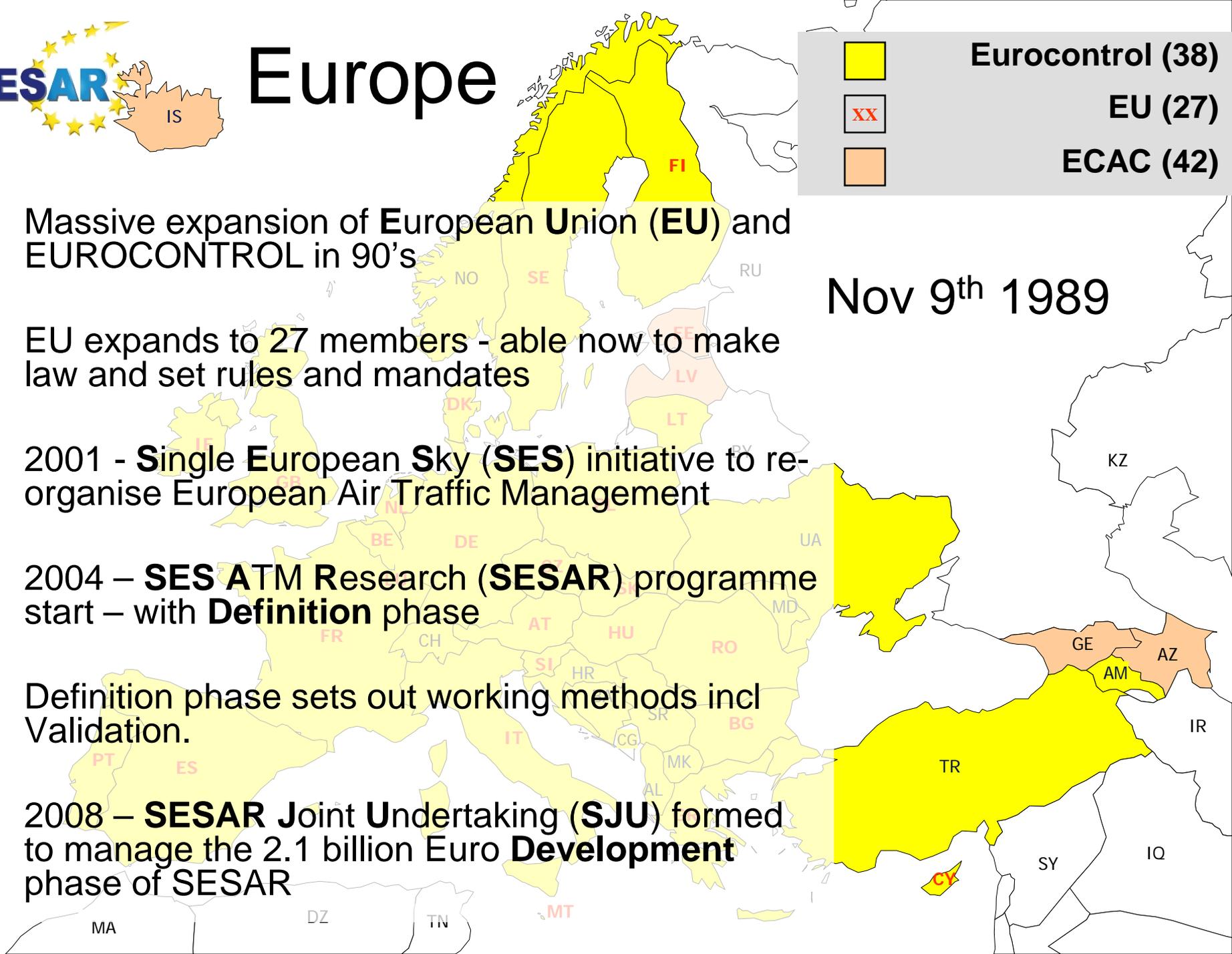


Europe

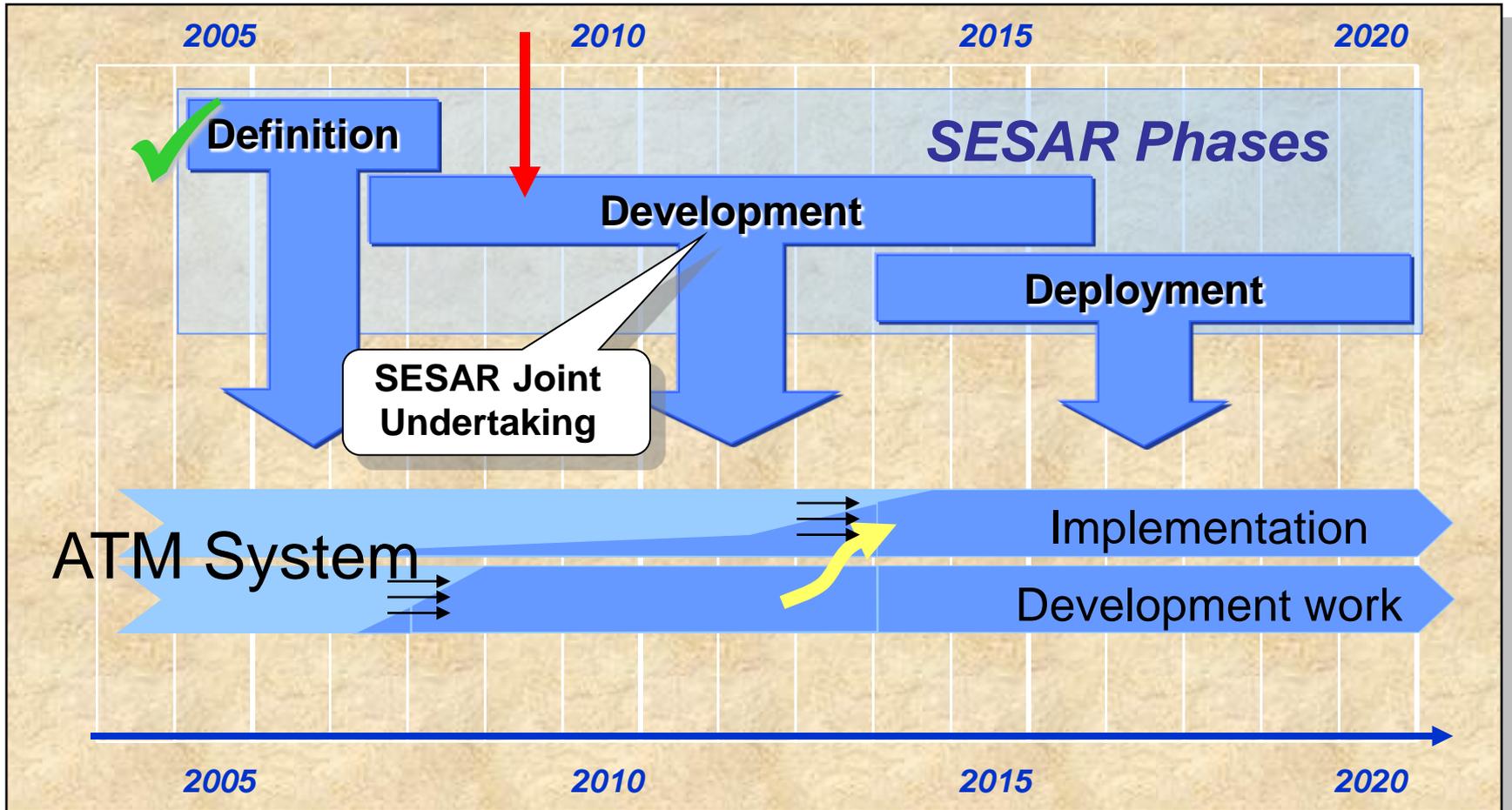


- Massive expansion of **European Union (EU)** and **EUROCONTROL** in 90's
- EU expands to 27 members - able now to make law and set rules and mandates
- 2001 - **Single European Sky (SES)** initiative to re-organise European Air Traffic Management
- 2004 – **SES ATM Research (SESAR)** programme start – with **Definition** phase
- Definition phase sets out working methods incl Validation.
- 2008 – **SESAR Joint Undertaking (SJU)** formed to manage the 2.1 billion Euro **Development** phase of SESAR

Nov 9th 1989



SESAR – R&D

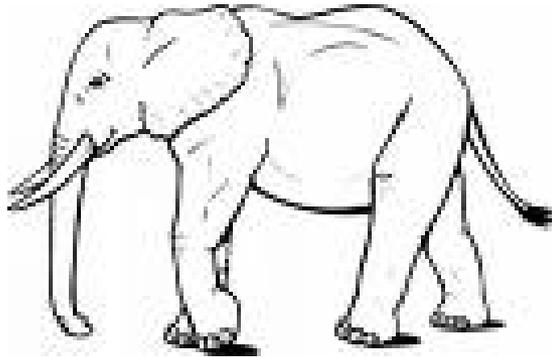


3 Implementation Packages



- **Each individual Air Traffic Service Provider (ANSP) will manage own procurement to comply with SESAR expectations**
 - **EUROCONTROL 38 member states of which 27 EU.**
- **Need clear processes.**
- **Validation methodology one of those processes**
 - **Now embedded in SESAR System Engineering Methodology**

