



ACAST/SBT Workshop 2005



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SBT Project Overview

Bob Kerczewski
NASA Glenn Research Center
Cleveland, Ohio - 16-17 August 2005

Presentation Outline:

- Background
- Project Description
- FY 2005 review
- Looking ahead to FY 2006



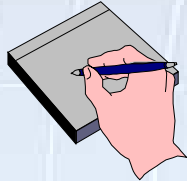
Space Based Technologies Project Overview

SBT consists of several subprojects and research activities that:

- Define the characteristics of the future communications, navigation and surveillance (CNS) infrastructure for the national and global airspace and how to transition from today's system to the future
- Develop and demonstrate key technologies to advance and accelerate the implementation of the future CNS infrastructure
- Enable near/mid-term system mobility and efficiency performance improvements through improved CNS
- Increase global interoperability of CNS systems

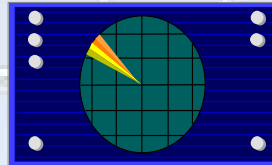
Evolution of ATC/ATM

Past
Procedural Separation



Estimate
current &
future aircraft
positions

Present
Radar Separation



Know current &
estimate future
aircraft
position

Future
4-D Trajectory Separation



Know
current and
Know future
positions

Intent →

*Courtesy Aviation Management Associates, Inc.

The future “transformed” airspace is enabled by a CNS infrastructure built on a network-centric architecture capable of moving information to and from anywhere it’s needed

- Current air traffic management (ATM), with sector-based control based on analog voice communications, presents a hard limit to increasing system capacity.
 - This limit will be reached in some areas by ~ 2011
- Emerging data communications in sector-based ATM can provide a limited increase in productivity
 - But data links planned for this use are of very limited capability, and there is no room in VHF band for new systems
- The long-term capacity gains are provided by ATM systems that go well beyond current methods – moving from air traffic control to airspace management based on 4-D trajectories
- The key element is digital information transfer through network-centric architecture

