

INFORMS

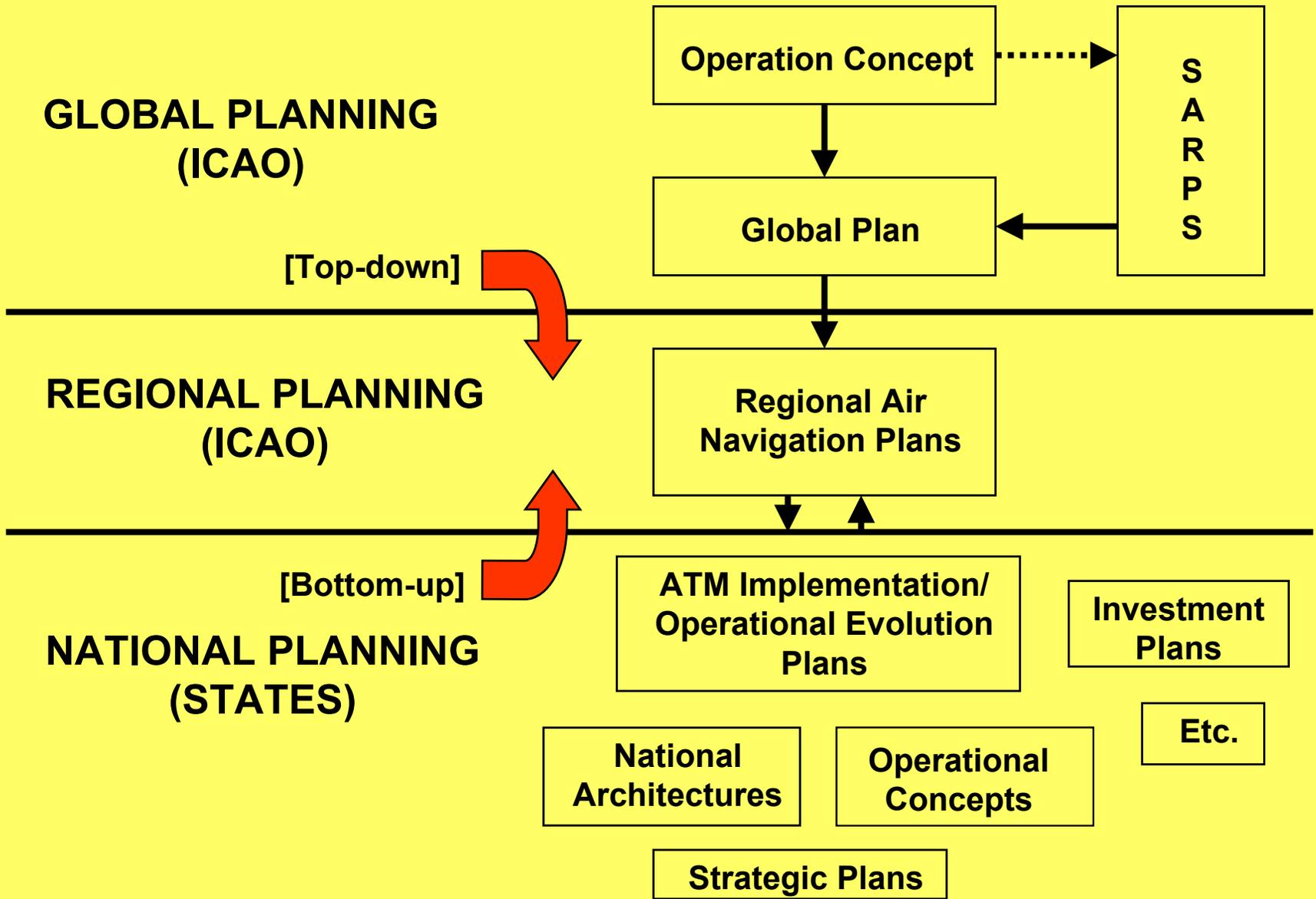
Miami Beach 2001

Charting the Course for Tomorrow's ATC System

MB36.1

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Architecture and Systems Engineering
Federal Aviation Administration
Washington, DC**

PLANNING STRUCTURE



Some Definitions...

NAS – Your National Airspace System

The CNS/ATM systems, airspace, procedures, airports, aircraft, and people that make up air transportation

System – of – Systems

A NAS is made up of a grouping of individual systems and planning/engineering must focus on dependencies and interdependencies

Concept of Use

How the changes in the NAS will operate as services and capabilities to produce benefits

Implementation Steps

The smallest increment of change that produces user benefits against defined metrics

Some Definitions...

Architecture

The highest-level concept of a system in its environment that defines the concept of operations

Architectural Description

A model, document, database or other product that communicates and records a system's structure

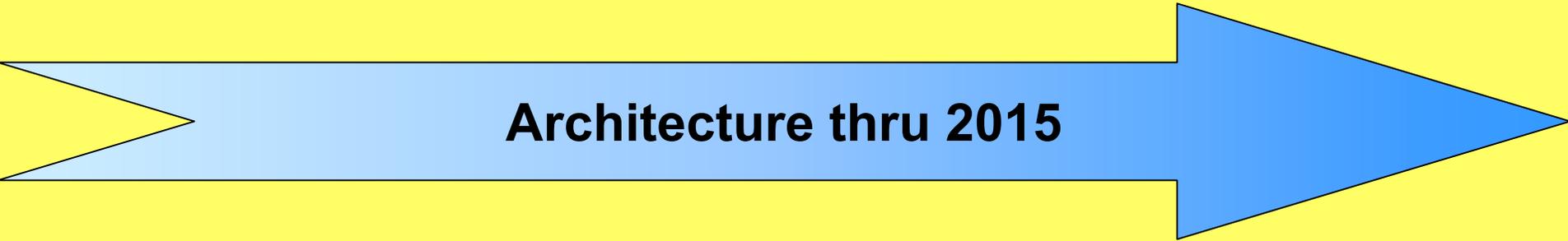
Conveys a set of views, which depict the system through varying perspectives/concerns

