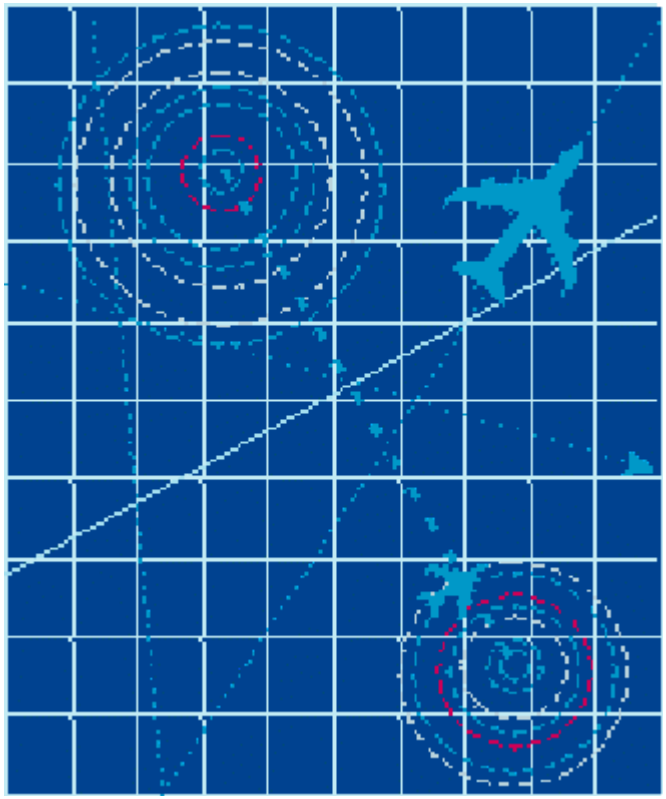


NAS Architecture Support of Small Aircraft Transportation System Concept

June 22, 1999

Jeff Breunig

Briefing Overview

- Objective
- Background
  - National Airspace System
- Needed Capabilities
  - Air Traffic Management
  - Communications
  - Navigation
  - Surveillance
  - Flight Information Service
  - Airports / Approaches
- Next Steps

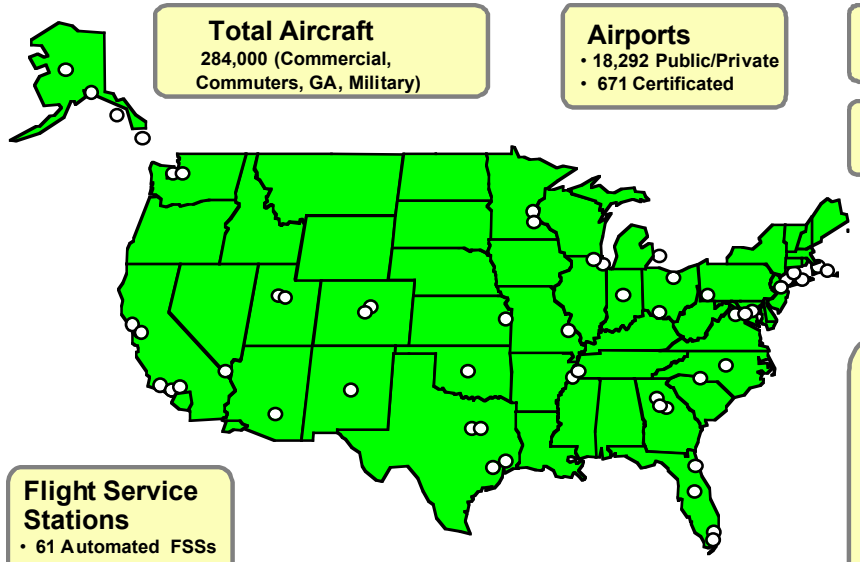
Objective

Informational Brief

The National Airspace System Architecture in relation to the Small Aircraft Transportation System Requirements.

The National Airspace System

The NAS is a complex collection of systems, procedures, facilities, aircraft, and people. These components work together as one system to ensure safe and efficient operations.