Evolution of ATC/ATM and CNS

Present

**Radar
Separation**

ATM = Control

Management by Intervention

**Analog Voice
Communication**

**Radar Surveillance,
Ground-based
Navigation**

**Point-to-point
Information
Transfer**

Future

**4-D Trajectory
Separation**

ATM = Monitor

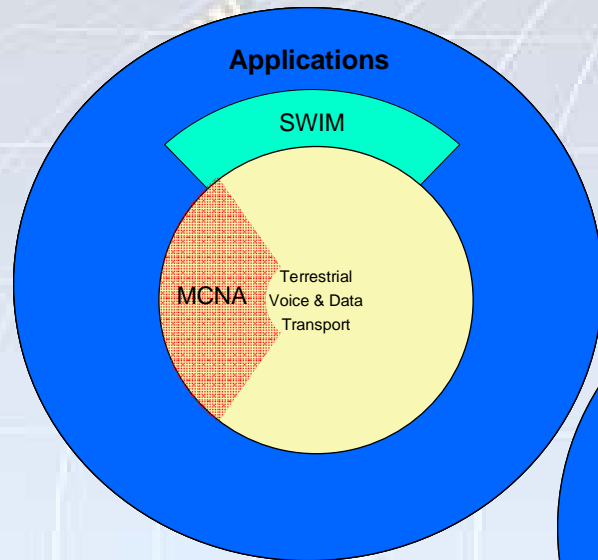
Management by Planning

**Digital Data
Communication**

**Digital Surveillance
and Space-Based
Navigation**

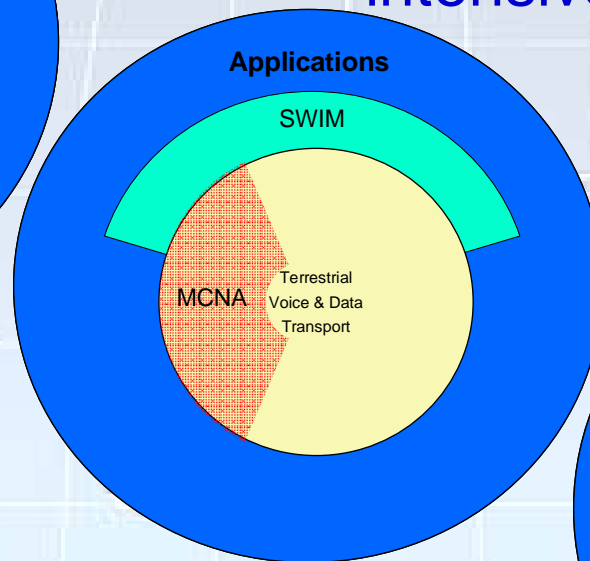
**Network
Centric
Operations**

Space-Based Technologies Project Focus

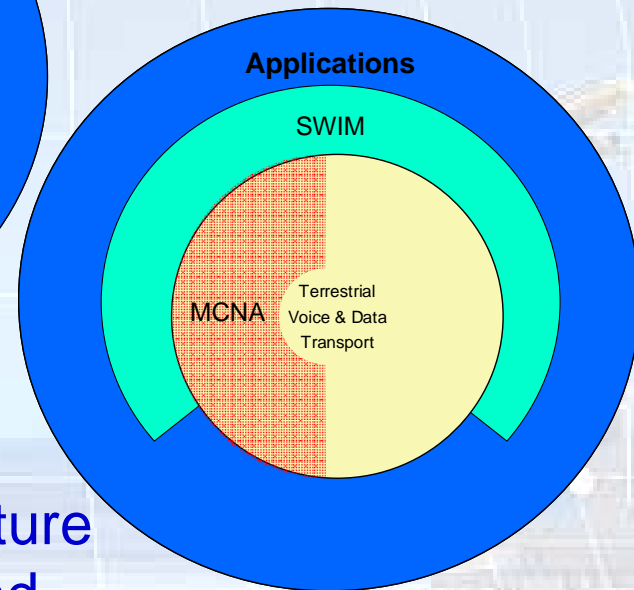


Near-Term

Migration from analog voice/terrestrial data network to mobile air-ground data intensive environment



