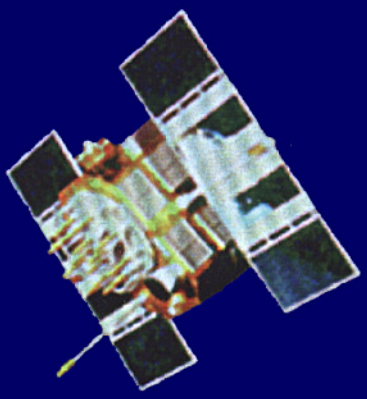
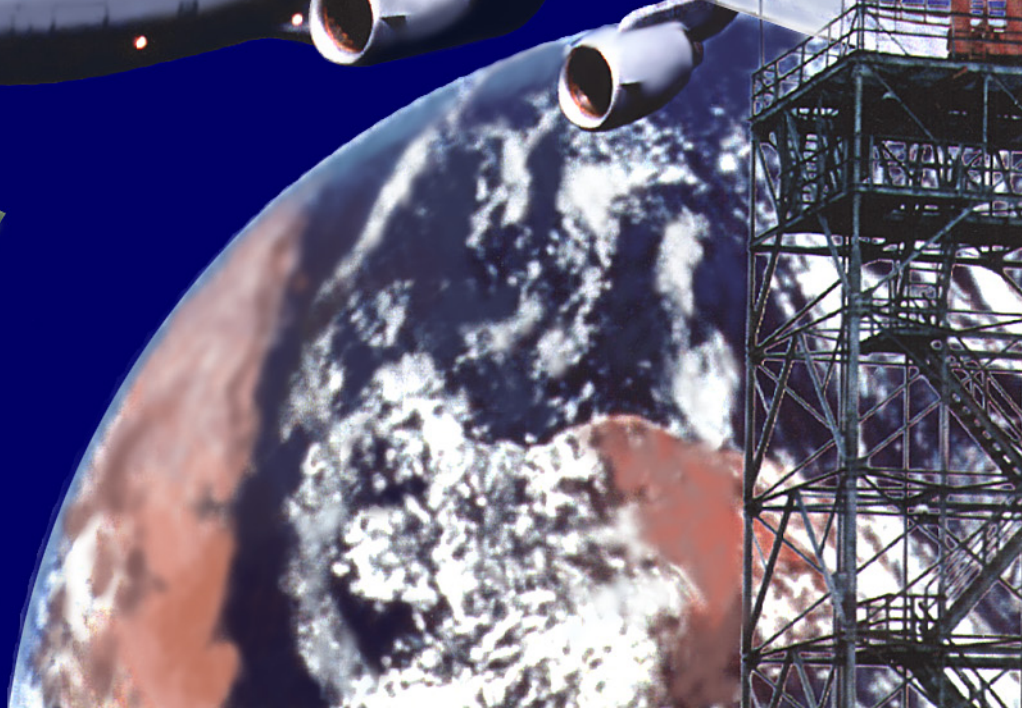
Global Access, Navigation, & Safety (GANS)



Strategic Management Plan

25 June 1998



The most current GANS information can be found at http://www.xo.hq.af.mil/xor/xor-gans/

This is the Air Force Strategic Management Plan for Global Access, Navigation, and Safety (GANS). The Air Force requires unrestricted global airspace access to support its vision of *Global Engagement* in the execution of the National Military Strategy. Presently fielded Air Force avionics and systems are not adequate to ensure unrestricted global airspace access in the future. This strategic plan is an effort to manage the most comprehensive avionics procurement and installation effort in Air Force history. GANS-related capabilities will eventually impact every Air Force aircraft and ground air traffic control system.

The GANS vision, *Global Access for Global Engagement*, flows from the Air Force vision and is our continuing commitment to provide unified commanders the capability to fly and fight when we need to, where we need to, across the full range of the National Military Strategy, from peacetime engagement to wartime response. This vision charts a path into the next century for an Air Force team, within a joint service team, to meet the GANS challenge.

- S I G N E D -

RALPH E. EBERHART
General, United States Air Force
Vice Chief of Staff

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T A B L E O F C O N T E N T S

THIS IS THE AIR FORCE STRATEGIC MANAGEMENT PLAN FOR GLOBAL ACCESS, NAVIGATION, AND SAFETY (GANS)

EXECUTIVE SUMMARY

GANS is a comprehensive effort to manage the programs and initiatives that facilitate unrestricted airspace access and global engagement. GANS enhances the Air Force's ability to meet mission requirements within civil airspace mandates and operate globally in a safe, efficient, and effective manner. GANS is especially critical in light of the impact of the changing global airspace architecture on peacetime engagement and contingency response missions. In addition, GANS-related installation of enhanced communications, navigation, safety, and air traffic management equipment will preserve combat capability and save lives by ensuring Air Force missions can be safely and effectively flown anywhere on the globe whenever called upon.

This Strategic Management Plan:

- States the GANS vision, goals, and objectives;
- Provides an integrated GANS strategy and lays out roadmaps that link Air Force efforts to emerging civil airspace architecture developments; and,
- Describes the organizational structure and business processes that are being used to manage the GANS effort.

GANS VISION

Global Access for Global Engagement

The ability to fly and fight when we need to, where we need to. . .

across the full range of the National Military Strategy. . .

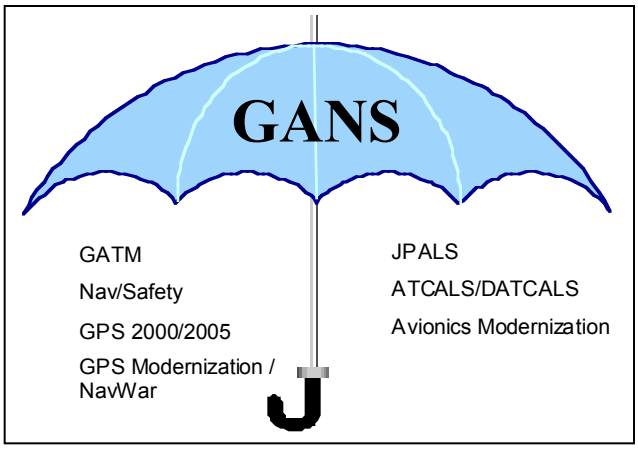
from peacetime engagement to wartime response

GANS IS THE MOST COMPREHENSIVE AVIONICS MODERNIZATION EFFORT IN AIR FORCE HISTORY

GANS GOALS

- *Preserve and enhance combat capability by reducing cost and aircraft down time through the consolidation of requirements among programs and initiatives*
- *Field operational capabilities that support Global Engagement mission needs through timely, affordable, flexible acquisition approaches*
- *Pursue parallel upgrade of related air, ground, and space air traffic management infrastructure to achieve compatibility and interoperability for seamless global operations and enhanced warfighting capability*
- *Engage civil authorities to bring about airspace access solutions that maximize military capabilities in support of Global Engagement at affordable costs*

The GANS effort was established to consolidate requirements, streamline acquisition execution, and provide oversight to its component programs and initiatives. Taken together, the seven components that fall under the GANS management umbrella comprise the most comprehensive avionics procurement and installation effort in Air Force history. GANS-related capabilities will eventually be integrated into every Air Force aircraft and ground air traffic control system. The components of GANS include:

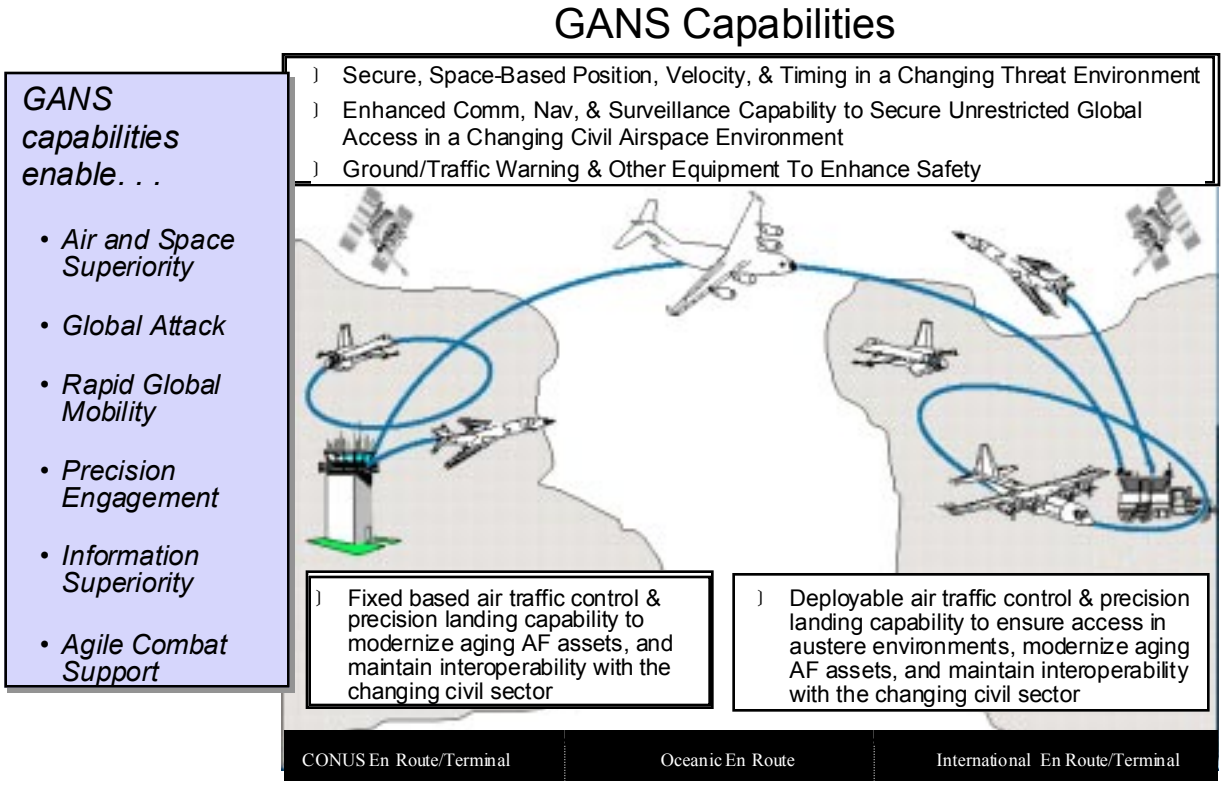


- Global Air Traffic Management (GATM): GATM provides the capabilities required to operate in airspace where new separation standards and air traffic management procedures are being implemented by civil authorities.
- Navigation and Safety Equipment (Nav/Safety): The Navigation and Safety Equipment Master Plan for Passenger-Carrying Aircraft is the Air Force's response to the 1996 SECDEF mandate to enhance navigation and flight safety capabilities for passenger capable aircraft. In addition to this mandate, the Air Force will continue to evaluate mission requirements for enhanced navigation and safety capability for all aircraft.
- Global Positioning System (GPS) Project 2000/2005: GPS 2000/2005 is DoD's response to 1993 congressional direction that all DoD aircraft, ships, armored vehicles and indirect fire weapon systems be equipped with GPS by September 30, 2000. The National Defense Authorization Act for FY99 extended the deadline to September 30, 2005.

- The GPS Modernization/Navigation Warfare (NavWar) Program: GPS modernization is focused on eight "enduring principles": 1) improved accuracy, 2) security, 3) denial and signal fratricide management, 4) backward compatibility, 5) civil interoperability, 6) integrity, 7) user friendliness, and 8) capable of wartime operations. NavWar has three objectives: protect U.S. and Allied forces ability to operate with GPS in an area of operations (AOO), prevent adversary forces use of satellite navigation and its associated augmentations in the AOO, and minimize the impact to civilian and commercial GPS users outside the AOO. A NavWar capability is scheduled to be fully operational by 2006 to support the presidential decision to set Selective Availability (S/A) to zero in that year. To ensure synchronization of ongoing GPS upgrades, NavWar has been included in the updated GPS Operational Requirements Document (ORD).
- The Joint Precision Approach and Landing System (JPALS) Program: JPALS is the DoD effort to acquire a rapidly deployable, interoperable precision approach and landing system to enhance warfighter capability during adverse weather conditions.
- The Air Traffic Control and Landing Systems (ATCALS) and Deployable ATCALS (DATCALS): ATCALS will upgrade and modernize ground-based Air Force air traffic facilities. This upgrade is being conducted in conjunction with Federal Aviation Administration (FAA) ground infrastructure modernization. DATCALS can be used to support fixed-base air traffic control facilities but, their primary role is to support austere airfield operations during contingencies and wartime.
- Avionics Modernization Programs: Avionics modernization enhances the mission capability of Air Force aircraft. Ongoing and planned avionics modernization efforts will be integrated with GANS-related modernization where feasible.

GANS CAPABILITIES ENABLE AIR FORCE CORE COMPETENCIES

The capabilities derived from the seven GANS components enable core competencies that are critical to an expeditionary Air Force across the full range of operations–from day-to-day training, to contingency deployment, to mission execution. The following figure shows the extent of these capabilities. In addition to these direct benefits, the indirect benefits of GANS-related capabilities and the GANS management philosophy will preserve combat capability by enhancing peacetime flight safety and make smart use of scarce modernization dollars through consolidation and synchronization, where possible.



GANS ENABLES ACCESS IN A CHANGING AIRSPACE AND THREAT ENVIRONMENT

To maintain global access, the Air Force is adapting to upcoming changes in the domestic and international civil airspace architecture that are designed to increase flight safety, efficiency, and system capacity. Although civil authorities cannot mandate system capability for the military, failure to equip for civil compliance has historically resulted in restrictions to flight operations. Adapting to the new civil airspace architecture becomes particularly important given the crucial roles of rapid global mobility and agile combat support across the full range of the National Military Strategy.

In developing the new airspace system, the move to a space-based architecture is clear—both the Federal Radio Navigation Plan and the CJCS Master Navigation Plan call for the systematic phase out of existing terrestrial navigation aids over the next ten to fifteen years. GPS will become a key component of the new architecture. GPS is currently vulnerable to intentional or unintentional radio frequency interference and other information warfare threats. GPS modernization, a critical component of the GANS effort, will address the protection of the GPS

signal. Additionally, user-equipment signal integrity monitoring capabilities are being examined.

The Changing Airspace Environment-- USAF Considerations	
Yesterday	**Tomorrow**
Relatively stable operations tempo and use of civil airspace—force structure forward based–humanitarian and "lesser" operations a sideline	Greater use of international air routes–power projection increasingly from the U.S.–more operations from austere airfields–humanitarian and "lesser" operations the norm
Increased civil demand for passenger and cargo traffic met by increasing aircraft capacity–little to no impact on USAF	Exponential growth in civil demand for increased passenger and cargo traffic met by increasing airspace capacity–significant impact for USAF
Civil airspace architecture based on long-standing, legacy systems--no need for a comprehensive USAF avionics modernization plan	Fast-paced technology enables increased airspace capacity through more stringent altitude, spacing, timing, and safety requirements–need for comprehensive avionics modernization plan
Equipment-based compliance–requires buying specific boxes	Performance based compliance–more potential to take advantage of military systems/capabilities
Ground-based, analog systems	Space-based, digital systems—new interference/information warfare protection and compatibility requirements
Separation based on ground air traffic control	Separation based on cockpit air traffic management—requires integrated aircraft comm, nav, and surveillance systems
Relatively homogeneous, long-established global airspace architecture	Regional variances during transition to new global architecture complicate fielding schedules and training requirements

The large increases in global air traffic operations have created enormous pressure on air transport and air traffic control service providers to maintain and enhance safety levels while increasing airspace capacity to meet air transport demands. In recognition of these pressures, the International Civil Aviation Organization (ICAO) developed the communications, navigation, surveillance/air traffic management (CNS/ATM) concept. GATM is the DoD response to CNS/ATM. CNS/ATM relies on extensive use of emerging technology, including satellite-based navigation systems, data links, automation, and new operating concepts.

The final solution for civil airspace architecture is still evolving and not all standards or operating procedures have been fully developed. In addition, global CNS/ATM modernization is occurring on a regional basis, depending on regional needs. Thus, some regions present new challenges that require specialized solutions, creating global interoperability issues for aircraft operators and air traffic control service providers that must operate on a global basis, especially the United States Air Force.

The new airspace access criteria are being implemented in a phased manner where the greatest benefits can be achieved in the shortest time period. This phased implementation is occurring first over oceanic regions, then over continental airspace (starting in Europe), and finally within terminal areas. Because of this phased implementation approach, Air Force

missions involving day-to-day operations in oceanic and civil en route airspace, such as global mobility, are the first to experience the greatest mission impact.

Given the evolving nature of CNS/ATM, regional implementation patterns, and level of uncertainty in some mid- and far-term requirements, ensuring continued global access is a significant challenge for the Air Force. It will require the Air Force to equip its aircraft and train its aircrews at a pace consistent with the mission impact of civil airspace changes. Failure to do so could result in significant mission impact due to exclusion from certain airspace as well as delays and higher operating cost from flying less efficient routes.

Because most of the GANS programs and initiatives are related to developments in the civil airspace management sector, the methods by which the Air Force engages civil aviation authorities is a critical component of the GANS effort. CNS/ATM uncertainties, coupled with the high cost and long lead times required to field new aircraft and ground equipment, call for active engagement with the civil sector on civil airspace technical solutions and operational procedures development.

