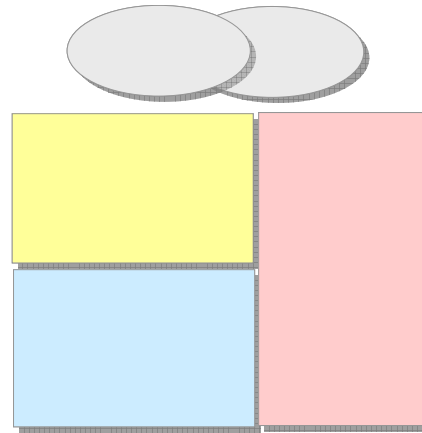


# Standardization and Regulation for CNS/ATM Avionics



**2008 ICNS Conference, Bethesda, MD**

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USAF 853<sup>rd</sup> Electronic Systems Group*

*7 May 2008*



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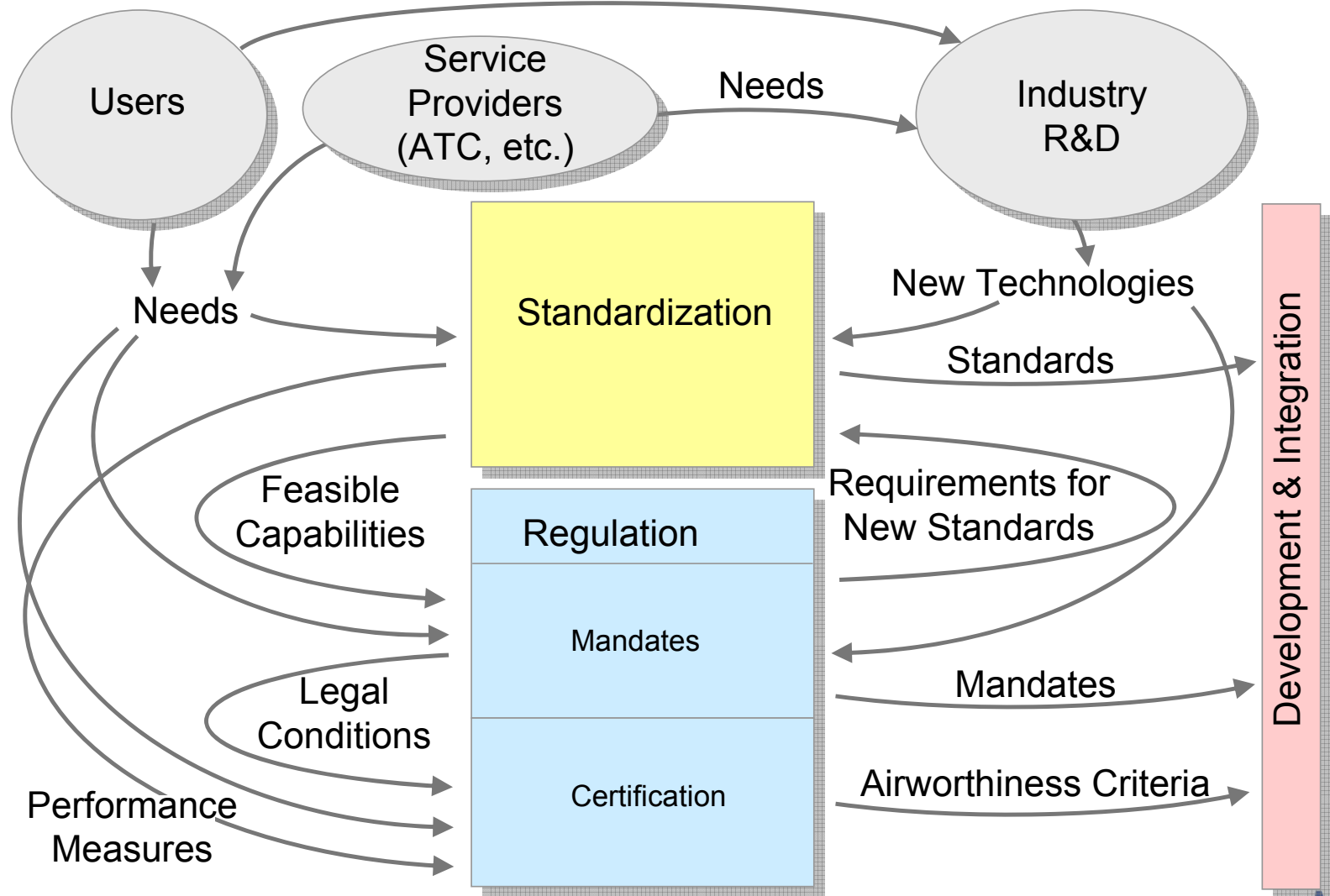
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# Background/Need