From a dream to reality

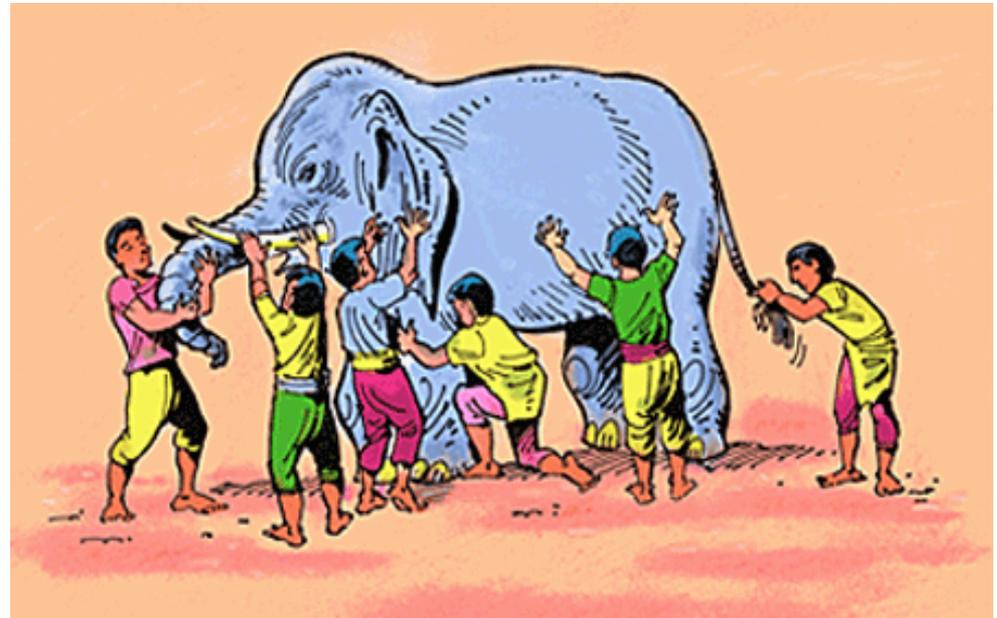


The dream!

Research determines the new transport capability (elephant)

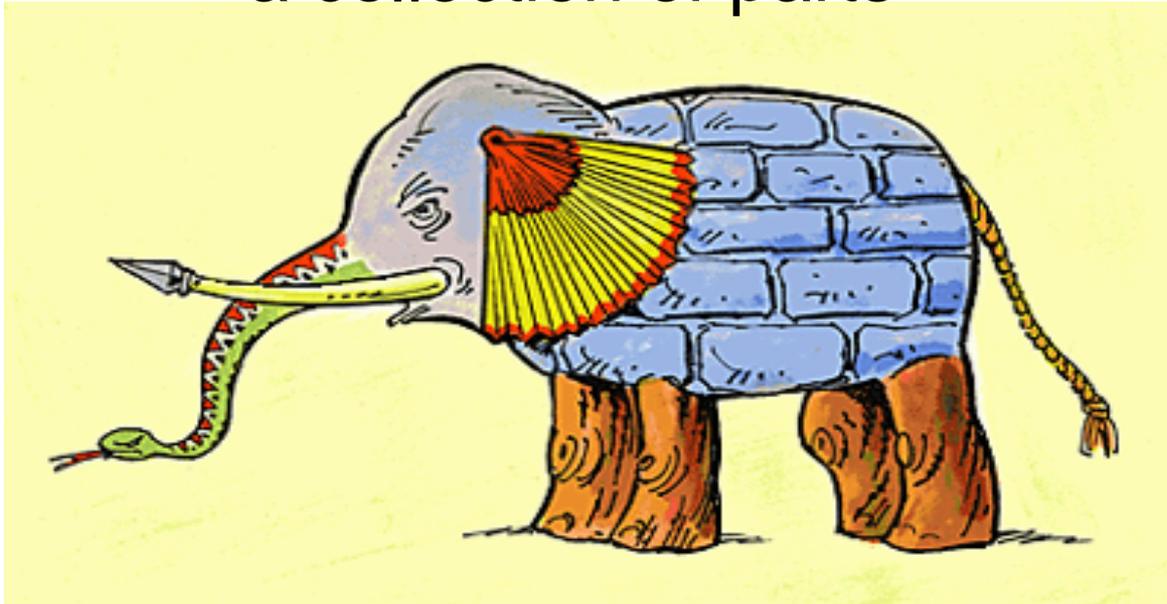
To build that dream many 'specialists' are needed

Different 'specialists' describe the various parts of this new system so that it can be built



The build

Result of not having a shared vision !!
a collection of parts



R&D must build a shared vision of the future.

This is what the European Operational Concept Validation Methodology sets out to do.

Validation during R&D

- European methodology is based on the belief that stakeholder's must be consulted through the R&D phases
 - Only way to get agreement about are we building the right system
- The concept will change as it develops
 - Validation criteria not easy to determine during these phases
- Validation during research and early development is an iterative consultation process to build a shared vision.



