ICAO's view of EA Supporting a Global Air Navigation System

Jim Nagle

Chief, Communications, Navigation, Surveillance / Aeronautical Information Resource Services Section

Air Navigation Bureau, ICAO

Presentation Outline

- Enterprise Architecture Intro
- ICAO Reference Terminology
- ICAO Enterprise Architecture framework
- Strategies
- The Artifacts of the ICAO EA

Enterprise Architecture

- Enterprise Architecture: **lays out the "form" of the enterprise**
  - ✓ Form must align with the business strategy
- Architecture**: The fundamental organization of a system embodied in its components, their relationships to each other and to the environment and the principles guiding its design and evolution (**IEEE 1471 – 2000**)**
- Output of EA: **includes artifacts that**
  - ✓ Describe the enterprise from various viewpoints
  - ✓ Constrain degrees of freedom so IT implementations align (and stay consistent) with strategic intent of the "management"

ICAO Reference Terminology

- **Architecture:** An integration of “enablers” needed to implement an operational concept
- **Enablers:** An “enabler” of the operational concept, or of an element of the operational concept, is “something” which contributes to making it feasible and supports performance requirements
- **Enablers may be:**
  - ✓ Something technical (availability of technology, an algorithm, etc.)
  - ✓ Something operational (e.g., operational procedures drawn up in accordance with the ICAO and other regulatory bodies regulations, training of operational staff)
  - ✓ Or something socio-economic (e.g., decision to invest, because benefits can be expected

Types of Enablers

- **Technical Enablers** of an element of the operational concept are technologies meeting both following conditions:
  - ✓ They meet properties required to implement the element
  - ✓ And it is realistic to consider that they can become operational in the element, during the proposed time frame
- **Operational Enablers** procedures supporting the operational concept are global operational procedures, rules of the air, standards, meeting all the following conditions:
  - They are consistent with the element
  - It is realistic to consider that they can be officially approved early enough to be operational in the element, during the proposed timeframe
  - Selection of staff, training to these procedures can be achieved early enough for application during the proposed timeframe
- **Socio-economic Enablers** of an element of the operational concept are *decisions* taken by stakeholders (including airlines), and *agreements between them* to make the operational concept possible, and everything that makes these decisions actually possible

ICAO Enterprise Architecture Framework

- The ICAO Enterprise Architecture framework is based on four key elements ;
  - ✓ A Common Vision – Measurable progress towards achievement of the Air Navigation System Operational Concept.
  - ✓ Agreed Strategies – The Global Air Navigation Plan and the Global Aviation Safety Plan.
  - ✓ Tactics – Facilitate the use of existing infrastructure, technology and best practices with Global Performance and Safety Initiatives.
  - ✓ Action – Global and Regional performance objectives as ICAO work programme deliverables.

ICAO Enterprise Architecture Framework (contd.)

- The ICAO Enterprise Architecture framework is supported by feedback via:
  - ✓ High-Level Indicators – Defined in the Business Plan and measured through industry statistics.
  - ✓ FASID* – Providing a global overview of installed facilities and services.

(*) – Facilities and Services Implementation Document – a list of installed facilities and services. Volume II of a Regional Air Navigation Plan