- Lots of organizations are involved.
- Lots of countries are involved.
- Lots of people are involved.
- They produce lots of different documents.
- The documents relate to each other.
- The documents determine how aircraft are equipped.
- If the aircraft aren't equipped right, people could die.
- It's expensive.
- ***Goal: describe this process in 10 pages and 20 minutes.***
- Analysis Sponsor: USAF  
Electronic Systems Center, 853rd  
Electronic Systems Group



# Overview of CNS/ATM Avionics Standardization and Regulation



# Typical Documents

## Standardization

Advisory Circular (AC)  
 Form, Fit, Function, and Interface (ARINC Standards)  
 Environmental Conditions and Test Procedures  
 Implementation Guidance  
 Interface Standards Control Document  
 Minimum Operational Performance Standard (MOPS)  
 Minimum Aviation System Performance Standard (MASPS)  
 Minimum Operational Performance Requirements (MOPR)  
 Minimum Performance Specification (MPS)  
 Minimum Interoperability Standard (MIS)  
 Procedures for Air Navigation Services (PANS)  
 Safety and Performance Requirements (SPR)  
 Standards and Recommended Practices (SARPS)  
 Standardized Agreement (STANAG)  
 Technical Standard Order (TSO)  
 Technical Standard Order Authorization (TSOA)

## Regulation

### Mandates

Program Plans and Deadlines (e.g., FAA, EUROCONTROL)  
 Aeronautical Information Publication (AIP)  
 Aeronautical Information Circular (AIC)  
 Federal Aviation Regulation (FAR—from FAA)

### Certification

Type Certificate (from FAA)  
 Supplemental Type Certificate (STC—from FAA)  
 Airworthiness Certificate (from USAF)  
 Parts Manufacturer Approval (PMA)

## Development & Integration

Contract  
 Statement of Work  
 System Requirements Document  
 Specification  
 Capability Development Document  
 Capability Production Document  
 Schedule  
 Test Plan  
 Developmental Test Results  
 Operational Test Results  
 System Safety Assessment  
 Functional Hazard Analysis  
 Modified Airworthiness Certification  
 Criteria

# Key Aviation Organizations

	Organization	Role(s)	
International	<b>ICAO</b>	International Civil Aviation Organization	International standards and recommended practices
	<b>SDOs</b>	Standards Development Organizations	There are approximately 200 ISO-recognized SDOs that set voluntary international standards
	<b>AEEC</b>	Airlines Electronic Engineering Committee	Avionics form/fit/function standards & protocols
	<b>IATA</b>	International Air Transport Association	Airline industry representation
Regional	<b>EUROCAE</b>	European Org. for Civil Aviation Equipment	European performance standards
	<b>EU</b>	European Union	Policy, regulation
	<b>EUROCONTROL</b>	European Organisation for the Safety of Air Navigation	Policy, programs, implementation guidance
	<b>ECAC</b>	European Civil Aviation Conference	Policy
	<b>NATO</b>	North Atlantic Treaty Organization	European standards for military users
	<b>EASA/JAA</b>	European Aviation Safety Agency / Joint Aviation Authorities	Certification standards and Implementing Rules / Certification standards (predecessor to EASA)
National	<b>FAA (and similar national authorities)</b>	Federal Aviation Administration	Policy, regulation, programs, performance standards, implementation guidance
	<b>RTCA</b>	Formerly Radio Technical Commission for Aeronautics, Inc.	U.S. and international performance standards