European Ops Concept Validation Methodology - E-OCVM

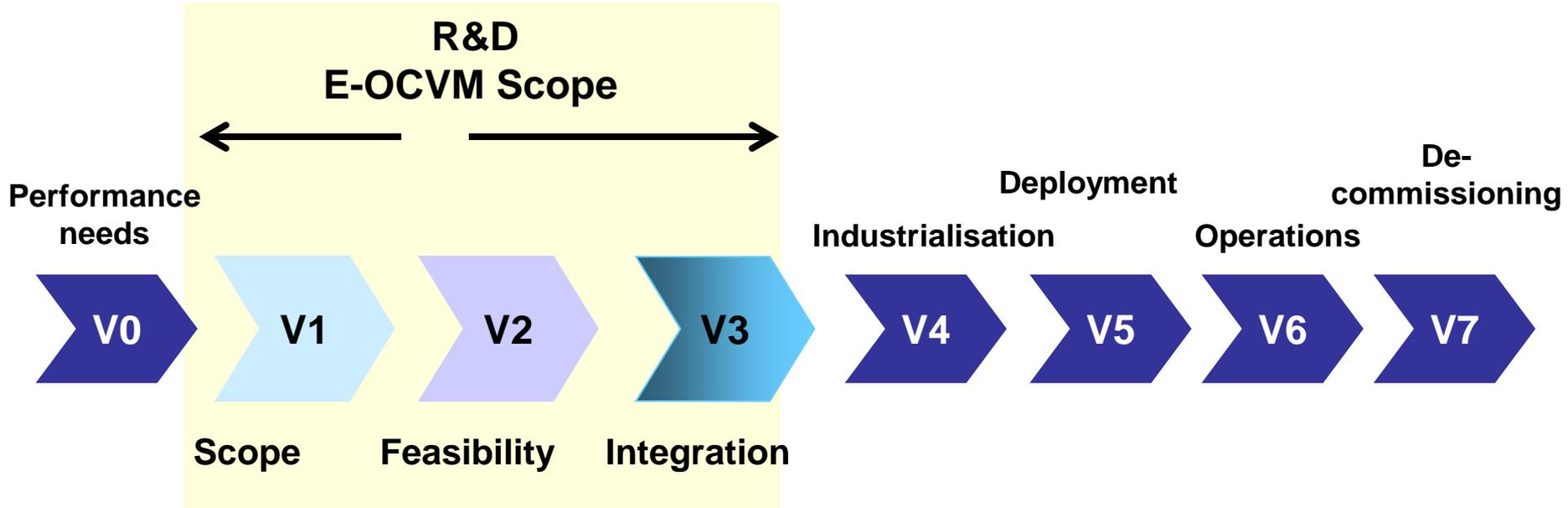


Three parts to the methodology

1. Lifecycle
2. Structured Planning checklist
3. Cases.

Following slides more detail on each part

1 - Life cycle



This life cycle has been adopted by SESAR Master Planning

2 - Structured Planning

| Step | Sub-Step | Name | Output |
|--|----------|--|---|
| 0. State Concept and Assumptions | 0.1 | Understand the Problem | ATM Problem Description |
| | 0.2 | Understand the Proposed Solution(s) | Description of ATM Operational Concept(s) or Operational Improvement(s), Typical Operational Scenarios, Alternatives Analysis |
| 1. Set Validation Strategy | 1.1 | Identify the Stakeholders, their Needs and Involvement | List of Stakeholders and their Needs, Initial Stakeholder Analysis, Key Stakeholder Questions |
| | 1.2 | Identify the existing Information, including Current and Target Levels of Maturity | Statement of Current and Target Levels of Maturity |
| | 1.3 | Describe Validation Expectations and outline Cases - outcomes, products, what success will look like | Validation Expectations, Information on Stakeholders' Needs to support case structuring |
| | 1.4 | Identify Concept Performance Objectives in Key Performance Areas | List of Concept Performance Objectives and Key Performance Areas |
| | 1.5 | Establish Initial Validation Requirements and draft Validation Strategy | Initial Validation Requirements, Draft Validation Strategy |
| | 1.6 | Select Validation Tools or Techniques | Decision on Tool(s) or Technique(s) to be used |
| | 1.7 | Define Validation Strategy | Validation Strategy |
| 2. Determine the Exercise Needs | 2.1 | Identify Stakeholders' Acceptance Criteria and Performance Requirements | List of Stakeholders' Acceptance Criteria and Performance Requirements |
| | 2.2 | Identify Project and Exercise Validation Objectives | List of Project and Exercise Validation Objectives, Refined Validation Requirements |
| | 2.3 | Refine Validation Strategy | Refined Validation Strategy |
| | 2.4 | Identify Indicators and Metrics | List of Indicators and Metrics |
| | 2.5 | Specify Validation Scenarios | Validation Scenario Specification, Traffic Samples, Platform Scenario Requirements |
| | 2.6 | Produce Validation Exercise Plan | Validation Exercise Plan , including Analysis Specification and detailed design |
| | 2.7 | Prepare the Platform or Facility | Prepared and Configured Platform |
| | 2.8 | Conduct Pre-Exercise Testing and Training | Tested Validation Platform, Trained Participants (where required) |
| 3. Conduct the Exercise | 3.1 | Conduct Validation Exercise | Raw Data |
| | 3.2 | Assess for Unexpected Effects or Behaviours | Concept Problem Reports |
| 4. Analyse the Results | 4.1 | Perform Analysis as specified in the Analysis Specification | Analysed Data |
| | 4.2 | Prepare Analysis Contributions | Analysis Contributions |
| | 4.3 | Prepare Validation Report | Validation Report , Information to Cases, Identification of Validation Strategy Shortcomings |
| 5. Disseminate Information to Stakeholders | 5.1 | Disseminate Information to Stakeholders and Decision Makers, using case based approach where available | Dissemination of Information to Stakeholders for review, Stakeholder Review of Results |
| | 5.2 | Draw Conclusions and decide on actions. Feedback to Validation Strategy | Conclusions and Actions, Modifications to Validation Strategy |

- Acts as a check list of what to do
- Provides structure to contracts for validation projects
- Applied to each R&D phase



Lifecycle Phase

Project/Exercise Level

Performance driven

Lifecycle Phase
Project/Exercise Level

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Understand the problem

What is stopping the current system from delivering better performance

Understand the solution

**What is the performance expectation
What is the benefit mechanism
How can improvements be measured**

Create a strategy to develop and test the solution

Ensure show-stopping issues identified early e.g. need for;

- Technical standards
- Safety regulatory tests
- SARPS (ICAO Operational procedures)