Subject to standardization

Purpose of an Architecture

Allows the implementation strategies to be placed under configuration control

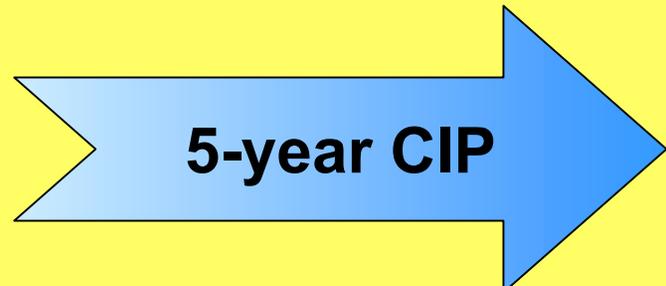
Aids in the clarification of requirements and assess their impact on system design



Architecture thru 2015



Operational Evolution Plan thru 2010



5-year CIP

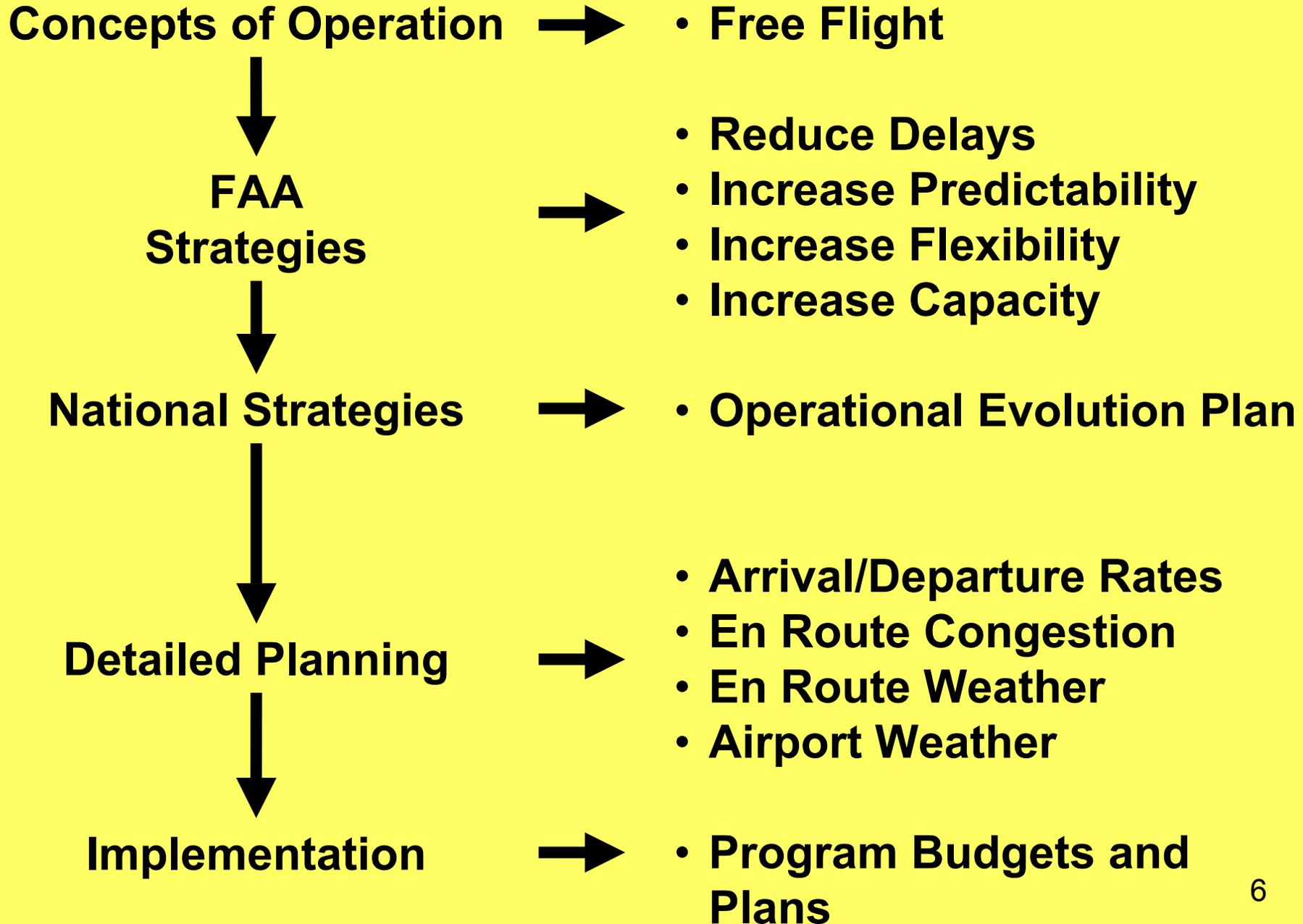


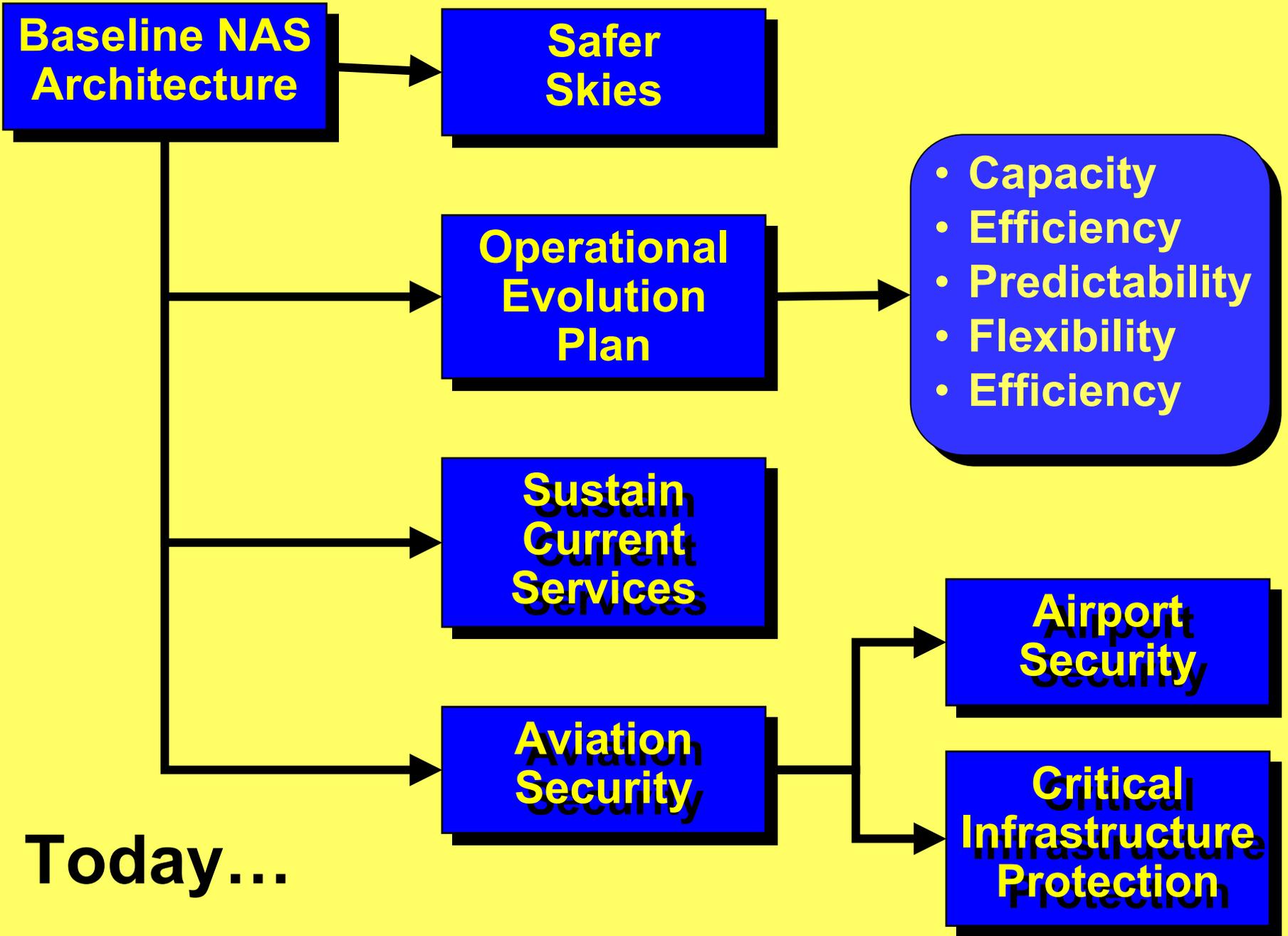
Budget Planning

**Planning Horizons
Must Support Sustainment
of Existing Services While
Adding New Capabilities in
Order to Improve
Safety and Meet Demand**



Example





Today...

Where Is The NAS Today?

- **Air transportation is in an economic recession combined with eroded public confidence in the security of air transportation**
- **Airlines have pulled back between 12 and 20 % of schedule**
 - **Money loosing and less profitable routes dropped**
 - **Older aircraft taken out of service (B 727, B 737, MD 80, L1011, B 747)**
 - **10-12 aircraft going to the bone yard in Arizona in October through January**
- **Load factors down to around 65% for the majors**
- **Mid-day schedule compression - drop early and late flights**
- **Flying at 92 % of pre September 11 demand**
- **Delays caused by volume being replaced by delays caused by security measures**
- **Passenger throughput times increasing at airports**

- **Airlines not in a position to invest in new technology**
- **Airports are modifying new runway construction plans**
 - **Detroit Opens new 4/22 in December**
 - **Minneapolis will slip one full year**
 - **Boston GA runway indefinite**
 - **Charlotte planned for 04 on hold**
 - **Atlanta new parallel scheduled for 05 now looks like 06 or 07**
 - **Miami, Orlando, and Cincinnati on schedule**
- **Recovery Scenarios?**

