ATM-CNS Interoperability Roadmap

Presentation by

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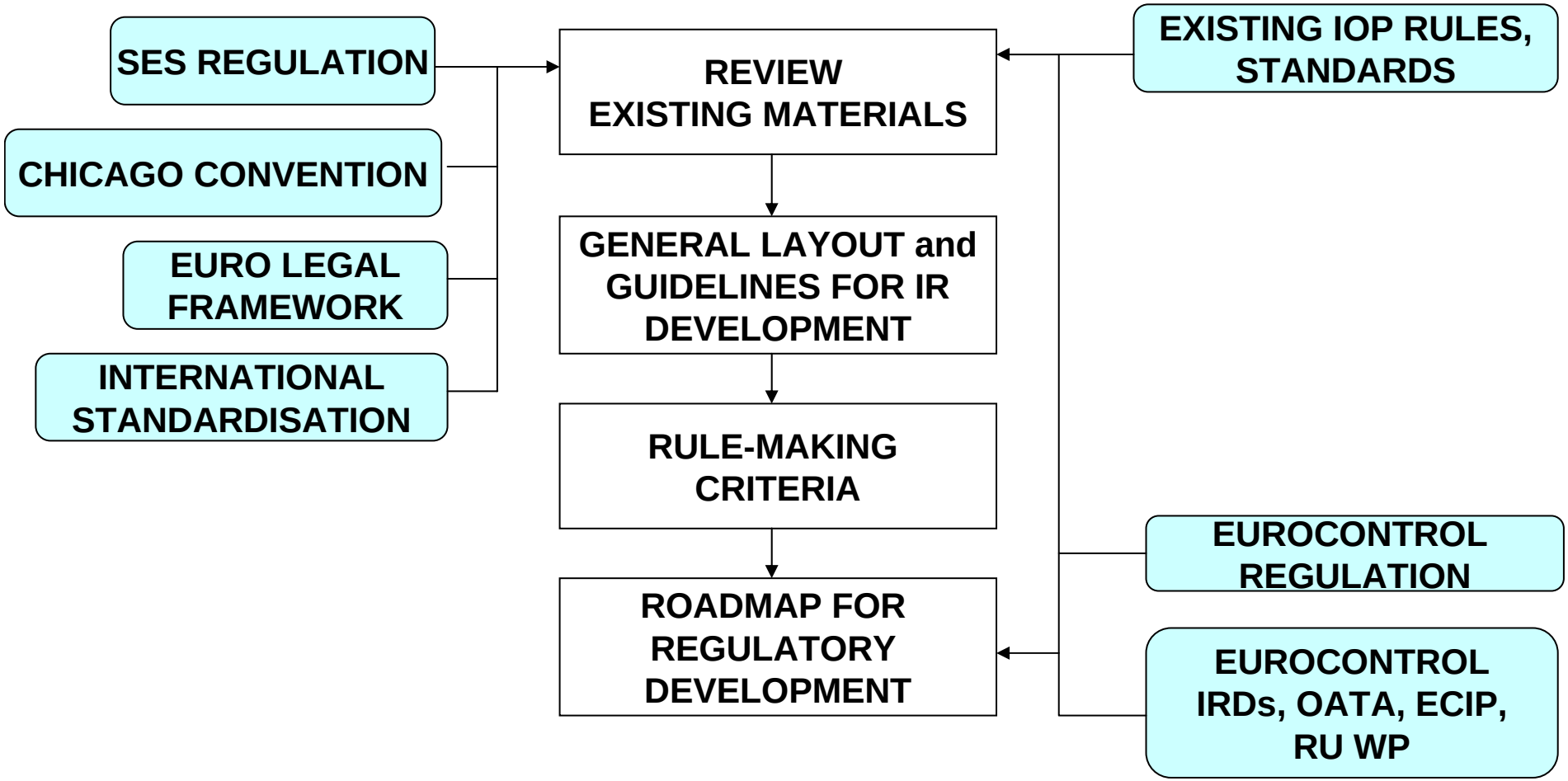
Objectives of the AIR study

Based on an analysis of existing and planned regulations, rules, standards, system qualification and operation practices,

• To define a generic layout and a set of guidelines for the production of implementing rules,

• To identify priorities and propose a work programme to develop a complete interoperability in the SES by 2012.

Study Approach



ASSESSMENT OF CURRENT RULES AND SPECIFICATIONS

	WMO	ITU	ISO	ICAO	ETSI	EUROCONTROL	EUROCAE
ASM							
ATFM							
ATC & FIS							V T
ATC/FDPS							
ATC/SDPS							
ATC/HMIS			V T				
G/G COM							
A/G COM							
A/A COM							
NAV		M T V T					V T
SUR		M T V T					V T
AIS			V A				V T
MET	M[1] O V T O		V A				

[1] Mandatory through cooperation with ICAO.

T: Technical, O: Operational, A : Administrative
V: Volountary, M: Mandatory

Agenda

- **Conformity assessment**
- **Guidelines for IR development**
- **Rule-making method**
- **Roadmap**

Conformity Assessment Issues (1)

Institutional/regulatory context of EU conformity assessment

- Agreement between the Commission and CEN/CENELEC/ETSI for the development of European standards
- Rules regulating the apposition of CE markings in connection with the establishment of Community Specifications
- Set of Conformity Verification modules defined by Dec. 93/465/EEC
- Adoption of ESARRs as EU Safety Requirements for Air Navigation Service Providers (art. 5 of Reg. 2001/0235 on Service Provision)
- Roles assigned to EUROCONTROL, National Authorities, ANSP and Notified Bodies in the Single European Sky Regulations

Conformity Assessment Issues (2)

Institutional/regulatory context of EU conformity assessment

Reg. 2001/0060 (Framework) : introduces the notion of IR

Reg. 2001/0235 (ANSP): defines the ESARR-based safety regulation regime for ANS Providers

Reg. 2001/0236 (A/S) : defines operational inter-operability requirements for ASM and ATFM

Set a context for adressing ANS level safety issues of systems operation

Set a context for system IOP in the ASM, ATFM and AIS domains

Reg. 2001/0237 (IOP): defines IOP domains and their ER
- assigns IR development role to EUROCONTROL
- assigns CS development role to EUROCAE+EUROCONTROL
- set constraints on IR content and structure

Dec. 93/465/EEC: defines Conformity Verification Modules

Conformity Assessment Issues (3)

Key findings and recommendations of the AIR Study (1/2)

- **Existing conformity assessment modules are limited to an initial assessment of conformity for products when put to the market:**
  safety concerns may require additional provisions for certain systems and constituents so as to efficiently ensure:
  - a periodic or continuous conformity verification of those products after their entry into operation,
  - an optimised conformity verification approach for products undergoing frequent (minor) modifications (especially software systems)