Learning from research

| | Step | Sub-Step | Name | Output |
|--|----------------------------------|--|--|--|
| Lifecycle Phase Project/Exercise Level | 0. State Concept and Assumptions | 0.1 | Understand the Problem | ATM Problem Description |
| | | 0.2 | Understand the Proposed Solution(s) and Alternatives | Description of ATM Operational Concept(s) or Operational Improvement(s), Applicable to the Problem |
| | 1. Set Validation Strategy | 1.1 | Identify the Stakeholders, their Needs and Involvement | List of Stakeholders and their Needs, Initial Stakeholder Analysis, Key Stakeholder Questions |
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Concept description

Validation strategy

Exercise objectives

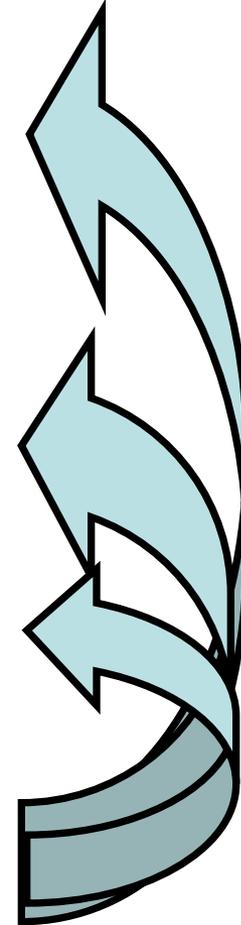
Exercise Results as expected?