Optimistic - 10 to 12 months

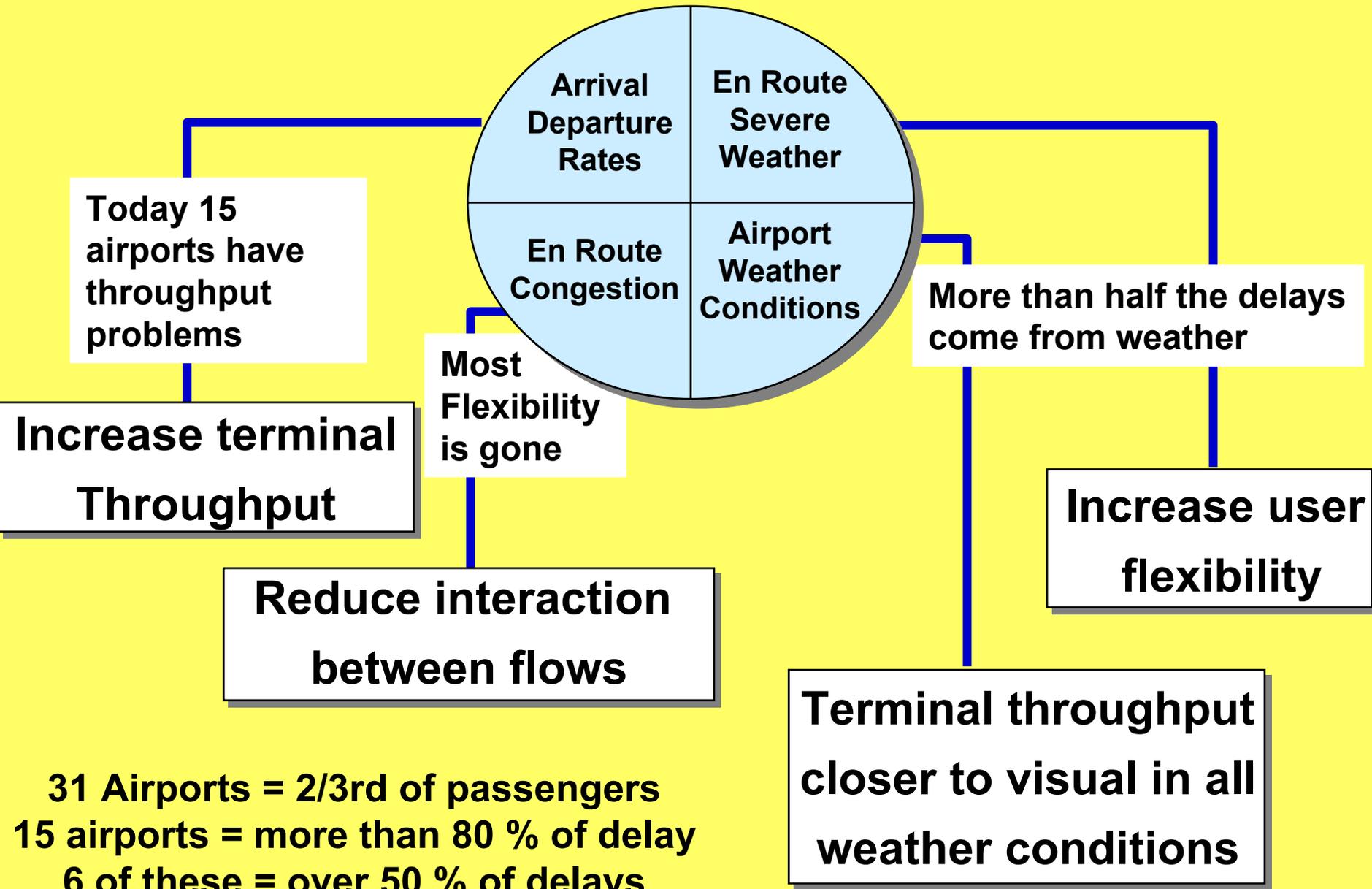
Most Likely - 12 to 18 months

Most Pessimistic - 24 months

Good News?

- **Message from the airlines - do not let up on capacity and efficiency initiatives, need improvements more than ever**
- **Delay airports are still major markets and congestion will return here first**
- **Experiencing en route and terminal delays today**
- **Continue with Satellite Navigation transition**
- **Continue with domestic reduced vertical separation**
- **Add RNAV approaches and departure routes**
- **Modify airspace to gain efficiencies**
- **Fleet Changes Help**
 - UAL will become all glass on Nov 1**
 - US Airways by April 02**
 - “Flex” aircraft increasing in use**
 - RJ’s are modern**