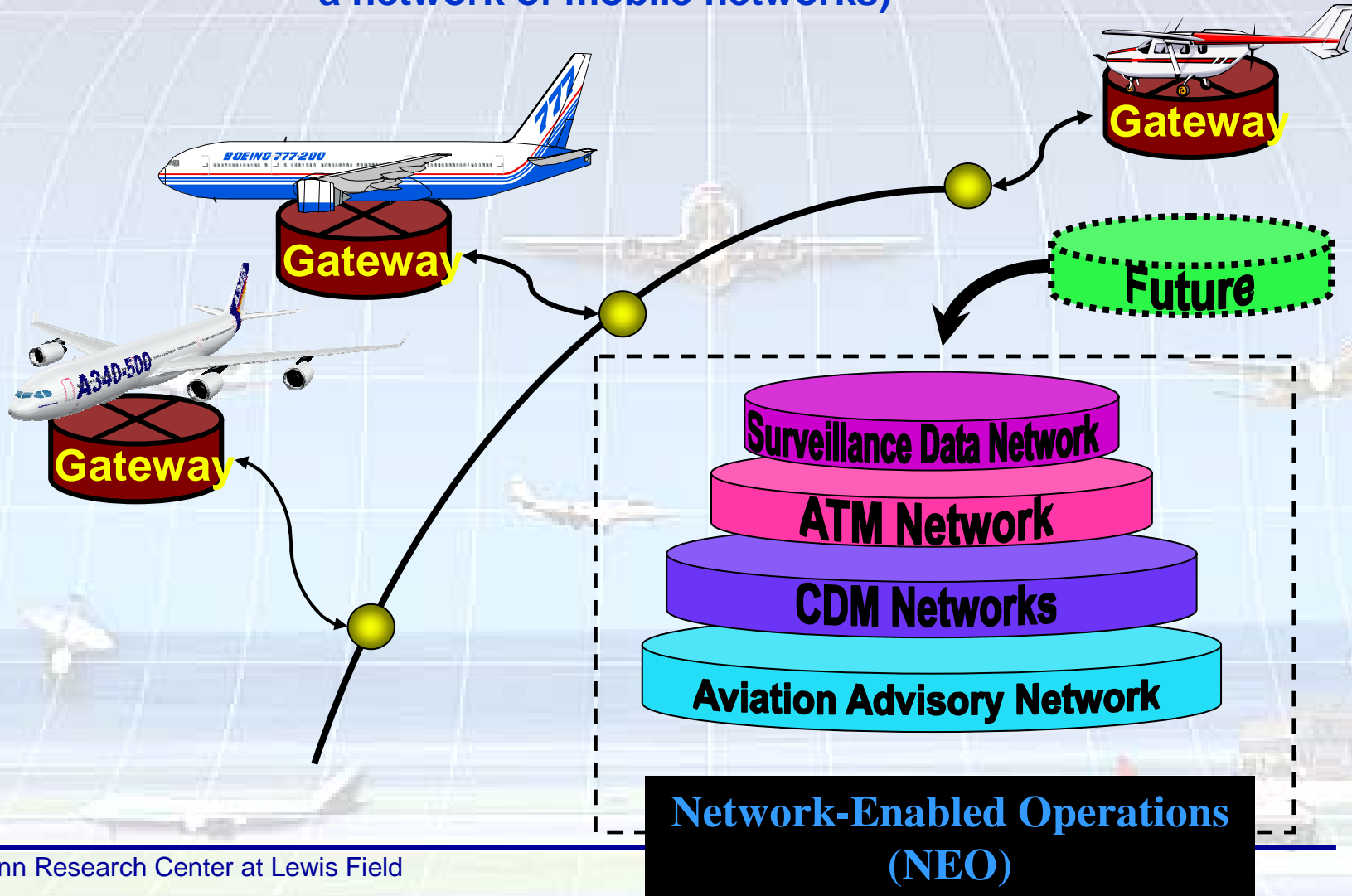
Mid-Term



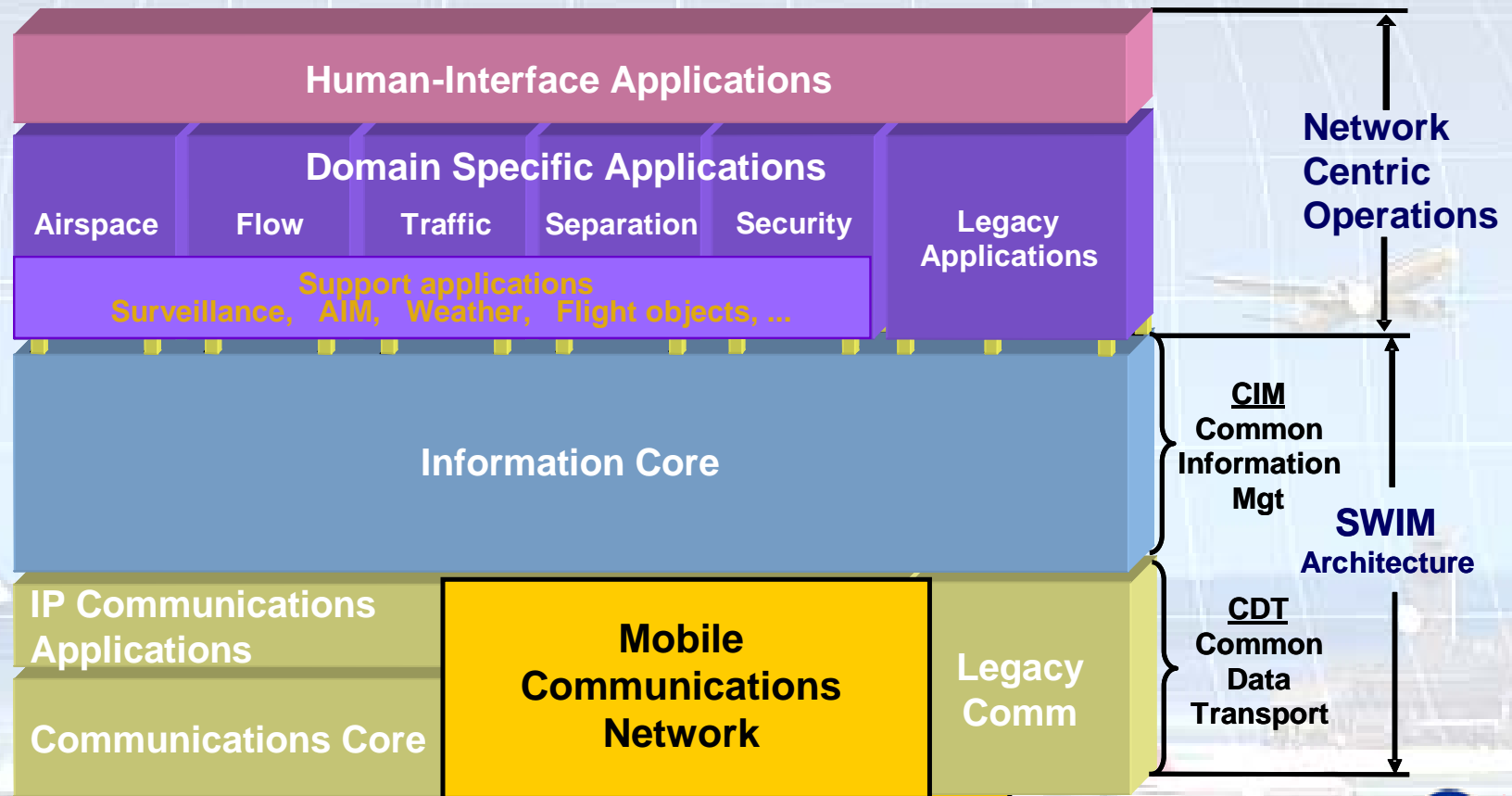
Far-Term

Mobile Communications Network Architecture (MCNA) defines the air-air and air-ground network-centric CNS infrastructure