Re-consider solution

Revisit strategy

Revisit exercise plan

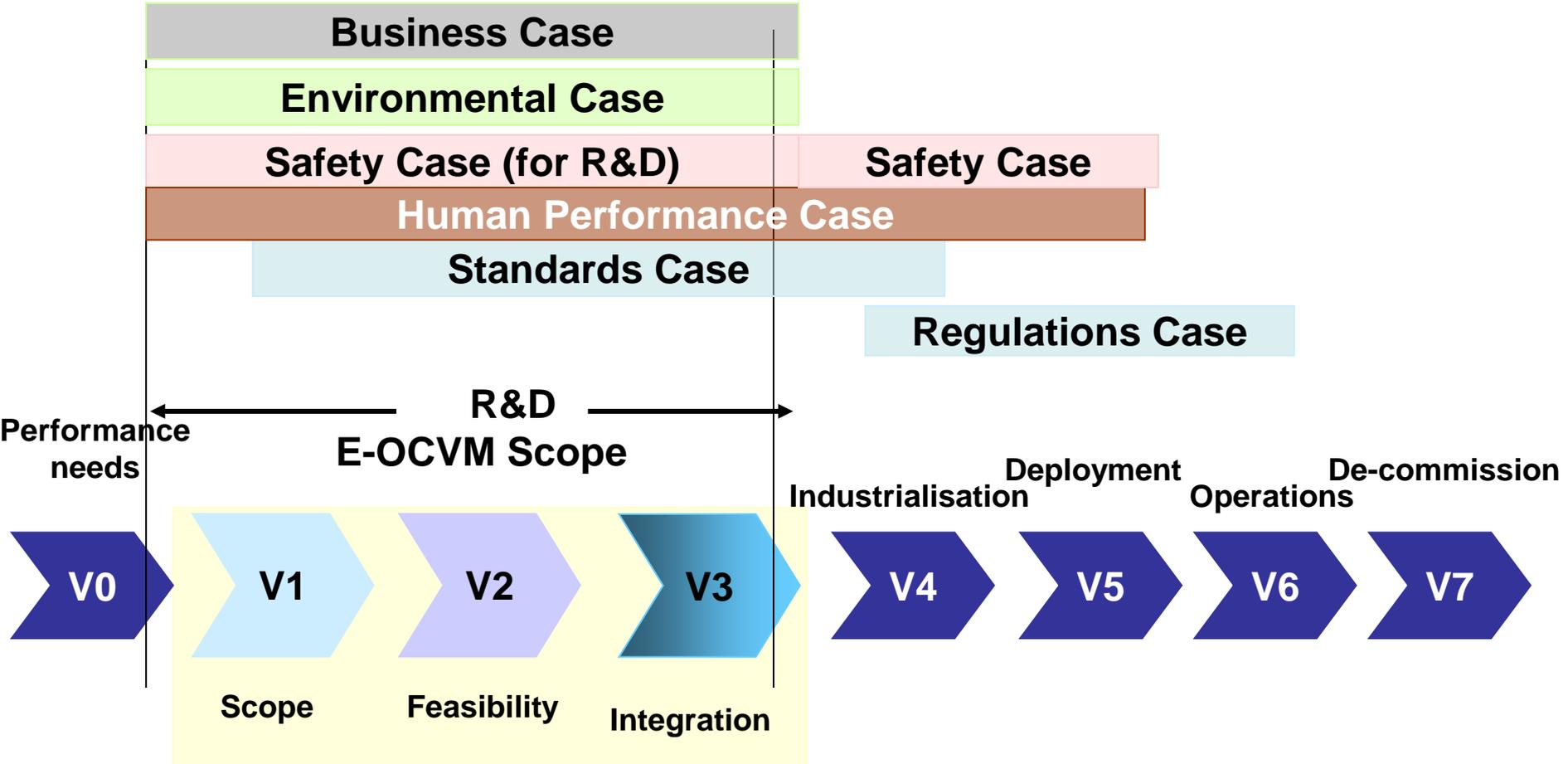
Results



Feedback from research is essential to ensure we get what we expect

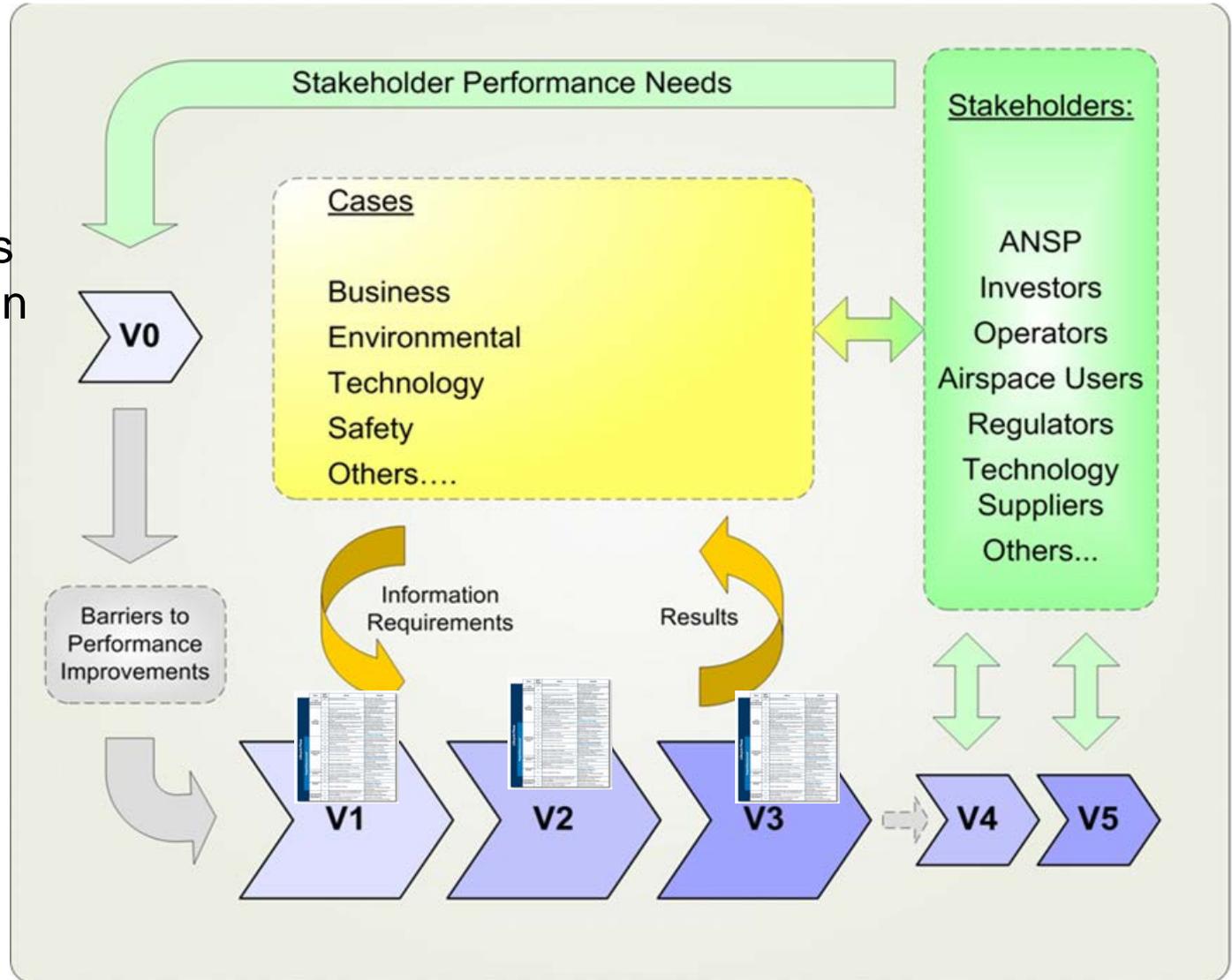
3 - Cases

Packaging the **evidence** to support stakeholders decisions