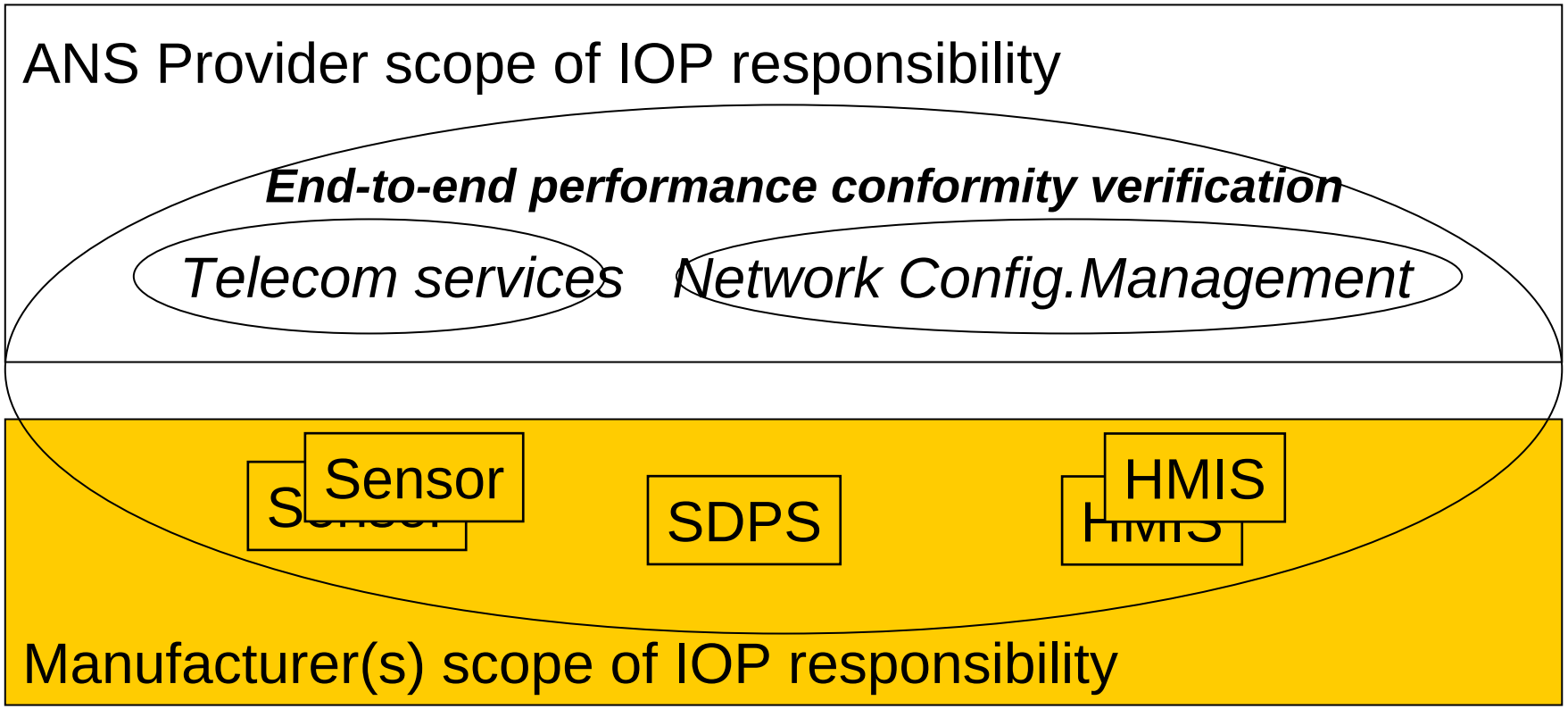
- **The conformity modules to be applied could be defined at the level of each Implementing Rule, yet a broad-based typology of systems and constituents would help selecting an appropriate "modules mix"**

- **The complexity of ATM/CNS systems requires a thorough interpretation of responsibilities; ANS providers remain responsible for the end-to-end conformity verification of distributed systems**

Conformity Assessment Issues (4)

Key findings and recommendations of the AIR Study (2/2)

- **Distribution of responsibilities for a distributed system: Surveillance Network Inter-operability**



Agenda

- **Review of existing material: findings and recommendations**
- **Conformity assessment**
- ➢ **Guidelines for IR development**
- **Rule-making method**
- **Roadmap**

Guidelines for developing Implementing Rules (1/2)

- IR must support a “top-down” ER-to-IR justification (based on a CBA and a consultation process of interested parties)
- IR must support a CS-to-IR “bottom-up” identification of those standards creating a presumption of conformity
- IR must specify a conformity verification regime (derived from 93/465/EEC modules) and acceptable means of compliance under that verification regime
- IR should demonstrate an EU-wise “added value” with respect to ICAO and other mandatory standards in each functional domain
- IR should be focused at the definition of:
  - responsibility assignments in a given framework of operation
  - functional service specifications for systems/constituents
  - system/constituent performance requirements
- technical details should be provided by Community Specifications
- IR = what you must do ; CS = how you can do it

Guidelines for developing Implementing Rules (2/2)

- IR should make reference to those elements of operational concept that require IOP clarifications/improvements
- Most IR should be domain-wise (for the sake of domain-wise ER traceability)
- IR should precisely identify those systems/constituents which it is applicable to (the reference model for describing the ATM/CNS logical architecture should be common to all the IR)
- The conformity verification regime should be patterned after a small set of generic combinations of modules, with a spectrum of options ranging from manufacturer self-declaration to a fully-fledged third party certification process
- The cost-to-benefit ratio of adopting a tight IOP verification regime should be a key element of decision (since safety margins depend on operational restrictions, system level safety issues may be limited)

Agenda

- **Review of existing material: findings and recommendations**
- **Conformity assessment**
- **Guidelines for IR development**
- ➢ **Rule-making criteria**
- **Roadmap**

Rule-making criteria (1)

- **Starting point for IR making:**
  - **IOP regulation: the ER (generic and domain-specific) (top down approach)**
  - **other SES regulations**
  - **the SES requirements concerning IR/CS :**

whenever mandatory procedures or voluntary standards could help :

- **in the definition of concepts and procedures,**
- **in the definition , development, improvement or maintenance of systems and constituents,**
- **in the verification of conformity of such systems**

in order to assure ATM/CNS systems seamlessness, safety, efficiency

Note the wide scope of interoperability !

Rule-making criteria (2)

- Interoperability definition
  « safe, seamless, efficient operation »

IOP REGULATION

- 8 domains (ASM, ATFM, ATS, COM, NAV, SUR, AIS, MET)

« DOMAINS » and not « SYSTEMS » !

- IOP achieved through system compliance with the ER

ESSENTIAL REQUIREMENTS

- Part of the regulation itself
- General rqts (7) – Specific rqts

- Seamless operation
- Support to new concepts of operation
- Safety
- Civil-Military co-ordination
- Environmental constraints
- Logical architecture principles
- System construction principles

IMPLEMENTING RULES

COMMUNITY SPECIFICATIONS

OTHER SES REGULATIONS

Rule-making criteria (3)

Objectives of the IR/CS development programme:

- To have a sufficient basis applicable from mid 2005

Are the general and domain specific ER sufficient:
do they allow a harmonised verification of conformity ?

- To go with the future developments from 2005 onwards

The objective of an implementing rule should be:

- to accelerate the implementation of solutions,
- to help solving pending inter-operability issues.

Rule-making criteria (4)

Comments:

IR should cover two aspects:

- IR defining responsibilities, common operational procedures and performance requirements for addressing inter-operability issues at the level of Air Traffic Services;

- IR defining services, performance and quality of services requirements at the level of technical systems and constituents.