Towers
- 264 Level I and II
- 155 Level III, IV, and V

Total Aircraft
284,000 (Commercial, Commuters, GA, Military)

Airports
- 18,292 Public/Private
- 671 Certificated

Passengers per Year
- 546.2 Million

Military Ops per Year
- 990,000 IFR Operations

Radio Sites
- 25,000 VHF Radios
- 15,000 UHF Radios
- 1,285 RTR
- 701 RCAG

Commercial Aircraft Ops per Year
- 25,000,000

Other TMU Sites and Data Feeds
Alaska, Honolulu, San Juan, Canada (8), Great Britain, Scotland, Contractor Analysis (13), Airlines (24), and DOD (3)

Weather Sites
- 61 AFSS
- 23 WARP
- 46 TDWR
- 594 ASOS
- 198 AWOS
- 25 ADAS
- 2 WMSCR
- 235 DASI
- 20 FSDPS

Flight Service Stations
- 61 Automated FSSs
- 14 Alaskan FSSs

Terminals
- 171 TRACONs
- 3 Offshore Sites

TFM Sites*
- ATCSCC – Herndon
- TFM Hub – Boston
- TMUs at:
  - 21 ARTCC
  - 28 TRACON
  - 9 Regional Offices

* Denoted Oy

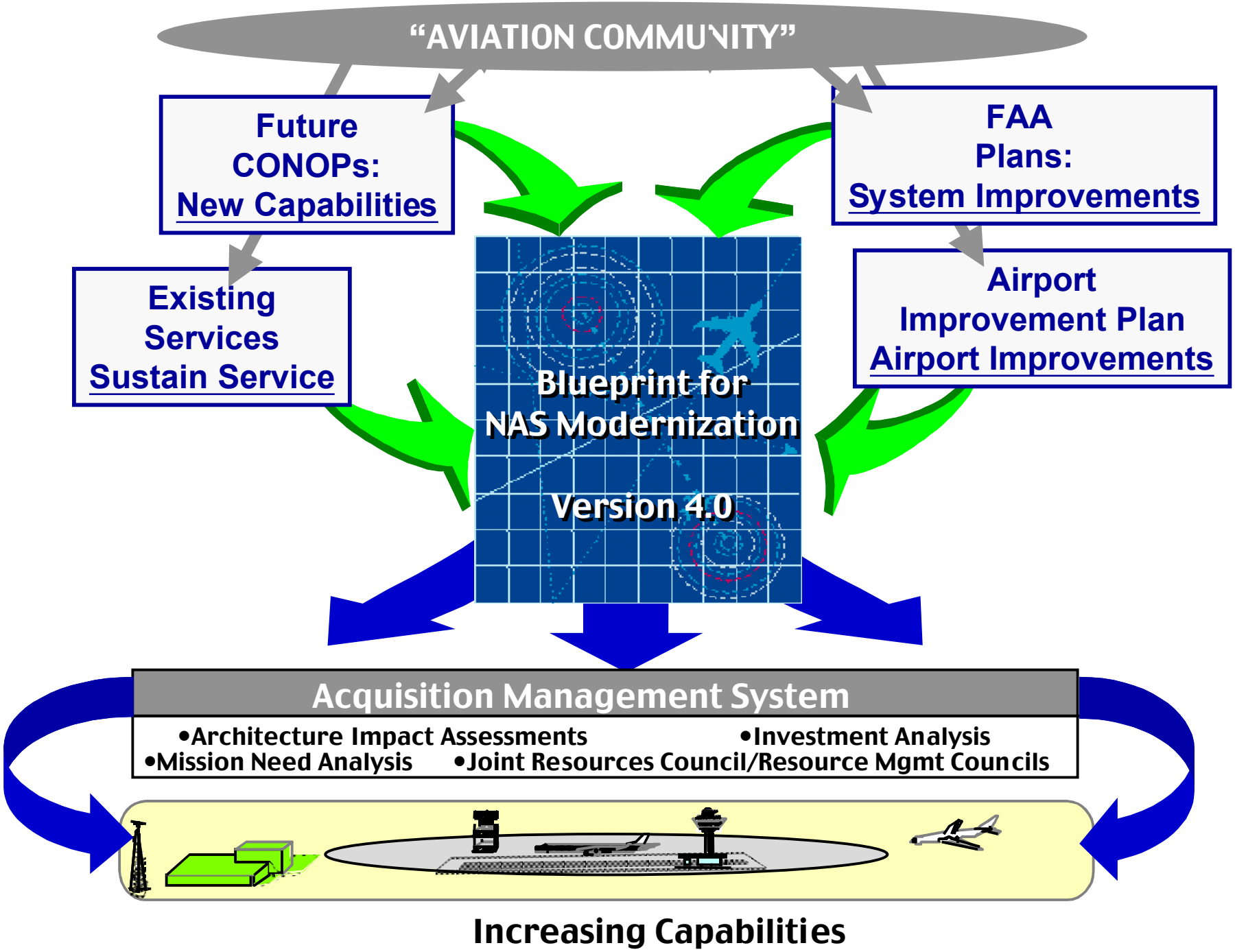
Radar Sites
- 116 LRR
- 220 ASR
- 40 ASDE