GANS SEEKS EFFICIENCIES THROUGH HARMONIZATION AND SYNCHRONIZATION OF ITS PROGRAMS

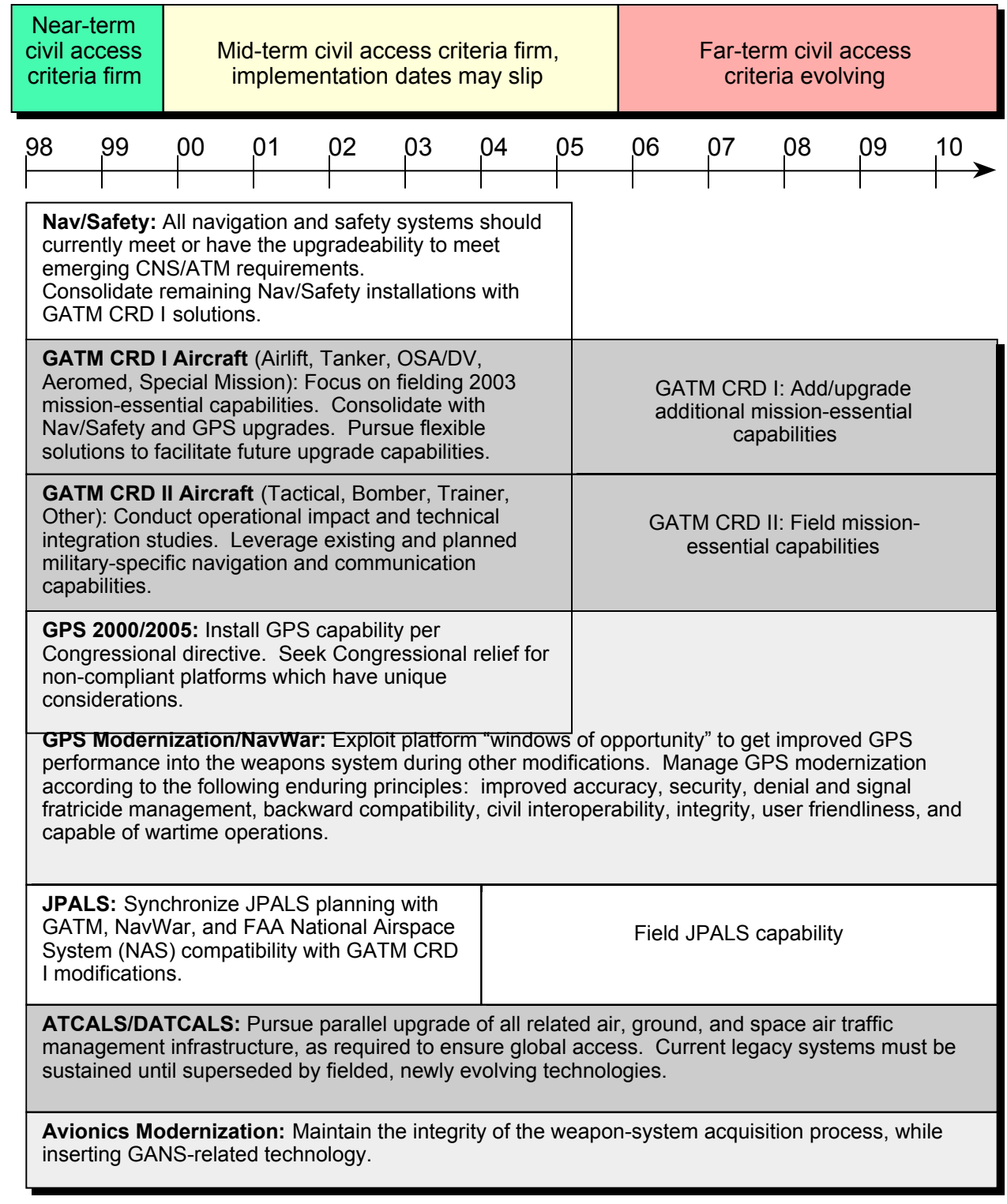
The seven GANS components are closely related and in many cases address overlapping requirements. However, each is different enough to make the GANS task particularly challenging. Some of the differences include:

- Differences in timing: Each program and initiative is on a different fielding timeline, which complicates synchronization efforts.
- Differences in focus: GATM, Nav/Safety, JPALS, and ATCALS are entirely focused on global access, navigation, and safety, while the focus for GPS, NavWar, and avionics modernization extend beyond airspace access issues.
- Differences in mandates: Nav/Safety is SECDEF directed, GPS 2000/2005 is congressionally directed, NavWar is derived from presidential direction. GATM, ATCALS/DATCALS, JPALS, and avionics modernization were driven through the standard requirements generation process.
- Differences in program management structure: Both GPS and JPALS have their own joint program management structures. ATCALS has an AF program management structure. Platform managers and the Global Air Traffic Operations/Mobility Command and Control System Program Office (GATO/MC2 SPO) have a shared responsibility for GATM and Nav/Safety.
- Differences in mission impact: Installation of GANS-related capabilities will be executed at the platform level. Each platform has a different starting equipment baseline and civil access

criteria will have different mission impacts for different aircraft categories (e.g., fighter, airlift, trainer).

The following figure shows the GANS implementation timelines and integrated strategies that are designed to address the GANS challenges and meet the GANS goals.

GANS Integrated Strategies and Implementation Timelines



GANS FIELDING PRIORITIES ARE DRIVEN BY MISSION IMPACT

The GANS fielding strategy centers on operational impacts caused by the phased implementation of civil access criteria. The near-term access criteria are already having an impact on missions that require routine operations in oceanic and European airspace.

- Category 1 includes those aircraft with significant near-term operational impacts that will field GATM systems prior to 2005
- Category 2 includes those aircraft with far-term operational impacts that can implement procedural work-arounds in the near and mid term.
- Category 3 includes ground systems covered by ATCALS/DATCALS.

The following table shows a broad, "snapshot" view of where the Air Force expects to be in implementing GANS capabilities.

GANS Fielding Plan by Platform Category

	98	00	05	End-State--beyond 2010
Category 1 • **Airlift** • **Tankers** • **DV/OSA** • **Aeromed** • **Special Use**	Varied baseline capability Requirements documentation started Fielding of Nav/Safety equipment ongoing	GATM fielding started for 2003-2005 civil access mission-essential capability Fielding of NavWar started as part of GPS modernization	Compliant with mid-term civil oceanic and continental requirements. Requirements documented for far-term "free-flight" solution JPALS fielding started	Compliant with far-term civil "free-flight" architecture
Category 2 • **Fighters** • **Bombers** • **Trainers** • **All Other Aircraft**	Varied baseline capability Operational impact and technical solution studies started	GATM requirements documented for civil access mission-essential capability Operational work-arounds established for transition period Fielding of NavWar capabilities started	Fielding started to include civil compliant solutions, JPALS Requirements documented for far-term "free-flight" solution	Compliant with far-term civil "free-flight" architecture
Category 3 • **ATCALS** • **DATCALS**	Documented requirements, but should consider Local Area Augmentation System (LAAS) and JPALS solutions	LAAS and JPALS solutions identified	Fielding started for precision landing solution	Interoperable with far-term civil "free-flight" architecture

The recognition of oceanic and continental operational restrictions that could result from further CNS/ATM development led to GATM Capstone Requirements Document (CRD) I for airlift, tankers, aeromed, Distinguished Visitor (DV)/Operational Support Aircraft (OSA), and special use aircraft. The GANS fielding plan for these aircraft involves consolidating GATM, Nav/Safety, GPS user equipment (UE) modernization/NavWar, and ongoing avionics modernization, where feasible, with a focus on civil airspace access criteria in 2003. This modernization will emphasize upgradability to accommodate future JPALS, GPS modernization, and further enhancements to the civil airspace architecture.

- Plan for GANS Platform Category 1
  - Requirements
    - ➢ Engage civil aviation authorities on near- and mid-term implementation timelines and mid- to far-term standards such as data link and automatic dependent surveillance to minimize operational impact while aircraft are being modified. Promote solutions that take advantage of military capabilities
    - ➢ Focus modifications on 2003 civil access criteria, pursue flexible architectures that promote upgradability to 2005 and beyond
    - ➢ Ensure Mission Area Plans (MAPs), ORDs, and other requirements documents, as appropriate, are completed or updated to reflect GANS impacts for the FY01 Amended Program Objective Memorandum (APOM)
  - Funding
    - ➢ Continue to pursue funding through ongoing Program Objective Memorandum (POM) efforts to ensure required capability is fielded in a timely manner
    - ➢ Closely monitor civil developments and program execution to identify any funding adjustments in follow-on budget cycles
  - Acquisition
    - ➢ Leverage commercial technology as much as possible
    - ➢ Incorporate GATM modifications with remaining Nav/Safety modifications, depending on platform baseline architecture and schedule
    - ➢ Incorporate modifications with ongoing cockpit modifications, where able
    - ➢ Include a multi-mode receiver (MMR) that contains a GPS Receiver Applications Module-Selective Availability Anti-Spoof Module (GRAM-SAASM) card to enhance the ability to operate in an electronic warfare (EW) environment and to facilitate meeting future JPALS requirements
    - ➢ Incorporate NavWar by including GRAM-SAASM capability in platform architectures.

The GANS plan for those aircraft that will be covered by GATM CRD II involves further requirements development, with operational impact studies and requirements documents complete by 2000. During the initial stages of civil CNS/ATM implementation, these aircraft will experience smaller mission impacts than those in Category 1. The higher costs involved in integrating systems in tactical aircraft drives this prudent GANS modernization approach. By 2000 the mid- and far-term CNS/ATM airspace access criteria will be clearer, as well as the JPALS solution. Mission impacts during the fielding period will need to be addressed by operational work-arounds.

- Plan for GANS Platform Category 2
  - Requirements
    - ➢ Engage civil aviation authorities on mid- to far-term standards and implementation timelines such as data link and automatic dependent surveillance. Promote solutions that take advantage of existing military capabilities
    - ➢ Conduct operational impact and technical integration studies for potential civil airspace access, navigation, and safety upgrade/modernization
    - ➢ Complete GATM CRD II and ensure Mission Area Plans (MAPs), ORDs, 1067s, and other requirements documents, as appropriate, are completed or updated to reflect GANS impacts for the FY02-07 Program Objective Memoranda (POM)
  - Funding
    - ➢ Program for necessary modifications in the FY 02-07 POM
    - ➢ Closely monitor civil developments and program execution to identify any funding adjustments in follow-on budget cycles
  - Acquisition
    - ➢ Modify with GATM, JPALS—where necessary—starting in 2005
    - ➢ Continue the GRAM-SAASM evolution
    - ➢ Maintain the flexibility to accelerate modifications based on results of studies and evolving mission impacts.

The GANS plan for ground systems (ATCALS/DATCALS) is contained in the USAF Air Traffic Management Strategic Plan. This plan will need to be updated approaching 2000 as the Federal Aviation Administration (FAA) identifies its new precision landing solution and the JPALS solution is determined.

- Plan for GANS Platform Category 3
  - Requirements
    - ➢ Engage civil authorities, promoting use of differential GPS for the Local Area Augmentation System (LAAS)

- ➢ Identify LAAS and JPALS solutions, then pursue parallel upgrade with civil systems. Develop requirements for the new mobile approach system

– Funding

- ➢ Continue to pursue funding through ongoing POM efforts to ensure required capability is fielded in a timely manner
- ➢ Closely monitor civil developments and program execution to identify any funding adjustments in follow-on budget cycles
- ➢ Sustain current systems while transitioning to the new architecture

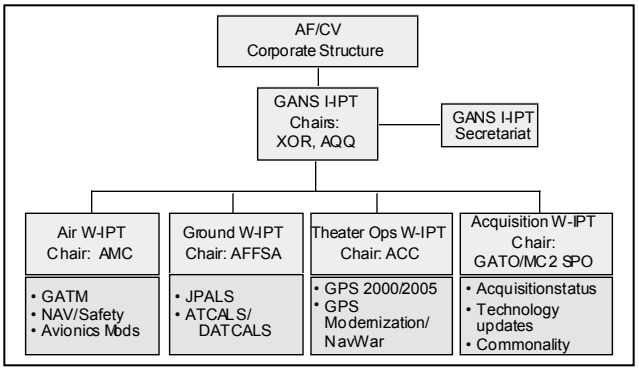
– Acquisition

- ➢ Phase-in precision landing solution with ATCALS/DATCALS modernization as outlined in the USAF ATM Strategic Plan
- ➢ Complete National Airspace System (NAS) Modernization Projects [Digital Airport Surveillance Radar (DASR), Standard Terminal Automation Replacement System (STARS), Enhanced Terminal Voice Switch (ETVS)].

In fielding these capabilities for all platform categories, commonality across the fleet and the use of commercial off-the-shelf and government off-the-shelf (COTS/GOTS) solutions will be pursued where feasible.

GANS INTEGRATES THE REQUIREMENTS, FUNDING, AND ACQUISITION COMMUNITIES

The GANS Integrated Process Team (IPT) structure brings together the requirements, Planning, Programming, and Budgeting System (PPBS), and acquisition communities in a common effort to achieve GANS goals and objectives. GANS participants have functional roles within their own organizations in one or more of the standard Air Force requirements generation, PPBS, or acquisition processes. The GANS IPT structure provides a forum for sharing information, building consensus, identifying issues, solving issues at the lowest possible level, and elevating issues that require the attention of senior Air Force leadership.



The GANS Integrating-IPT (I-IPT), co-chaired by the Director of Operational Requirements (AF/XOR) and the Director of Global Reach Programs, Assistant Secretary of the Air Force for Acquisition, Global Reach Directorate (SAF/AQQ), reports to the Vice Chief of Staff of the Air Force and the Air Force

corporate structure. The I-IPT is responsible for overall management of the GANS effort. The I-IPT manages four Working-IPTs (W-IPTs).

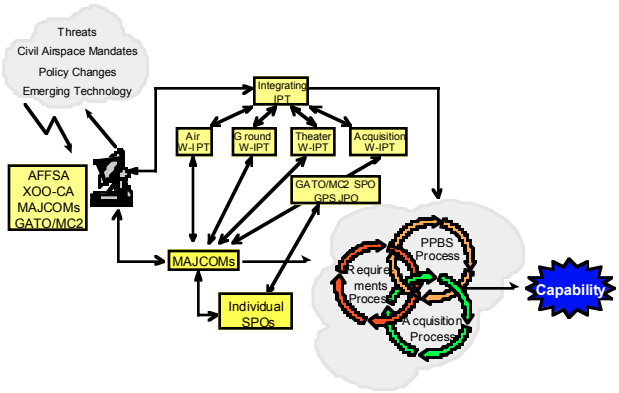
- The Air W-IPT, chaired by Air Mobility Command (AMC), is responsible for consolidating requirements and funding strategies for GATM, Nav/Safety, and avionics modernization.

- The Ground W-IPT, chaired by Air Force Flight Standards Agency (AFFSA), is responsible for consolidating requirements and funding strategies for JPALS and ATCALS/ DATCALS.

- The Theater W-IPT, chaired by Air Combat Command (ACC), is responsible for consolidating requirements and funding strategies for GPS 2000/2005 and GPS Modernization/NavWar.

- The Acquisition W-IPT, chaired by the Global Air Traffic Operations/Mobility Command and Control Systems Program Office (GATO/MC2 SPO), working in conjunction with the GPS Joint Program Office (JPO), is responsible for monitoring acquisition status, providing technology updates, and promoting commonality among GANS programs and initiatives.

The IPT structure enhances the ability of the participants to move toward common GANS goals and objectives in their functional roles while representing their individual organizations. The IPT structure may also be called upon as a collective GANS organization to provide information or recommendations on GANS-related issues by the Air Force corporate structure.



The GANS acquisition structure consists of the Air Force Program Executive Officer/Airlift and Trainers (PEO/AT), who is the Air Force acquisition execution lead for GATM, Nav/Safety, JPALS, and ATCALS/DATCALS. The Space and Missile Center Commander (SMC/CC) is the acquisition execution lead for GPS/NavWar. Various AFMC organizations are responsible for cockpit avionics modernization. The basis for the GANS acquisition strategy lies with Electronic Systems Center's (ESCs) GATO/MC2 SPO and the GPS JPO. Platform single managers, the GATO/MC2 SPO, and the GPS JPO must work together in field execution of GANS-related programs. The relationship between the GATO/MC2 SPO, the platform single managers, and the GPS/JPO is critical to the GANS acquisition strategy.

In its first six months of existence, the GANS management structure concentrated on requirements and funding strategies. Currently, the process is increasing its focus on acquisition

issues. Actions being taken to further enhance the effectiveness of the GANS management structure can be grouped into four main categories:

- Improving GANS Integrating IPT (I-IPT) administrative procedures and enhancing information flow through electronic means
- Facilitating decision making, issue identification, and performance measurement
- Strengthening the process through which the Air Force engages with civil aviation authorities and other external organizations
- Further refining the acquisition strategy governing the relationship between the GATO/MC2 SPO, the GPS JPO, and the individual platform managers.

CONCLUSION

GANS is an extremely challenging and uniquely ambitious undertaking. It impacts every aircraft and ground-based air traffic control system within the Air Force, spans multiple programs and initiatives, seeks to fuse the requirements, funding, and acquisition communities, and depends on domestic and international civil aviation decisions. Successful achievement of GANS goals will enhance Air Force core capabilities, conserve warfighting capabilities, and save lives. This plan documents the steps the Air Force is taking to meet the GANS challenge.

1.0 INTRODUCTION

1.1 Purpose

This is the Air Force Strategic Management Plan for Global Access, Navigation, and Safety (GANS). The Air Force requires unrestricted global access to implement its vision of Global Engagement. This access is critical to support the unified commanders in the execution of the National Military Strategy.

To maintain global access, the Air Force is adapting to upcoming changes in the domestic and international civil airspace architecture that are designed to increase flight efficiency and system capacity. In many cases, these changes will require significant aircraft and ground system modifications. GANS is a collective effort to manage related programs and initiatives that comprise the most comprehensive avionics modernization effort in Air Force history.

The Air Force will save lives and preserve combat capability by installing the enhanced communications, navigation, safety, and air traffic management equipment associated with GANS. Much of this equipment relies on space-based positioning, velocity, and timing information that requires improved protection from intentional or unintentional interference and other information warfare threats. GANS programs and initiatives enhance the Air Force's ability to meet mission requirements within civil aviation mandates and operate globally in a safe, secure, efficient, and effective manner.

This Strategic Management Plan provides direction by clearly stating the GANS vision, goals, and objectives. It documents the emerging developments in civil aviation; describes the programs and initiatives that fall under the GANS management umbrella; describes the process to fuse the requirements, funding, and acquisition processes for GANS programs and initiatives; and documents the management philosophy and acquisition strategy to achieve GANS goals.

The purpose of any strategic plan is to foster strategic thinking and acting. This plan was produced with participation of the various Air Force organizations charged with developing requirements, securing funding, and acquiring GANS-related capabilities. This strategic management plan will be a "living document," managed by interactive participation throughout the GANS community. As such, it will provide a framework to raise issues, take actions, and document those actions and their impact on achieving the GANS goals.

1.2 Document Organization

The GANS Strategic Management Plan is organized as follows:

- Section 1 of this plan contains the purpose, document organization, and the GANS vision, goals, and objectives.
- Section 2 provides background on the evolving civil aviation and threat environment and the resulting Air Force actions that led to the establishment of the GANS concept.
- Section 3 contains roadmaps that lay out the direction of civil airspace access criteria, GANS programs and initiatives, and the Air Force strategy to achieve the GANS goals by platform type.
- Section 4 describes the GANS organizational process, including those specific actions necessary to achieve the GANS goals and objectives. Section 4 also describes how performance in achieving the GANS goals will be measured and how this plan will be updated.
- Appendix A describes civil airspace access criteria and communications, navigation, surveillance/air traffic management (CNS/ATM) developments in detail, including civil market trends, driving forces, technical/operational concepts, implementation timelines, and a regional situational assessment
- Appendix B contains a matrix that compares similar requirements across GANS programs and initiatives.
- Appendix C contains the list of implementation actions to improve GANS business processes. This list includes the responsible organizations, the suspense dates, and the status.
- Appendix D contains charters for the GANS Integrated Process Teams (IPTs).
- Appendix E includes a standard Integrating IPT (I-IPT) meeting agenda and briefing formats designed to focus GANS-related issues and topics for discussion and action at GANS I-IPT meetings.
- Appendix F contains a list of GANS points of contact for the GANS I-IPT and Working IPTs (W-IPTs).
- Appendix G contains a bibliography of military and civil documents related to the GANS effort.
- Appendix H contains GANS-related World Wide Web sites.
- Appendix I contains a list of acronyms.

1.3 Vision

The GANS vision focuses on unrestricted airspace access for the United States Air Force. This vision is directly linked to the Air Force vision and the three components of the National Military Strategy–SHAPE, RESPOND, PREPARE. It emphases the capability to fight major theater wars while recognizing the importance of shaping the international environment and responding to a variety of smaller-scale contingencies. Global access is a critical requirement for the Air Force to achieve its Global Engagement vision and execute its responsibilities

through Air Force core competencies, particularly Global Attack, Rapid Global Mobility, and Agile Combat Support.

GANS VISION

Global Access for Global Engagement. . .

The ability to fly and fight when we need to, where we need to. . .

across the full spectrum of the National Military Strategy. . .

from peacetime engagement to wartime response

The actions necessary to fulfill the GANS vision are derived from four major goals, each further defined by associated objectives designed to guide the Air Force requirements, planning, programming, budgeting, and acquisition communities for all GANS-related efforts.