ICAO Enterprise Architecture Elements and Artifacts

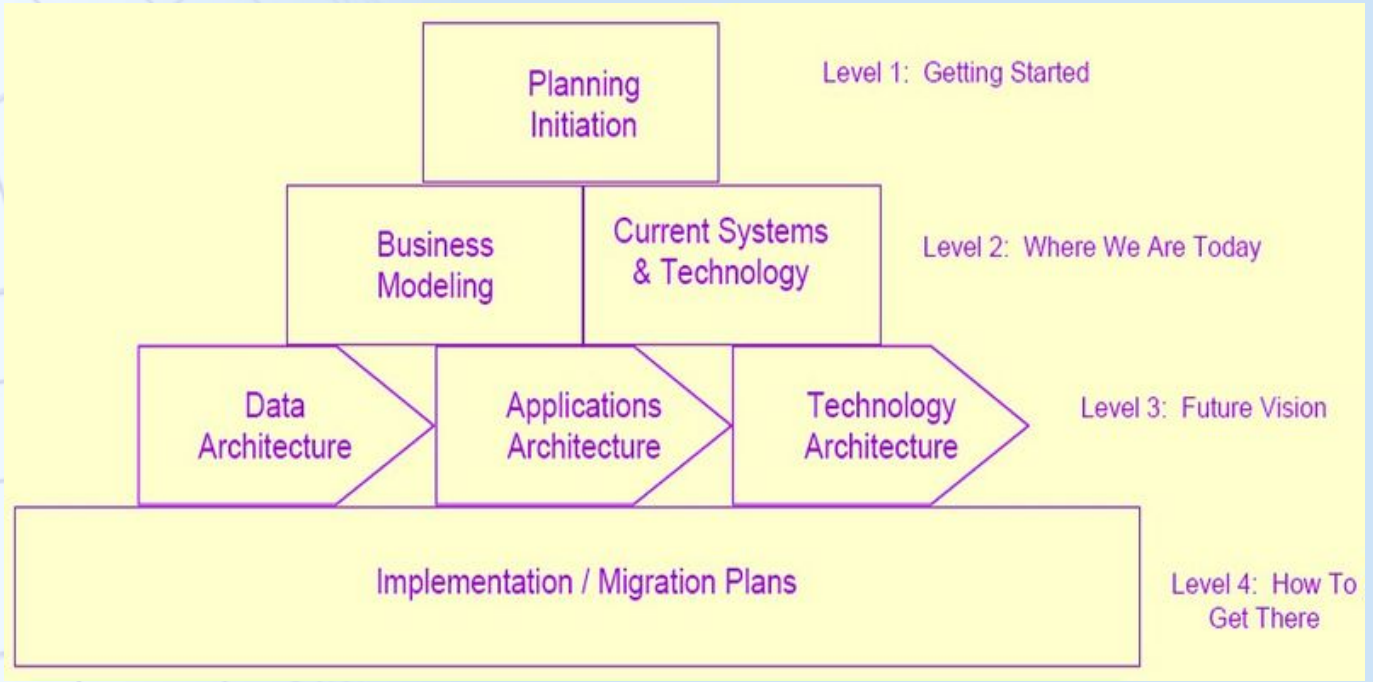
Vision → Strategy → Tactics → Action

All Supported by the

ICAO Business Plan

Lets Take a step back…

- And consider Enterprise Architecture Planning.



- Now, lets consider the levels from ICAO's perspective.
  - ✓ Level 1 – the presentation so far.

Level 2: Where we are today

- Where we are today and ***how we are measured***

ROLE	Described by:	Measured by:
STRATEGIC OBJECTIVES	BUSINESS PLAN	High-Level Indicators (Based on industry statistics)
VISION	ATM OPERATIONAL CONCEPT (DOC 9854)	
STRATEGY	GLOBAL AIR NAVIGATION PLAN (DOC 9750)	
TACTICS	GLOBAL PLAN INITIATIVES (GPI) GLOBAL SAFETY INITIATIVES (GSI)	
ACTION	REGIONAL PLANS	FASID (Facilities and Services Implementation Document)

Level 3: Future Vision

- **Simple** - fill in the blanks and improve what we have.
  - ✓ *International Cooperation and technology are the enablers.*

ROLE	Described by:	Measured by:
STRATEGIC OBJECTIVES	BUSINESS PLAN	High-Level Indicators (Based on industry statistics)
VISION	ATM OPERATIONAL CONCEPT (DOC 9854)	
STRATEGY	GLOBAL AIR NAVIGATION PLAN (DOC 9750)	
TACTICS	GLOBAL PLAN INITIATIVES (GPI) GLOBAL SAFETY INITIATIVES (GSI)	? ?
ACTION	ICAO REGIONAL PLANS	FASID (Facilities and Services Implementation Document)

Level 4: How to Get There?