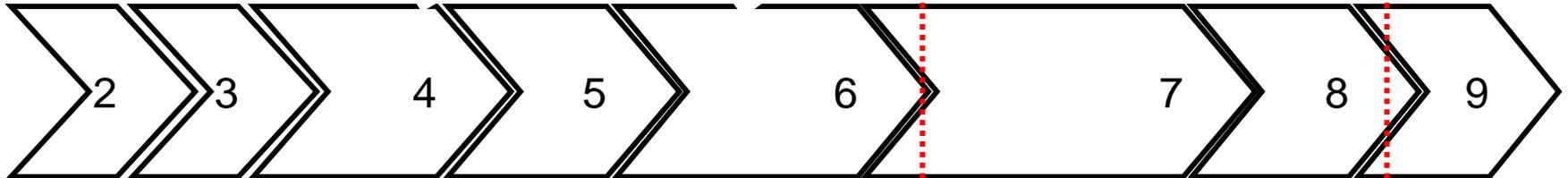
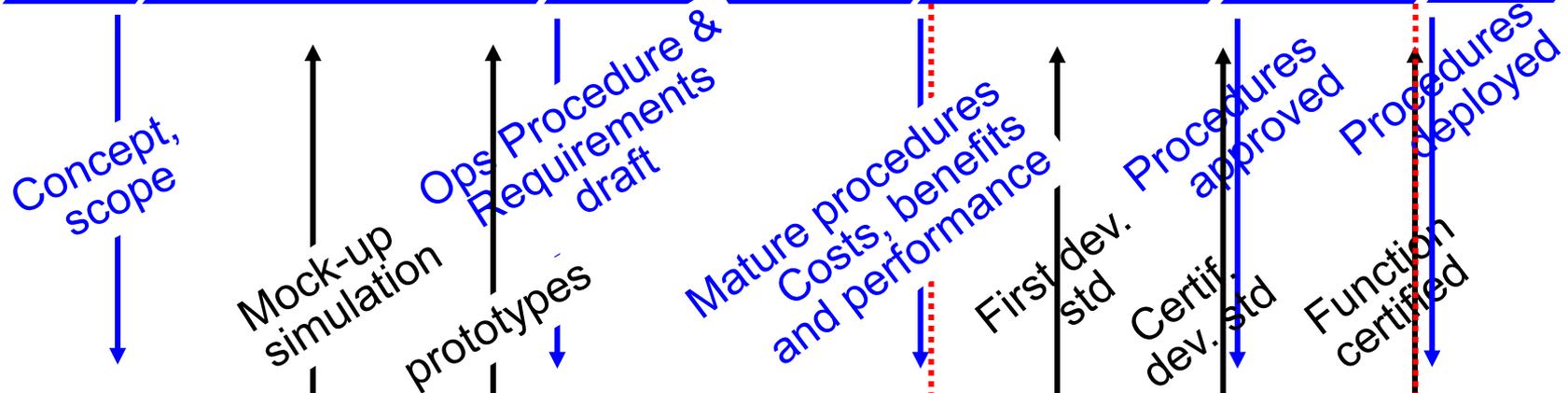
A process

Three parts
 A process that follows the lifecycle phases
 Performance driven
 Interactive with stakeholders &
 Evidence dependant



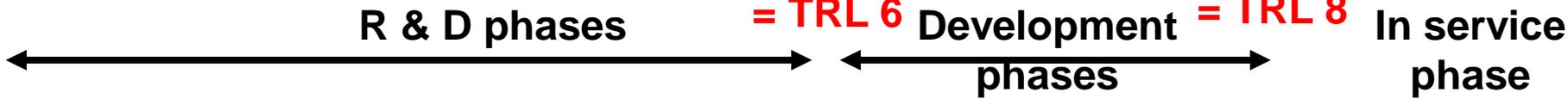
Interface with SESAR Industrial partners