1.4 Goals and Objectives

The first goal focuses on preserving and enhancing combat capability by seeking cross-program efficiencies. In many cases, the various GANS programs and initiatives contain similar or overlapping requirements. For example, Global Positioning System capability is a common thread among GANS programs and initiatives. In some cases, GANS-specific requirements for a particular platform may be consolidated with other requirements for that platform. In other cases, the timelines for aircraft modifications for GANS and other programs could be synchronized to reduce aircraft downtime.

GOAL 1

Preserve and enhance combat capability by reducing cost and aircraft down time through the consolidation of requirements among programs and initiatives

Objectives

1.1 Identify overlapping requirements and minimize redundant solutions among GANS programs and initiatives

1.2 Examine other military programs and initiatives to determine if GANS requirements can be met or combined with existing or planned capabilities

1.3 Examine GANS modifications to determine if the enhanced communications and navigation capabilities can be used to meet other military requirements

The second goal focuses on smart acquisition and fielding of GANS capabilities based on mission need. GANS-related requirements will eventually impact every aircraft in the Air Force inventory. Fielding these capabilities, however, can be phased in based on weapon system-specific mission impact of the phased implementation of the new civil airspace access criteria. Additionally, although GANS-related modifications will be executed at the platform level, the benefits of reducing acquisition costs by seeking commonality among platforms, where feasible, is evident. At the same time, because many of the actual standards, practices, and implementation timelines in reaching the civil end state are still undetermined, another clear objective is the pursuit of flexible technical solutions that can facilitate potential upgrade requirements.

GOAL 2

Field operational capabilities that support Global Engagement mission needs through timely, affordable, flexible acquisition approaches

Objectives

2.1 Pursue a phased fielding strategy based on weapon system-specific mission impact resulti from the phased implementation of civil airspace access criteria

2.2 Maintain the integrity of weapon system-specific acquisition processes while promoting common acquisition mechanisms

2.3 Pursue flexible architectures that minimize hardware upgrades as requirements evolve

2.4 Leverage commercial technology, when possible

2.5 Employ efficient spectrum utilization approaches when implementing GANS solutions

The third goal focuses on the relationship between the air, space, and ground components of air traffic management. The Air Force furnishes air traffic services to U.S. and allied aircraft with radar approach controls, air traffic control towers, navigation aids, and approach aids. As a service provider, the Air Force must upgrade or replace its systems in parallel with civil airspace architecture changes, as well as changes in capability due to avionics modernization on the military aircraft that the Air Force ground systems support. In addition, Air Force airborne command, control, communication, computers, intelligence, surveillance, and reconnaissance (C4ISR) assets, such as the E-3 Airborne Warning and Control System (AWACs), can leverage GANS capabilities to interact with civil airspace management systems.

GOAL 3

Pursue parallel upgrade of related air, ground, and space air traffic managemen infrastructure to achieve compatibility and interoperability for seamless global

operations and enhanced warfighting capability

Objectives

3.1 Maintain interoperability with domestic and foreign civil air traffic control authorities in fixed and deployable ground systems

3.2 Ensure airborne C4ISR assets take full advantage of the mission implications of emerging GANS-related capabilities

The final GANS goal focuses on engaging the various civil authorities that establish airspace standards and practices. Although the civil direction to move from ground-based analog to space-based digital capabilities is clear– both the Federal Radio Navigation Plan and the CJCS Master Navigation Plan call for the systematic phase out of existing terrestrial navigation aids over the next ten to fifteen years–many of the actual standards, procedures, and implementation timelines in reaching the end state are still evolving. Through active, early engagement, the Air Force can influence upcoming decisions to promote solutions that reconcile warfighter needs with commercial desire to increase airspace capacity and enhance safety.

GOAL 4

Engage civil authorities to bring about airspace access solutions that maximize military capabilities in support of Global Engagement at affordable costs

Objectives

4.1 Establish coordinated Air Force positions on specific civil airspace technical and operational requirements and implementation timelines

4.2 Work closely with the Office of the Secretary of Defense, other Services, and Joint organizations to establish supporting Department of Defense positions on specific civil airspace technical and operational requirements and implementation timelines

4.3 Ensure the proper Air Force people (technical, operational, policy) participate in key civil meetings and actively promote Department of Defense positions. Engage at senior leadership levels, when appropriate

4.4 Establish a mechanism to enhance the collection, storage, and dissemination of civil airspace information

GANS is an extremely challenging and uniquely ambitious undertaking. It impacts every aircraft and ground-based air traffic control system within the Air Force; spans multiple programs and initiatives; seeks to fuse the requirements, funding, and acquisition communities; and depends on domestic and international civil aviation decisions. This plan documents the steps the Air Force is taking to meet the challenge of procuring and integrating the best possible systems with the most efficient use of scarce modernization funds and provides direction to guide Air Force planning and programming. The following sections discuss the

background on the evolving civil and Air Force aviation environment, roadmaps that define the Air Force strategy to achieve GANS goals, and the GANS organizational process–including the specific actions being taken to achieve GANS goals and objectives.

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2.0 BACKGROUND

To understand the GANS challenges, it is necessary to review both the civil and military background. The combination of economic pressures to increase airspace capacity, reduce costs, and increase safety are driving the civil sector from a ground-based analog airspace management environment toward a space-based digital solution. These changes alone would have a significant impact on Air Force aircraft and ground air traffic systems. At the same time, the Air Force is responding to U.S. government mandates to enhance navigation and safety capabilities, exploiting space-based technologies for position, velocity, and timing (PVT) information, and upgrading aircraft avionics. In addition, spaced-based PVT signals are becoming increasingly vulnerable to intentional and unintentional interference. GANS represents an acknowledgment by senior Air Force leadership that efficiencies and enhanced mission capabilities can be achieved through comprehensive integration of Air Force efforts in addressing these developments.

2.1 Civil Aviation Background

Global economic growth has resulted in rapid increases in worldwide air passenger and cargo operations. The fall of the Soviet Union, liberalization of world trade polices, increasing gross domestic product (GDP) per capita of the world's population, and the need for industrialized countries of the world to achieve competitive advantage continues to fuel rapid global economic growth.

Air travel demand is highly sensitive to changes in economic activity. Therefore, relatively small differences in overall economic growth have considerable impact on air transportation demand. World air travel is expected to increase 5-6% on average, although its geographic spread will be uneven. This 5-6% average growth per year, when projected out ten years, equates to a total compounded increase in air traffic of 70-80%.

Large increases in global air traffic operations have created enormous pressure on air transport and air traffic control service providers to maintain and enhance safety levels while increasing airspace capacity to meet air transport demands. The requirement to maintain high levels of aviation safety while continuing to increase airspace capacity impacts not only civil aviation, but also military aviation in terms of global flight operations, avionics, and supporting air traffic control infrastructure.

In recognition of the challenges to increase airspace capacity while maintaining or increasing safety, the International Civil Aviation Organization (ICAO) Special Committee on Future Air Navigation Systems (FANS) developed the FANS concept, which later became known as the CNS/ATM concept. The CNS/ATM concept is designed to overcome the limitations of terrestrial-based air traffic control systems and give aircraft operators and air traffic service providers greater flexibility to fly more efficient routes while maintaining high levels of safety and increasing airspace capacity. The concept relies on extensive use of technology such as satellite-based navigation systems, data links, automation, and new operating concepts. Although there are many CNS/ATM components, some key technologies and

operational concepts include:

- **Required Navigation Performance (RNP)**: A key part of CNS/ATM is the RNP concept that recognizes that airspace planning is dependent on measured performance rather than designed-in capability. RNP describes the minimum navigation performance accuracy necessary for operation within a defined airspace. The RNP types specify the minimum navigation performance accuracy of all the user and navigation system combinations within an airspace. Thus, RNP-10 signifies that an aircraft must be within 10 nautical miles of its cleared position (cross track and along track) 95% of the time during the duration of the flight. Worldwide progression of RNP criteria will eventually reach RNP-1 for en-route and terminal operations.

- **Reduced Vertical Separation Minimum (RVSM)**: The goal of RVSM is to reduce the vertical separation of aircraft between Flight Level (FL) 290 and FL 410, inclusive, from 2,000 feet minimum to 1,000 feet minimum in order to increase capacity. RVSM will be initially implemented in oceanic areas and transition to continental areas as more operational experience is gained.

- **Reduced Horizontal Separation Minimum (RHSM)**: RHSM increases airspace capacity by reducing lateral and longitudinal separations in oceanic airspace, initially from 100 nautical miles (NM) to 50 NM, and eventually to 30 NM. RHSM is enabled by improved navigation performance (RNP) and, in some cases, by use of data links for improved surveillance and pilot-controller communications. In addition, various reduced longitudinal separation minima are being evaluated including 7-minute and 5-minute based minima.

- **In-Trail Climb/In-Trail Descent (ITC/ITD)**. The ITC/ITD initiative uses the traffic alert and collision avoidance system (TCAS), air-to-air very high frequency (VHF) communications, and high frequency (HF) communications. ITC/ITD provides a procedural mechanism whereby an aircraft desiring an altitude climb/descent may do so with as little as 15-nm longitudinal separation from a leading aircraft. Aircraft flying behind and 2000 feet above or below the other aircraft along the same oceanic route may request a climb or descent through the altitude of the lead aircraft as long as the distance between them is 15 nm, as observed on the TCAS, and the ground speed closure rate is 20 knots or less.

- **Automatic Dependent Surveillance (ADS) and automation**: ADS is a surveillance technique in which aircraft automatically provide, via a data link, data derived from on-board navigation and position-fixing systems. Although the application of ADS does not specifically encompass air traffic control (ATC) automation or procedures, all of these elements must be tailored to support the ADS function. Therefore, it is critical to consider airborne and ground-based automation [e.g., cockpit display of traffic information (CDTI) and standard terminal automation replacement system (STARS)] and communications systems [satellite, ultra high frequency (UHF), VHF, and HF voice and data systems] as the foundation upon which ADS operations rely. Implementation of

ADS will overcome limitations found today in procedural ATC systems based on pilot-reported position reports. The introduction of air-ground data links through which ADS reports and associated messages will be transmitted, together with accurate and reliable aircraft navigation systems, is designed to improve surveillance of aircraft in oceanic, remote land, beyond-line-of-site, and continental airspace.

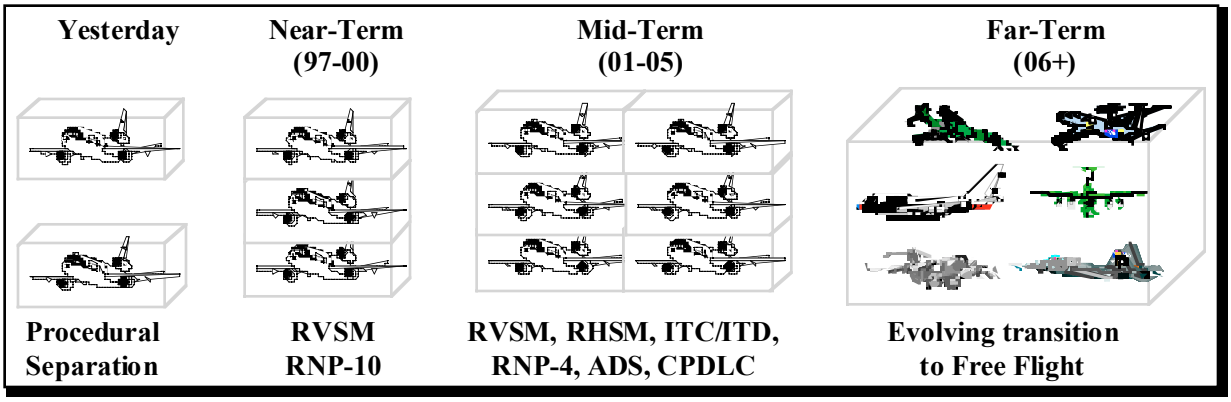
- **Controller-Pilot Data Link Communications (CPDLC)**: The CPDLC message set is designed to facilitate pilot-controller communications. It allows pilots to report their position and intent, to report emergencies, to request clearance to change altitude, speed, route, and other flight plan parameters, and to negotiate the requested changes with ground controllers.

- **Global Navigation Satellite System (GNSS)**: GNSS, based on the Global Positioning System (GPS), Global Orbiting Navigation Satellite System (GLONASS) or other systems that are not yet defined, is a key enabling technology that will provide users with the capability to navigate with a high degree of accuracy anywhere in the world. Current GNSS components include GPS, GLONASS, and Wide Area Augmentation System (WAAS). Other augmentation systems, e.g., European Geostationary Navigation Overlay System (EGNOS) and Multipurpose Transportation Satellite (MTSAT), would provide an initial worldwide capability. GNSS overcomes the limitations of current terrestrial-based navigation systems, which are limited by line-of-sight and other geographic factors (limited oceanic and remote-area coverage) and provides better navigation accuracy. The future vision of GNSS is a seamless worldwide system comprised of interoperable, regionally controlled systems made up of one or more of the current systems or their replacements. The availability of a highly accurate navigation signal is essential in order for the CNS/ATM concept to reach its full potential.

- **Free Flight**: Free flight is a concept that is currently being defined and explored (explained in greater detail in *Final Report of RTCA Task Force 3: Free Flight Implementation*). It includes the application of user-preferred trajectory definitions (with little or no restrictions on changes to flight plans) to capture wind efficient tracks or flight profiles. The concept entails flexibility in horizontal and vertical dimensions, given a flight path free of conflict or with known resolvable conflicts. The Federal Aviation Administration's (FAAs) Flight 2000 Program will transfer the free flight concept to a real operational setting and conduct a complete operational system evaluation prior to National Airspace System (NAS)-wide deployment.

Exhibit 2-1 Evolving Airspace Structure

Exhibit 2-1 depicts the evolving airspace structure based on the CNS/ATM concept.


Yesterday
Near-Term
(97-00)
Mid-Term
(01-05)
Far-Term
(06+)
Procedural
Separation
RVSM
RNP-10
RVSM, RHSM, ITC/ITD,
RNP-4, ADS, CPDLC
Evolving transition
to Free Flight

Although ICAO CNS/ATM implementation plans are global, it is the responsibility of ICAO member States to develop their own implementation plans. ICAO has stated that global CNS/ATM implementation will most likely occur on a regional basis due to unique regional circumstances, including: geographic factors, air traffic growth rates, and the ability of States in the region to finance CNS/ATM infrastructure. For example, user groups in the Pacific have urgent needs to implement CNS/ATM in order to increase airspace capacity in a region experiencing high air traffic growth rates due to the expanding regional economies. Financial considerations will determine the speed at which the nations of the Pacific region will implement CNS/ATM. This is in contrast to Africa, which, although it has vastly remote land areas with very limited air traffic control coverage, has a very low rate of air traffic growth, and lacks the ability to finance CNS/ATM infrastructure development. Additionally, some regions may have unique problems, which require implementation of regional-specific CNS/ATM solutions. This is evident in Europe in the form of the 8.33-kilohertz (kHz) VHF radio, protected instrument landing system (ILS) receiver, and microwave landing system (MLS). Therefore, although CNS/ATM implementation is planned globally, implementation will most likely continue to occur regionally, and each region, such as Europe, may have special circumstances that warrant unique solutions.

Regional CNS/ATM implementation implies several challenges for the various user groups. Users must maintain their ability to operate using present systems while upgrading to CNS/ATM capability–for which not all technical and procedural standards have been fully developed, such as data link, free flight operating procedures, and other factors. This means that users must make decisions concerning operational and cost impacts based on subjective data (e.g., when will CNS/ATM standards be fully developed, in what regions, and what schedule) as well as known, quantifiable data. These factors, compounded with special regionalized CNS/ATM requirements, such as the 8.33 kHz VHF radio in Europe, present significant implementation challenges for user groups. This is especially true for Air Force which has a global mission and cannot, in most cases, regionalize the fleet like the airlines, but must adapt to the highest denominator.

The Air Force must accomplish civil airspace access planning within the Planning, Programming, and Budgeting System (PPBS) structure. The PPBS process, at times, is not able to plan for and implement CNS/ATM solutions as rapidly as global CNS/ATM architectures evolve. Therefore, the Air Force must not only react to the rapidly changing CNS/ATM environment, but must also be proactive by trying to influence CNS/ATM requirements as they develop in formal and informal ICAO and other working groups, and through the DoD Policy Board on Federal Aviation (PBFA) process.

2.2 Air Force Background

In early 1997, the Commander of Air Force Material Command (AFMC) recommended that the Air Staff take an integrated look at all navigation and safety-related requirements. At that time several concurrent programs and initiatives were underway. On April 6, 1997, the Vice Chief of Staff of the Air Force (AF/CV) released a message announcing an effort to consolidate

requirements, streamline acquisition execution, and provide oversight of seven closely related programs and initiatives including:

- **Global Air Traffic Management (GATM):** GATM is the initiative that provides DoD aircraft with the CNS/ATM capabilities required to operate in airspace where new separation standards and ATM procedures are implemented by civil authorities.

- **Navigation and Safety Equipment (Nav/Safety):** The Navigation and Safety Equipment Master Plan for Passenger-Carrying Aircraft is the Air Force's response to the 1996 SECDEF mandate to enhance navigation and flight safety capabilities for passenger capable aircraft. In addition to this mandate, the Air Force continues to evaluate mission requirements for enhanced navigation and safety capability for all aircraft.

- **GPS Project 2000/2005 (GPS 2000/2005):** In 1993, Congress directed that all DoD aircraft, ships, armored vehicles and indirect fire weapon systems be equipped with GPS by September 30, 2000 with the following language:

  > "Limitation on procurement of systems not GPS-equipped: After September 30, 2000, funds may not be obligated to modify or procure any Department of Defense aircraft, ship, armored vehicle, or indirect-fire weapon system that is not equipped with a Global Positioning System receiver." - H 9194, 10 November 1993

  The National Defense Authorization Act for Fiscal Year 1999 extended the deadline to 2005. GPS 2000, now GPS 2000/2005, is DoD's response to this congressional direction. GPS is being integrated into over forty different USAF aircraft types.

- **GPS Modernization/Navigation Warfare (NavWar) Program:** GPS modernization is focused on eight "enduring principles": 1) improved accuracy, 2) security, 3) denial and signal fratricide management, 4) backward compatibility, 5) civil interoperability, 6) integrity, 7) user friendliness, and 8) capable of wartime operations. NavWar has three objectives: protect U.S. and Allied forces ability to operate with GPS in an area of operations (AOO), prevent adversary forces use of satellite navigation and its associated augmentations in the AOO, and minimize the impact to civilian and commercial GPS users outside the AOO. A NavWar capability is scheduled to be fully operational by 2006 to support the presidential decision to set Selective Availability (S/A) to zero in that year.

- **The Joint Precision Approach and Landing System (JPALS) Program:** JPALS is the DoD effort to acquire a rapidly deployable, interoperable precision approach and landing system to enhance warfighter capability (on land and at sea) during adverse weather conditions. JPALS avionics equipment must allow any aircraft the capability for precision approach and landing to all required mission locations, including locations where only civil systems are provided or mandated for use by host nation agreements.

JPALS equipped airfields shall support landing of all Service aircraft, as well as civil aircraft supporting military operations at locations where civil aircraft are supported.

- **Military ground-based Air Traffic Control and Landing Systems (ATCALS) and Deployable Air Traffic Control and Landing Systems (DATCALS):** ATCALS is designed to upgrade and modernize ground-based Air Force air traffic facilities. These facilities include radar approach controls (RAPCONs), air traffic control towers (ATCTs), navigation aids (NAVAIDs), and approach aids. DoD is participating with the FAA to upgrade the voice switches, radars, and automation systems comprising ATCALS. DATCALS functionality is similar to fixed-based air traffic control facilities but, are primarily designed for, and used to support deployable, contingency, and wartime operational requirements.