Personnel
- FAA OPERATIONS PERSONNEL
  - 17,000 Operational Controllers
  - 3,500 Flight Service Personnel
  - 8,000 Field Maintenance Personnel
- USERS
  - 665,000 Pilots
  - 2,000 Manufacturers

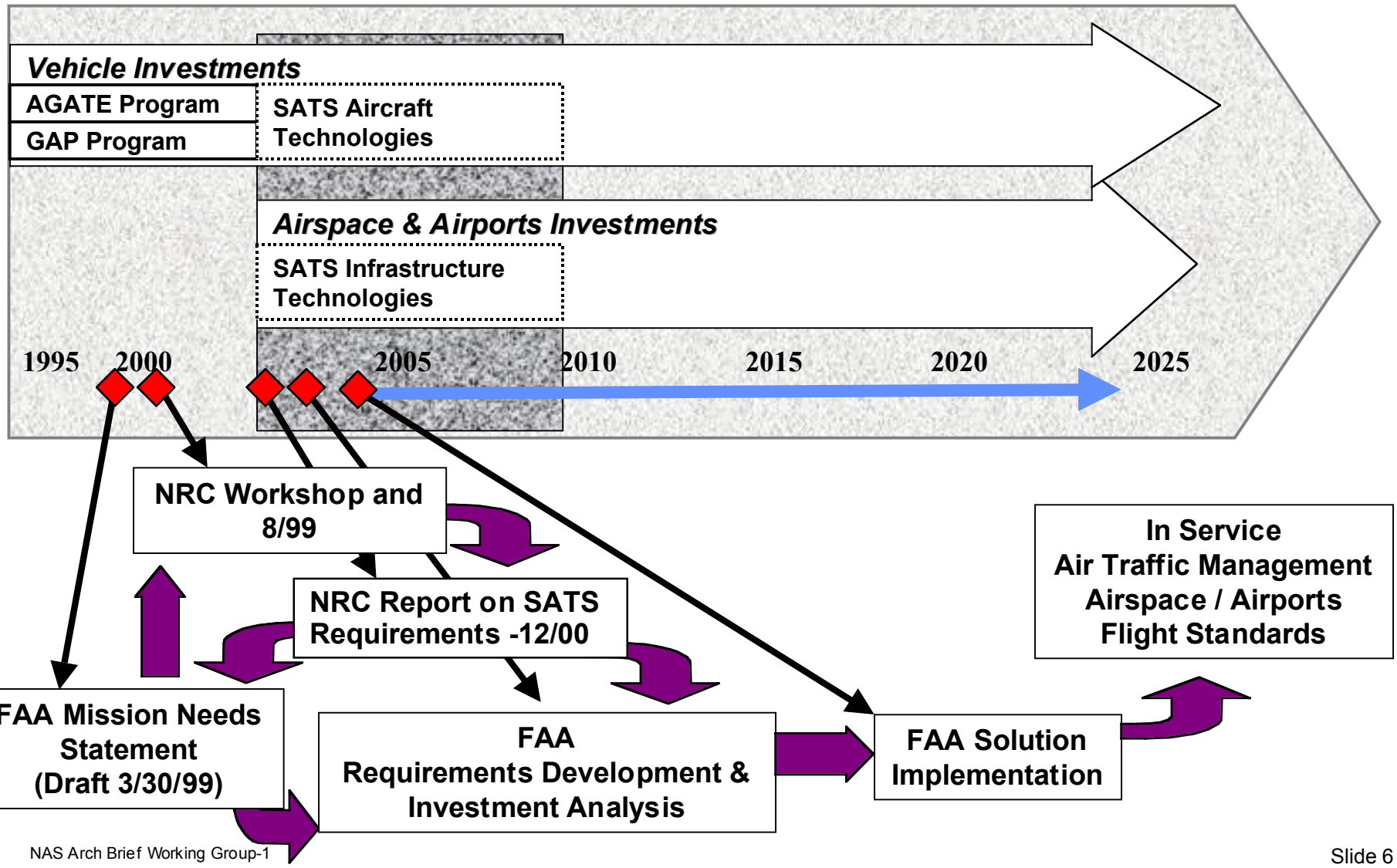
Navigation Sites
- 1,016 VOR
- 1,028 ILS – CAT I
- 85 ILS – CAT II/III