- Some examples:

Global Plan Initiatives *– we are now mapping these to NextGen and SESAR Operational Improvements.*

- ✓ *Results are in a database.*
  - *A useful tool for gap analysis and to give visibility to issues where interoperability will be a concern, regionally and* ***globally.***
  - *Will be used to drive ICAO's work programme.*
- ✓ *The result? – validation and effectiveness.*

Next *– link this to the NextGen Joint Planning Environment, SESAR e-ATM and other states' web-sites.*

- ✓ *The result? – transparency and improved coordination*

Level 4: How to Get There? (contd.)

- Another example

  FASID* – *today it is maintained manually and is paper-intensive.*

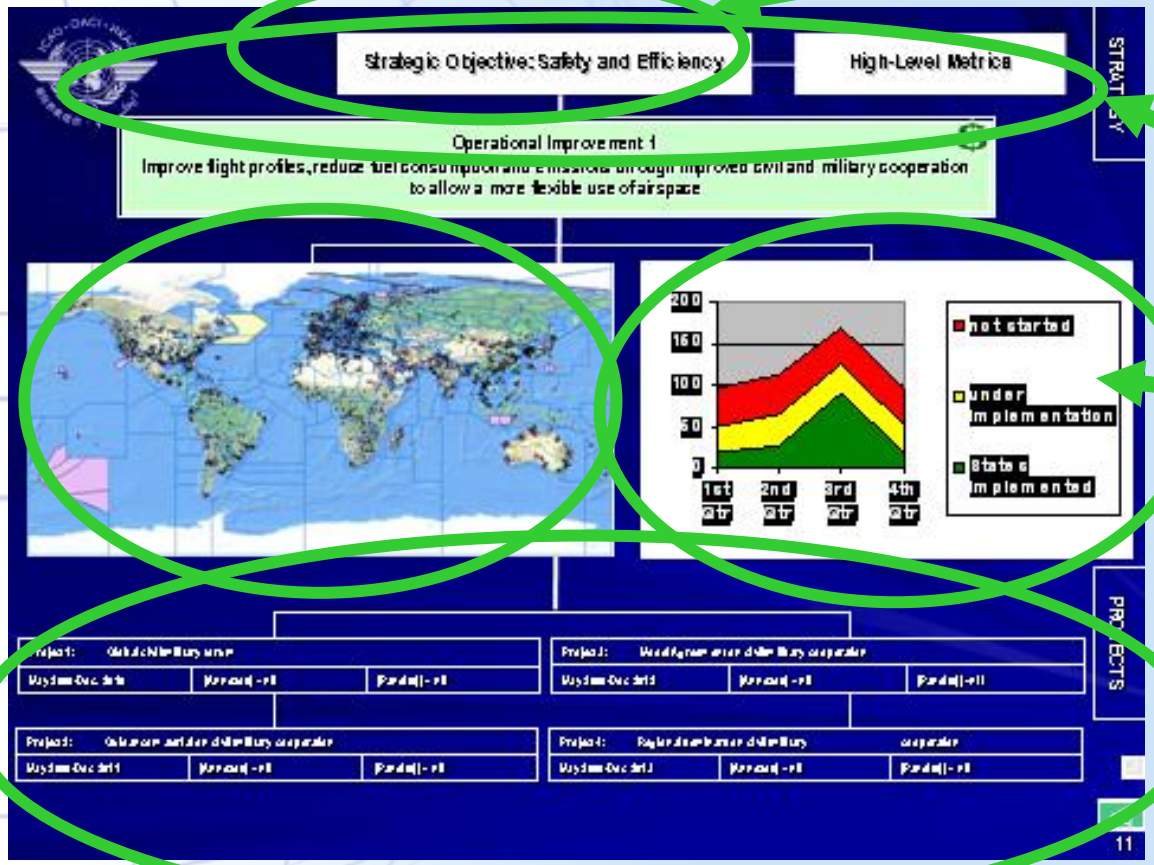
  - ✓ *Alternatives exist.*
    - *e-AIPs where implemented, provide on-line updates on status of facilities and services**.***
    - *Could be used to directly update FASIDs drastically reducing delays*
  - ✓ *The result? – up to date snapshot of ATM facilities and services. Identify shortcoming but also **validate progress**.*

***Next** – extend e-AIPs globally.*

- ✓ *The result? – a global enterprise architecture for ATM*

(*) – Facilities and Services Implementation Document – a list of installed facilities and services.