This corresponds to the two types of Community Specifications:

Specifications drawn up by EUROCONTROL on matters of operational co-ordination between ANSPs

European standards for systems and constituents and relevant procedures, drawn up by the European standardisation bodies (CEN/CENELEC/ETSI) in conjunction with EUROCAE

tory mater

Rule-making criteria (5)

Different elements can be used:

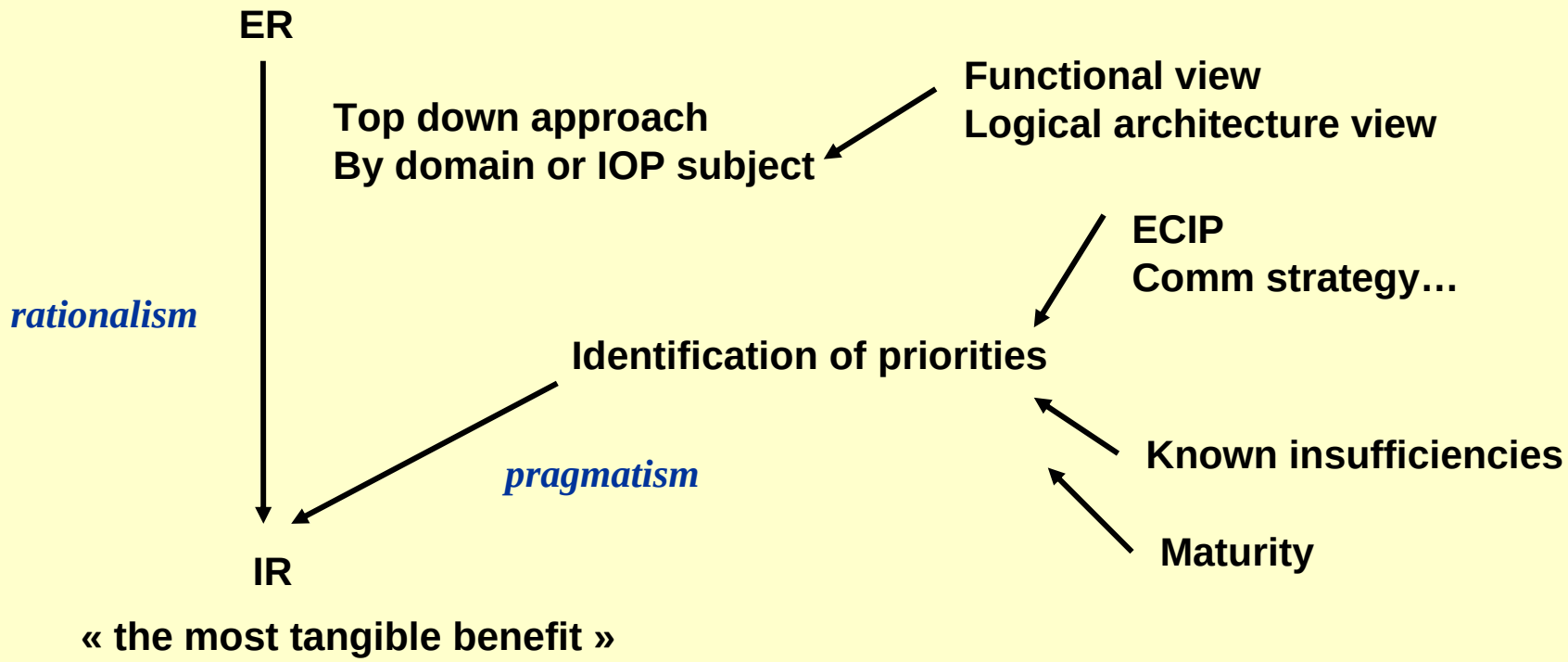
- **to identify, structure and prioritise interoperability issues,**
- **to classify the implementing rules,**
- **to give advisory elements to complement the rules that will be defined.**

These elements are:

- **the European Convergence and Implementation Plan (ECIP) document,**
- **the IRDs documents relative to flight data in ATM, the EATMP Consolidated Interoperability Summary,**
- **the OATA architecture.**

These documents should being used for the definition of the roadmap but also in future rules developments.

Rule-making criteria (6)



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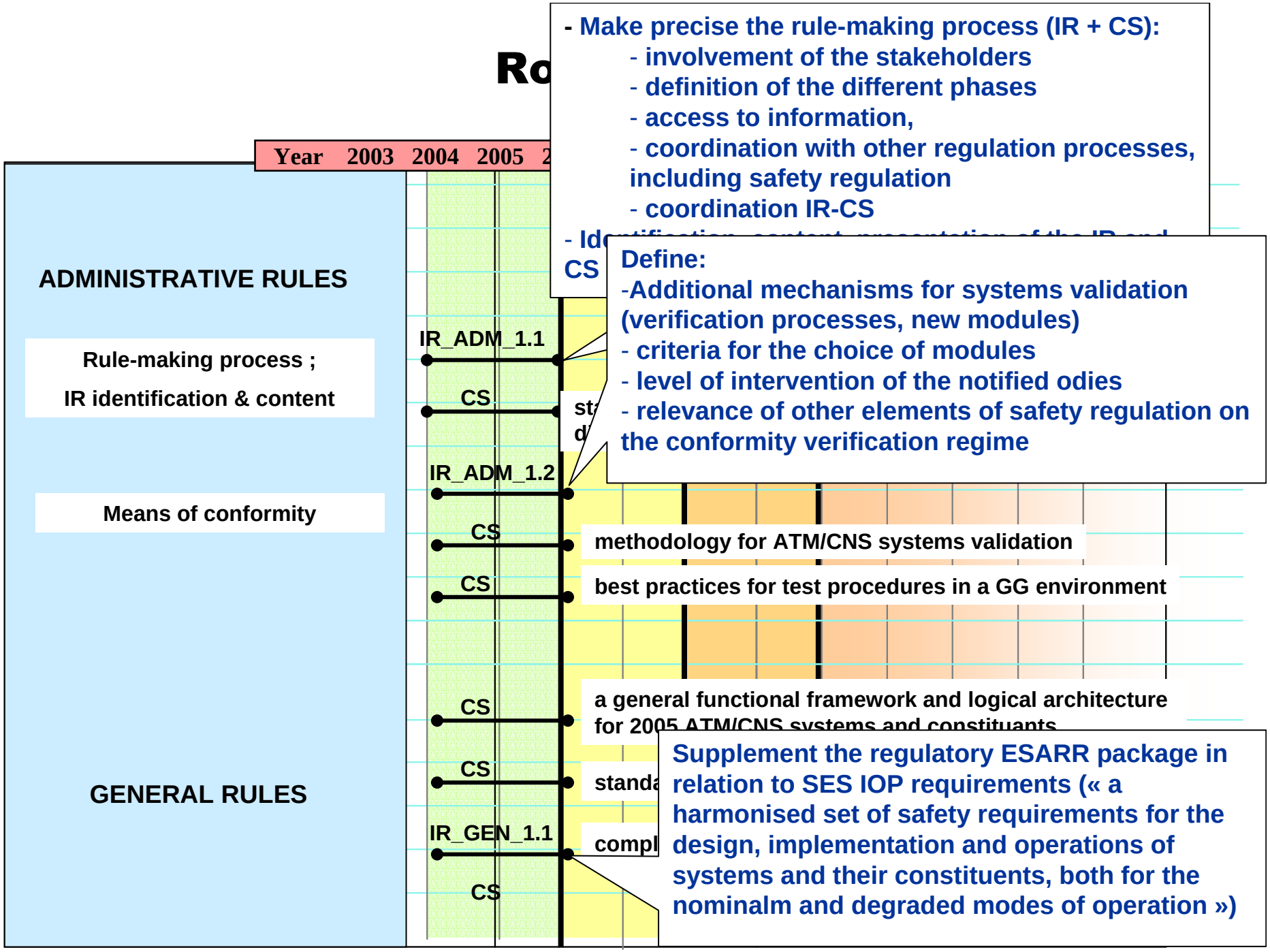
- ➢ **Roadmap**