En Route Sites
- 20 ARTCC

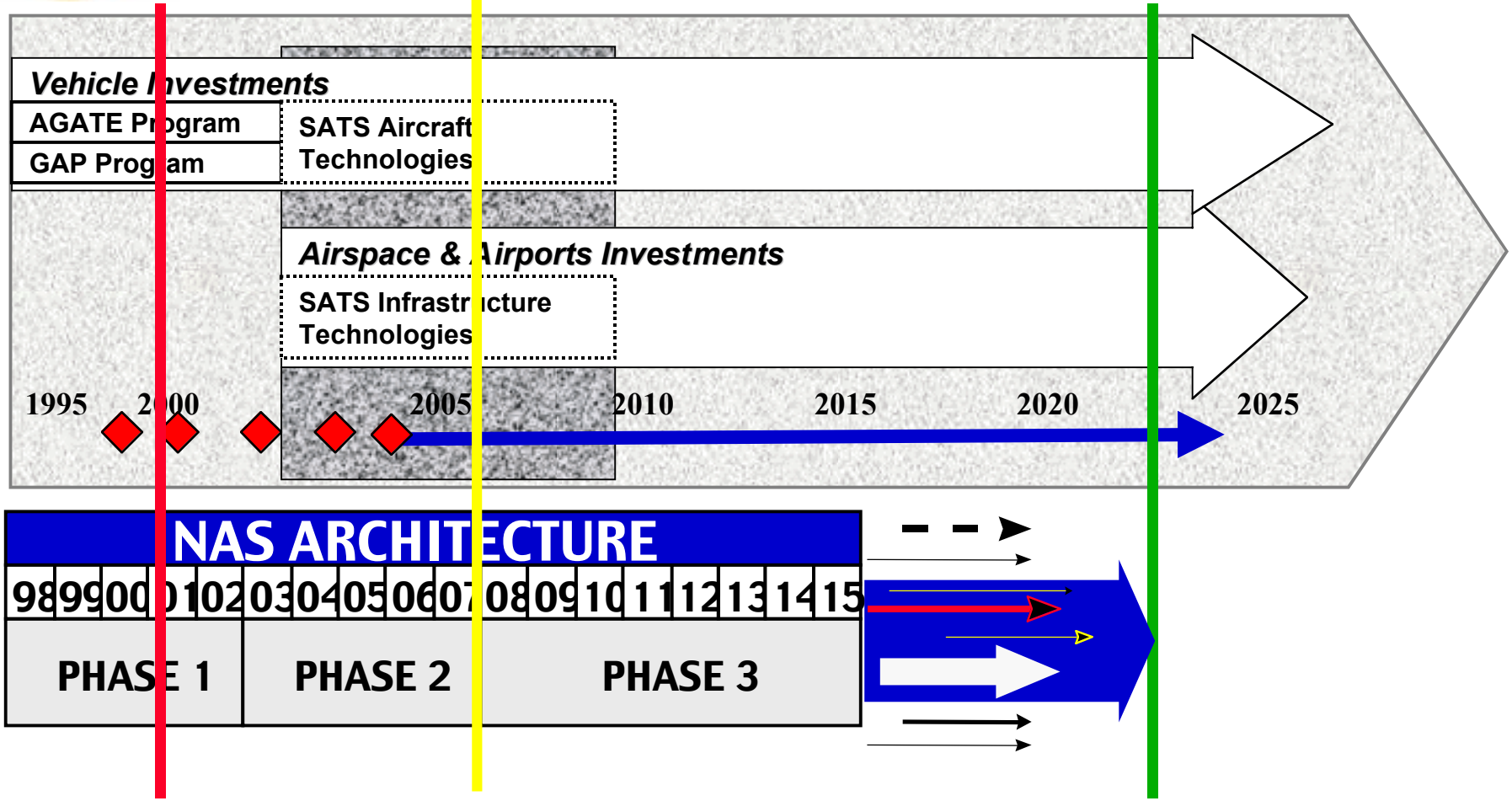
Oceanic Sites
- 3 Centers


"AVIATION COMMUNITY"
Future CONOPs: New Capabilities
FAA Plans: System Improvements
Existing Services Sustain Service
Airport Improvement Plan Airport Improvements
Blueprint for NAS Modernization
Version 4.0
Acquisition Management System
•Architecture Impact Assessments
•Investment Analysis
•Mission Need Analysis
•Joint Resources Council/Resource Mgmt Councils
Increasing Capabilities

SATS Roadmap



SATS Roadmap



SATS Needed Capability

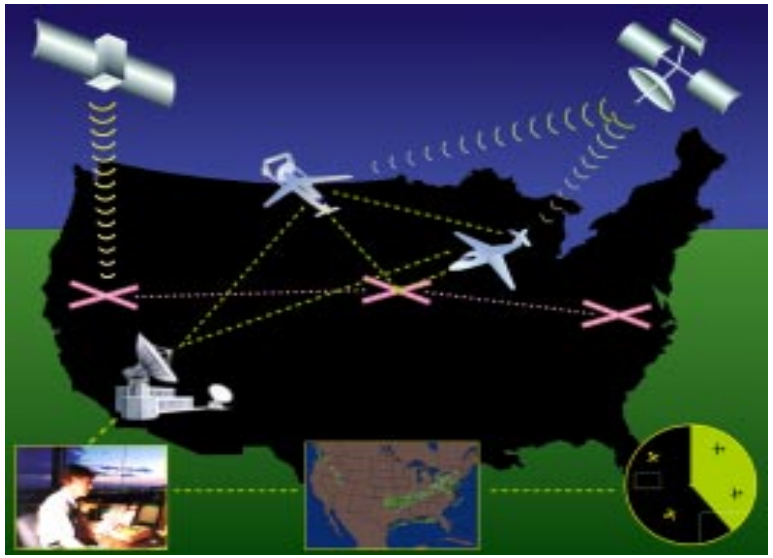
Needed Capability -- 2007

Air Traffic Management

•Provide users with information on traffic flows and system status to permit knowledgeable flight operations.

Needed Capability

- Greater operating efficiencies through more direct routing and user route selection
- Change in airspace design & structure to to capitalize on emerging SATS capabilities
- Optimize advanced technology decision support tools
- Minimized delays and congestion
- Maximizing NAS throughput & flexibility
- Accommodate mixed equipage aircraft
- In-flight re-planning capability



Current & Planned Capability

- FFP1 limited deployment of five core capabilities
- Enhanced Traffic Management System (ETMS) to assist in strategic flow decisions
- Enroute - Display System Replacement (DSR) to aid controllers
- Terminal - Std Terminal Automation Replacement System (STARS)

Watch Items & Shortfalls

- Analysis of SATS aircraft & their capabilities on NAS & ATC system
- Determine procedural requirements to effectively support SATS
- Determine airspace needs for SATS operations
- Implementation of SATS supportive air traffic management procedures