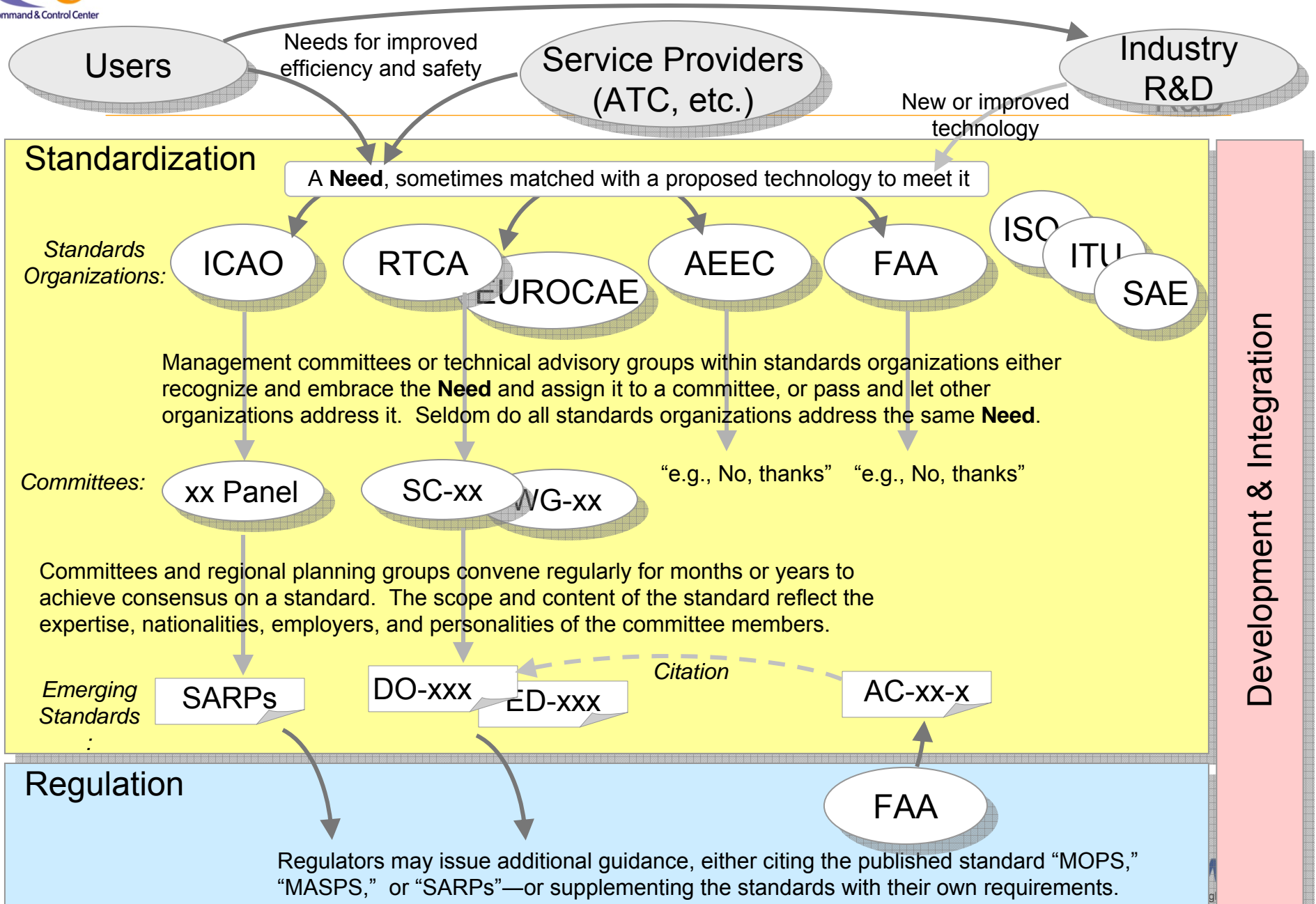


# Who Publishes What?

Organization	Types of Products <span style="float: right;">———— Rough Chronological Order ———&gt;</span>															
	Policy	Program Plans	Guidance & Recommendations	Standardization					Regulation						Operational Procedures	
				Standards and Recommended Practices (SARPs)	Minimum Operational Performance Standards (MOPS)	Minimum Performance Specification (MPS)	Minimum Aviation System Performance Standards (MASPS)	Interface Standards / Control Document	Aeronautical Information Publication/ Circular (AIP/AIC)	Federal Aviation Regulations (FARs)	Implementation Guidance (e.g., FAA's ACs)	Guidance for Airworthiness Approval	Certification Standard	Type Certificate and STC		
FAA (and similar national authorities)	X	X	X			X				X	X	X	X	X	X	X
EUROCONTROL		X	X									X		X		X
European Union	X		X													
ECAC	X		X													
ICAO			X	X												X
NATO			X									X				X
EASA/JAA			X									X		X	X	
RTCA			X		X	X	X	X								
EUROCAE			X		X	X	X	X								
AEEC			X					X								
IATA, AOPA, and other user groups			X													X