The Network-Centric Architecture enables aircraft to operate as a “Node-on-the-Net” (but functionally it is a network of mobile networks)



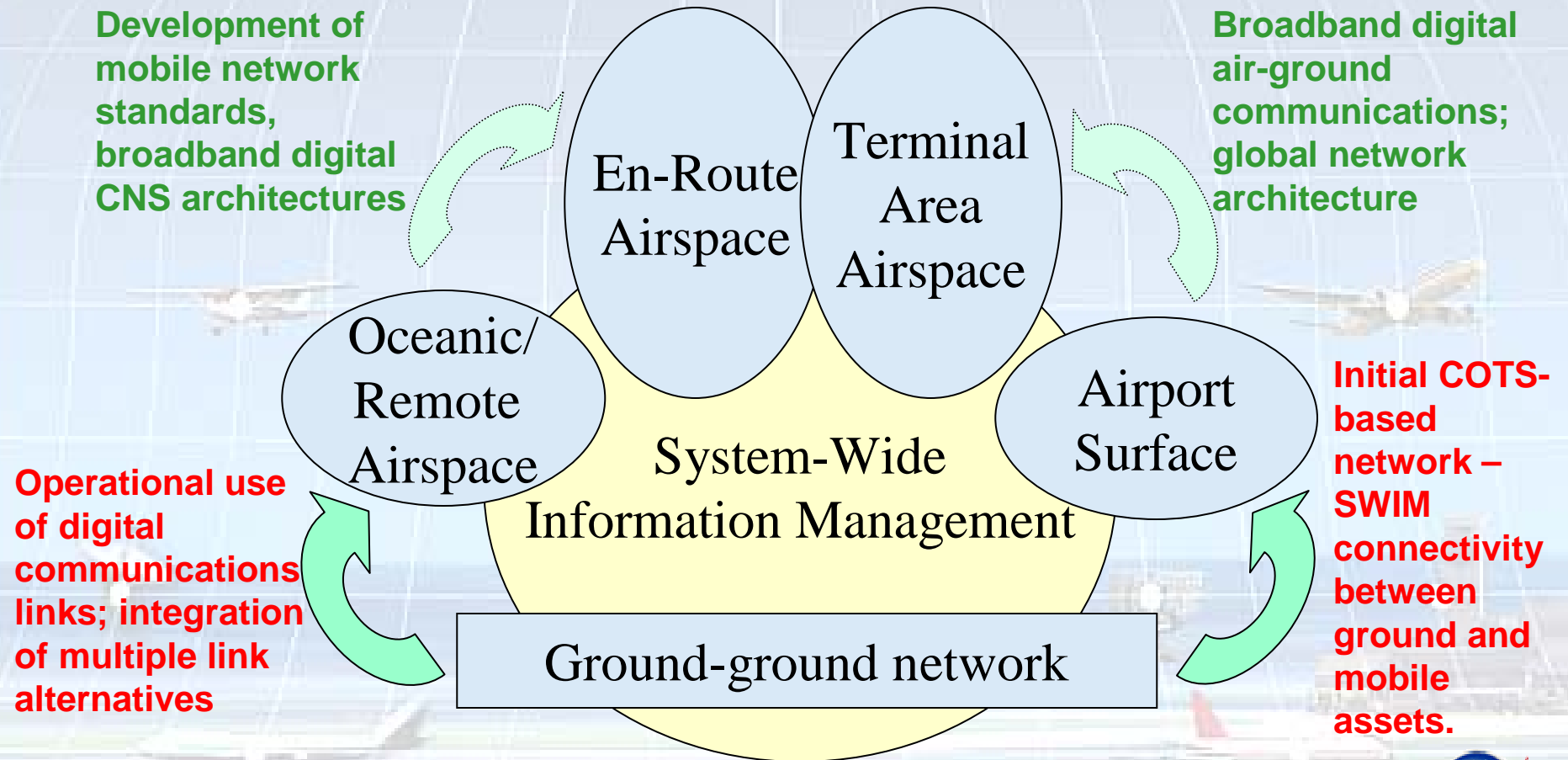
Digital Information Movement = Network-Enabled Operations through a Network-centric Digital CNS System