- **Various avionics modernization programs:** Avionics modernization enhances the mission capability of Air Force aircraft. Ongoing and planned avionics modernization efforts will be integrated with GANS-related modernization where feasible.

The seven GANS components provide capabilities required to execute the Air Force mission–they directly support Air Force core competencies. Exhibit 2-2 shows the capabilities that GANS-related programs bring to support Global Engagement.

Exhibit 2-2 GANS enables capabilities that are critical to Global Engagement

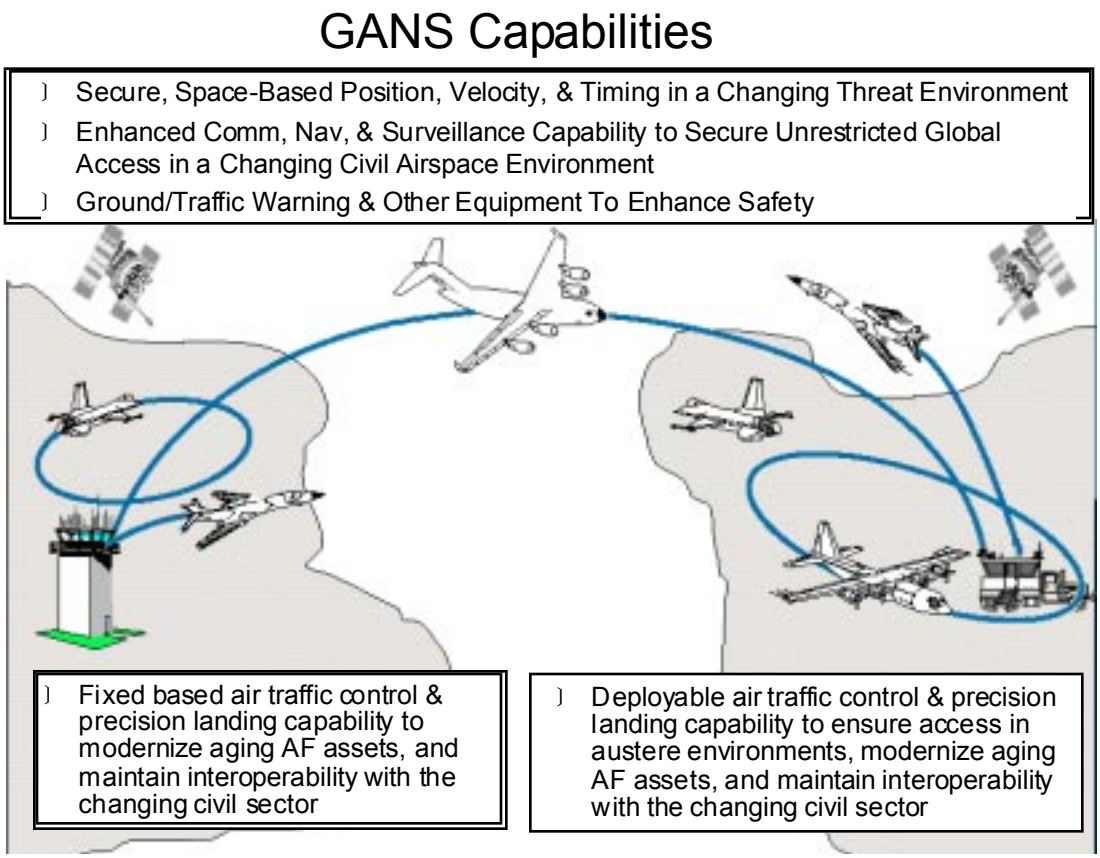


Exhibit 2-3 shows the direct relationship between GANS-related capabilities and Air Force core competencies in three areas: day-to-day training (T), contingency deployment (D), and mission execution (E).

Exhibit 2-3 Direct Relationship Between GANS-Related Capabilities and AF Core Competencies.

GANS Enables and Supports Air Force Core Competencies							
	GATM	**Nav/Safety**	**GPS 2000/2005**	**GPS UE MODERN-IZATION/ NavWar**	**JPALS**	**ATCALS/ DATCALS**	**Avionics Mods**
	Comm, nav, surveillance capability to comply with emerging civil airspace architecture	Ground/traffic warning systems, other safety equipment, and GPS navigation	Space-based position, velocity, and timing	Improved accuracy, security, denial and signal fratricide management, backward compatibility, civil interoperability, integrity, user friendliness, capable of wartime operations	Enhanced deployable precision landing capability	Fixed-based and deployable air traffic control capabilities, interoperable with the civil environment	Enhanced mission performance, reliability/ maintainability, facilitates aircrew workload
Air and Space Superiority	T, D		T,D,E	T,D,E	T,D,E	T,D,E	T,D,E
Global Attack	T, D, E		T,D,E	T,D,E	T,D,E	T,D,E	T,D,E
Rapid Global Mobility	T, D, E	T, D, E	T, D, E	T, D, E	T, D, E	T, D, E	T, D, E
Precision Engagement	T, D		T, D, E	T, D, E	T, D, E	T, D, E	T, D, E
Information Superiority	T, D, E		T, D, E	T, D, E	T, D, E	T, D, E	T, D, E
Agile Combat Support	T, D, E	T, D, E	T, D, E	T, D, E	T, D, E	T, D, E	T, D, E

In addition to these direct benefits, the indirect benefits of GANS-related capabilities and the GANS management philosophy include preserving combat capability by enhancing peacetime flight safety and smart use of scarce modernization dollars through consolidation and synchronization, where possible.

GANS was established to provide an umbrella management tool and acquisition strategy for these seven programs and initiatives, and to serve as the focal point for Air Force requirements, acquisition, and funding policy recommendations. The seven GANS programs and initiatives are closely related, and in some cases address overlapping requirements.

However, each is different enough to make the GANS task particularly challenging. Some of the differences include:

- Differences in timing: Each program and initiative is on a different fielding timeline, which complicates synchronization efforts.
- Differences in focus: GATM, Nav/Safety, JPALS, and ATCALS are entirely focused on global access, navigation, and safety, while the focus for GPS, NavWar, and avionics modernization extend beyond airspace access issues.
- Differences in mandates: Nav/Safety is SECDEF directed, GPS 2000/2005 is congressionally directed, NavWar is derived from presidential direction. GATM, ATCALS/DATCALS, JPALS, and avionics modernization were driven through the standard requirements generation process.
- Differences in program management structure: Both GPS and JPALS have their own joint program management structures. ATCALS has an AF program management structure. Platform managers and the GATO/MC2 SPO have a shared responsibility for GATM and Nav/Safety.
- Differences in mission impact: Installation of GANS-related capabilities will be executed at the platform level. Each platform has a different starting equipment baseline and civil access criteria will have different mission impacts for different aircraft categories (e.g., fighter, airlift, trainer).

An IPT structure, consisting of an I-IPT and four W-IPTs, manages the GANS effort. The W-IPTs are tasked to accomplish a total review and definition of GANS-related requirements. W-IPTs are tasked to work with the Major Commands (MAJCOMs) to assess aircraft and system integration requirements, develop cost estimates, determine fielding timelines, and develop prioritized budget initiatives.

The GANS acquisition structure consists of the Air Force Program Executive Officer/Airlift and Trainers (PEO/AT), who is the Air Force acquisition execution lead for GATM, Nav/Safety, JPALS, and ATCALS/DATCALS. The Space and Missile Center Commander (SMC/CC) is the acquisition execution lead for GPS/NavWar. Various AFMC organizations are responsible for cockpit avionics modernization. The basis for the GANS acquisition strategy lies with Electronic Systems Center's (ESCs) Global Air Traffic Operations/Mobility Command and Control Systems Program Office (GATO/MC2 SPO) and the GPS Joint Program Office (JPO). Platform single managers, the GATO/MC2 SPO, and the GPS JPO must work together in field execution of GANS-related programs. The relationship between the GATO/MC2 SPO, the platform single managers, and the GPS/JPO is a critical to the GANS acquisition strategy. Section 4.0 describes GANS organizational structure and processes.

The following section describes civil airspace architecture developments and GANS programs and initiatives in greater detail and provides roadmaps and strategies that support the goals and objectives of the GANS effort.

3.0 ROADMAPS

This section contains three groups of roadmaps:

- Civil airspace architecture developments and implementation timelines;
- GANS timelines and strategies from a program perspective; and
- GANS portrayed from a platform category perspective.

Taken together, the roadmaps present a picture of where the civil airspace environment is headed, how the Air Force plans to upgrade its aircraft and ground air traffic control systems for seamless global operations, and how these upgrades can be implemented in the most effective and efficient manner.

3.1 CIVIL AIRSPACE ARCHITECTURE ROADMAP

CNS/ATM is undergoing a phased implementation where the greatest benefits can be achieved in the shortest time period. Current status of CNS/ATM developments by ICAO region and a description of CNS/ATM systems and concepts are contained in Appendix A. This phased implementation is occurring first over oceanic regions, where airspace capacity and flexibility can be greatly increased due to satellite-based technology such as GPS and data link communications. These space-based technologies provide increased air traffic management capabilities where only lesser capabilities, such as pilot voice position reports, previously existed. In continental airspace, CNS/ATM is being implemented on a regional basis depending on the urgency of the need for enhanced capacity. The accuracy of satellite navigation coupled with a real-time data link and certain other aircraft systems can provide increased capacity, airspace flexibility, and enhanced safety over land areas currently relying on less accurate ground-based navigation aids. The terminal area can achieve benefits in the far-term as CNS/ATM technology continues to evolve. The use of CNS/ATM technology can increase terminal airspace capacity and increase flight safety through improved airport surveillance of flight and ground operations. Exhibits 3-1 through 3-4 illustrate current and evolving future oceanic, continental, and terminal airspace environments.

Because the CNS/ATM architecture is still evolving, not all requirements are firm. In general, near term requirements (1998-2000) have firm implementation timelines. Mid-term requirements (2000-2005) are firm; however, implementation timelines may change due to variable factors which affect implementation, such as development of standards, operating procedures, and regional needs (e.g., transition from near-term Future Air Navigation System (FANS)-1 data link standards to mid-term CNS/ATM-1 standards). The far-term requirements (2005+) are still evolving. ICAO standards, specifications and operating procedures are still being determined by government and industry groups through the ICAO process. Exhibits 3-5 through 3-8 provide roadmaps which illustrates the phased CNS/ATM implementation.