Capacity/Delay Message



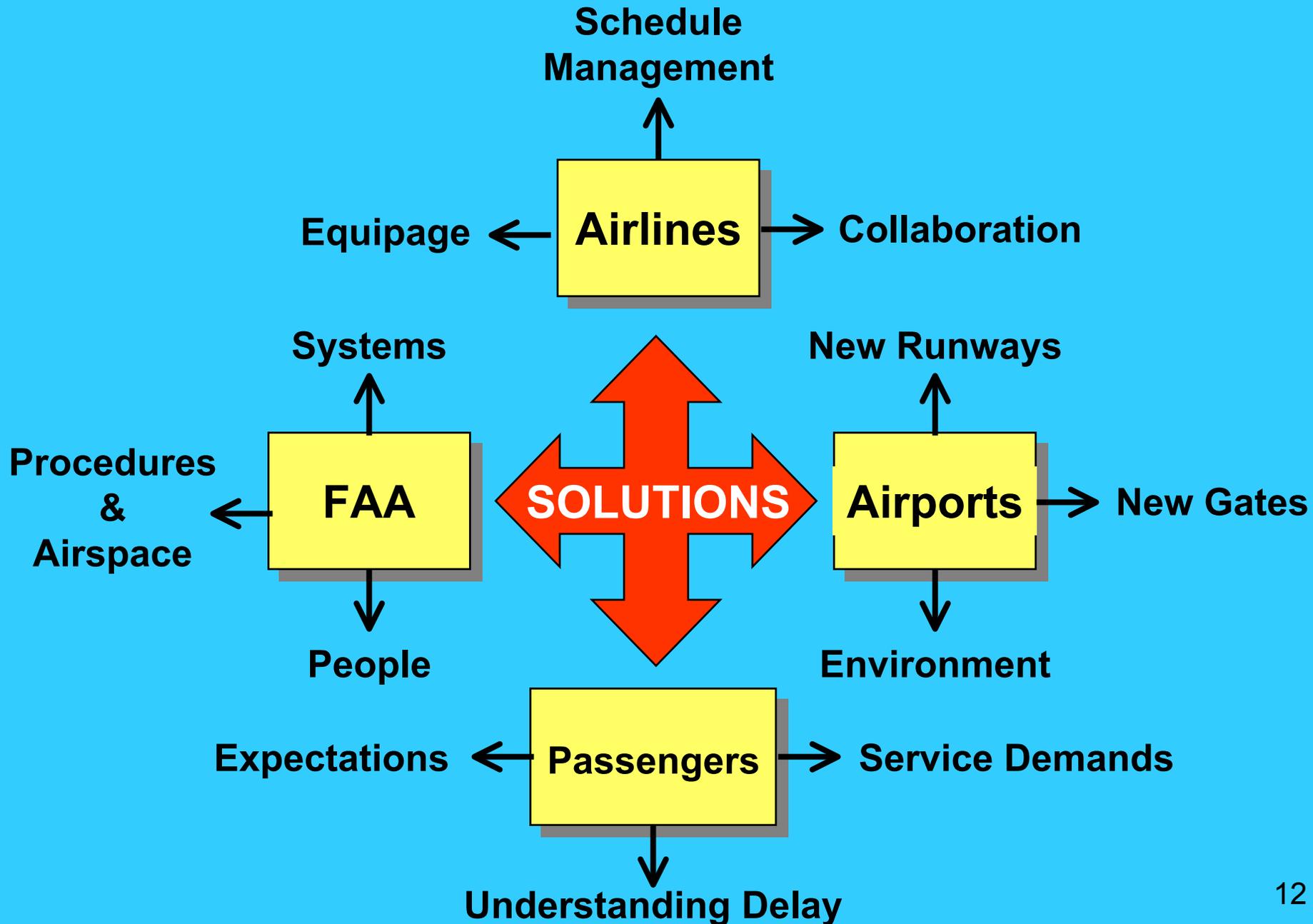
31 Airports = 2/3rd of passengers

15 airports = more than 80 % of delay

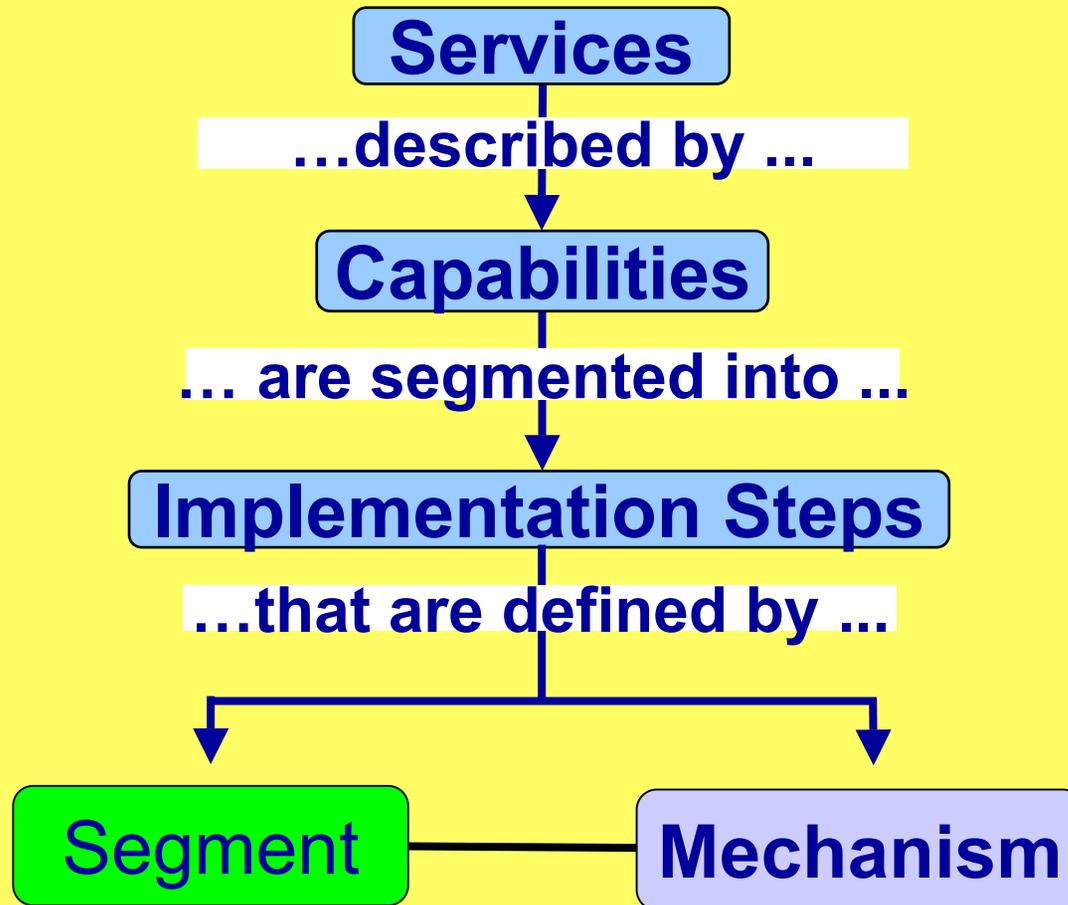
6 of these = over 50 % of delays

LGA - EWR - ORD - SFO - BOS - PHL

Capacity/Delay – The Players



Summary of Approach



...Paired Information for Decision Making...

Operational Evolution Plan

**Policy
Accountability
Schedules, Costs and Resources
Airports and Users Have Roles as Well**

**Operational Changes
(Airspace, Procedures,
People, Certification)**



**NAS
Architecture**

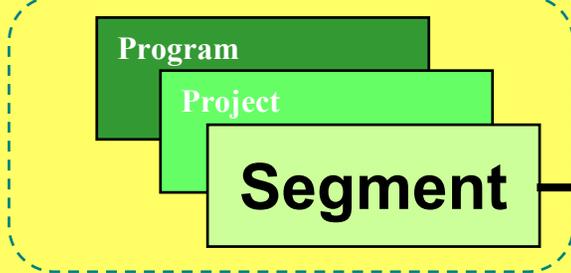
**Users can count on delivery of
services and capabilities with
alignment of resources with
changes being delivered over
the next 10 years**

**Minimum
Commitment