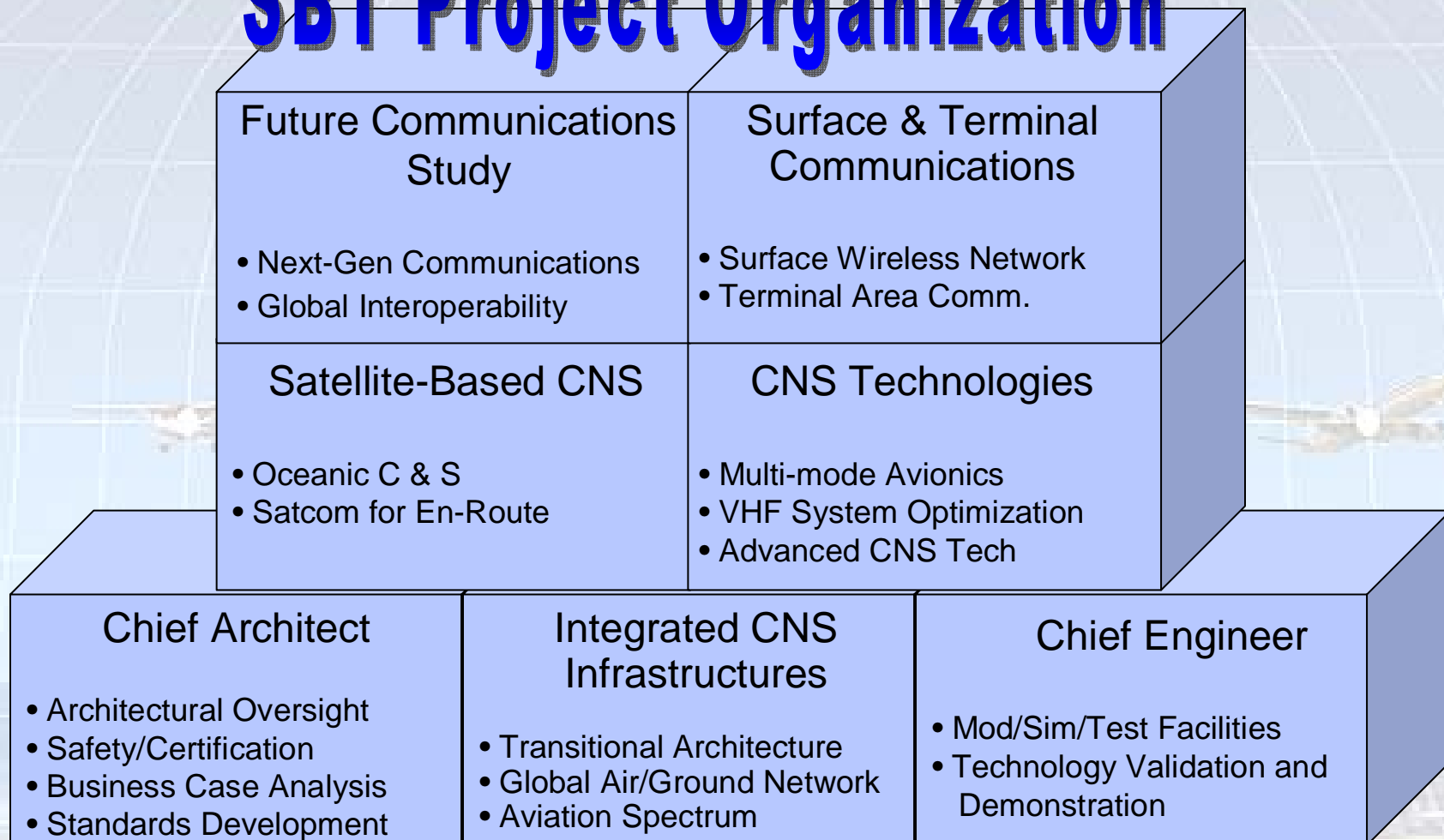
What's needed?