Roadmap (1)

- **Delays of the rule-making process:**
  - **without Advanced NPRM: 25 (-6,+13) months**
  - **with Advanced NPRM: 32 (-6,+10) months**
- **Highly dependent on the type (safety, interoperability, performance, QOS…) and complexity of the issue, motivation of the stakeholders…**
- **We consider that the production of IR can be broken down in 4 packages of 2 to 3 years.**


Ro
- Make precise the rule-making process (IR + CS):
- involvement of the stakeholders
- definition of the different phases
- access to information,
- coordination with other regulation processes, including safety regulation
- coordination IR-CS
Year 2003 2004 2005
ADMINISTRATIVE RULES
Rule-making process ;
IR identification & content
IR_ADM_1.1
CS
Define:
-Additional mechanisms for systems validation (verification processes, new modules)
- criteria for the choice of modules
- level of intervention of the notified odies
- relevance of other elements of safety regulation on the conformity verification regime
IR_ADM_1.2
Means of conformity
CS
methodology for ATM/CNS systems validation
CS
best practices for test procedures in a GG environment
CS
a general functional framework and logical architecture
GENERAL RULES
CS
IR_GEN_1.1
CS
Supplement the regulatory ESARR package in relation to SES IOP requirements (« a harmonised set of safety requirements for the design, implementation and operations of systems and their constituents, both for the nominalm and degraded modes of operation »)

Roadmap (3)

COM :

- **Seamless operation:**
  Clarify the performance requirements for every part of the communication model

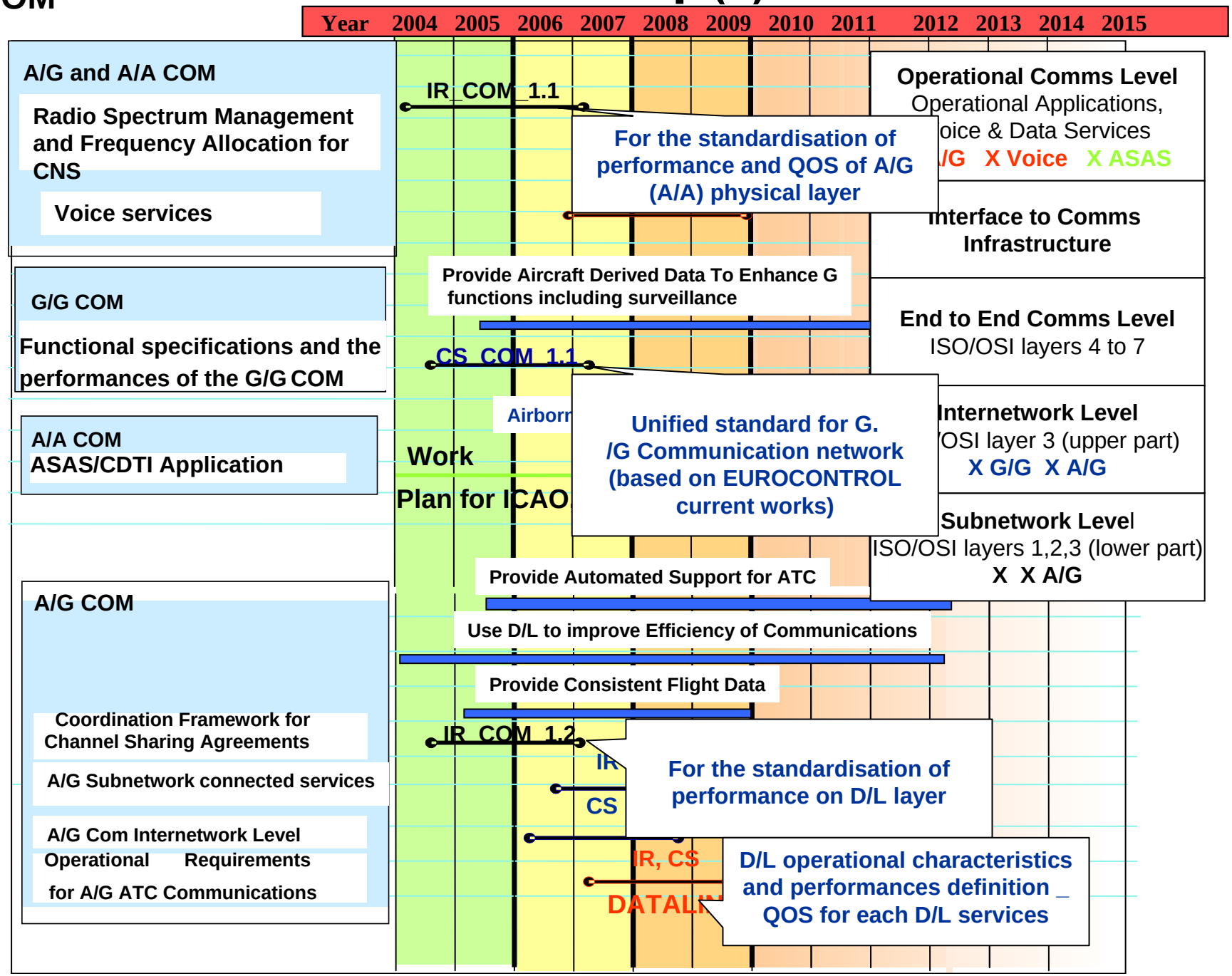
- **Support to new concepts:**
  Facilitate ASAS

Operational Comms Level Operational Applications, Voice & Data Services **X A/G X Voice X ASAS**
Interface to Comms Infrastructure
End to End Comms Level ISO/OSI layers 4 to 7
Internetwork Level ISO/OSI layer 3 (upper part) **X G/G X A/G**
Subnetwork Level ISO/OSI layers 1,2,3 (lower part) **X X A/G**