Over 10 Years**

Architecture Database consists of...

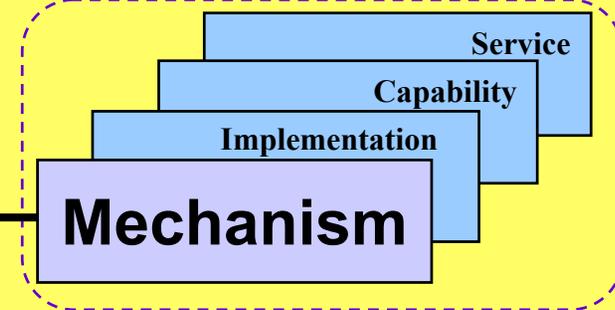
SEGMENT - MECHANISM Pairs

PROGRAMMATIC



- Dollars
 - FAA
 - User
 - DoD
 - NASA
- Schedule

TECHNICAL



- People
- Systems (HW, SW, Facilities)
- Support Activities
 - Airspace Design
 - Adaptation
 - Certification
 - Procedure Development
 - Training
 - Spectrum Engineering
 - Rulemaking

The building blocks of the NAS Architecture Database are **UNIQUE Segment-Mechanism pairs**

Modernization Process

“AVIATION COMMUNITY”

Existing Services

Sustain Service

Future CONOPS

New Capabilities

FAA Plans

Enterprise Improvements

Airport Changes

Airport Improvements

ARCHITECTURE

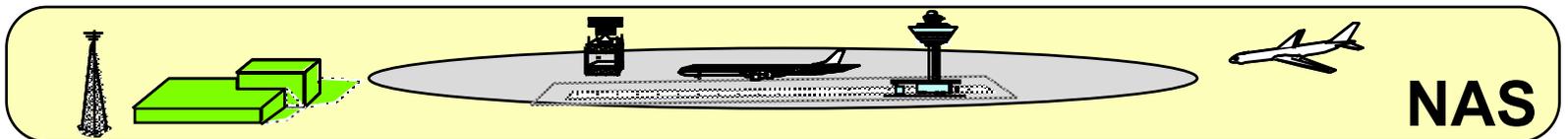
98 99 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15