Simple and Clear Intention



Strategic Objective

Identify Strategic Operational Improvement that expresses 'what is being done' in a way that is easily understood

Metrics for tracking <u>effectiveness</u> of tasks along with a graphical depiction on implementation status to all Regional; Performance efforts

Work Programmes, assigned and traced

The Artifacts of the ICAO EA

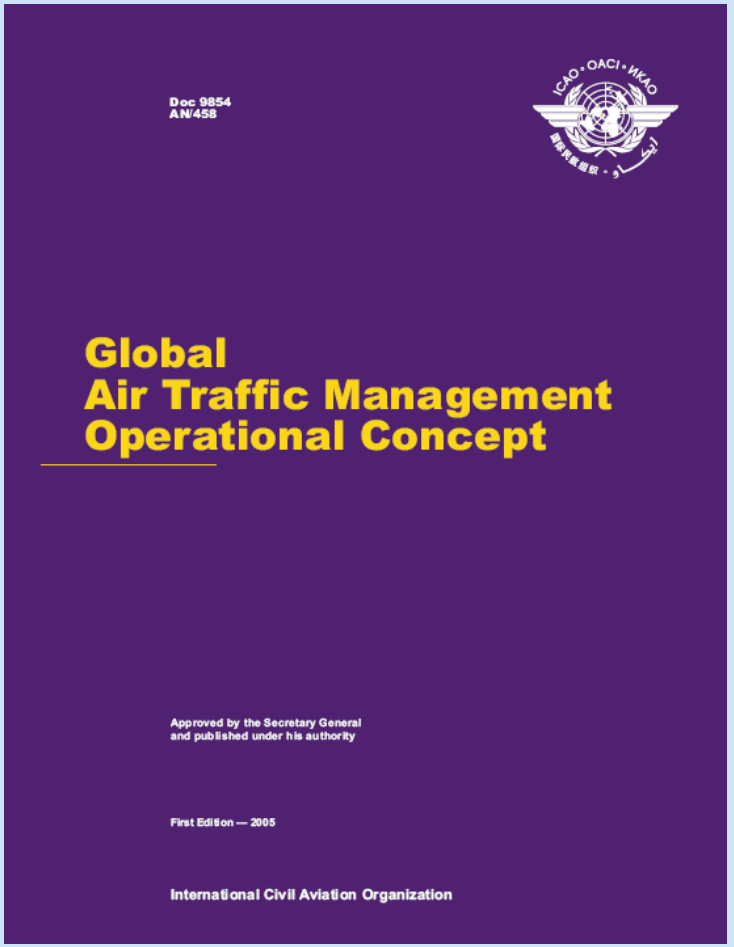
- A seamless, interoperable, worldwide system based on:
  - ✓ Seamless safety across all regions
    - For all users during all phases of flight
  - ✓ Physical connectedness
    - Homogeneous ATM areas and Major Traffic flows
  - ✓ Common requirements, Standards and procedures
    - Integration (TMAs, aerodromes)
    - Performance based equipment carriage requirements
  - ✓ Common aeronautical information exchange models
  - ✓ Meets environmental objectives
  - ✓ Meets national security requirements