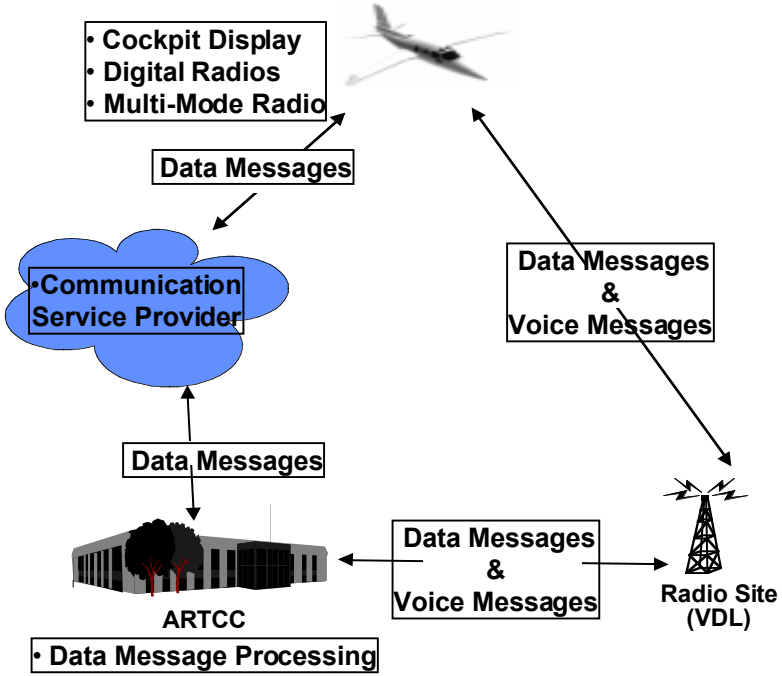
Needed Capability -- 2007

Communications

•Reliable, accurate, timely and cost efficient communications capabilities to include operations information, position and surveillance information and weather data .

Needed Capability

- **Reliable comm from surface up in all areas of operation**
- **In-flight re-planning capability**
- **Clearances through Special Use Airspace**



Current & Planned Capability

- **Deployment of Next Generation CNS Systems**
- **Introduction of digital radios & data link services**
- **Cooperation as effective service provider**
- **Participates as a partner in the public-private alliances seeking to advance state-of-the-art.**

Watch Items & Shortfalls

- **Streamlined avionics certification process**
- **Transition to Next-Generation Air Ground Comm System - fully integrated digital comm not completed until 2015**
- **Minimum equipage required for en route and terminal area operation**
- **Spectrum availability**
- **Cost of data link services**

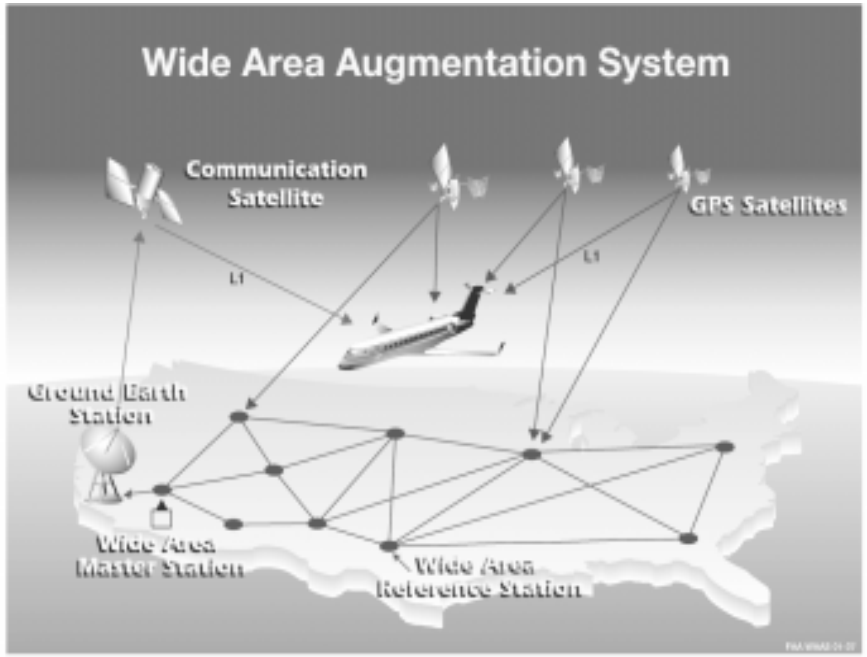
Needed Capability -- 2007

Navigation

•Navigation support must provide reliable, improved position location resolution in all flight modes, from surface upward and in all weather conditions.