Budget

Capital Plan

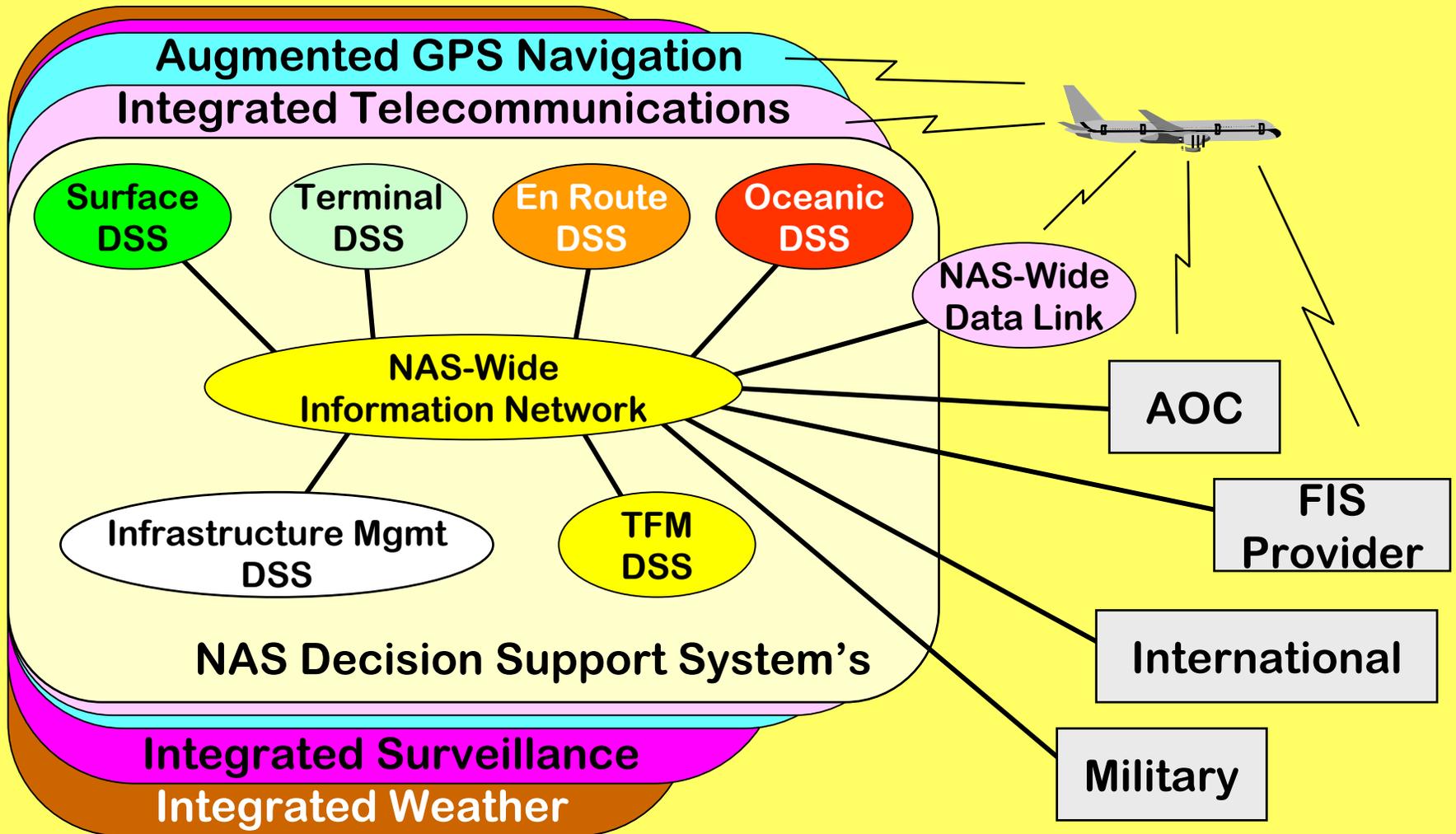
Acquisition Decisions

Buy, Build, Install, Operate

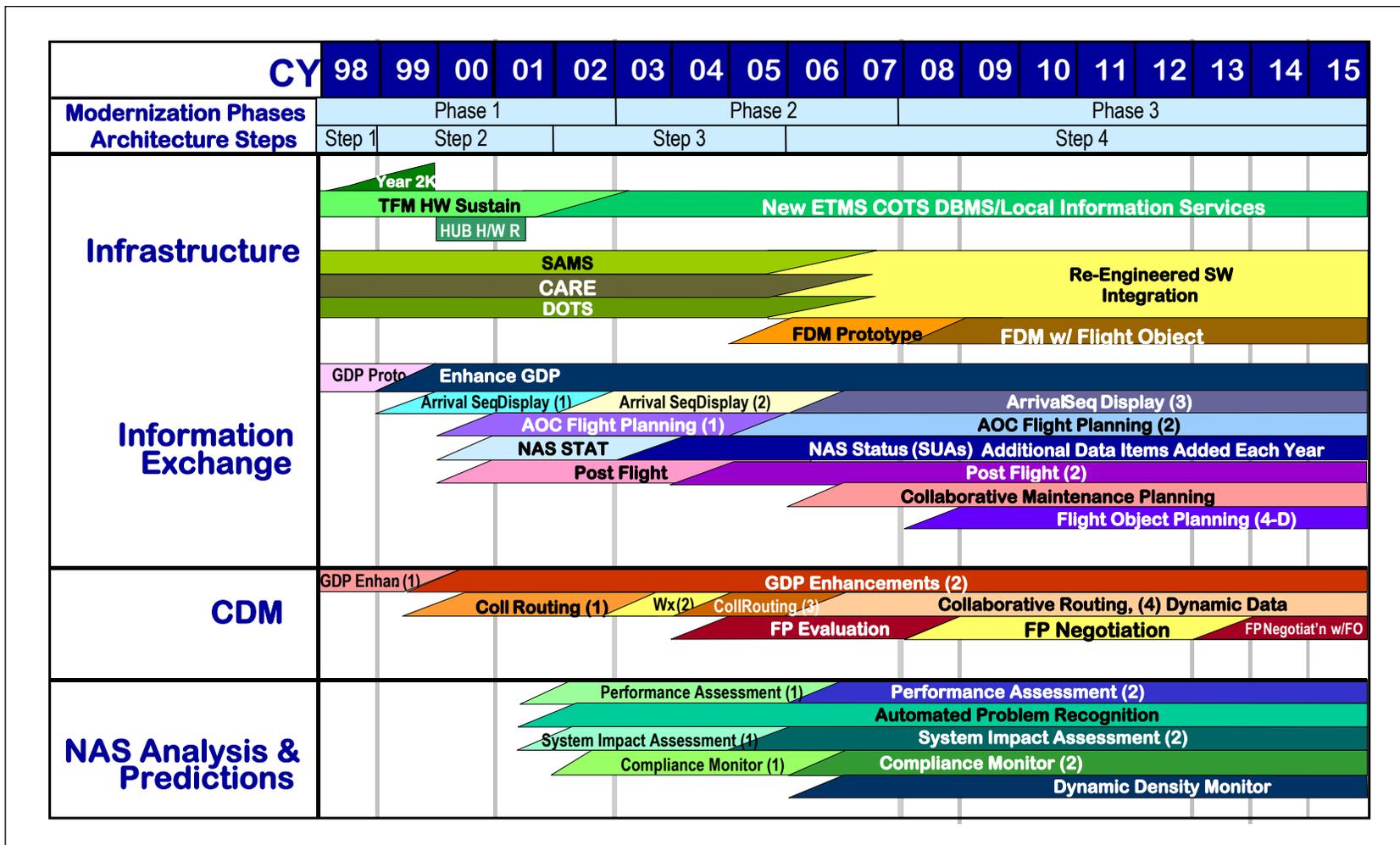


Increasing Capabilities

Systems View of the Future CONOPs



Traffic Flow Management Transition



Legend

AOC - Aeronautical Operational Control
 COTS - Commercial Off-the-Shelf
 DBMS - database Management System
 DOTS - Dynamic Ocean Tracking System
 ETMS - Enhanced Traffic Management System
 FP - Flight Plan

FDM - Flight Data Management
 GDP - Ground Delay Program
 HW - Hardware
 SAMS - Special Use Airspace Management System
 TFM - Traffic Flow Management

Capability and Architecture Tool Suite (CATS)

The NAS Architecture is available at your desk
via CATS

- CATS I supports browser access to NAS Architecture
- Public Internet
 - <http://www.nas-architecture.faa.gov>
- Provides user interface into database

Building Blocks for NAS Architecture Analysis

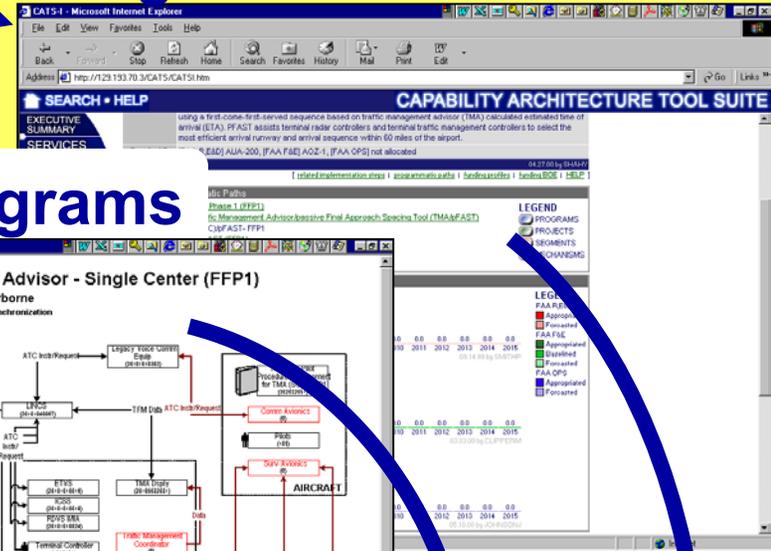
Developed from NAS expertise and technical knowledge

Programmatic Data

Service Diagrams

Service Descriptions

- Interdependencies
- Traceability
- Operational Use
- Requirements



6 Implementation Step Description

Prior to the TMA (Traffic Management Advisor) the Arrival Sequencing Program (ASP) generated metering times and delay values for use by both the TMCs (Traffic Management Coordinators) and sector controllers. Knowledge gained from previous routes gives TMCs a limited ability to predict future traffic conditions. Sites not equipped with the TMA prototype use ASP.