Communication model

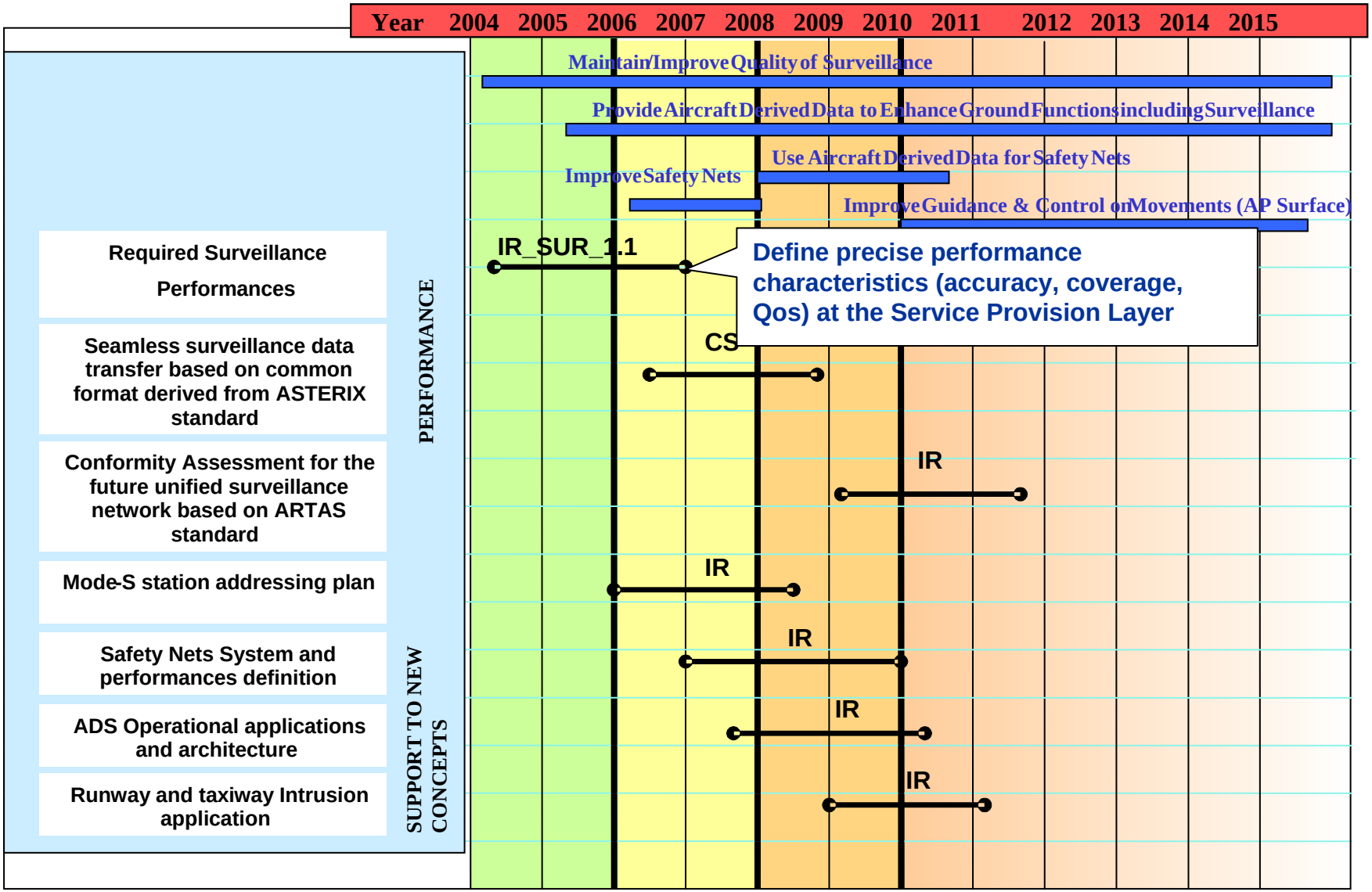
COM

Roadmap (4)

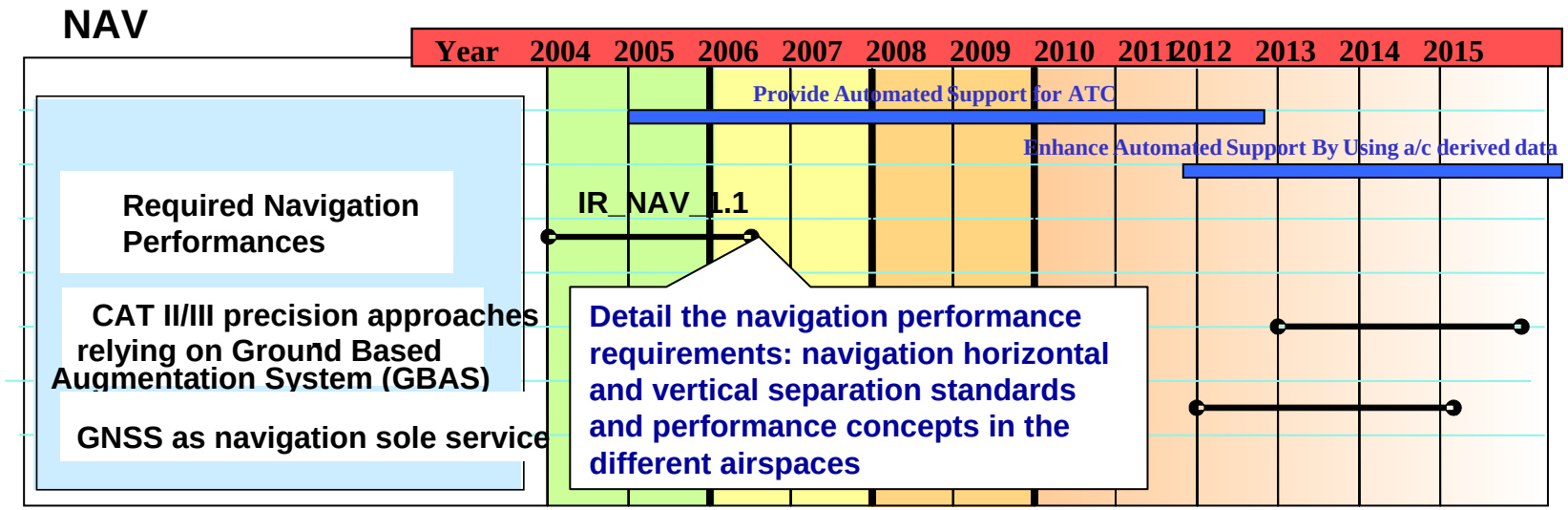


SUR

Roadmap (5)