Exhibit 3-1 Current Oceanic Airspace Environments

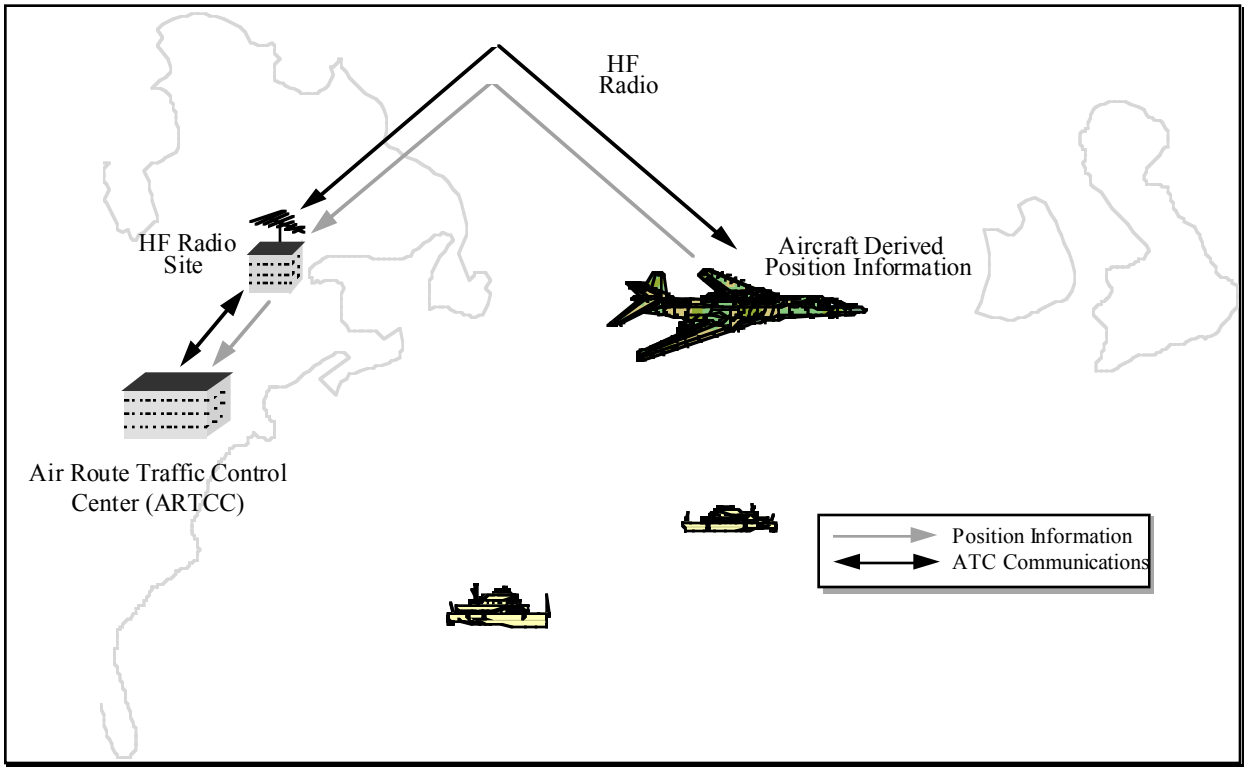


Exhibit 3-2 Evolving (Future) Oceanic Airspace Environment

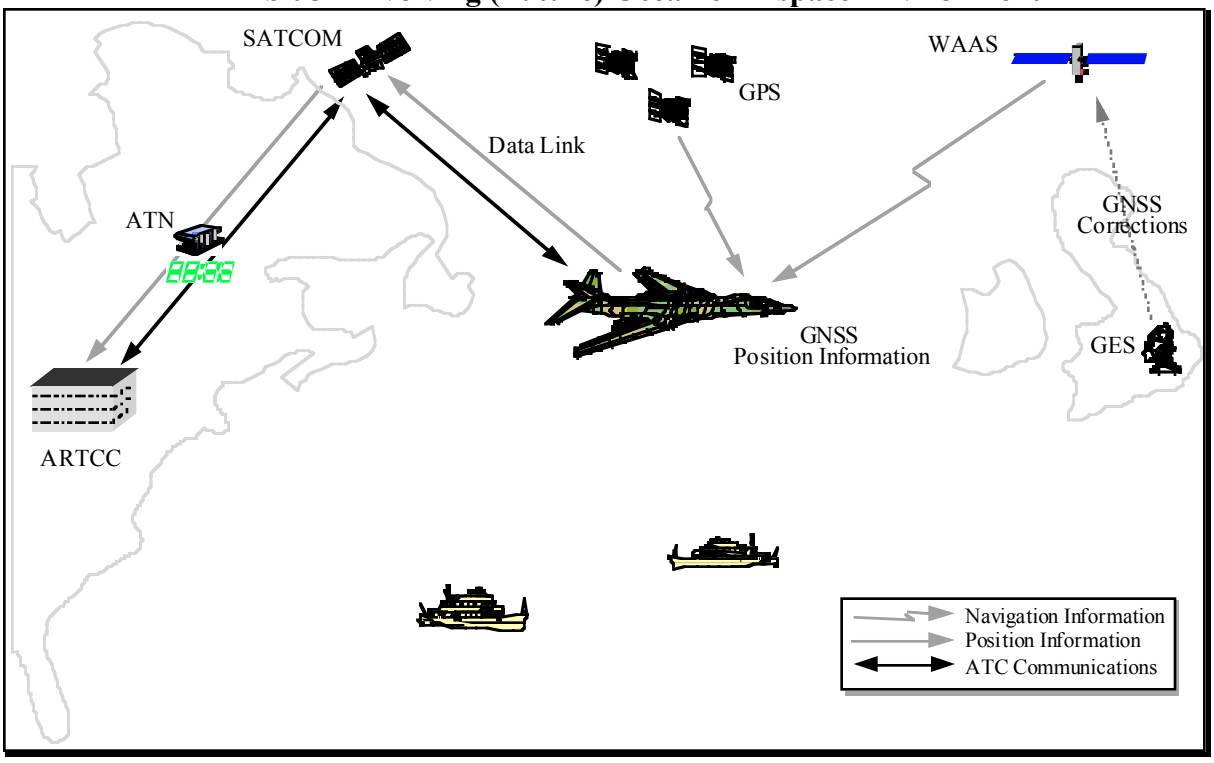


Exhibit 3-3 Current Continental and Terminal Airspace Environment

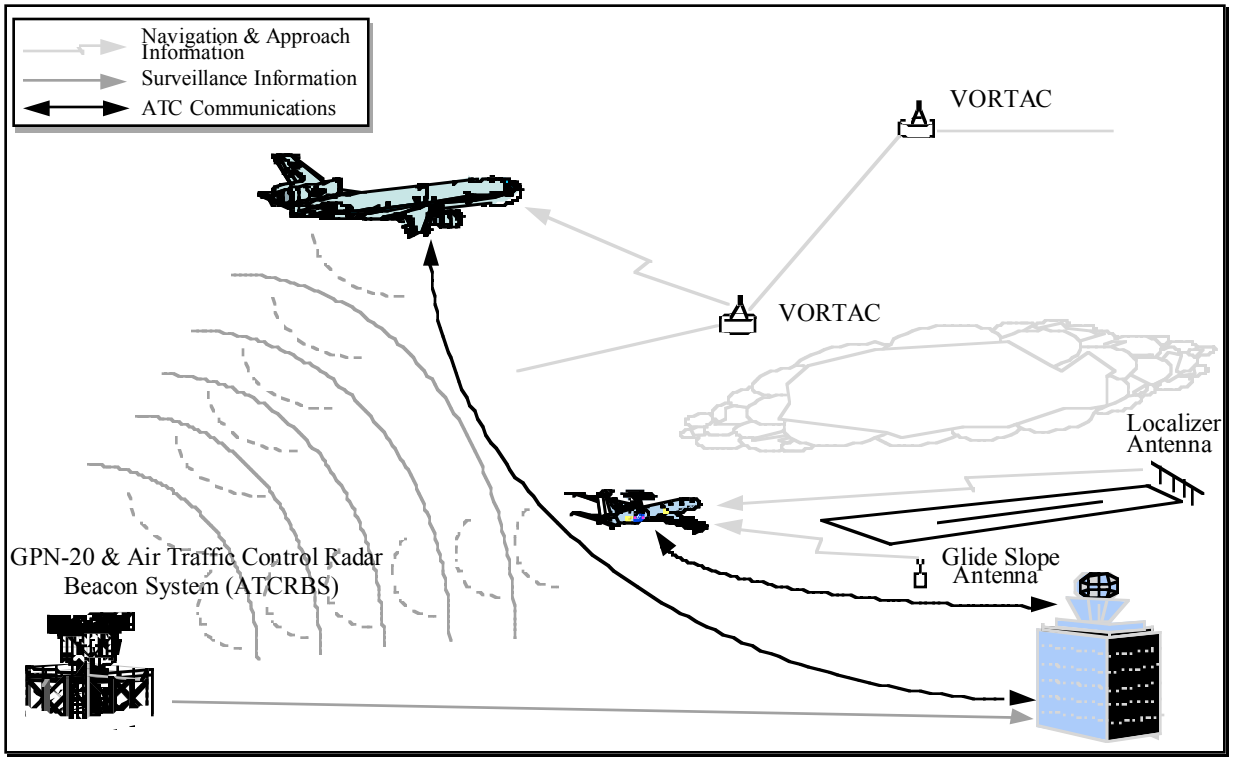


Exhibit 3-4 Evolving (Future) Continental and Terminal Airspace Environment

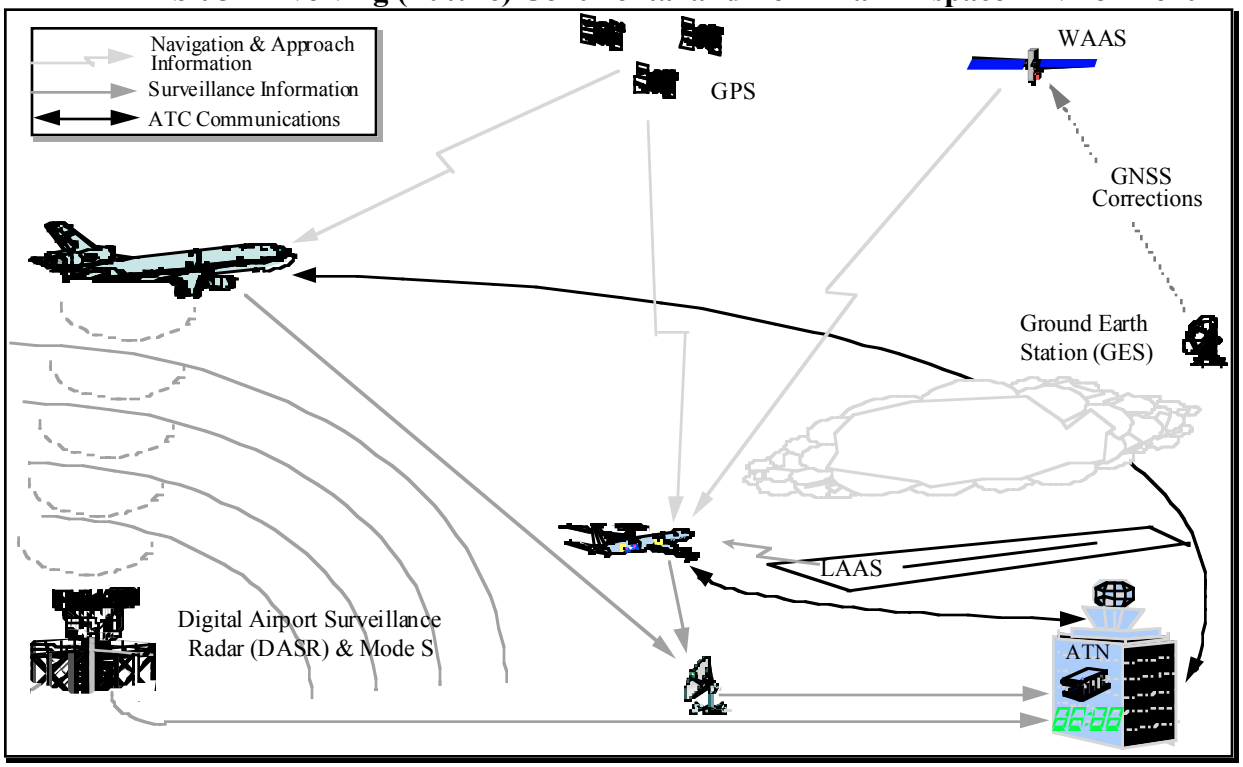


Exhibit 3-5 Near-Term Requirements

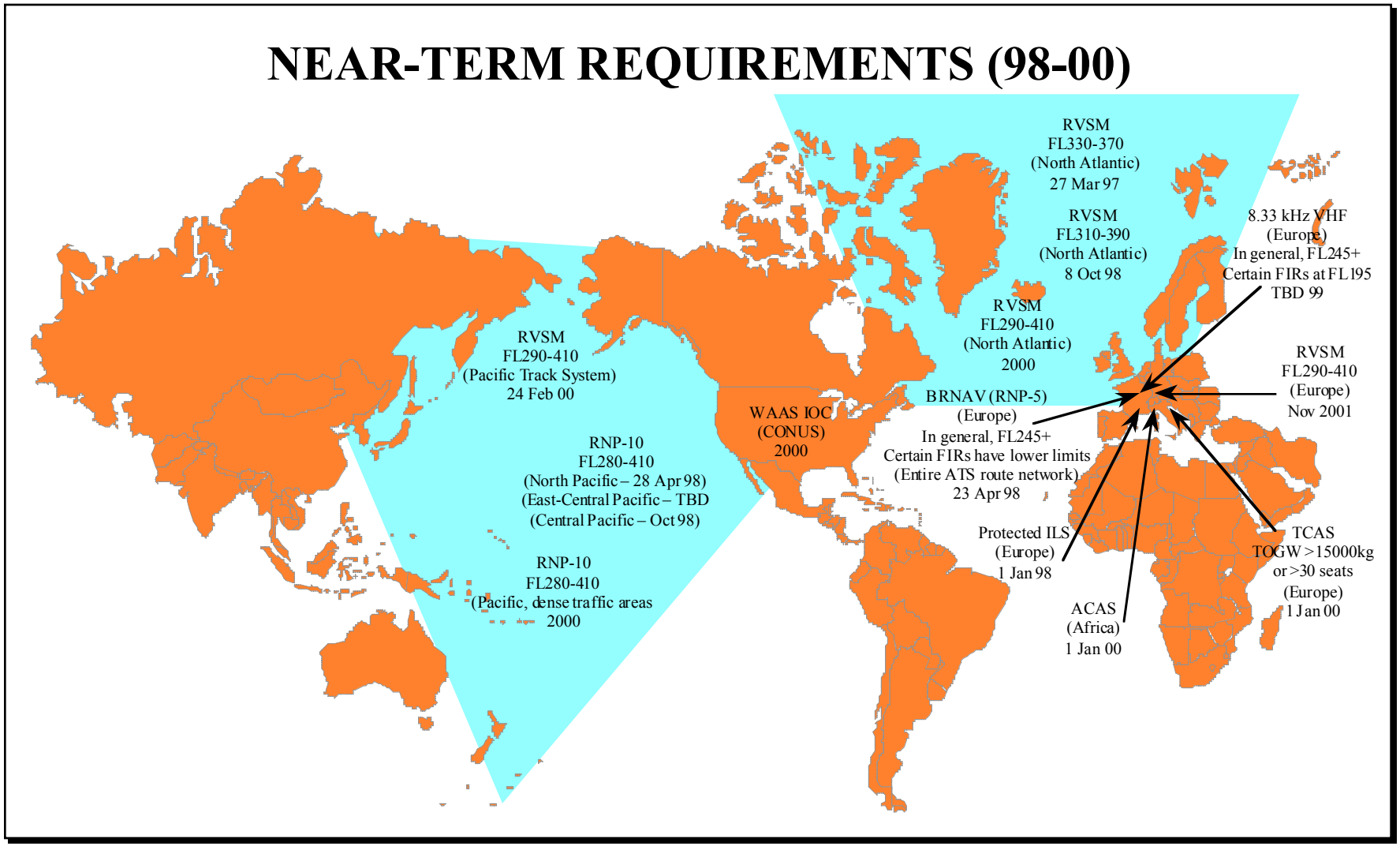


Exhibit 3-6 Mid-Term Requirements

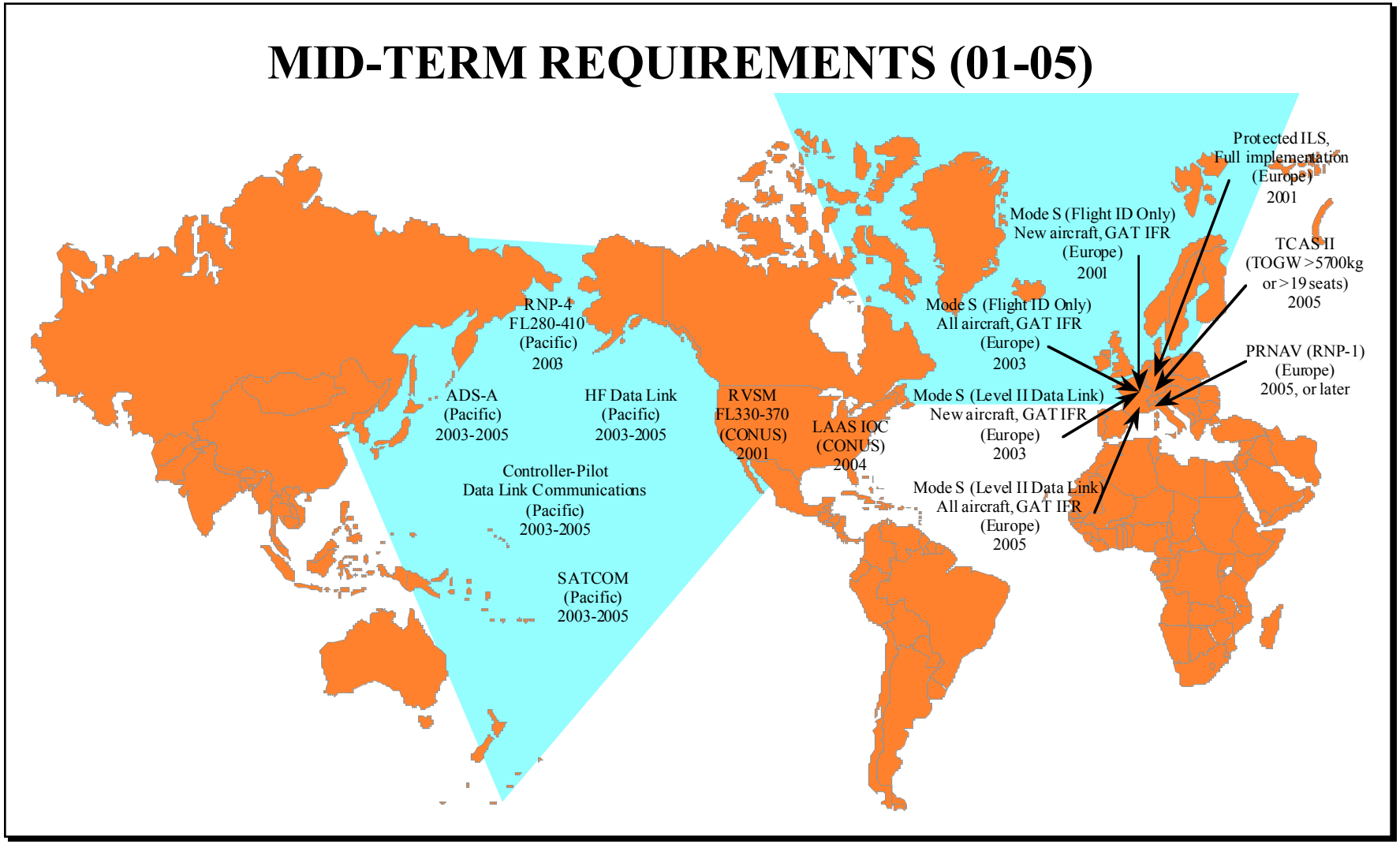


Exhibit 3-7 Far-Term Requirements

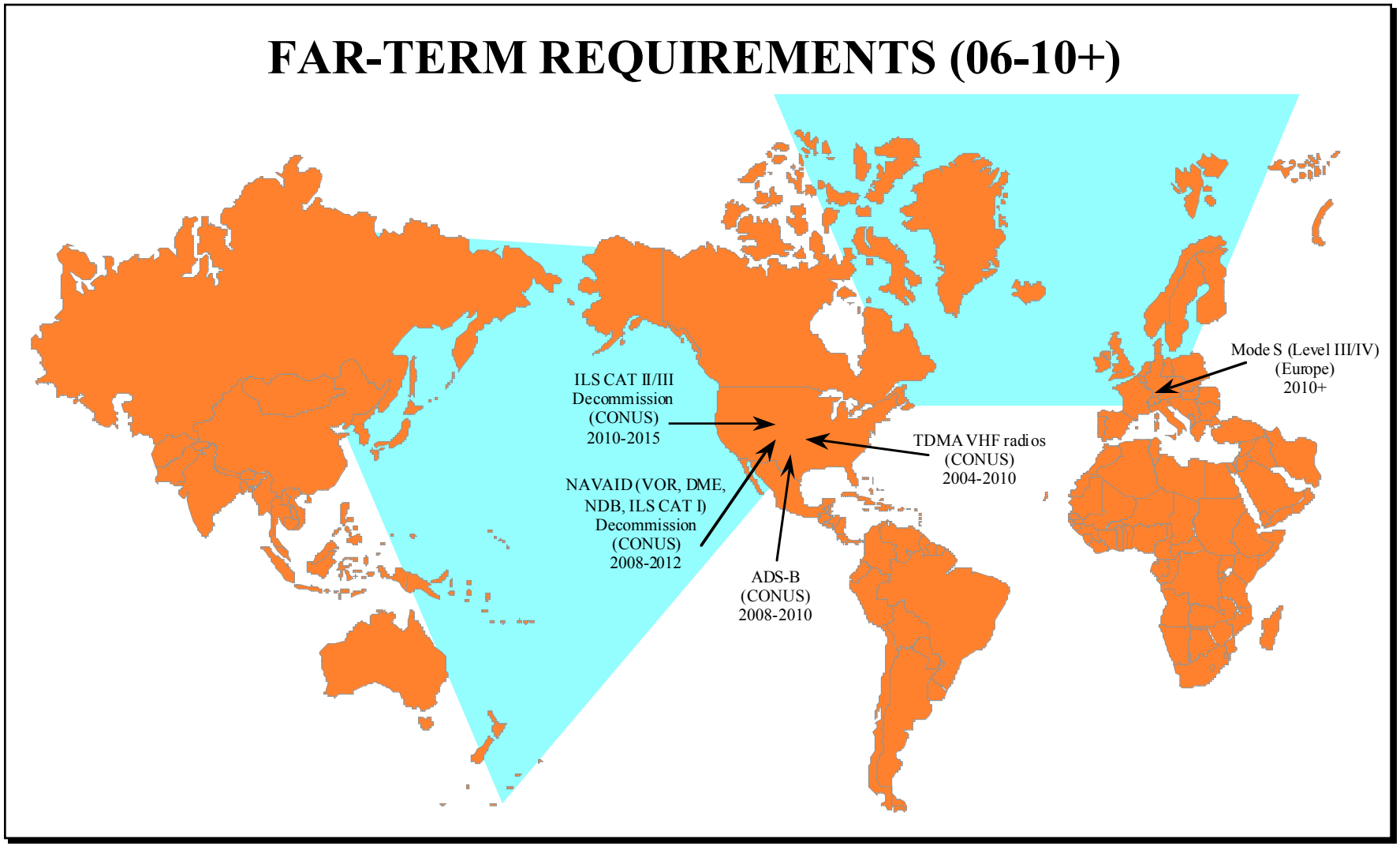
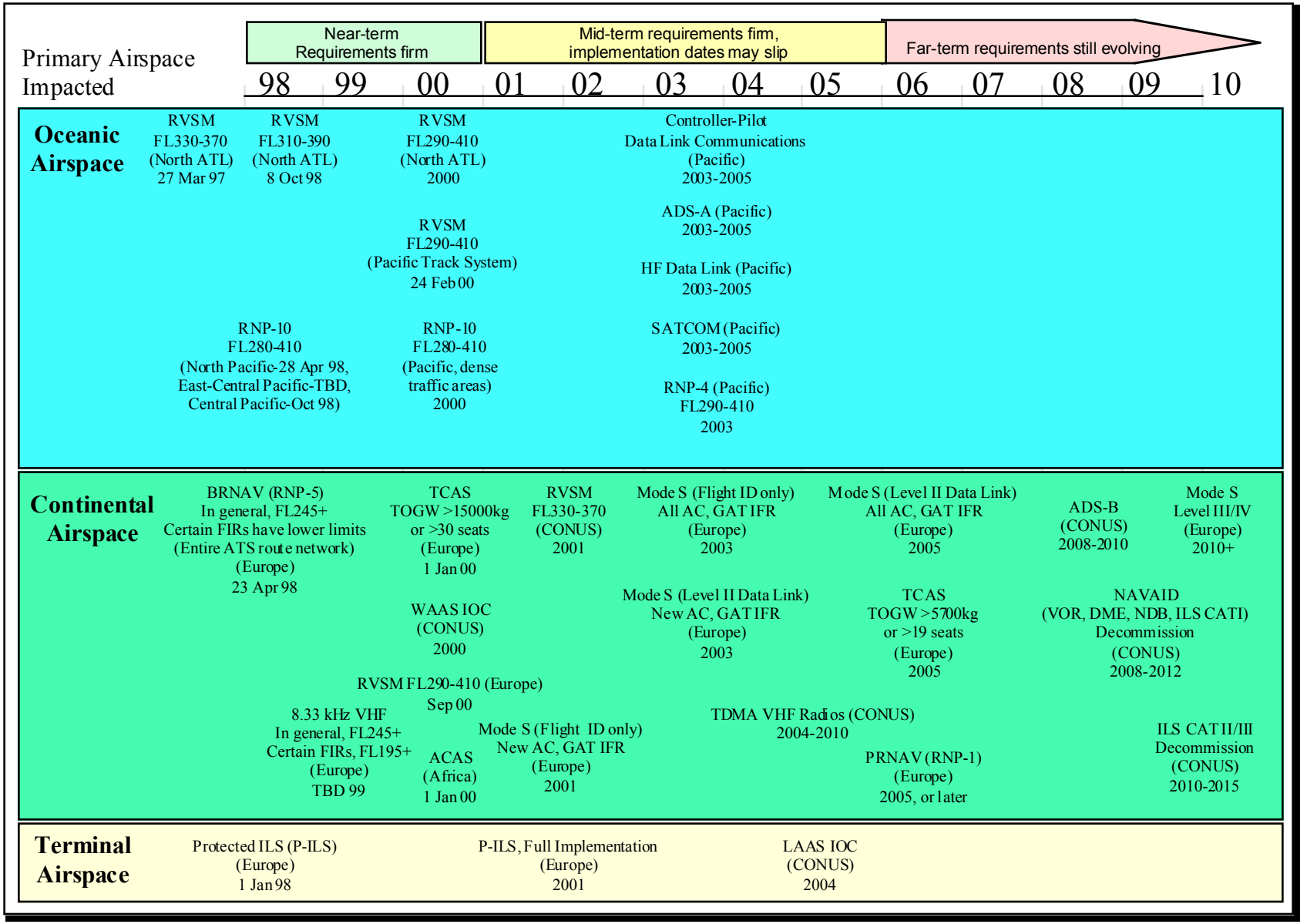


Exhibit 3-8 CNS/ATM Roadmap



3.1.1 Risks

In general, the USAF, unlike the commercial air carriers, does not have the luxury of regionalizing its fleet. Many USAF aircraft not affected by international airspace access mandates on a daily basis must still conform to the most restrictive global airspace access criteria. This conformity is necessary for aircraft to support their peacetime and wartime global mobility and power projection requirements. Given the evolving nature of CNS/ATM, regional implementation patterns, and level of uncertainty in some mid- and far-term requirements, the Air Force faces some degree of risk as it plans to operate in tomorrow's airspace environment. Risks include:

- Exclusion from certain types of airspace resulting from not equipping aircraft adequately for airspace where RVSM, RNP, or 8.33 kHz VHF operations have been implemented
- Adverse mission impacts and higher operating costs from flying less efficient air routes
- Cost to upgrade from near-term installation of CNS/ATM systems whose final standards have not yet been fully developed (e.g., upgrading FANS-1 communications equipment to CNS/ATM-1 standards)
- Mission disruption from intentional/unintentional GPS interference, as well as other information warfare threats.