Needed Capability

- **Ability to accurately determine & broadcast current location in all areas of operation**
- **Means to separate from other aircraft in remote areas**
- **Near all-weather operations**
- **In-flight re-planning capability**



Current & Planned Capability

- **Enroute Navigation via GPS/WAAS**
- **WAAS achieves full operating capability**
- **Deployment of Next Generation CNS Systems**

Watch Items & Shortfalls

- **Streamlined avionics certification process**
- **Affordable avionics**
- **Transition schedule for reduction of ground based navigation systems**
- **Policies on carrying redundant equipage**
- **WAAS performance and funding**

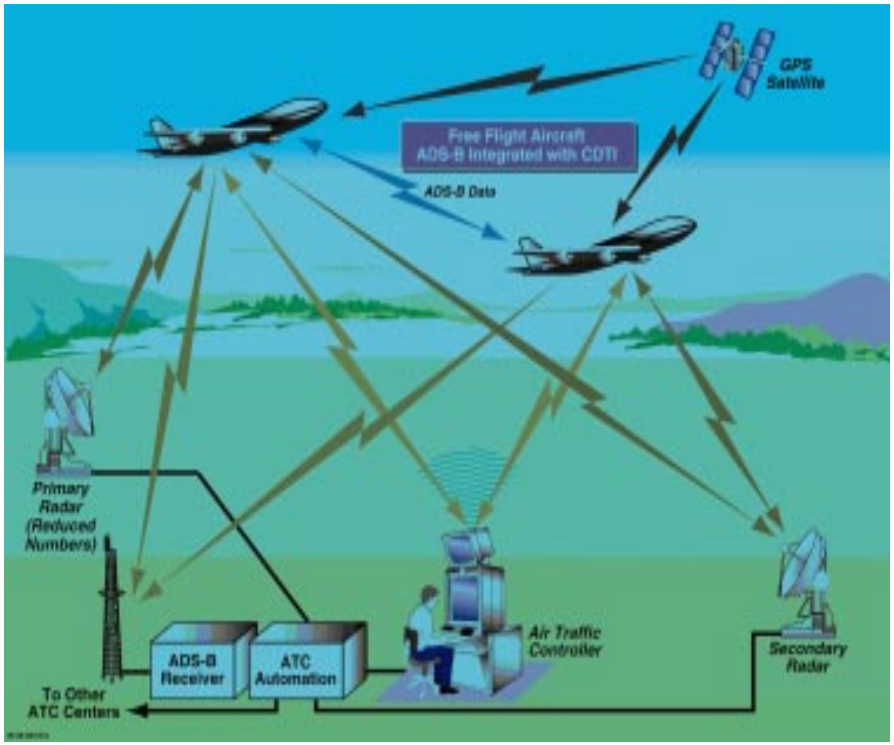
Needed Capability -- 2007

Surveillance

•Reliable,accurate, timely, and cost efficient position information to and from all aircraft from surface up, in all terrain and all airspace areas.

Needed Capability

- **Means to separate from other aircraft in all areas of operation and all terrain**
- **Means to self separate in non-surveillance areas**
- **Near all-weather operations**



Current & Planned Capability

- **Safe Flight 21 Demonstration**
- **ADS-B becomes available for air-to-air surveillance and self separation**
- **Deployment of Next Generation CNS Systems**

Watch Items & Shortfalls

- **Streamlined avionics certification process**
- **Affordable avionics**
- **Ability to separate aircraft in all areas of anticipated operation**
- **Development & evaluation of ADS-B**
- **ADS-B ground infrastructure dependant on user demand**
- **ADS-B ground system installed 2008-2015**

Needed Capability -- 2007

Flight Information Service (FIS)

•Provide reliable,accurate, timely, and cost efficient flight information to include weather, NOTAMS, and special use airspace information.