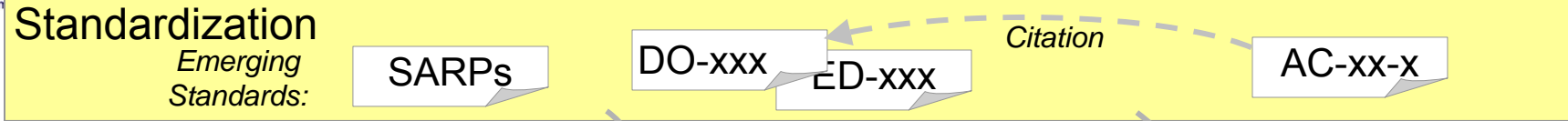


# Basic Flow: Standardization

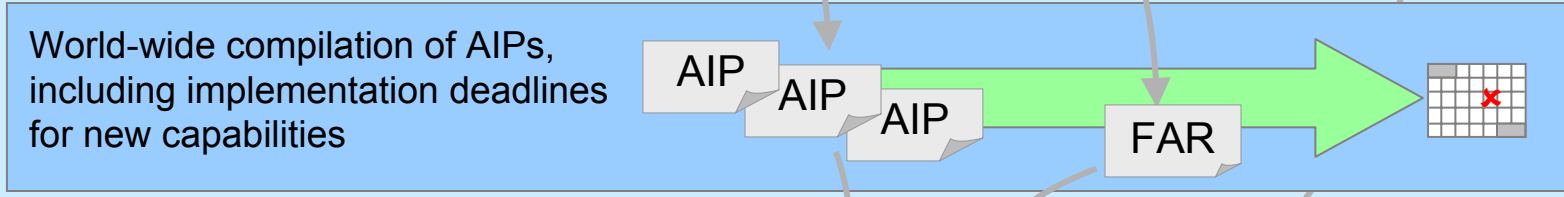
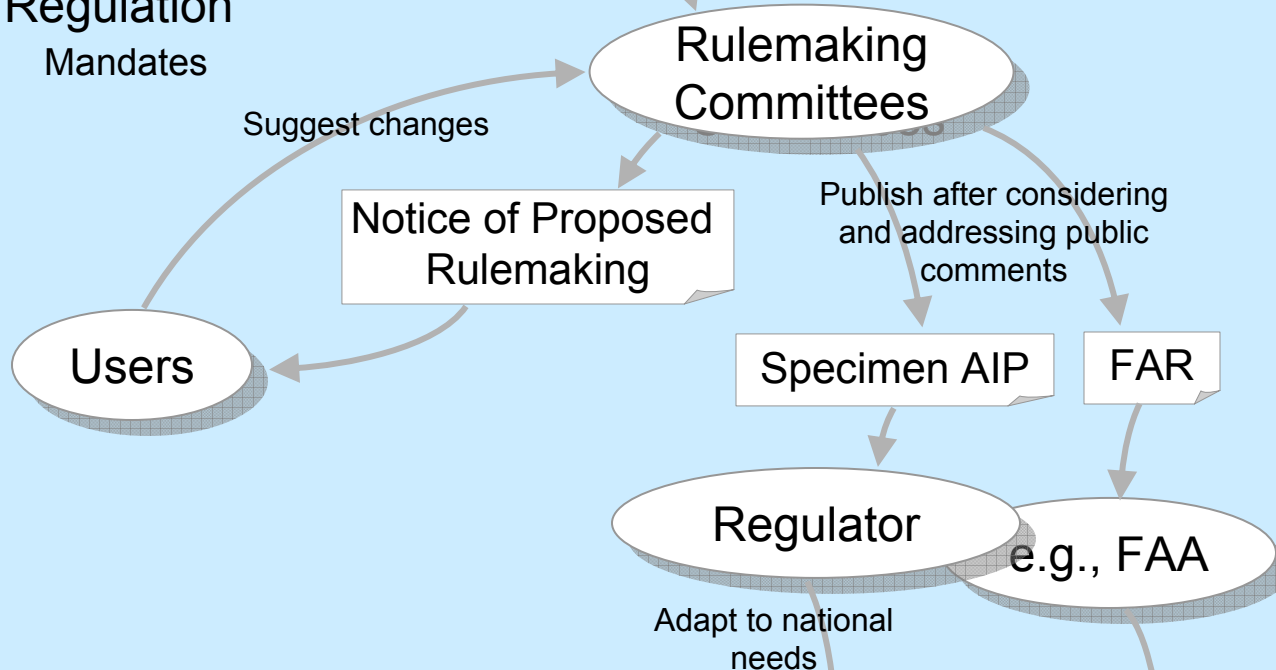