- Mobile network architecture, standards and protocols, especially for air-ground segment
 - Mobility for high-speed operations, security, QoS are key problems
- Next generation digital communications link, outside of VHF band
 - Pure safety communications may remain in VHF, but the biggest data load is AOC and related information
 - Other bands for ground-based systems (L-band, C-band);
Satellite communications is now more attractive, reduced ground infrastructure costs
- Rapid and cost-effective implementation of new technologies
 - Cannot afford the >15-year cycle of the past
 - Software radio techniques have the best potential
- Begin the transition to network-centric operations ASAP through insertion of digital datalink/network oriented systems
 - Enable development and demonstration of high-value applications
 - Begin reaping operational gains, develop confidence in the concepts

Migration of digital data communications and network centric concepts from today's emerging ground-ground networks to all airspace



SBT Project Organization



SBT Technology R&D / Demonstration Matrix

Technology Demonstrations, Evaluations, Simulations

	MMDA Technology Demonstration	Airport Surface Network Demonstration	Oceanic Comm/Surv Demonstration	Simulation/Evaluation/Analysis
Technology R & D Areas	CNS Transition Architecture	Avionics Transition	Net-Centric Transition	Digital Comm Transition
	Global Air-Ground Network	Network Interface	1st Network Operations	Network Stds & Protocols
	Spectrum		C-Band	AMS(R)S Band L-Band, etc.
	CNS Technologies	SDR Technologies		C, N, & S Technologies
	Satellite-based CNS			Oceanic SatCom Future SatCom Architecture
	Future Comm. Study	Flexible Architecture	802.XX C-Band Net	SatCom Alternatives Future A/G Comm

FY 2005 Review

- Issues and Impacts
 - NASA's Budget
 - Earmarks
 - Budget and Staffing
- Accomplishments

FY 2005 Review

- Issues and Impacts
 - NASA's Budget (*reality check*)

The US Administration has decided to aggressively pursue future Space Exploration activities, including future missions to the moon and Mars.

The Administration has also moved to reduce the size and number of NASA research projects that are vulnerable to accusations of government subsidization of commercial aviation – mainly in NASA's Vehicle Systems Program.

Major staffing cutbacks at NASA's aeronautics research centers have been predicted, some have already occurred.

If RIF is not permitted and increases in NASA's aeronautics budget do not occur, this will place a major budget burden on the remaining projects in FY 2006 and beyond.

FY 2005 Review

- **Issues and Impacts**
- **Earmarks**

Earmarks were inserted into NASA's FY 2005 Budget by Congress and additional funding was provided.

NASA assigned these earmarks to specific project areas.

NASA used the additional money provided for aeronautics-related earmarks for other purposes and requires project to fund earmarks out of their regular budget.

This had a major negative impact on many NASA aeronautics projects.

For ACAST, this earmark impact, in addition to other budget cuts, effectively eliminated our procurement budget for FY 2005.

(The Airspace Systems Program was able to provide funding to continue the Future Communications Study)

FY 2005 Review

- Issues and Impacts
 - Budget and Staffing

Reductions to NASA's Aeronautics Budget in FY 2005 had severe impacts on other projects (especially within the Vehicle System Program).