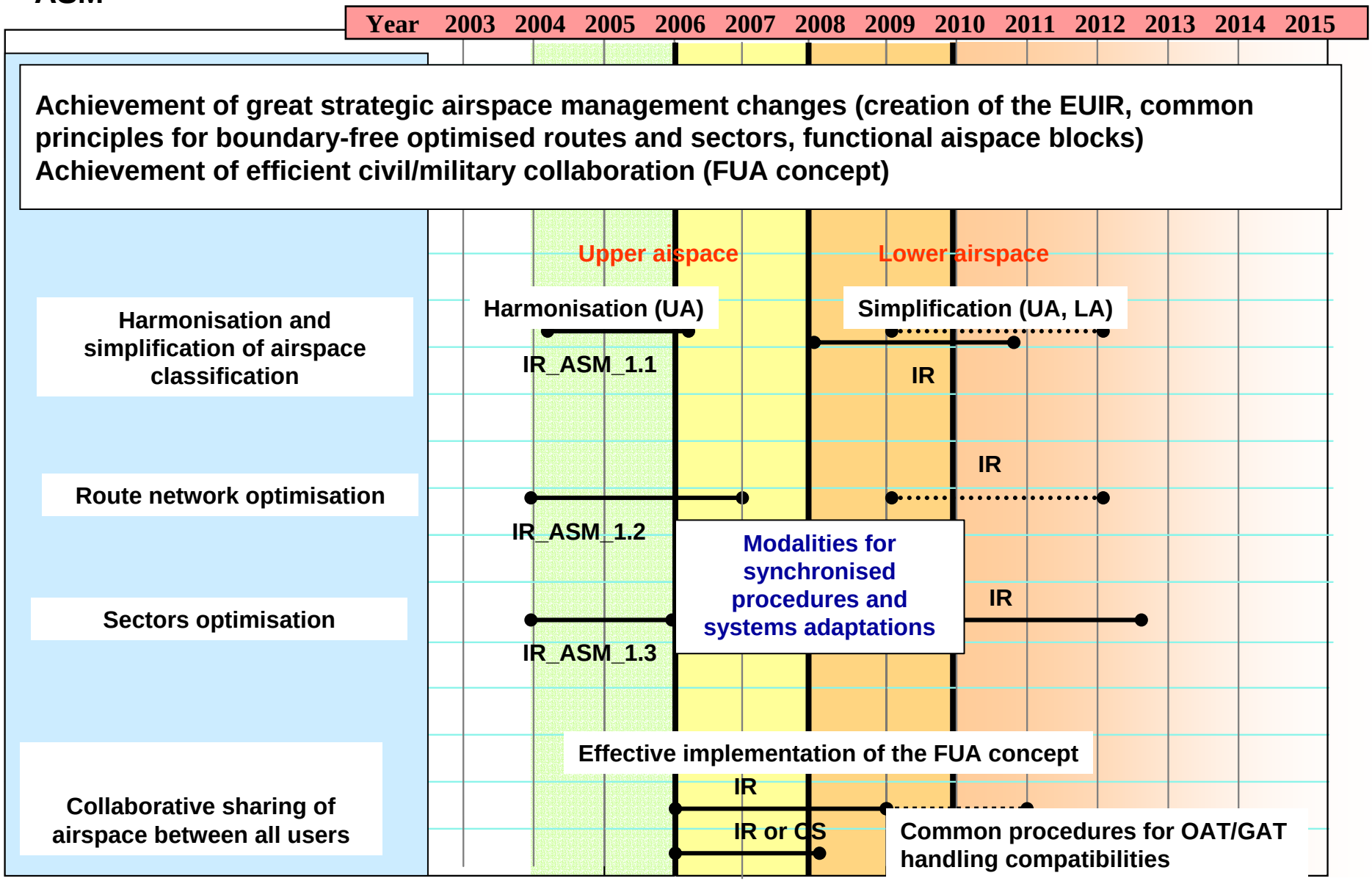


Roadmap (6)

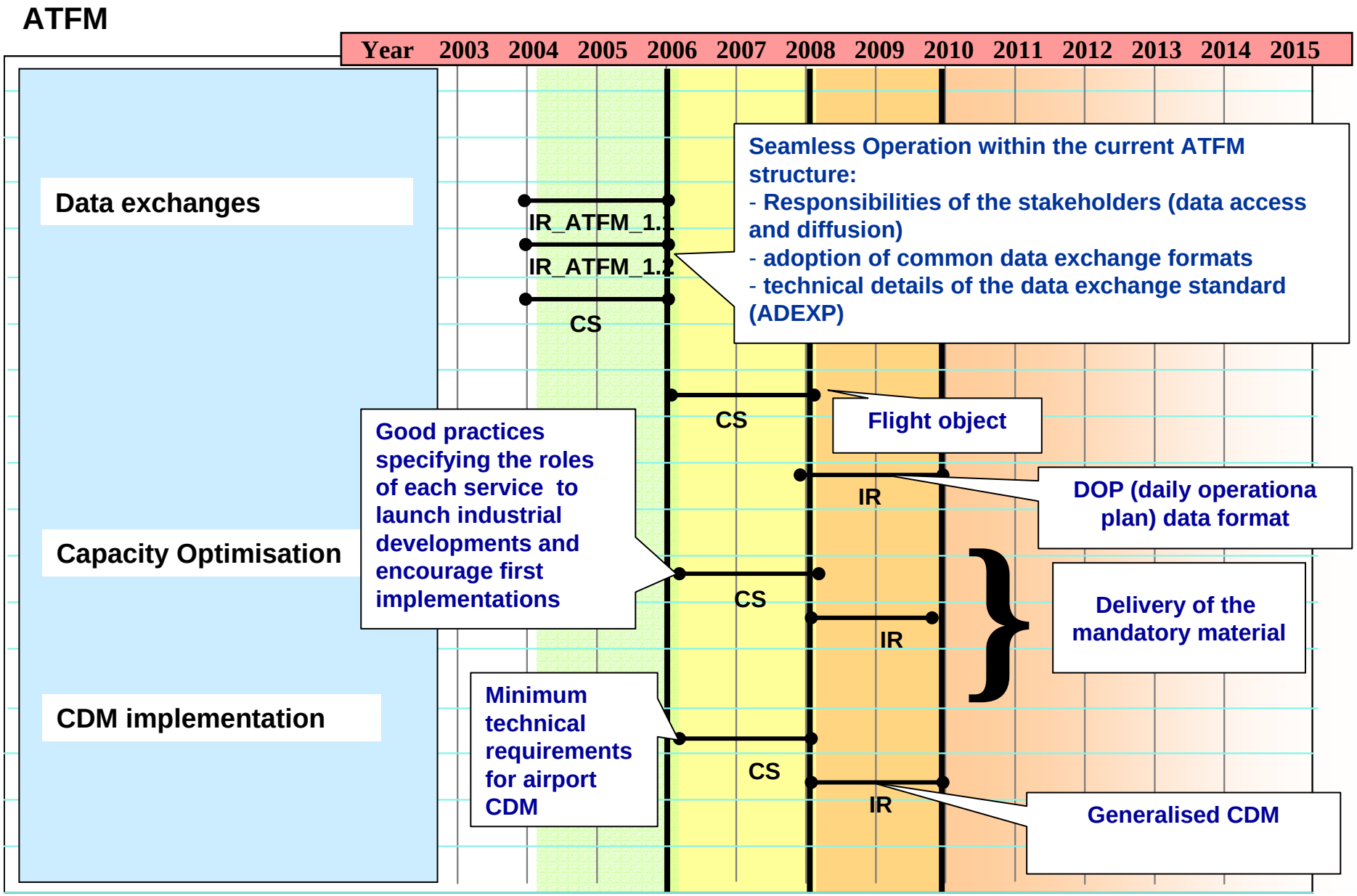

NAV
Year 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
Provide Automated Support for ATC
Enhance Automated Support By Using a/c derived data
Required Navigation Performances
IR_NAV_1.1
CAT II/III precision approaches relying on Ground Based Augmentation System (GBAS)
GNSS as navigation sole service
Detail the navigation performance requirements: navigation horizontal and vertical separation standards and performance concepts in the different airspaces

