The Need for a Safety Roadmap

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Outline

• Challenges in ATM from now – 2020
• Safety assessment ‘architecture’
• Vision of what a Safety Roadmap could provide
Today’s Challenges

EC Commissioner Jacques Barrot expressed the **SESAR 2020 Performance Targets** as follows:

- **Capacity**: times 3
- **Safety Level**: times 10
- **ATM Unit Costs**: divided by 2
- **Environmental impact**: minus 10%
Today’s Performance

- **SESAR D1:**
  - €117 Bn business with problems -
    - Capacity at Airports
    - Fragmentation and productivity costs
    - Low level of interoperability
    - Lack of predictability in the system

- **Today’s Performance (PRR2005):**
  - Safety reporting = poor
  - Traffic increase = 4% (up to 18% in regions)
  - ATFM attributed delay = €1 Bn
  - Flight inefficiencies = €1.4 Bn
  - Service provision costs = €7 Bn
Tomorrow’s Expectations

• SESAR D1:
  – Performance based system
  – Network Plan
  – Single functional architectural design
  – Treat Air and Ground System as one
  – Increased automation
Episode III

"A collaborative and co-ordinated layered planning framework for ATM operations in a gateway of Collaborative Decision Making and System Wide Information Management"

Paradigm Change
Solution Context

• Exploit available work
  – ICAO, EUROCONTROL
  – ACARE
  – National and Industry
  – Concept Elements ….

• SESAR – push the Paradigm
  – Airspace User Requirements
  – Key Performance Areas
  – Prioritized Concept Elements

• Achievable by 2020
• Global interoperability
Concept Elements being considered - ongoing

- **Collaboratively Planned System**
  - All stakeholders (AUO, Airports, Military ...) Layered planning processes
  - Demand & Capacity Balancing
  - Network Operations Plan

- **Airspace Organisation & Management**
  - User preferred routings (flexible/free) with RNP, RNAV, CDA/CCD
  - Flexible & dynamic airspace management with FUA

- **Traffic Synchronisation**
  - Trajectory Management (4D) from gate to gate
  - Data-link communications
  - Airborne Separation Assistance System applications
  - Airport operations & integrated arrival/departure processes

- **Conflict Management**
  - Trajectory based
  - Airborne Separation Assistance System applications

- **Information & Management Services**
  - Supported by System Wide Information Management
The safety challenge – reducing accident rate

(1) Projections based on current accident rates
(2) Projections based on industry estimates
(3) Projections based on current accident rates
Questions for System Developers

• Will each individual element be safe?
• Will the whole system be acceptably safe?
• By what year do we need certain elements in place to maintain safety?
• Is the implementation sequence sensitive?
• How will we actually monitor safety, as we implement new elements?
• What if we don’t get as much safety as we predicted (need)?

The answers are required to control safety
Need for both Top-Down / Bottom-up Processes

Top-Down

FHA

PSSA

Risk Target

Risks assessed for individual Concept Components are rolled up and compared with Overall Risk Target

Rolled-up Concept Risk

ASAS, ATC, CDM, etc.
Foundation: The Barrier Model

ATM System Boundary

Demand - traffic volume / pattern

Potential Conflicts

Overload Protection

Strategic Conflict Management

Airspace Design

Flow & Capacity Management

Procedural De-confliction

Conflict Avoidance

ATC Tactical De-confliction

Separation Provision

Separation

Conflict Avoidance

Separation Infringement

ATC Recovery

Collision Avoidance

Pilot Recovery

Providence

Recovery
Types of Insights from a Roadmap

- Will need significant safety improvement by 201X
  - E.g. by 2012 will need MSAW, APM, APW... to maintain safety
- Key inter-dependencies must be addressed
  - E.g. STCA & TCAS; MSAW & EGPWS?
- Risk decrement should be Y% by 201Z
  - E.g. 100% by 2015 - using what safety indicators?
- Safety improvement partnerships important
  - Conflict reduction tool = 30%
  - Datalink = 8%
  - Conflict reduction tool AND datalink = 70%
- Implementation sequence important
  - E.g. ASAS not before ADD
Safety Roadmap Concept
True Risk Management System: expected safety impacts are realised, exceeded, or fall short
Thank You
**State's implementation evidence**

**HL Argument**

**Arg 0**
Medium-Term Concept will be acceptably safe

**St 001**
Medium-Term Conops is acceptably safe in principle
- Preliminary Safety Case to show that the Medium-Term Concept will be acceptably safe in principle – i.e. subject to complete and correct implementation of all Safety Requirements derived for it
- State ANSPs’ safety cases / Operator approvals to show that the Medium-Term concept will be acceptably safe in implementation

**Arg 1**
Medium-Term Conops SSA + Safety Case

**Arg 2**
Migration to modified ATM service will be acceptably safe

**Arg 3**
The Medium-Term Conops Safety Requirements have been implemented completely and correctly

**Arg 4**
On-going operations of the Medium-Term Concept will be shown to be acceptably safe

**C001**
For the entire ATM service:
- Strategic conflict management (AO&M)
- ATFCM
- Traffic synchronization
- Tactical conflict management
- Collision avoidance
- Information services

**C002**
For all ATM systems including ground- and air-based CNS and ATC-related equipment on the aircraft

**C003**
For all equipment-, procedural- and human-related issues

**C004**
Covers for incremental deployment

**Cr 001**
Acceptably safe defined (from Medium-Term Conops High Level Safety Objectives) as risks from accidents and serious or risk-bearing incidents shall:
1. Meet TLS
2. Be no greater than for current ATM systems
3. Be reduced as far as reasonably practicable

**Cr 002**
[Acceptably safe] in principle means subject to the complete and correct implementation of the Medium-Term Conops Safety Requirements

**Responsibility of EC 6th FWP EP3 + EEC MTV**

**Responsibility of operational organisations, such as ANSPs, regulators etc**
The Medium-Term Conops Safety Requirements have been implemented completely and correctly. Arg 3

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Arg 4
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Top-down: IRP – Model overview

Risks (frequencies of accidents)

Accident categories

Causal factors (technical failures, human errors)

Influences (safety management, operating environment)
1. ATM changes due to SESAR Conops implementation are represented in risk model.

2. Risk model predicts whether overall safety target will be met.

3. If target is not met, implementation assumptions must be changed.

4. Once target is met, modelled performance becomes components safety criteria.

5. If criteria cannot be met (or is exceeded), implementation assumptions must be changed.