Needed Capability

- **High resolution, accurate weather data for all areas of operation**
- **Suitable means to disseminate weather in the cockpit data**
- **Ability to avoid & negotiate Special Use Airspace (SUA)**
- **In-flight re-planning capability**

Current & Planned Capability

- **Capstone Demonstration**
- **FIS broadcast of wx data thru commercial vender data link**
- **Cooperation as effective service provider**
- **Participates as a partner in the public-private alliances seeking to advance state-of-the-art.**

Watch Items & Shortfalls

- **Streamlined avionics certification process**
- **Affordable avionics**
- **Policy regarding content, process, & display of weather products & electronic PIREPS**
- **Ability to receive and display FIS data (SUA, NOTAMS, etc)**
- **NAS wide information sharing/data link 2008-2015**

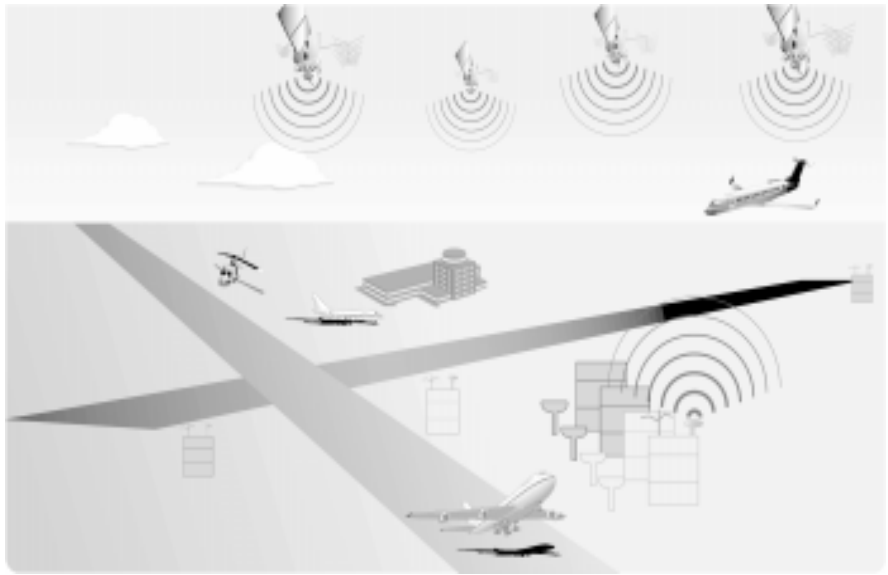
Needed Capability -- 2007

Approaches / Airports

•Facilitate precision instrument approaches, departures, and ground operations to all SATS designated airports.

Needed Capability

- **Precision Approach Capability**
- **Near all-weather utility**
- **Airports available to SATS & non SATS aircraft**
- **Paved, marked, lighted for 24/7 operations**
- **Low cost approach lighting/guidance systems**
- **Meet all airport / environmental regulations**



Current & Planned Capability

- **WAAS provide CAT I approach capability**
- **LAAS deployment (CAT I/II/III) approaches available outside WAAS coverage**
- **Capable of completing Airport / Environmental master planning for 75 airports/year**

Watch Items & Shortfalls

- **New GPS satellites with second civil frequency**
- **LAAS deployment scheduled for 150 airports**
- **Certified, affordable avionics**
- **Development of LAAS standards**
- **Estimate 200 airport/environmental master plans/year must be processed**
- **Airport Lighting to support LAAS approaches**

Next Steps

- Attain FAA JRC Commitment
- Establish Research Areas
- Identify Infrastructure Shortfalls
  - Establish criteria for a "SATS" airport infrastructure requirements
    - SATS requirements 2007
    - SATS requirements 2025
- Reinsert SATS program in FAA AMS process
  - JRC 1 -- Investment analysis
- NAS Architecture Update to reflect SATS Requirements