Roadmap (7)

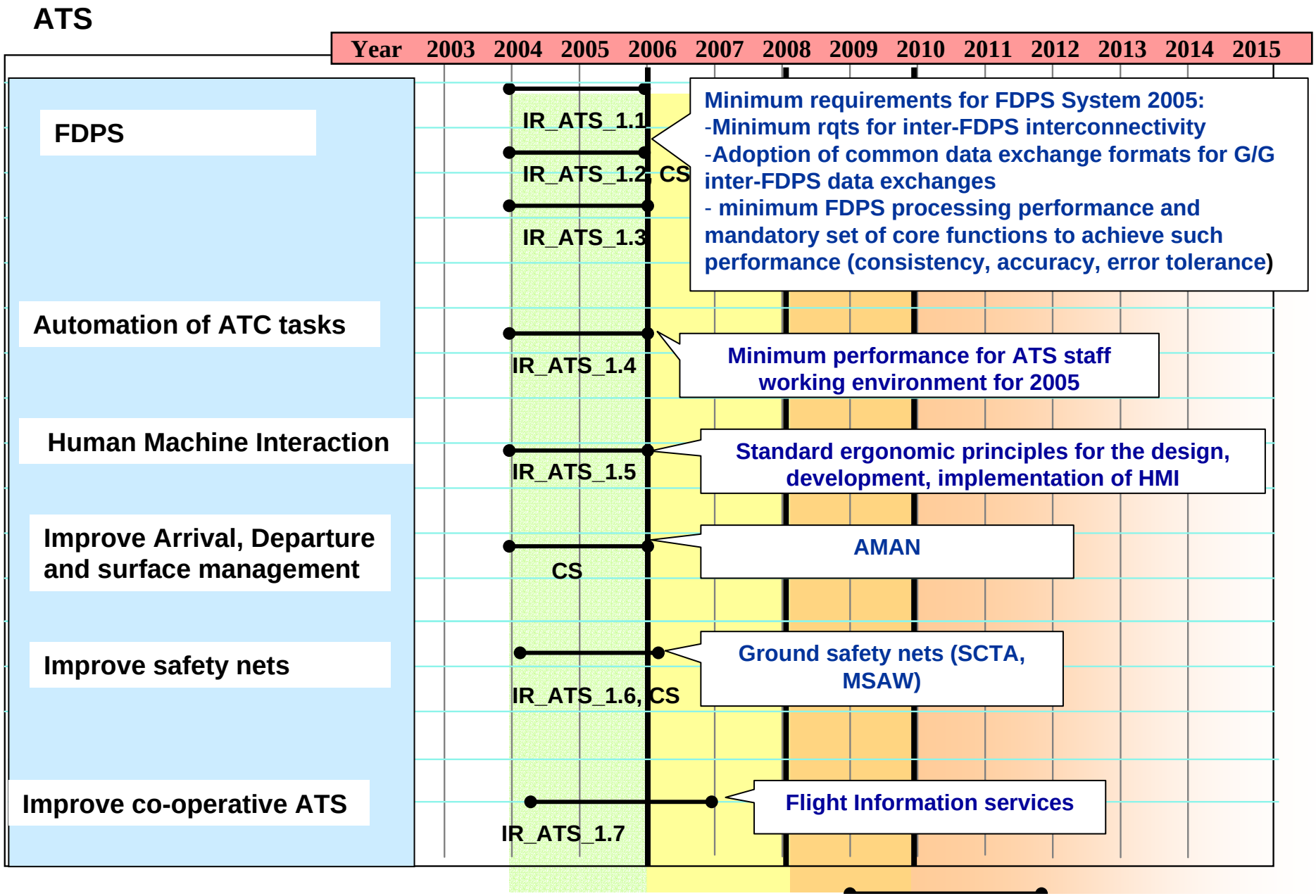
ASM



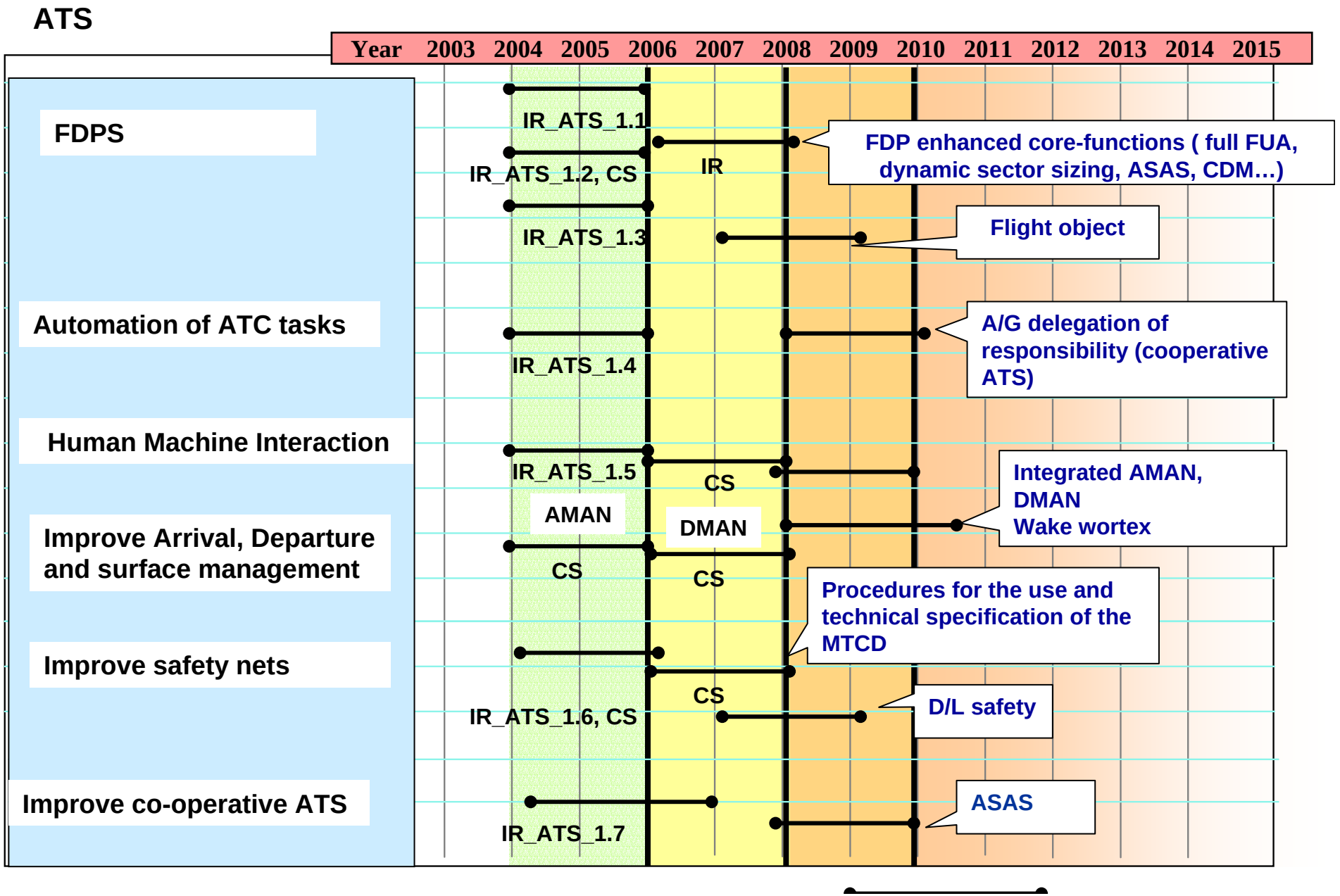
Roadmap (8)