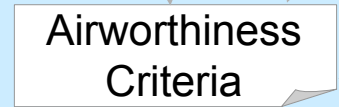
# Basic Flow: Regulation



## Regulation Mandates



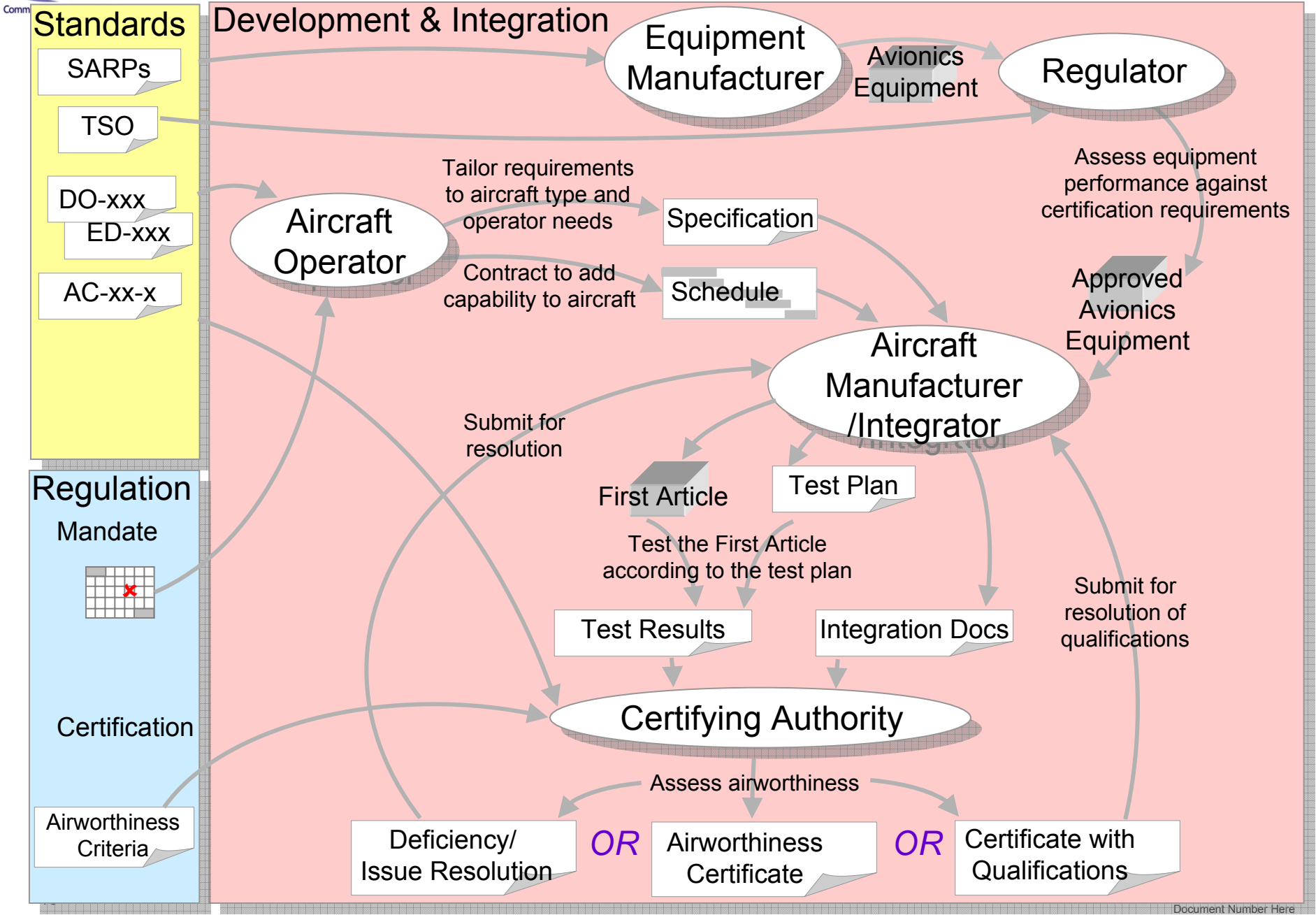
## Certification



Development & Integration



# Basic Flow: Development and Integration



# Tables for Tracking Requirements & Standards

## 1. Organizations Influencing Avionics Standards

Name	Mission	Scope/Region	Products	Purpose
EASA		Europe		
FAA		USA, NAT, PAC	ACs, TSOs	
ICAO		Worldwide	SARPS	
NATO		Europe	STANAGs	
RTCA		USA	MOPS, MASPS	
Etc.				

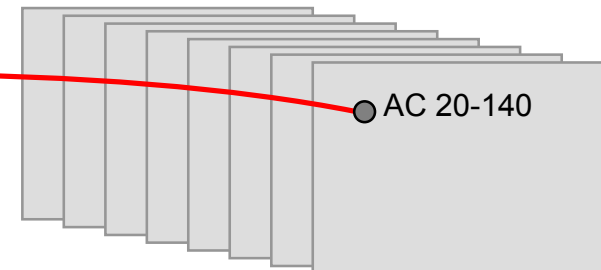
## 2. CNS/ATM Requirements Worldwide

Capability	Regions Affected					Need
8.33	X				X	1999
ADS-C			X			1995
ADS-B	X	X	X			2005
CPDLC		X				2010
HFDL				X		2007
Mode S	X				X	2009

## 3. CNS/ATM Applicable Standards

Capability	RTCA	EUROCAE	FAA	AEEC	ICAO
8.33	DO-186A	ED-23B	TSO C-169		
ADS-C	DO-258		AC 20-140		
ADS-B					
CPDLC	DO-258		AC 20-140		
HFDL	DO-265			ARINC 753	SARPS
Mode S	DO-181C		AIR-100		