3.1.2 Opportunities

Opportunities exist for the Air Force to influence some mid- and far-term CNS/ATM developments. The formal DoD PBFA input to the Interagency Group on International Aviation (IGIA) is one method of attempting to influence civil aviation requirements. However, the PBFA/IGIA process is also the final opportunity. A higher probability of success may be achieved through AF participation as part of the U.S. delegation in ICAO working and regional planning groups, and through informal working groups early in the CNS/ATM requirements development process. A goal of this Strategic Management Plan is to enhance Air Force interaction with FAA, ICAO, Informal CNS/ATM Working Groups, and industry to improve high-level and working group interaction on technical and operational issues. A more detailed discussion of Air Force interaction with the civil CNS/ATM requirements process is contained in Section 4.0 of this document.

Each GANS program and/or initiative can be linked to specific CNS/ATM requirements and ongoing developments. The following section describes the GANS programs and initiatives and provides the Air Force avionics modernization strategy and timelines for meeting current and evolving GANS requirements.

3.2 GANS PROGRAM/INITIATIVE ROADMAPS

This section provides a broad overview of each GANS program and initiative and describe the current Air Force strategy to harmonize and synchronize each program and initiative from a GANS perspective.

Two charts accompany each program description. The first provides a broad overview, including a brief description, a listing of associated equipment, an indication of how the program or initiative overlaps with other GANS components, a GANS strategy, and a timeline. The second chart highlights the program/initiative implementation timeline and GANS strategy. As additional programs are covered, the second chart builds upon the previous information and eventually shows all of the program/initiative timelines and accompanying strategies.

3.2.1 GATM Strategy

GATM is an initiative to support military aviation operations in civil-controlled airspace. The Air Force is approaching GATM in two phases in recognition of external civil implementation schedules and differences in military mission requirements by type aircraft. The initial focus will be on those aircraft that frequently operate in international, civil-controlled airspace and will be most impacted by CNS/ATM developments in oceanic and upper European airspace in the 2000-2005 time frame. A GATM Capstone Requirements Document (CRD I) addresses these immediate GATM requirements for airlifters, tankers, operational support, distinguished visitor (DV), aeromedical evacuation, and special use platforms.

Follow-on GATM actions will be governed by CRD II. CRD II will address tactical aircraft, bombers, trainers, and other aircraft not covered by CRD I. The GATM CRDs will serve as the basis for development of platform-specific requirements documentation, such as Operational Requirements Documents (ORDs) and AF 1067s. Requirements for those aircraft covered by CRD II are expected to be identified by 2000. The platform-specific requirements documents will be the defining acquisition documents for GATM systems development and testing.

Appendix A includes a high-level description of each of the current GATM components. Individual CNS/ATM components become increasingly more integrated from a systems perspective starting in the FY 03 time frame when RNP-4 begins implementation in oceanic airspace. A CNS capability (RNP-4, ADS, and CPDLC) that allows access to reduced-separation oceanic airspace, is the initial GATM objective for CRD I aircraft. As the civil access criteria evolve, any new military requirements will be updated in revisions to the GATM CRD. Air Force MAJCOMs will translate these new civil developments into operational requirements for their particular aircraft based on mission assessment.

One of the new concepts of CNS/ATM is the idea of required system performance (RSP). The intent is to describe the system performance necessary for operation in specific airspace rather than mandate carriage of specific avionics. The required performance concept offers DoD the possibility of meeting GATM requirements, particularly for tactical aircraft, by leveraging military-specific navigation and communication capabilities already on DoD aircraft. Until RSP

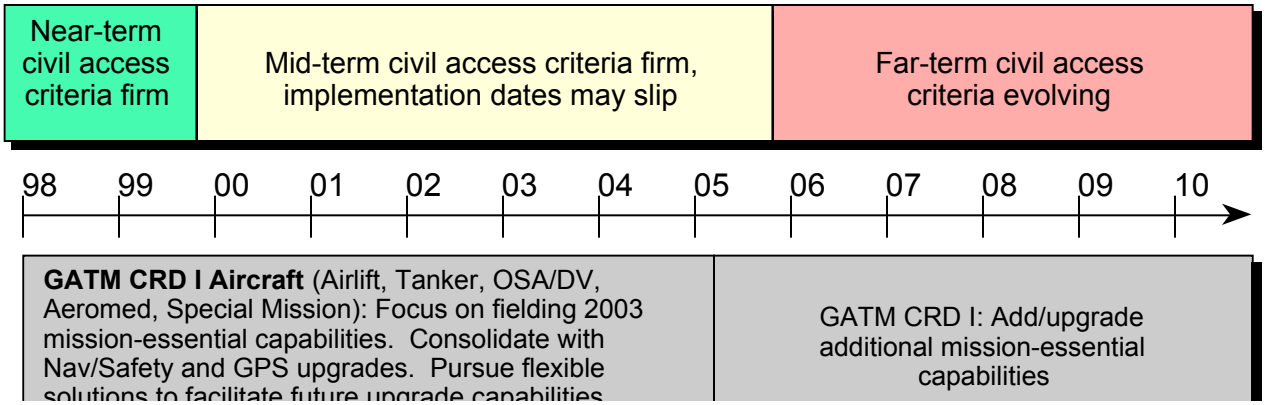
is fully defined, however, the implementation of new CNS/ATM systems is still, in many cases, defined in terms of specific hardware/software solutions.

GATM has common or similar requirements with several other GANS programs. Appendix B contains a matrix of all GANS-related requirements and is designed to show program/initiative overlap. Exhibit 3-9 contains a brief GATM description, a summary of current GATM components, identifies overlap of GATM requirements with other GANS programs and initiatives, and depicts the GANS management strategy for GATM, and the GATM timeline. Exhibit 3-10 shows the preliminary GATM installation timeline and the GANS management strategy for GATM.

Exhibit 3-9 GATM and GANS Strategy Overview

GATM Description	Current GATM Equipment Components
GATM is the DoD program to meet civil aviation requirements. GATM encompasses the CNS/ATM capabilities required to operate within the evolving air traffic environment. Current GATM capabilities include: ▪ Required Navigation Performance (RNP) Capability ▪ Reduced Vertical Separation Minima (RVSM) Capability ▪ Area Navigation (RNAV) Capability ▪ Controller-Pilot Data Link Communications (CPDLC)	• 8.33 kHz radio ▪ VHF data link ▪ HF data link ▪ Satellite communications (SATCOM) ▪ Communications Management Unit (CMU) ▪ NavWar-capable GPS ▪ Protected ILS ▪ Automatic Dependent Surveillance (ADS) ▪ TCAS [also referred to as Airborne Collision Avoidance System (ACAS) in the international community] ▪ Flight Management System (FMS) ▪ Multi-Mode Receiver (MMR)
Overlapping GA	
• GPS 2000/2005: GPS receiver • GPS Modernization/NavWar: GRAM-SAASM compliant GPS receiver • JPALS: Precision Landing System Receiver (PLSR) - (GRAM-SAASM compliant GPS receiver, ILS, MMR) • Nav/Safety: GPS receiver, TCAS, ILS, RNAV, Mode S • ATCALS: Data Link, 8.33 kHz VHF, CMU, SATCOM, CPDLC	**CRD I Aircraft**: Focus on 2003 capabilities, consolidate with Nav/Safety and GPS upgrades. Pursue flexible solutions to facilitate upgrade for future capabilities (CNS/ATM, JPALS, GPS /NavWar). **CRD II Aircraft**: Conduct operational impact and technical integration studies. Leverage existing and planned military-specific navigation and C4ISR capabilities (e.g., Inertial Navigation System (INS), Joint Tactical Information Distribution System (JTIDS))

Exhibit 3-10 GATM Strategy and GANS Timeline



3.2.2 Nav/Safety Strategy

The Air Force continually evaluates mission requirements for enhanced navigation and safety capability for all aircraft. The Navigation and Safety Equipment Master Plan for DoD Passenger Carrying Aircraft, published in August 1996, establishes a common navigation and safety equipment baseline (with recommended exceptions) and contains the Nav/Safety roadmap for passenger and troop carrying aircraft. The plan is a direct result of a SECDEF mandate to install enhanced safety equipment on 89 Airlift Wing, distinguished visitor, and operational support aircraft (OSA); accelerate GPS installations on all passenger capable aircraft; and plan for the installation of enhanced safety equipment on other passenger and troop carrying aircraft.

Nav/Safety modifications are being pursued in two phases. Phase I installs all of the equipment on the executive fleet [DV, 89 Air Wing (AW), OSA] and installs GPS receivers on all passenger/troop carrying aircraft. Phase II installs all the equipment (except GPS covered under Phase I) on remaining passenger carrying aircraft.

The Nav/Safety plan preceded GATM CRD I, and the overlap between requirements for the two initiatives was one of the primary factors that drove the establishment of the GANS structure. The Nav/Safety plan recommends installing equipment which currently meets or has the upgradability to meet emerging CNS/ATM requirements. Where platform timelines permit, GATM and Nav/Safety modifications are being integrated. Nav/Safety enhancements for non-passenger carrying aircraft will continue to be evaluated by the operating commands as part of the GANS process.

Exhibit 3-11 contains a brief Nav/Safety description, a summary of Nav/Safety components, identifies overlap of Nav/Safety requirements with other GANS programs and initiatives, and depicts the GANS management strategy for Nav/Safety, and the Nav/Safety timeline. Exhibit 3-12 shows the Nav/Safety installation timeline and GANS management strategy overlaid with the same information for GATM.

Exhibit 3-11 Nav/Safety and GANS Strategy Overview

Nav/Safety Description	Equipment Components	
SECDEF and CSAF mandated program to enhance navigation and safety capabilities for DoD passenger and troop carrying aircraft. • Phase 1 installs all equipment on executive fleet and GPS receivers on all passenger carrying aircraft. • Phase 2 installs all remaining equipment on remaining passenger and troop carrying aircraft. • Nav/Safety enhancements for non-passenger carrying aircraft will continue to be evaluated by the operating commands as part of the GANS process.	• NavWar–capable GPS Receiver • Weather Radar • Flight Data Recorder (FDR) • Cockpit Voice Recorder (CVR) • TCAS • CPDLC • Windshear • RNAV • Emergency Locator Transmitter (ELT)	• Mode S • VOR/DME • ILS • NDB • RVSM • TACAN

	• Terrain Awareness and Warning System (TAWS)
Overlapping GANS Requirements	**GANS Strategy**
• GPS 2000/2005: GPS receiver • GPS UE mod/NavWar: GRAM-SAASM compliant GPS receiver • JPALS: PLSR (GRAM-SAASM compliant GPS receiver, ILS) • GATM: GRAM-SAASM compliant GPS receiver RNAV, TCAS, Protected ILS, Mode S • ATCALS: TACAN	All navigation and safety systems should currently meet or have the upgradeability to meet emerging CNS/ATM requirements. Where platform timelines permit, GATM and Nav/Safety modifications are being integrated.

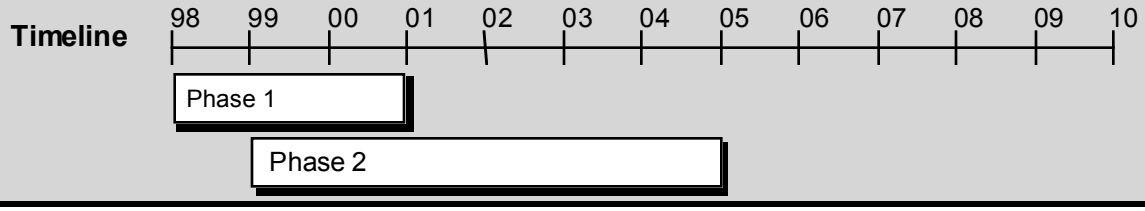
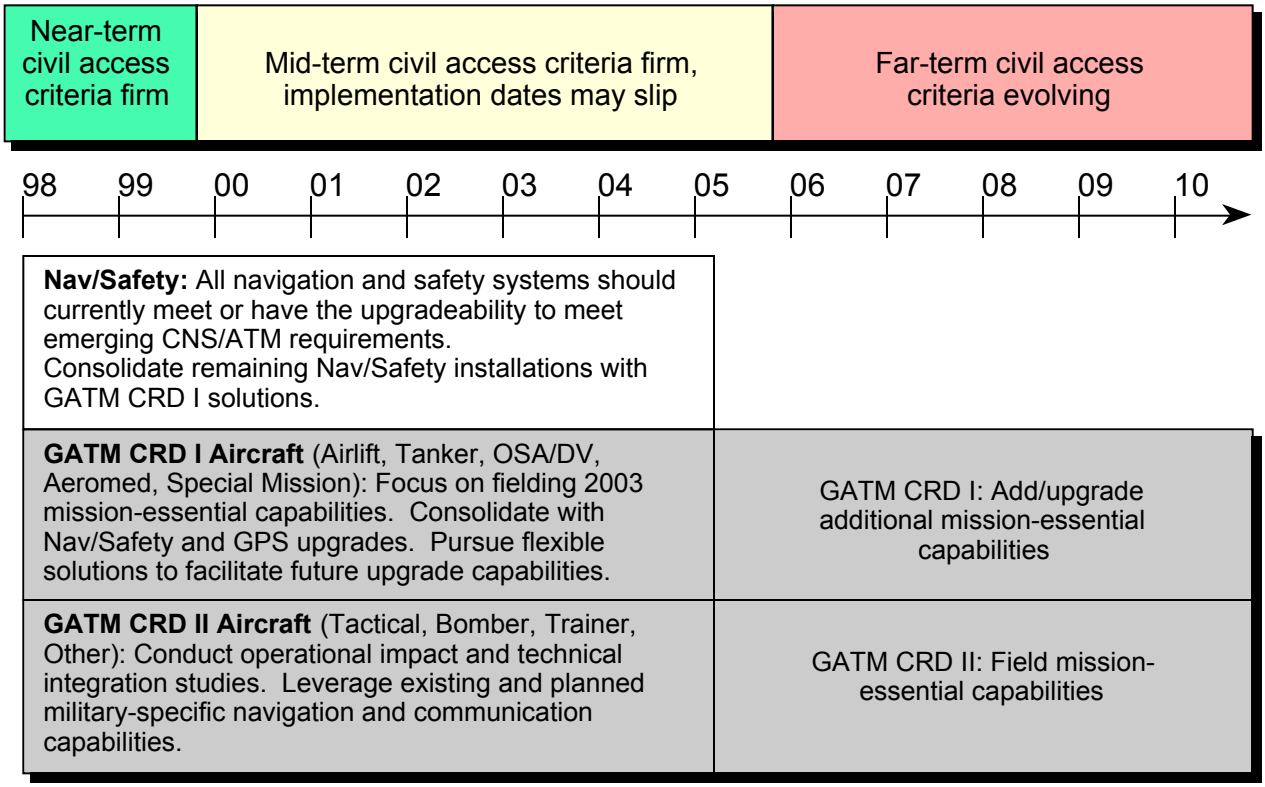


Exhibit 3-12 Nav/Safety Strategy and GANS Timeline



3.2.3 GPS 2000/2005 and GPS Modernization/NavWar Strategy

GPS Project 2000/2005 is only one component of a broader GPS strategy for providing enhanced capability to Air Force aircraft. From a GANS perspective, GPS will provide the accurate and secure PVT signals that are the common thread among GANS programs and initiatives.

GPS modernization is focusing on eight enduring principles. These principles represent the qualities of GPS products that GPS users, both civil and military, expect from a space-based

radionavigation system to meet both combat and non-combat requirements for the foreseeable future. The eight enduring principles are:

- Improved Accuracy
- Security
- Denial and Signal Fratricide Management
- Backward Compatibility
- Civil Interoperability
- Integrity
- User Friendliness
- Capable of wartime operations.

Some of these capabilities are currently available as commercial off-the-shelf (COTS). Others will be available in the near- or mid-term upon additional research and development. User requirements will define how unit equipment upgrades are implemented. Open systems architectures (OSA) provide the path to enhance existing GPS user equipment and facilitate future upgrades. GPS Receiver Applications Module (GRAM) Selective Availability Anti-Spoofing Module (SAASM) represents a standard to be used by manufacturers who plan to incorporate GPS into any future military system. GRAM configurations will use an OSA approach which allows system components to be added, replaced or eliminated without redesigning the entire system.

Given the current and projected threat to GPS navigation and timing signals from jamming, deception, and other disruptive effects, and the increasing use of GPS by potential adversaries around the globe, NavWar activities will ensure the US military retains an advantage in combat positioning and navigation capabilities. NavWar has three objectives:

- Protect U.S. and Allied forces ability to operate with GPS in an area of operations (AOO)
- Prevent adversary forces use of satellite navigation and its associated augmentations in the AOO
- Allow the civil and commercial community access to satellite navigation signals outside the AOO.

The end-state GPS Modernization/NavWar solution will involve user equipment modifications. The ability of current user equipment to receive and process navigation and timing information will not be degraded. The initial NavWar concept calls for NavWar protection modifications and techniques to be transparent to users. A NavWar capability is scheduled to be fully operational by 2006 to support the Presidential decision to set Selective Availability (S/A) to zero in that year. Some GPS Modernization/NavWar capabilities may be available as early as 2001 with the SAASM.

Exhibit 3-13 Notional GPS Technology Insertion Availability

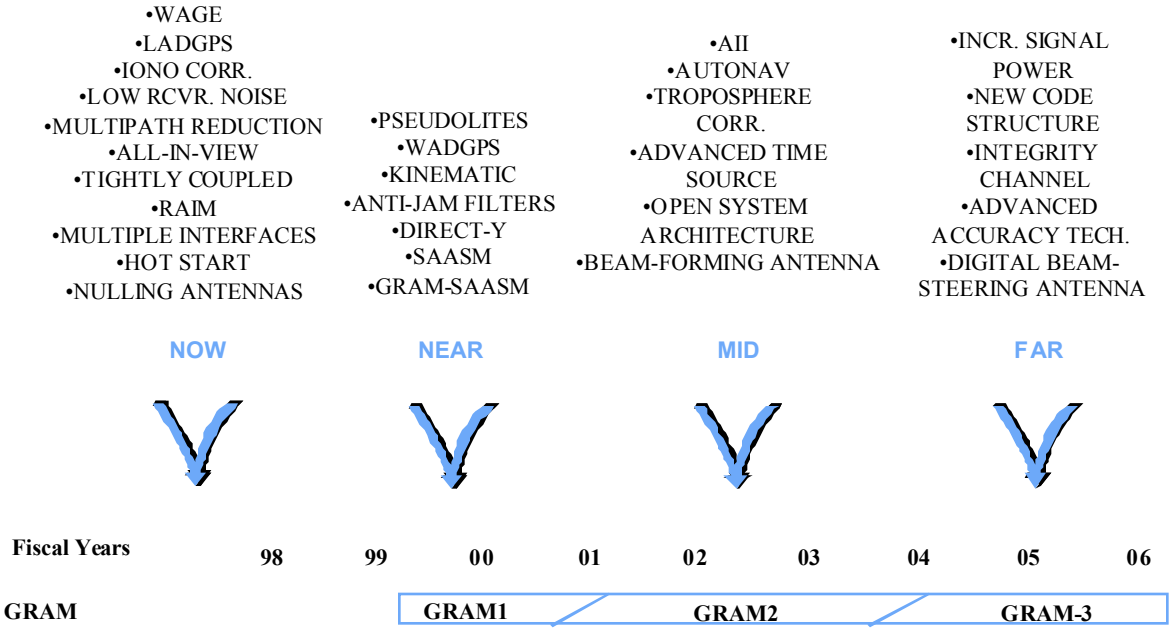


Exhibit 3-14 contains a brief GPS description, identifies overlap of GPS platform requirements with other GANS programs and initiatives, and depicts the GANS management strategy for GPS and the GPS timeline. Exhibit 3-15 shows the GPS timeline and the GANS management strategy for GPS.