ATFM
Year 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
Data exchanges
IR_ATFM_1.1
IR_ATFM_1.2
CS
Seamless Operation within the current ATFM structure:
- Responsibilities of the stakeholders (data access and diffusion)
- adoption of common data exchange formats
- technical details of the data exchange standard (ADEXP)
CS
Flight object
Capacity Optimisation
Good practices specifying the roles of each service to launch industrial developments and encourage first implementations
IR
DOP (daily operationa plan) data format
CS
IR
Delivery of the mandatory material
CDM implementation
Minimum technical requirements for airport CDM
CS
IR
Generalised CDM

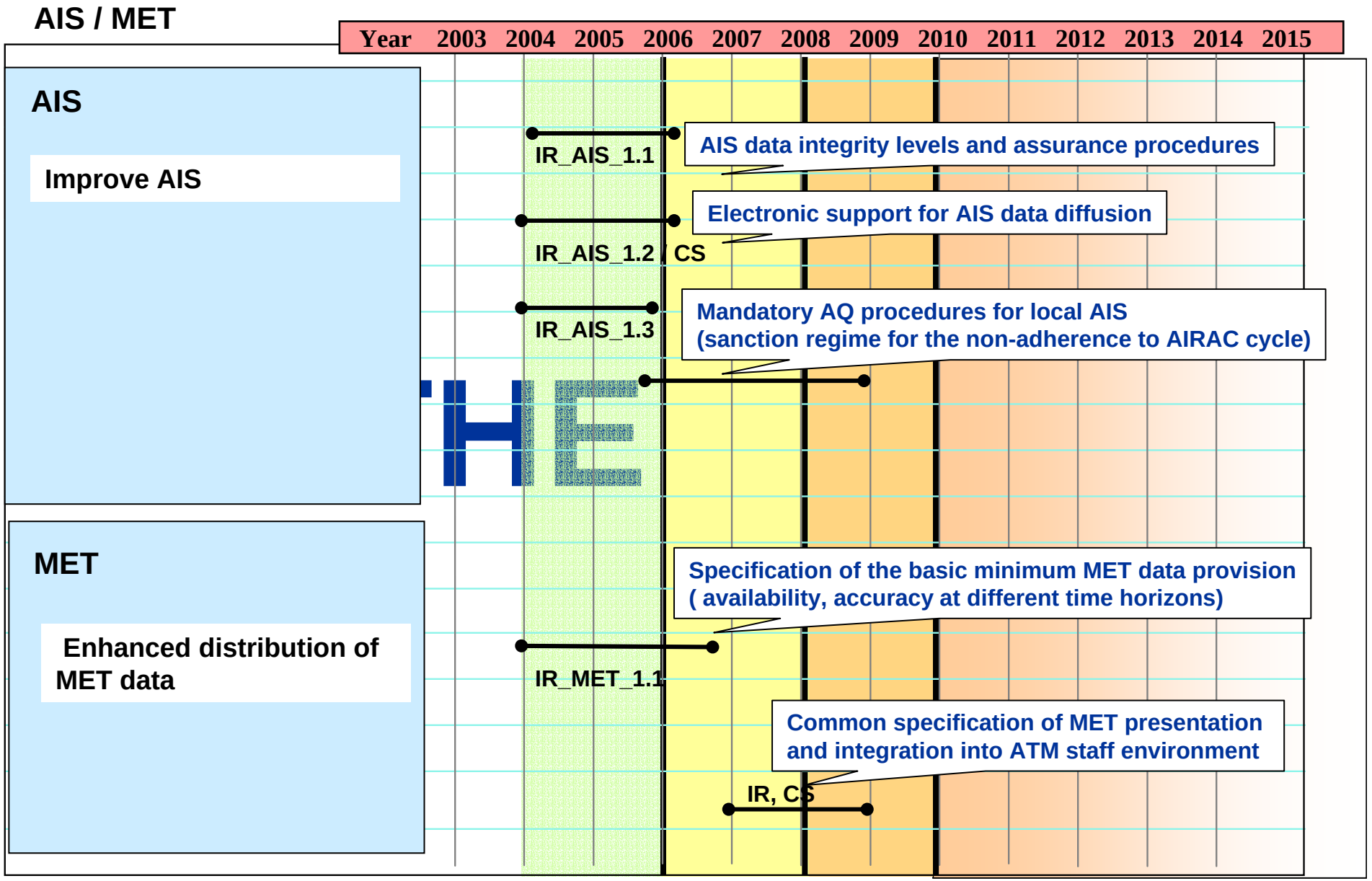
Roadmap (9)


ATS
Year 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
FDPS
IR_ATS_1.1
IR_ATS_1.2, CS
IR_ATS_1.3
Minimum requirements for FDPS System 2005:
-Minimum rqts for inter-FDPS interconnectivity
-Adoption of common data exchange formats for G/G inter-FDPS data exchanges
- minimum FDPS processing performance and mandatory set of core functions to achieve such performance (consistency, accuracy, error tolerance)
Automation of ATC tasks
IR_ATS_1.4
Minimum performance for ATS staff working environment for 2005
Human Machine Interaction
IR_ATS_1.5
Standard ergonomic principles for the design, development, implementation of HMI
Improve Arrival, Departure and surface management
CS
AMAN
Improve safety nets
IR_ATS_1.6, CS
Ground safety nets (SCTA, MSAW)
Improve co-operative ATS
IR_ATS_1.7
Flight Information services

Roadmap (10)


ATS
Year 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
FDPS
Automation of ATC tasks
Human Machine Interaction
Improve Arrival, Departure and surface management
Improve safety nets
Improve co-operative ATS
IR_ATS_1.1
IR_ATS_1.2, CS
IR
IR_ATS_1.3
IR_ATS_1.4
IR_ATS_1.5
CS
AMAN
DMAN
CS
CS
CS
IR_ATS_1.6, CS
IR_ATS_1.7
FDP enhanced core-functions (full FUA, dynamic sector sizing, ASAS, CDM…)
Flight object
A/G delegation of responsibility (cooperative ATS)
Integrated AMAN, DMAN
Wake wortex
Procedures for the use and technical specification of the MTCD
D/L safety
ASAS

Roadmap (11)


AIS / MET
Year 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
AIS
Improve AIS
IR_AIS_1.1
AIS data integrity levels and assurance procedures
IR_AIS_1.2 / CS
Electronic support for AIS data diffusion
IR_AIS_1.3
Mandatory AQ procedures for local AIS
(sanction regime for the non-adherence to AIRAC cycle)
MET
Enhanced distribution of MET data
Specification of the basic minimum MET data provision
(availability, accuracy at different time horizons)
IR_MET_1.1
Common specification of MET presentation and integration into ATM staff environment
IR, CS