GRC Vehicle Systems Program projects could support previously staff levels - this significantly raised the cost of each person SBT was paying for.

Ultimately, we did not have enough "non-procurement" budget to maintain our in-house (civil servant) staffing level, so we had to reduce our in-house staff during the course of the year.

FY 2005 Review

• Issues and Impacts

Bottom line:

We could not start any new contractual efforts in FY 05 (we could only complete things started with FY 04 money) except for the Future Communications Study.

We were forced to work with reduced CS staffing, although we worked to try to retain as much as we could through working off-budget (ie charging to overhead).

Finally, we struggled very much to retain our highly skilled and difficult-to-replace in-house contractor staff, and we appear to have succeeded in that. But it wasn't easy.

Impact to the project is that most milestones scheduled for FY 2005 could not be completed.



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FY 2005 Review

• Accomplishments

Despite all of the budget-related difficulties, we have made significant strides forward this year. Subproject Managers will provide details about accomplishments in their areas during the upcoming presentations, but some of the major ones overall are:

- Future Communications Study Phase I
- Terminal Area Requirements Study
- Oceanic Benefits Analysis
- C-band Channel-sounding Campaign
- Mobile Communications Network Architecture (MCNA)
- Datalink and Network Modeling, Simulation and Analysis
- ICAO Aeronautical Communications Panel Working Paper Inputs
- Contributions to Industry Standards Activities
- Business Case and Certification Analyses for MMDA
- Testbed Requirements Development



FY 2006

- **Planning Activities**

- **Budget**

- **Changes and potential further impacts**

- **Milestone Rescheduling**

- **Procurement Activities**

- **Key Planned Activities**

- **Final Thoughts**

FY 2006

- **Planning Activities**

- **Budget**

- **Changes and potential further impacts**

Previously mentioned – NASA’s Space Exploration initiative and reductions in NASA’s Vehicle System Program and their impacts.

Creation of a new Program within the Aeronautics Research Mission Directorate – Foundational Research Program.

Will require 20% of Airspace Systems Program budget in FY 07 and beyond.

Will impact SBT budget.

We will not be able to afford basic research (previously referred to as “low TRL”) in FY 07 and beyond, the new Program will have to fund it; possible further impacts.

FY 2006

- **Planning Activities**
 - **Milestone Rescheduling**

The previously described budget and staffing issues impacted performance on FY 05 milestones.

We have re-scheduled milestones into FY 09 to use project budget and schedule reserves that were placed in FY 09.

The following chart shows how milestones have been rescheduled so far.

Since more budget changes are expected, there may be further milestone changes as well.



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FY 2006

• **Key Procurement Activities**

External procurements will in FY 2006 will continue to make use of existing procurements vehicles:

- Small Business (IDIQ) Task Order Contract
- Systems Analysis Task order Contract
- University Grants
- GRC On-site Engineering and Administrative Contracts

We will complete the development of 2 new Task Order Contracts

- CNS Avionics Task Order contract

All paperwork in GRC's Procurement Department, release is imminent

- CNS Systems Task order Contract

Draft paperwork is in GRC's Procurement Department.

Watch the ACAST Website: <http://acast.grc.nasa.gov/>



FY 2006**• Key Planned Activities**

Subproject Managers will provide some additional details about FY 2006 activities, but some of the major ones overall are:

- Future Communications Study Phase II
- Completion of WRC-07 technical support activities
- Full definition of oceanic demonstrations and developments
- Establish 2 major task order procurement vehicles
- Major MMDA architecture studies
- Initial testbed operating capability
- Initial surface technology demonstrations – Wake Vortex at Denver
- Operating concepts definitions for surface, oceanic
- Surface cost/benefit – business case analysis
- Initial global aviation network concept definition
- National Center for CNS R&D (NCCR) up and operating
- ...and much more.



Final Thoughts

Although budget threats always exist, and final budget for FY 06 is still a month away, I still expect FY 2006 to have much more activity than 2005, and hope for an adequate budget with which we can considerably expand on the work we have already accomplished.

We will also be expanding our external partnerships and coordination and collaboration with external organizations.

As JPDO outputs continue to be developed and refined in detail, and other aviation community plans emerge, we will compare our work to emerging consensus on the long-term direction of the Next Generation Air Traffic System and adjust to maintain alignment with those goals.