Exhibit 3-14 GPS 2000/2005 and GPS Modernization/NavWar Overview

GPS Description

In 1993, Congress directed that all DoD aircraft, ships, armored vehicles, and indirect fire weapons be equipped with GPS by September 30, 2000. The National Defense Authorization Act for Fiscal Year 1999 extended the deadline to September 30, 2005. The military Services have undertaken aggressive measures to meet this mandate. GPS user equipment (UE) will be upgraded with enhanced capabilities based on mission requirements. Enduring principles for GPS modernization include:

- Improved accuracy
- Security
- Denial and signal fratricide management
- Backward compatibility
- Civil interoperability
- Integrity
- User friendliness
- Capable of wartime operations

Navigation Warfare activities ensure that the U.S. military can protect U.S. and Allied Forces ability to operate with GPS, prevent adversary forces use of satellite navigation, and allow the civil and commercial community access to satellite navigation signals outside an area of operations.

Equipment Components

- NavWar-capable GPS Receivers
- NavWar Options include:
  - UE modifications
  - UE modifications plus terrestrial augmentation
  - Space-segment modifications
  - Space-segment and UE modifications
  - Space-segment and UE modifications plus terrestrial augmentation

Overlapping GANS Requirements

- Nav/Safety: GRAM-SAASM compliant receiver
- JPALS: GRAM-SAASM compliant receiver
- GATM: GRAM-SAASM compliant receiver
- Avionics Modernization: GRAM-SAASM compliant receiver

GANS Strategy

Use platform "windows of opportunity" to get GPS UE improvements into the weapons systems.

For NavWar, the most cost-effective architecture providing the greatest military worth will be selected. Regardless of the alternative selected, the ability of current user equipment to receive and process navigation and timing information must not be degraded.

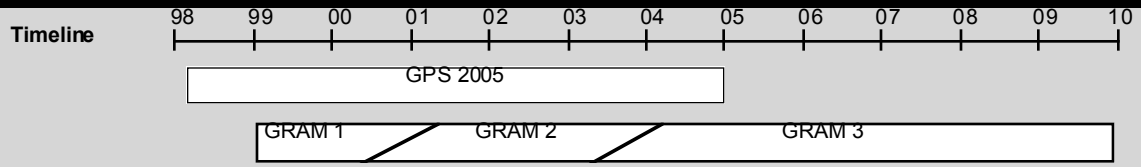
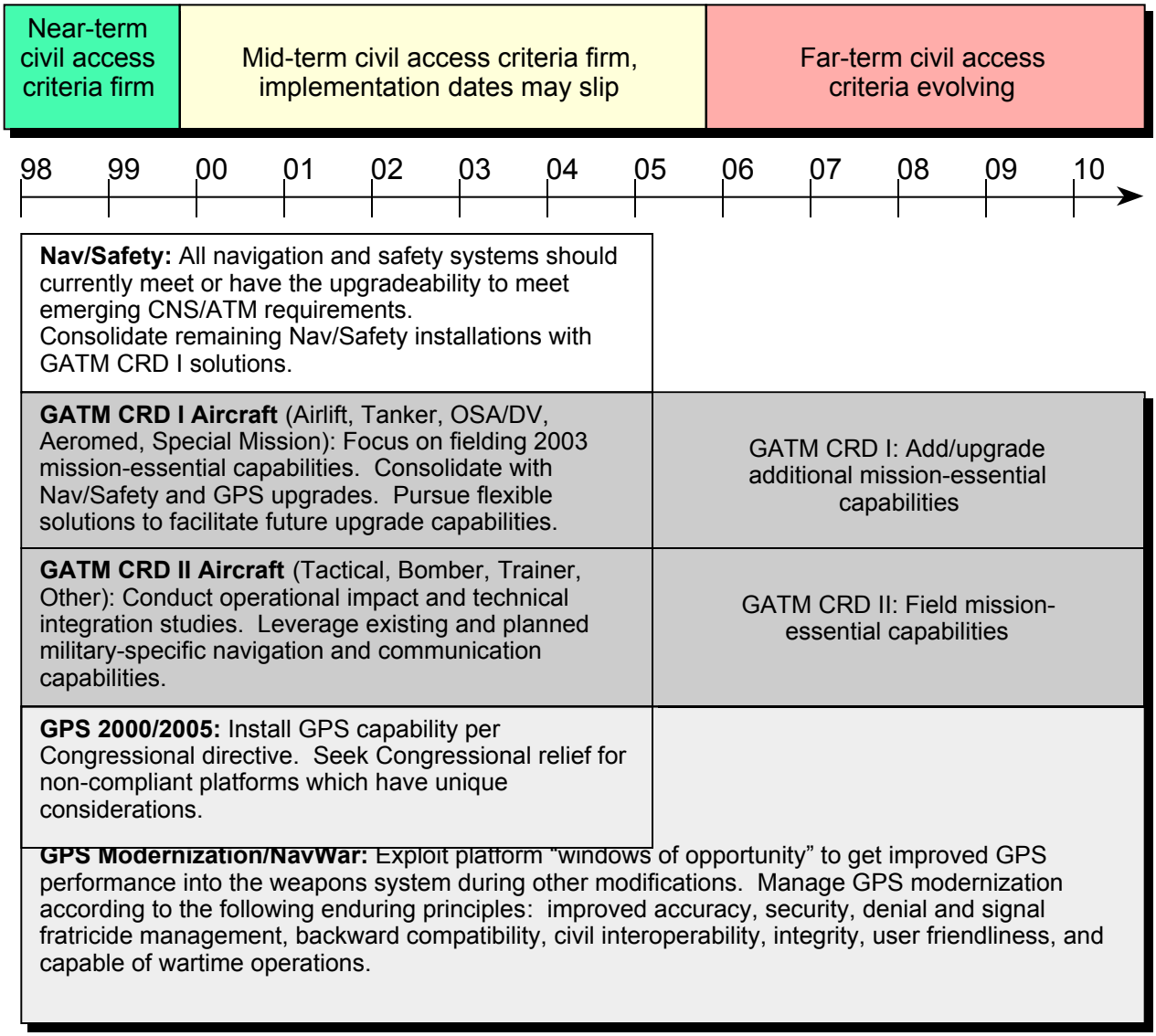


Exhibit 3-15 GPS Strategy and GANS Timeline



3.2.4 JPALS Strategy

JPALS is a joint initiative still in the early stages of the acquisition process. JPALS is the DoD effort to acquire a rapidly deployable, interoperable precision approach and landing system to enhance warfighter capability (on land and at sea) during adverse weather conditions. JPALS avionics equipment must allow military, civil contract carrier, and Civil Reserve Airfleet (CRAF) aircraft the capability for precision approach and landing to all required mission locations, including locations where only civil systems are provided or mandated for use by host nation agreements.

JPALS equipped airfields shall support landing of all Service aircraft, as well as civil aircraft supporting military operations at locations where civil aircraft are supported. The JPALS Analysis of Alternative (AoA) recommended the most promising precision landing system alternatives which should be pursued during Phase 1 Program Definition and Risk Reduction (PDRR). These included the Local Area Differential GPS (LDGPS) and the Automatic Carrier

Landing System Plus (ACLS+). LDGPS holds the most promise to be the backbone of the long term JPALS architecture. It is the only solution applicable to all four environments, and the avionics have multiple uses. ACLS+ is the most promising shipboard option in conjunction with LDGPS. Avionics associated with alternatives are listed in Exhibit 3-16.

Exhibit 3-16 JPALS-Associated Avionics

LDGPS	ACLS+
GPS with Data Link or MMR	Data Link Airborne Beacon

Test and Evaluation (T&E) objectives will be to provide sufficient evidence that key technical risks for LDGPS and ACLS+ have been reduced, help define the JPALS technical architecture needed to meet ORD requirements, and provide data to support the next milestone decision.

JPALS overlaps with GPS receivers, data link, and MMR for other GANS programs. The current JPALS strategy is to integrate JPALS capability to be backward compatible in the MMRs being procured under GATM for CRD I aircraft. JPALS capability will be integrated with GATM CRD II fielding where feasible based on mission need and modification schedules. Exhibit 3-17 contains a brief JPALS description, a summary of JPALS components, identifies overlap of JPALS requirements with other GANS programs and initiatives, the GANS management strategy for JPALS, and the JPALS timeline. Exhibit 3-18 shows the JPALS timeline and GANS management strategy overlaid with the same information for GPS/NavWar, Nav/Safety and GATM.

Exhibit 3-17 JPALS and GANS Strategy Overview

JPALS Description	Equipment Components
JPALS provides a precision approach capability that must be mobile, transportable, survivable, supportable, interoperable between the Services, civil contract carrier, CRAF, and civilians, if possible.	Technical solution has not been determined. Program is in AoA phase. Options may include: • PLSR (ILS, MLS, DGPS) • PAR • ICLS • TTLS • OMAR • ACLS
Overlapping GANS Requirements	**GANS Strategy**
• GPS 2000/2005: GPS receiver • GPS UE mod/NavWar: GRAM-SAASM capable receiver • Nav/Safety: GPS receiver, ILS • ATCALS: PAR, MLS • GATM: GRAM-SAASM capable receiver, Protected ILS, MMR	Synchronize JPALS planning with GATM, GPS UE mod/NavWar, and FAA NAS Architecture. Plan for backward compatibility with GATM CRD I modifications.

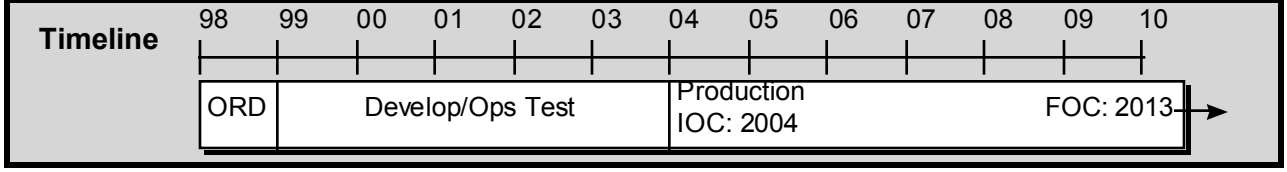
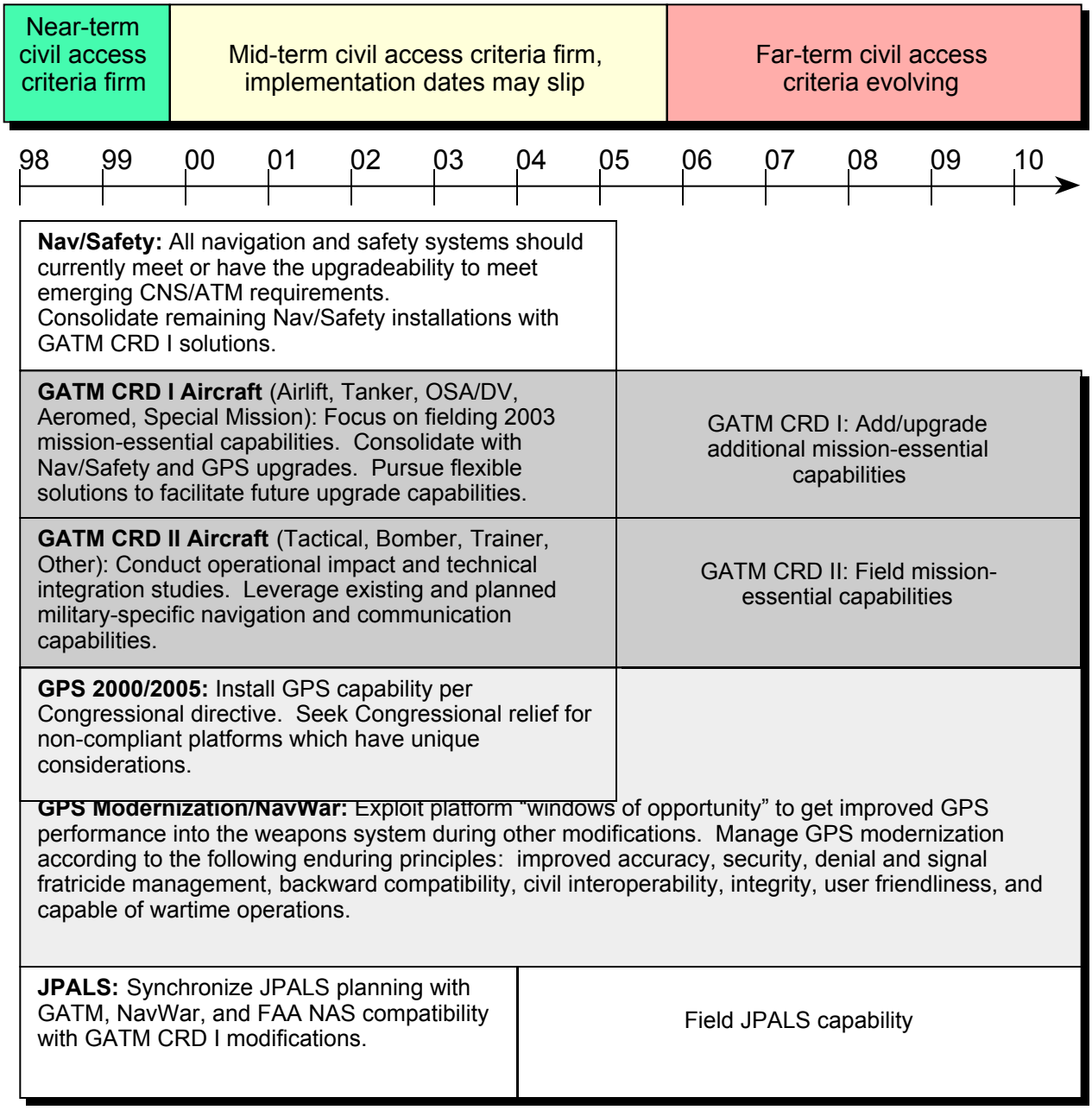


Exhibit 3-18 JPALS Strategy and GANS Timeline



3.2.5 ATCALS/DATCALS Strategy

The Air Force ATCALS program encompasses both fixed-base and deployable (DATCALS) assets. DATCALS supports contingency and wartime operations. The Air Force operates fixed-base ATCALS to ensure a trained cadre of personnel are available to support contingency and wartime operations and to provide ATC services in the vicinity of Air Force bases around the world. The deployable and fixed-based ATCALS must interface with adjacent ATC systems and furnish the same level of service as host nations provide. Key elements of ATCALS include control towers, approach controls, and base operations utilizing ground-based NAVAIDS, radars, radio communications, telecommunication voice switches, notice-to-airmen (NOTAM) systems, airspace management systems, and associated computers and software to operate a fully integrated ATC system.

For fixed locations, the DoD is participating with the FAA to upgrade the voice switches, radars, and automation systems comprising ATCALS. Current ATCALS must be sustained while transitioning to the new architecture. Sustainment will allow for a graceful transfer of function without degrading existing ATC and navigation services until all US military aircraft have completed appropriate avionics upgrades. Hence, the new system must also be backward compatible with existing ATC systems. To address the need for the next generation of precision approach capability, the Air Force Flight Standards Agency (AFFSA) was designated the lead for JPALS. ATCALS/DATCALS overlaps with JPALS precision landing capability, GATM communications components, and navigation and safety equipment baseline components. In order to achieve seamless global operations, it will be necessary to pursue parallel upgrade of all related air, ground, and space air traffic management infrastructure. This will require a coordinated effort throughout the GANS requirements, funding, and acquisition communities, as well as active engagement with civil aviation authorities.

Exhibit 3-19 contains a brief ATCALS/DATCALS description, a summary of ATCALS/ DATCALS components, identifies the overlap of ATCALS/DATCALS requirements with other GANS programs and initiatives, and depicts the GANS management strategy for ATCALS/DATCALS, and corresponding timeline. Exhibit 3-20 shows the ATCALS/DATCALS timeline and GANS management strategy overlaid with the same information for JPALS, GPS/NavWar, Nav/Safety and GATM.

Exhibit 3-19 ATCALS/DATCALS and GANS Strategy Overview

ATCALS/DATCALS Description	Equipment Components
ATCALS is designed to upgrade and modernize ground-based air traffic control facilities. This upgrade is being conducted in conjunction with FAA ground infrastructure (NAS) modernization. DATCALS functionality is similar to fixed-based air traffic control facilities, but are primarily designed for, and used to support deployable, contingency, and wartime operational requirements.	• ATCALS – ETVS – VOR – DBRITE – DASR – TACAN – Mobile MLS – STARS – ATIS – Enhanced comm – ILS • DATCALS – Deployable RAPCONS – Deployable control tower – Deployable TACANs – MMLS
Overlapping GANS Requirements	**GANS Strategy**
• Nav/Safety: TACA • JPALS: MLS • GATM: 8.33 kHz VHF, data link, SATCOM, CMU, CPDLC)	Pursue parallel upgrade of all related air, ground, and space air traffic management infrastructure to achieve compatibility and interoperability for seamless global operations.