The TMA develops and initiates flow management plans that mitigate the difference between the expected demand and estimated capacity of the facility. Designed as a strategic flow management tool, TMA helps TMCs work the congested traffic by providing a prediction of near-future traffic conditions. A TMA uses historical knowledge of traffic, a spatially oriented display, a plan view display (PVD), and the Arrival Sequencing Program (ASP) tool to manage the flow of traffic.

The initial implementation of Traffic Management Advisor (TMA) (single center), also referred to as single center metering, is a prototype that provides improved traffic flow to selected airports. It provides en route controllers and traffic managers with arrival scheduling tools to synchronize traffic that is controlled by a single Air Route Traffic Control Center (ARTCC). This planning and controller decision support tool improves the efficiency of sequencing aircraft into arrival gateways and fixes. This implementation provides synchronization capability into airports served predominately or solely by a single ARTCC, and is planned for limited deployment the year 2000 as part of Free Flight Phase 1 (FFP1). Initial deployment of TMA is planned at eight locations: (1) Fort Worth ARTCC, (2) Los Angeles ARTCC, (3) Atlanta ARTCC, (4) Minneapolis ARTCC, (5) Oakland ARTCC, (6) Miami ARTCC, (7) Denver ARTCC, and (8) Chicago ARTCC. This implementation strategy allows rapid deployment of critical capabilities necessary for FFP1 and will provide early benefits to NAS users. These benefits consist of early runway assignments to maximize airport capacity, significant fuel savings, and reduced passenger delays.