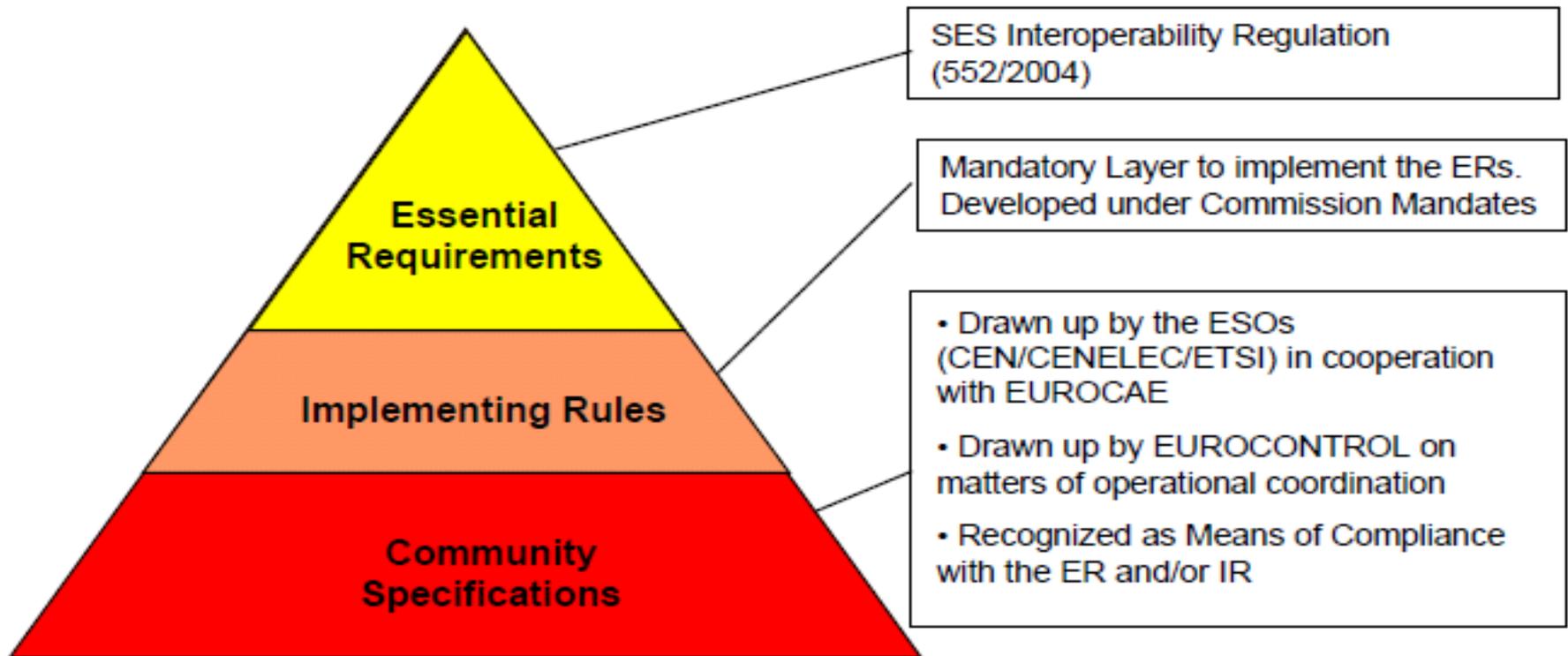
E-OCVM



NASA TRL

End of V3 = TRL 6 **End of V5 = TRL 8**



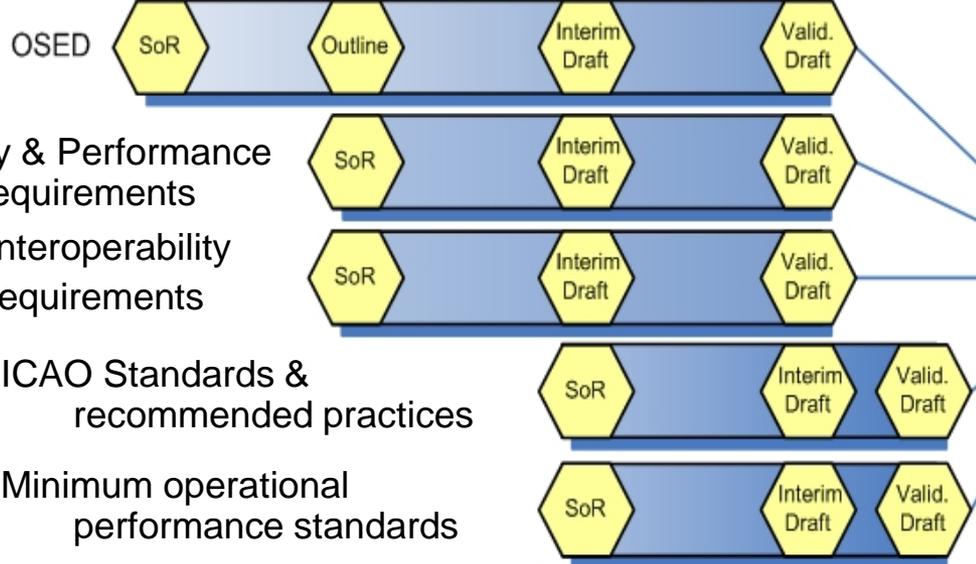
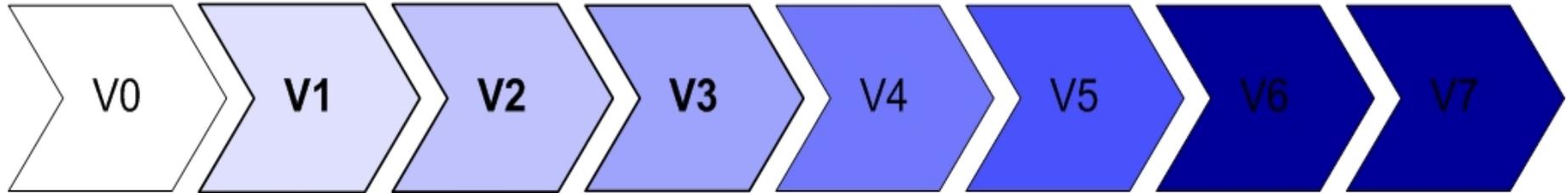


Community specifications are standards or specifications covering technical and operational issue.

They are

- Fundamental to building the system described during R&D, &
- Important aspect of the R&D validation strategy

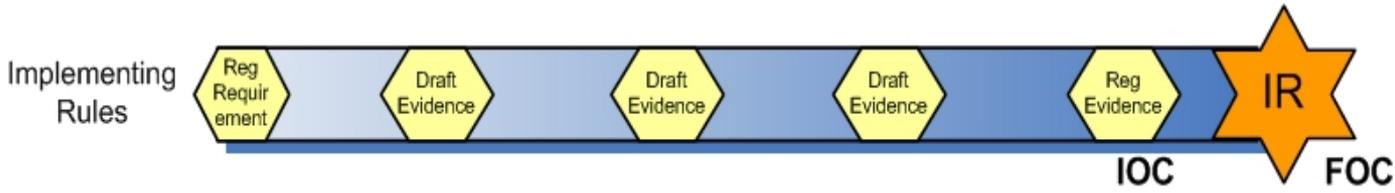
Standards milestones



OSD - Ops Services & Environment description - key document linking concept to technical description



Community Specifications.



IOC FOC



Turning research into reality by building consensus



Building a shared vision based on evidence is critical in turning research into reality.

Validation during R&D is getting buy-in from key stakeholders

- operational staff,
- airspace users,
- technology supply industry,
- regulators

Making sure 'we are building the right system'

COMMON SENSE;

ADDRESSED TO THE

INHABITANTS

O F

A M E R I C A,

On the following interesting

S U B J E C T S.

- I. Of the Origin and Design of Government in general, with concise Remarks on the English Constitution.
- II. Of Monarchy and Hereditary Succession.
- III. Thoughts on the present State of American Affairs.
- IV. Of the present Ability of America, with some miscellaneous Reflections.

Man knows no Matter save creating HEAVEN,
Of those whom choice and common good ordain.

THOMSON.

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MDCCCLXXVI.

Questions

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