Thank you

Background

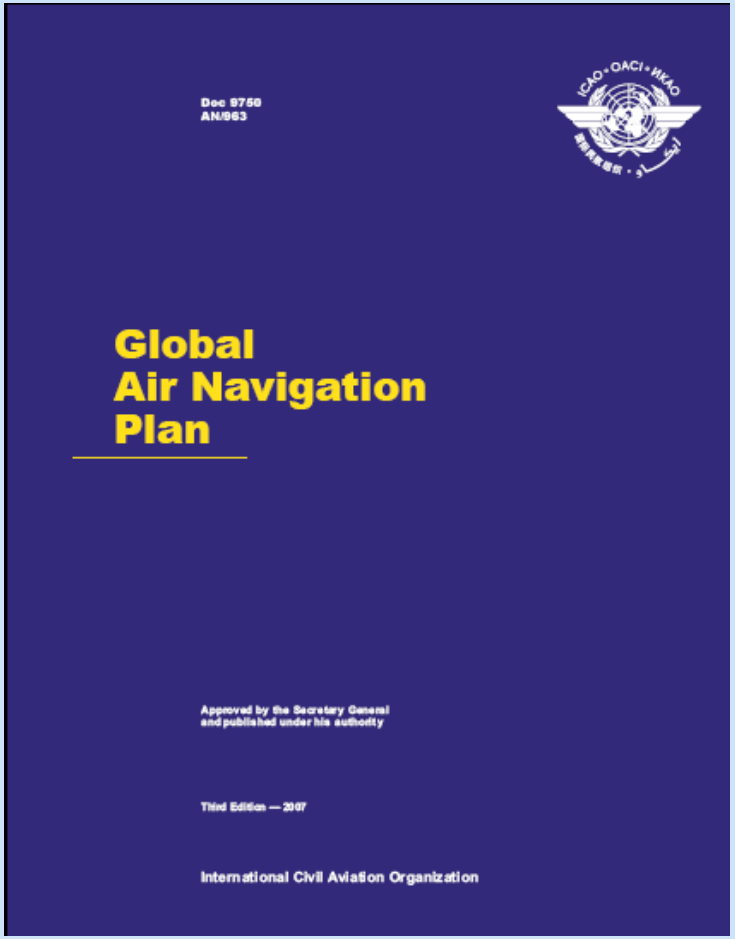
Global Air Navigation System - Vision

- **The Global Air Traffic Management System Operational Concept;**
  - ✓ describes how an integrated global air navigation system should operate
  - ✓ describes what is envisaged on the basis of services
  - ✓ describes how the services form an integrated system
  - ✓ utilizes an information rich environment, that solves most problems strategically, through a collaborative process
  - ✓ provides States and industry with clearer objectives for the design and implementation of ATM and supporting CNS systems
- **ATM user expectations are drivers for change, requiring:**
  - ✓ Safety case
  - ✓ Business case



Global Air Navigation System – Strategy GANP

- **The Global Air Navigation Plan,**
  - ✓ aligned to the operational concept and the Strategic Objectives of ICAO.
  - ✓ developed on the basis of an industry roadmap to facilitate implementation of the Recommendations of the 11th Air Navigation Conference
  - ✓ focuses on efforts leading to near- and medium-term benefits.
  - ✓ provides guidance on air navigation system improvements necessary to support a uniform transition to the air navigation system envisioned in the operational concept.
  - ✓ Long-term initiatives will be added to the Global Plan as the technology matures and the supporting provisions are developed