The TMA implementation for a single ARTCC is based on the Center-TRACON Automation System (CTAS) prototypes now in operation at Fort Worth ARTCC. Algorithms, displays, and interfaces developed

Implementation Step Descriptions

Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit

Address http://129.193.70.3/CATS/CATSI.htm

SEARCH • HELP

EXECUTIVE SUMMARY
SERVICES
INFORMATION
PROGRAMS
MECHANISMS
LOCATIONS
ORGANIZATIONS
MODERNIZATION
NAS DOMAINS
ARCHITECTURE
PERFORMANCE MEASUREMENT
SCHEDULES & REPORTS
TUTORIALS & REFERENCE
COMMENT STATUS

CATS Project Description
Government/Industry Operational Concept for the Evolution of Free Flight
FFP1 Performance Metrics: An Operational Impact Evaluation Plan
Version 1.0
FFP1 Program Overview, Metrics Plan, Version 1.0

6 Implementation Step Description

Prior to the TMA (Traffic Management Advisor) the Arrival Sequencing Program (ASP) tool to manage the initial implementation of Traffic Management Advisor (TMA) center metering, is a prototype that provides improved traffic flow controllers and traffic managers with arrival scheduling tools to single Air Route Traffic Control Center (ARTCC). This planning improves the efficiency of sequencing aircraft into arrival gateway synchronization capability into airports served predominately for limited deployment the year 2000 as part of Free Flight Phase planned at eight locations: (1) Fort Worth ARTCC, (2) Los Angeles Minneapolis ARTCC, (5) Oakland ARTCC, (6) Miami ARTCC. This implementation strategy allows rapid deployment of critical provide early benefits to NAS users. These benefits consist of airport capacity, significant fuel savings, and reduced passenger

The TMA implementation for a single ARTCC is based on the (CATS) prototypes now in operation at Fort Worth ARTCC. Also the TMA implementation for a single ARTCC is based on the (CATS) prototypes now in operation at Fort Worth ARTCC.

Done

Outline

1. Service Group Name
2. Service Name
3. Capability Name
4. Implementation Step
5. Reference Sources
6. Step Description
7. Scenarios
8. People
9. Systems
10. Support Activities
11. Interfaces

 Airway Facilities Technician

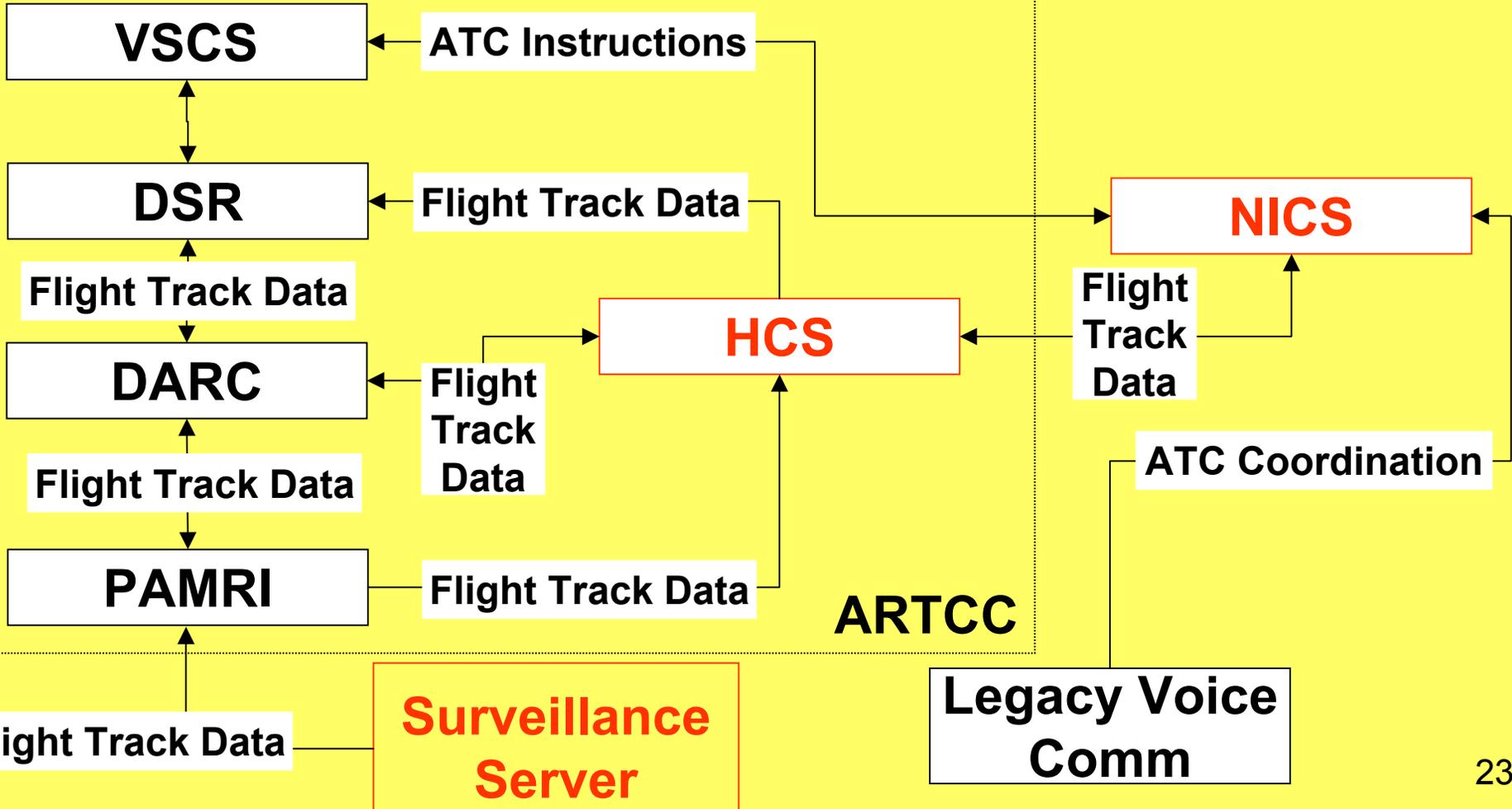
 En Route Controller



AF Training



AT Training



Summary

- **Service-based architecture helps define the future**
- **NAS Architecture is represented in the integrated database**
- **The Operational Evolution Plan represents the commitment and is available at www.faa.gov**
- **The web-based version of the NAS architecture is available at www.nas-architecture.faa.gov/cats**
- **Implementation of the CONOPS is in small steps that produce user benefits**
- **Long-term capital budget planning and policies make the commitments real**

Corporate decisions require corporate data