## 4. Standards Documents

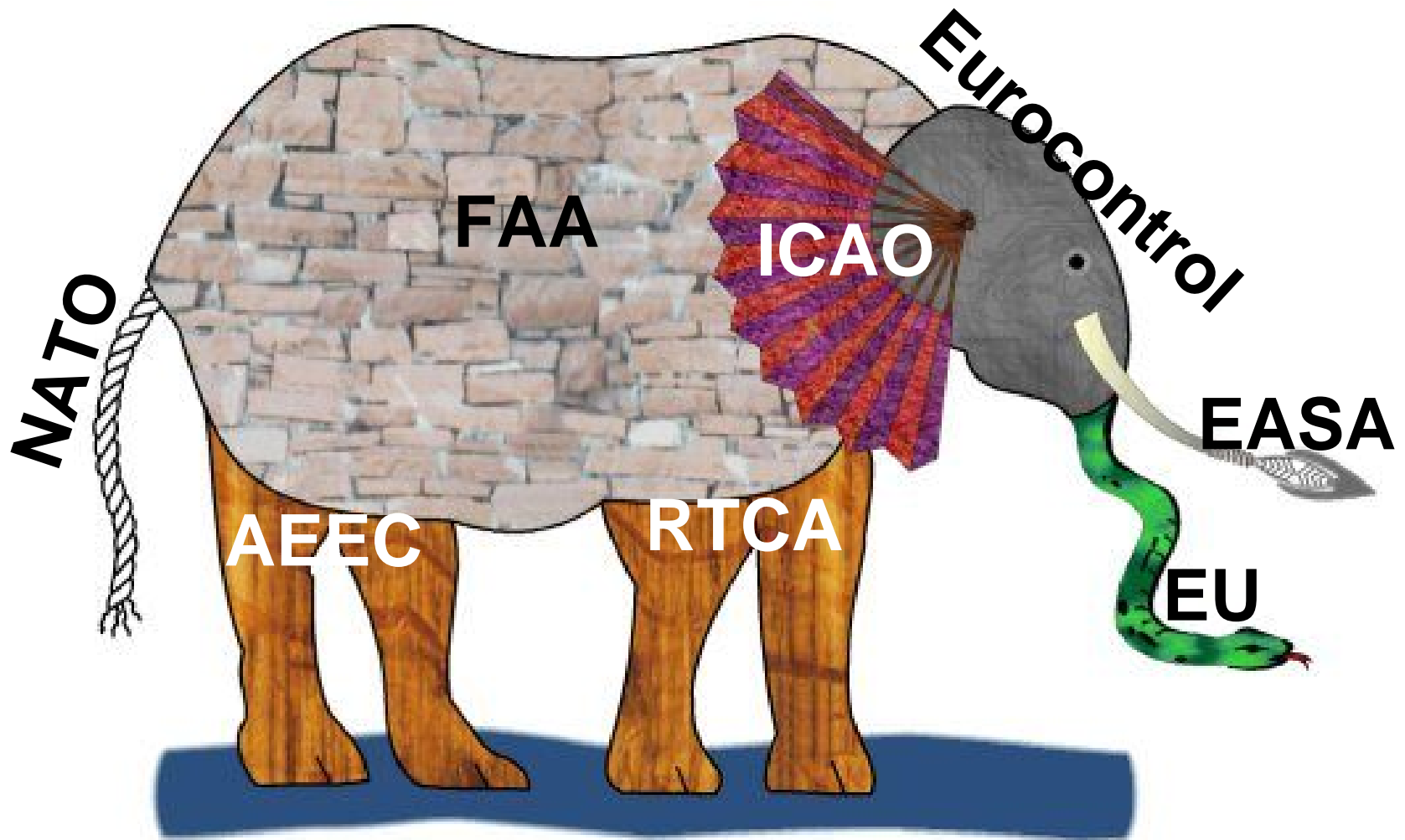


# Observations

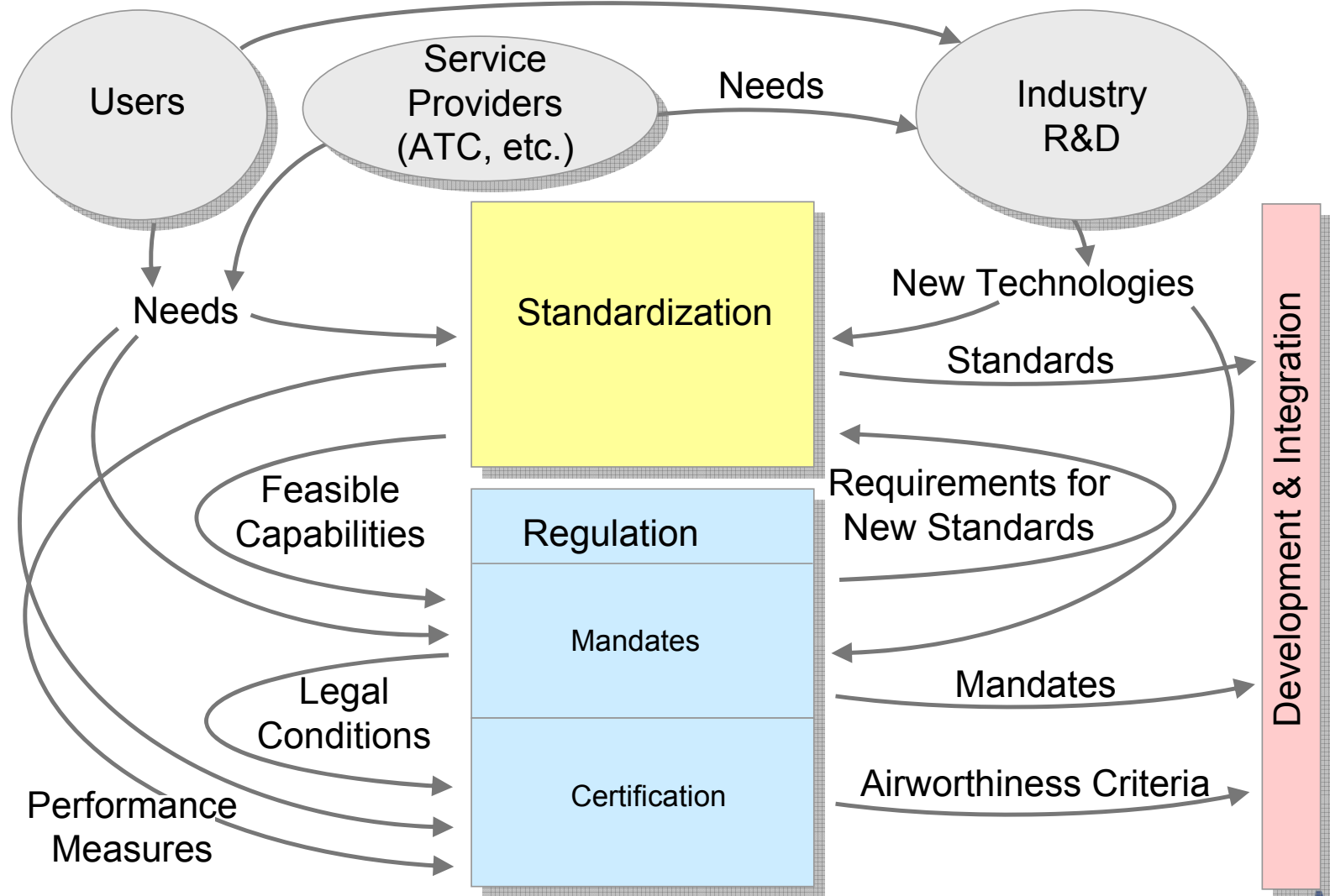
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- **The process for developing standards and regulations is a worldwide enterprise.**
- **Most standards are based on consensus.**
  - Reaching consensus can be a lengthy process.
  - Results might be documented in multiple overlapping areas.
- **Parts of the process can seem arbitrary and ad hoc, with exceptions to the rules.**
- **Few participants in the process have a complete picture of the entire process.**