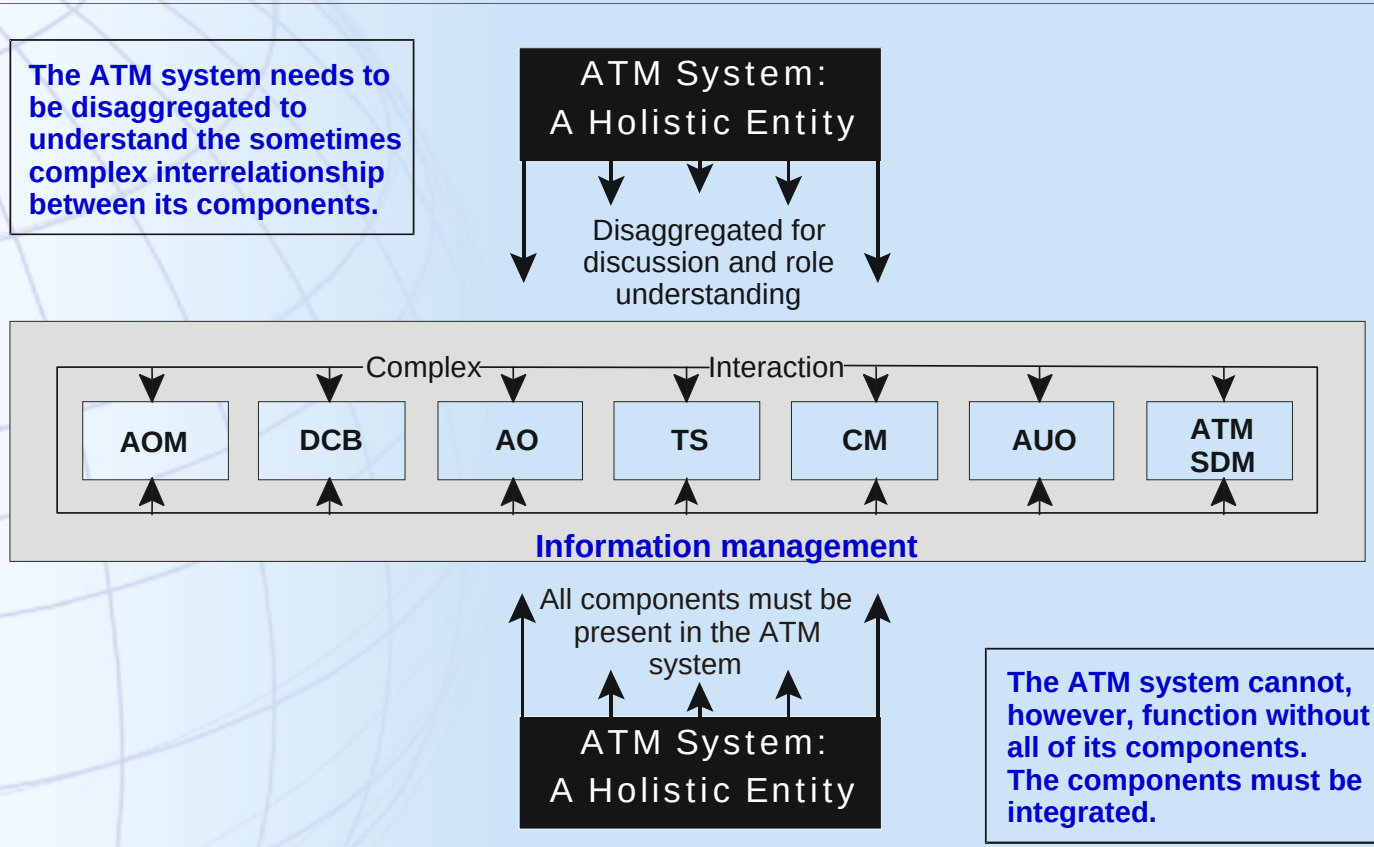


Global Air Navigation System – Strategy GASP

- **The Global Aviation Safety Plan**
  - ✓ the ICAO strategy for States, regions and industry to address the focus areas identified in the Global Aviation Safety Roadmap
  - ✓ establishes a coordination mechanism to ensure that the roadmap and the plan are kept up-to-date in a coordinated way.
  - ✓ developed with the close coordination and participation of industry
  - ✓ provides a common framework to ensure that regional, sub-regional, national and individual initiatives are coordinated to deliver a harmonized, safe and efficient international civil aviation system.

The seven ATM concept components

The ATM system needs to be disaggregated to understand the sometimes complex interrelationship between its components.



The ATM system cannot, however, function without all of its components. The components must be integrated.

AOM — Airspace organization and management
DCB — Demand/capacity balancing
AO — Aerodrome operations
TS — Traffic synchronization
CM — Conflict management
AUO — Airspace user operations
ATM SDM — ATM service delivery management

The ICAO EA is a global Integration of a common vision