# The Big Picture



# Summary



# Glossary

<b>AC</b>	Advisory Circular	<b>ICAO</b>	International Civil Aviation Organization
<b>AD</b>	Airworthiness Directive	<b>ISO</b>	International Standards Organization
<b>AEEC</b>	Airlines Electronic Engineering Committee	<b>JAA</b>	Joint Aviation Authorities
<b>AIC</b>	Aeronautical Information Circular	<b>MASPS</b>	Minimum Aviation System Performance Standard
<b>AIM</b>	Aeronautical Information Manual	<b>MOPS</b>	Minimum Operational Performance Standard
<b>AIP</b>	Aeronautical Information Publication	<b>NATMC</b>	NATO Air Traffic Management Committee
<b>AP</b>	Area Planning	<b>NATO</b>	North Atlantic Treaty Organization
<b>ARINC</b>	Aeronautical Radio, Incorporated	<b>NPRM</b>	Notice of Proposed Rulemaking
<b>CMAC</b>	Civil-Military ATM Conference (Europe)	<b>PANS</b>	Procedures for Air Navigation Services
<b>EASA</b>	European Aviation Safety Agency	<b>PMA</b>	Parts Manufacturer Approval
<b>EC</b>	European Commission	<b>RTCA</b>	Radio Technical Commission for Aeronautics (formerly)
<b>ECAC</b>	European Civil Aviation Conference	<b>SAE</b>	Society of Automotive Engineers
<b>ENPRM</b>	EUROCONTROL Notice of Proposed Rulemaking	<b>SARPS</b>	Standards and Recommended Practices
<b>ERAF</b>	EUROCONTROL Regulatory and Advisory Framework	<b>SCRSP</b>	Surveillance and Conflict Resolution Systems Panel (ICAO)
<b>EU</b>	European Union	<b>STANAG</b>	Standardized Agreement (NATO)
<b>EUROCAE</b>	European Organization for Civil Aviation Equipment	<b>STC</b>	Supplemental Type Certificate
<b>EUROCONTROL</b>	European Organization for the Safety of Air Navigation	<b>TC</b>	Type Certificate
<b>FAA</b>	Federal Aviation Administration	<b>TGL</b>	Temporary Guidance Leaflet
<b>FAR</b>	Federal Aviation Regulation	<b>TSO</b>	Technical Standard Order
<b>FITS</b>	FANS Interoperability Teams	<b>US DoD</b>	United States Department of Defense
<b>FLIP</b>	Flight Information Publications Program	<b>WRC</b>	World Radiocommunication Conference
<b>IATA</b>	International Air Transport Association		