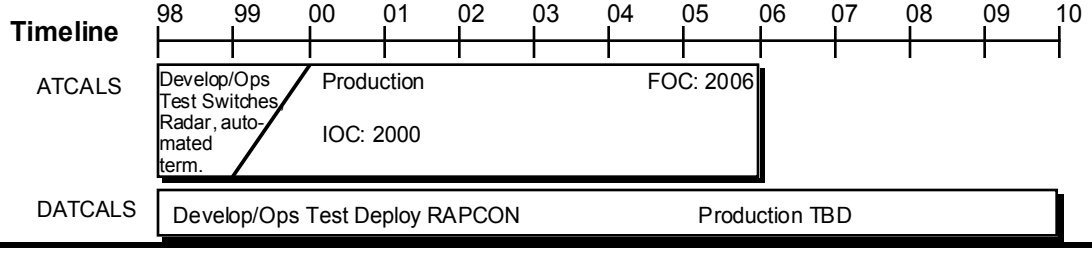
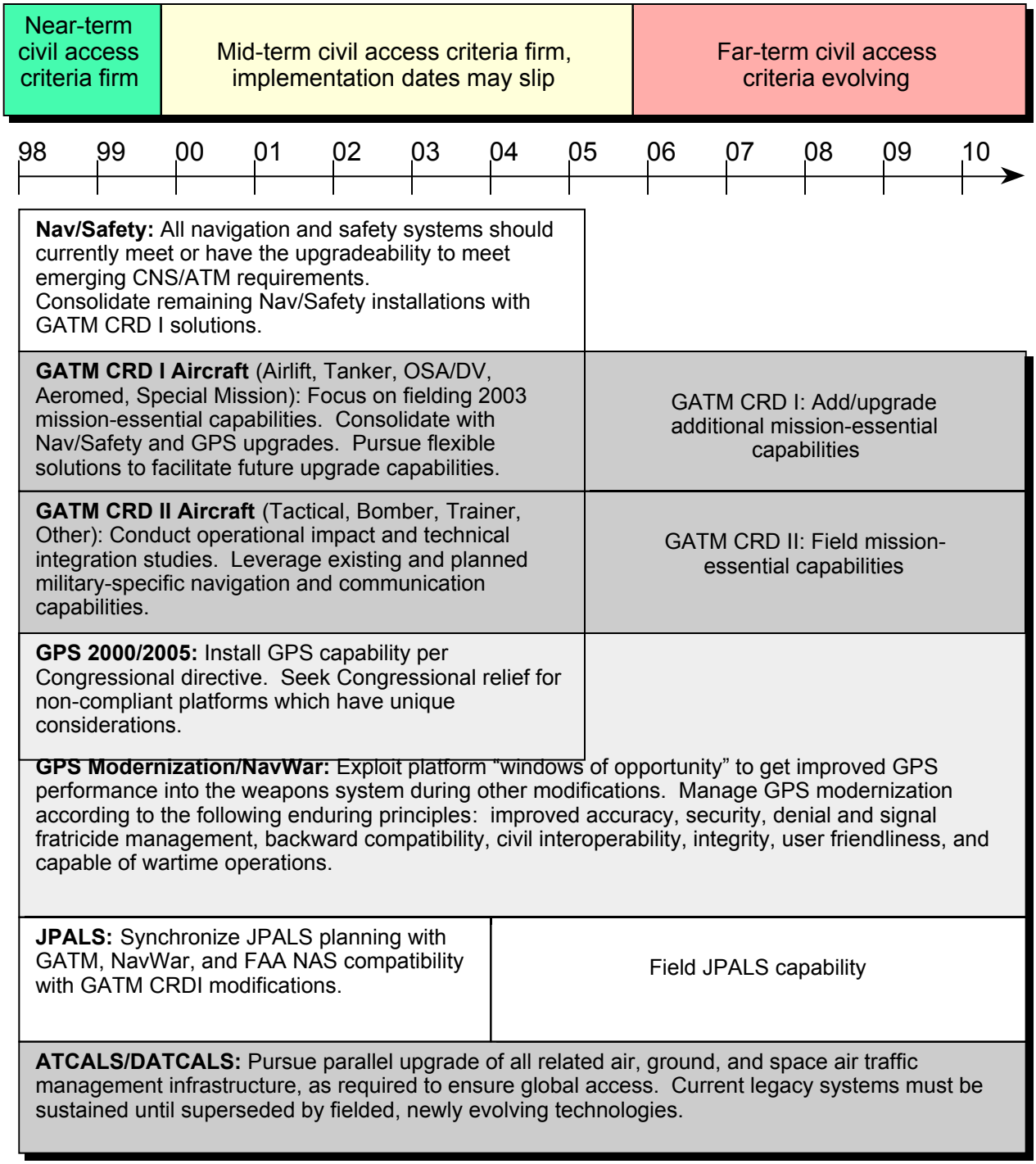


Exhibit 3-20 ATCALS/DATCALS Strategy and GANS Timeline



Avionics modernization components may include flight management systems (FMS), communications management unit (CMU), inertial navigation system (INS), and integrated digital avionics. Ongoing modifications include major avionics upgrades to the KC-135 (PACER CRAG); the T-38 Avionics Upgrade Program (AUP); the C-5 Avionics Modernization Program (AMP); and the C-21, T-43, and C-130 cockpit modernization programs. GANS integration with platform avionics modernization programs will be worked on a platform by platform basis. Exhibit 3-21 contains a brief description of avionics modernization, a summary of avionics modernization components, identifies the overlap of avionics modernization

requirements with other GANS programs and initiatives, the GANS management strategy for avionics modernization, and the avionics modernization timeline. Exhibit 3-22 shows the avionics modernization timeline and GANS management strategy overlaid with the same information for ATCALS/DATCALS, JPALS, GPS/NavWar, Nav/Safety and GATM.

Exhibit 3-21 Avionics Modernization and GANS Strategy Overview

Avionics Modernization Description	Ongoing Modifications
Avionics modernization is an ongoing process for Air Force platforms. This initiative was incorporated into GANS to ensure continuity between GANS initiatives and other aircraft avionics modernization efforts. These efforts may include: INS systems, weather radar, windshear detection, Link 16, FMS, and CMU modifications.	• KC-135 PACER CRAG • T-38 Avionics Upgrade Program • C-5 Avionics Modernization Program • C-21 Cockpit Upgrade Program • C-130 Avionics Modernization Program • B-1BG Avionics Modernization Program
Overlapping GANS Requirements	**GANS Strategy**
Each platform modification is unique. Platform-specific information will be included in the GANS annunciator panel, maintained by the GATO/MC2 SPO.	Maintain the integrity of weapon system-specific acquisition processes while identifying and minimizing redundant solutions for GANS-related modifications.

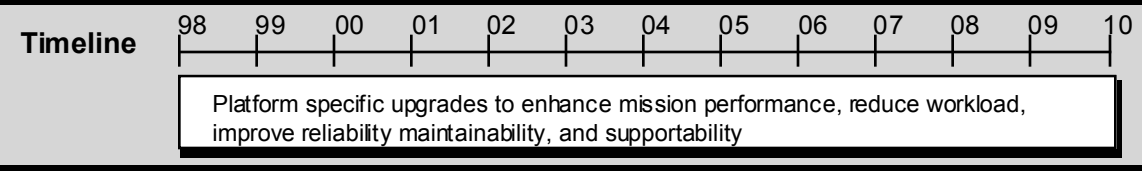
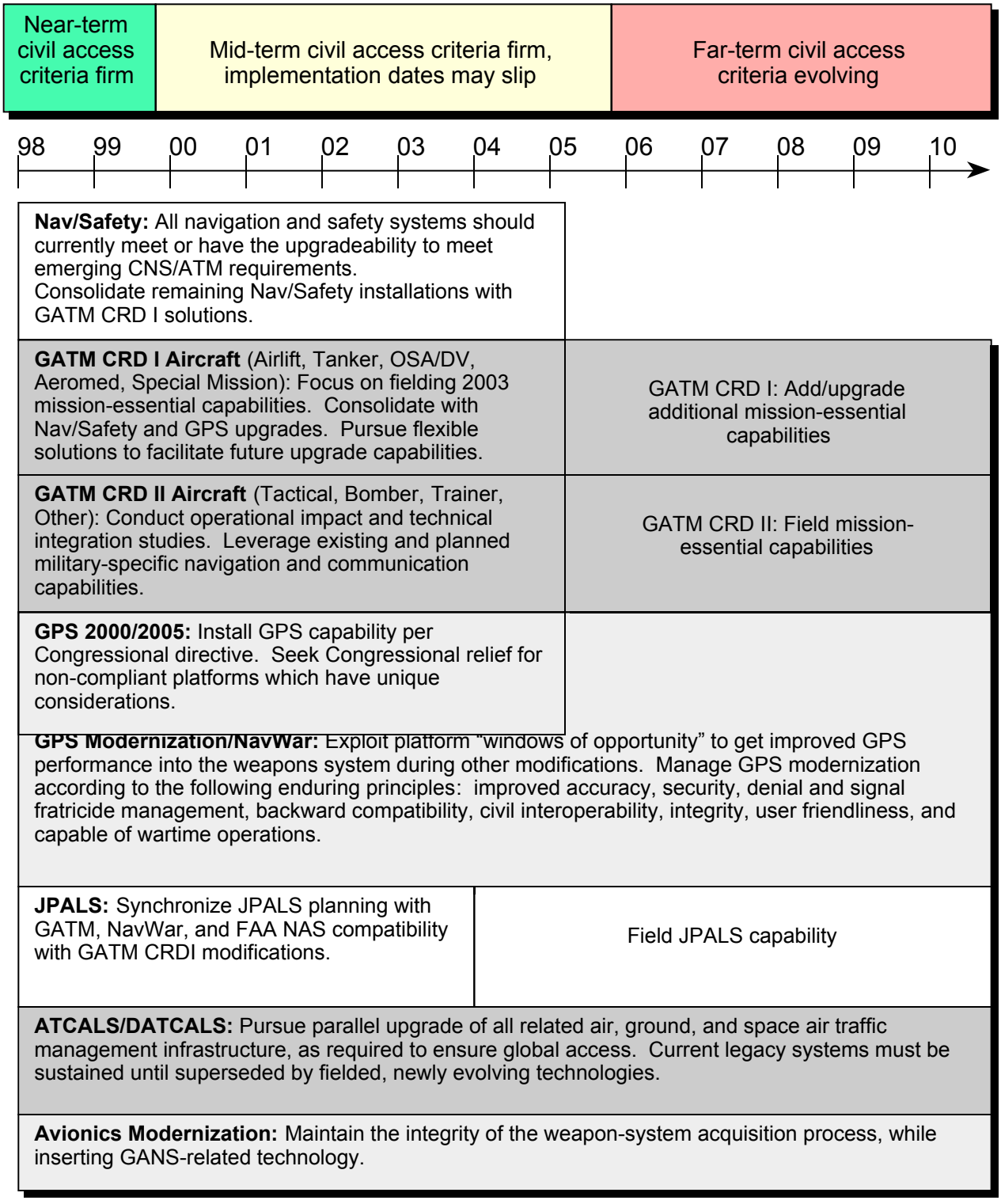


Exhibit 3-22 Avionics Modernization Strategy and GANS Timeline



3.3 GANS PLAN BY PLATFORM CATEGORY

The GANS platform strategy can best be described by grouping platforms into three categories: those aircraft covered by GATM CRD I; those aircraft covered by GATM CRD II;

and ground systems covered by ATCALS/DATCALS. Although GPS is the common thread among GANS programs and initiatives, the GANS strategy centers on GATM and the operational impacts caused by civil access developments. With the implementation of RVSM in the North Atlantic, the near-term civil access criteria began to impact global mobility and power projection missions. This impact, and the recognition of future operational restrictions that could result from further CNS/ATM development, led to GATM CRD I.

3.3.1 GANS Plan for Category 1 Platforms:

The first GANS-related installation of aircraft equipment will result from a consolidation of GATM, Nav/Safety, and GPS requirements for CRD I aircraft. The GANS plan for the 1998-2005 time frame for aircraft in the category defined by GATM CRD I–airlifters, tankers, OSA/DV, aeromedical evacuation, and special mission follows:

- Requirements
  - Engage civil aviation authorities on near- and mid-term implementation timelines and mid- to far-term standards such as data link and automatic dependent surveillance to minimize operational impact while aircraft are being modified. Promote solutions that take advantage of military capabilities
  - Focus modifications on 2003 civil access criteria, pursue flexible architectures that promote upgradability to 2005 and beyond
  - Ensure Mission Area Plans (MAPs), ORDs, 1067s, and other requirements documents, as appropriate, are completed or updated to reflect GANS impacts for the FY01 APOM
- Funding
  - Continue to pursue funding through ongoing POM efforts to ensure required capability is fielded in a timely manner
  - Closely monitor civil developments and program execution to identify any funding adjustments in follow-on budget cycles
- Acquisition
  - Leverage commercial technology as much as possible
  - Incorporate GATM modifications with remaining Nav/Safety modifications, depending on platform baseline architecture and schedule
  - Incorporate modifications with ongoing cockpit modifications, where able
  - Include a multi-mode receiver (MMR) that contains a GRAM-SAASM card to enhance the ability to operate in an EW environment and to facilitate meeting future JPALS requirements
  - Incorporate NavWar by including GRAM-SAASM capability in platform architectures.

3.3.2 GANS Plan for Category 2 Platforms:

Fighter, bomber, trainer, and the other aircraft not covered by GATM CRD I form the second platform category for GANS. Considerations for aircraft in this category include mission

impacts in the mid- and far-term CNS/ATM environment, the high cost of miniaturization and ruggedization that may be required to modify

tactical aircraft and potentially unmanned airborne vehicles (UAVs). The GANS plan for the 1998-2005 time frame for aircraft in the category defined by GATM CRD II follows:

- Requirements
  - Engage civil aviation authorities on mid- to far-term standards and implementation timelines such as data link and automatic dependent surveillance. Promote solutions that take advantage of existing military capabilities
  - Conduct operational impact and technical integration studies
  - Complete GATM CRD II and ensure Mission Area Plans (MAPs), ORDs, 1067s, and other requirements documents, as appropriate, are completed or updated to reflect GANS impacts
- Funding
  - Program for necessary modifications in the FY 02-07 Program Objective Memoranda (POM)
  - Closely monitor civil developments and program execution to identify any funding adjustments in follow-on budget cycles
- Acquisition
  - Modify with GATM, JPALS—where necessary—starting in 2005.
  - Continue the GPS GRAM-SAASM evolution
  - Maintain the flexibility to accelerate modifications based on results of studies and evolving mission impacts.

3.3.3 GANS Plan for Category 3 Platforms:

The third GANS platform category covers ground systems (ATCALS/DATCALS). The plan for these systems are contained in the USAF Air Traffic Management Strategic Plan. This plan should be updated approaching 2000 as the FAA identifies its local area augmentation system (LAAS) solution and the JPALS solution is determined.

- Requirements
  - Engage civil authorities, promoting use of differential GPS for the Local Area Augmentation System (LAAS)
  - Identify LAAS and JPALS solutions, then pursue parallel upgrade with civil systems
  - Develop requirements for the new mobile approach control system
- Funding
  - Continue to pursue funding through ongoing POM efforts to ensure required capability is fielded in a timely manner

  - Closely monitor civil developments and program execution to identify any funding adjustments in follow-on budget cycles
  - Sustain current systems while transitioning to the new architecture

- Acquisition
  - Phase-in precision landing solution with ATCALS/DATCALS modernization as outlined in the USAF ATM Strategic Plan
  - Complete National Airspace System (NAS) Modernization Projects [Digital Airport Surveillance Radar (DASR), Standard Terminal Automation Replacement System (STARS), Enhanced Terminal Voice Switch (ETVS)]

The following exhibit provides a roadmap for GANS fielding by platform category. This table shows a broad, "snapshot" view of where the Air Force expects to be in implementing GANS capabilities.

Exhibit 3-23 GANS Roadmap by Platform Category

	98	00	05	End-State--beyond 2010
Category 1 ➢ C-5 ➢ C-9 ➢ C-17 ➢ C-20 ➢ C-21 ➢ VC-25 ➢ C-26 ➢ C-32 ➢ C-37 ➢ C-38 ➢ C-130 ➢ C-137 ➢ C-141 ➢ E-3 ➢ E-4 ➢ E-8 ➢ T-43 ➢ KC-10 ➢ KC-135 ➢ RC-135 ➢ O/R/T/W C-135 ➢ AC-130H ➢ AC-130U ➢ EC-130E ➢ EC-130H ➢ HC-130P ➢ MC-130E ➢ MC-130H ➢ MC-130P ➢ MH-53J ➢ UAV	Varied baseline capability Requirements documentation started Fielding of Nav/Safety equipment ongoing	GATM fielding started for 2003-2005 civil access mission-essential capability Fielding of NavWar started as part of GPS modernization	Compliant with mid-term civil oceanic and continental requirements Requirements documented for far-term "free-flight" solution Fielding started for JPALS	Compliant with far-term civil "free-flight" architecture
Category 2 ➢ A-10 ➢ F-15 ➢ F-15E ➢ F-16 ➢ F-117 ➢ F-22 ➢ B-1 ➢ B-2 ➢ B-52 ➢ T-1 ➢ T-3 ➢ T-6A ➢ T-37 ➢ T-38 ➢ U-2 ➢ C-12 ➢ CV-22 ➢ HH-1 ➢ UH-1 ➢ All Other Air Vehicles not in Category 1	Varied baseline capability Operational impact and technical solution studies started	GATM requirements documented for civil access mission-essential capability Operational work-arounds established for transition period Fielding of NavWar capabilities started	Fielding started to include civil compliant solutions, JPALS Requirements documented for far-term "free-flight" solution	Compliant with far-term civil "free-flight" architecture
Category 3 ➢ ATCALS ➢ DATCALS ➢ MACS (Mobile Approach Control System)	Documented requirements, but should consider Local Area Augmentation (LAAS) and JPALS solutions	LAAS and JPALS solutions identified MACS requirements documented	Fielding started for precision landing solution and MACS	Interoperable with far-term civil "Free-flight" architecture

This section described civil airspace access drivers and the GANS strategies by program/initiative and platform category. The following section will describe the organizational structure and processes that have been put in place to manage the GANS effort.

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4.0 Organizational Structure and Processes

The previous section described roadmaps and strategies that are designed to achieve GANS goals from a program/initiative perspective. This section describes GANS from an organizational perspective. It describes the structure and processes that have been put in place to oversee GANS efforts.

4.1 ORGANIZATIONAL STRUCTURE

GANS activities revolve around the IPT structure depicted in Exhibit 4-1. The I-IPT charter is included in Appendix D. The GANS I-IPT, co-chaired by the Air Force Directorate of Operational Requirements (AF/XOR) and the Assistant Secretary of the Air Force for Acquisition Directorate of Global Reach Programs (SAF/AQQ), reports to the Air Force corporate structure and is responsible for overall management of the GANS effort. The I-IPT manages four W-IPTs.

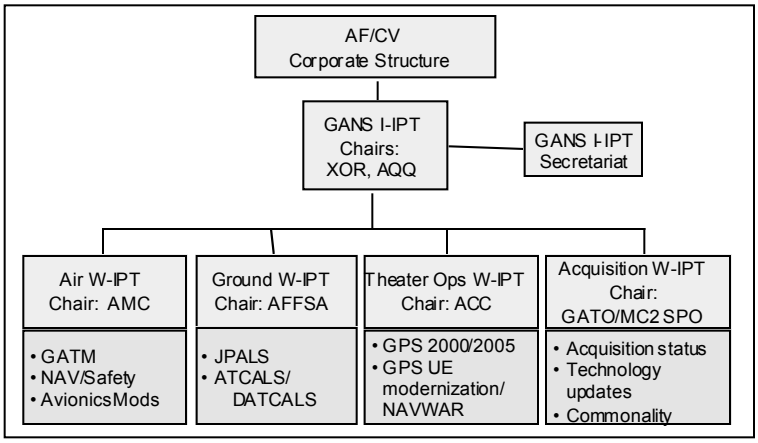


Exhibit 4-1 GANS IPT Structure

- The Air W-IPT, chaired by Air Mobility Command (AMC), is responsible for consolidating requirements and funding strategies for GATM, Nav/Safety, and avionics modernization.

- The Ground W-IPT, chaired by AFFSA, is responsible for consolidating requirements and funding strategies for JPALS and ATCALS/ DATCALS.

- The Theater Operations W-IPT, chaired by Air Combat Command (ACC), is responsible for consolidating requirements and funding strategies for GPS 2000/2005 and GPS Modernization/NavWar.

- The Acquisition W-IPT, chaired by the GATO/MC2 SPO, working in conjunction with the GPS JPO, is responsible for monitoring acquisition status, providing technology updates, and promoting commonality among GANS programs and initiatives.

A GANS secretariat performs the day-to-day administrative functions for the GANS I-IPT. A GANS executive board, consisting of the co-leaders of the I-IPT and the chairs of the W-IPTs, oversees the management of the GANS effort.

4.2 Roles and Responsibilities

The organizations that make up the GANS IPT structure represent a cross-section of Air Force operations, requirements, programming, and acquisition expertise. Exhibit 4-2 outlines the roles of each of the key participants:

Exhibit 4-2 GANS Roles and Responsibilities

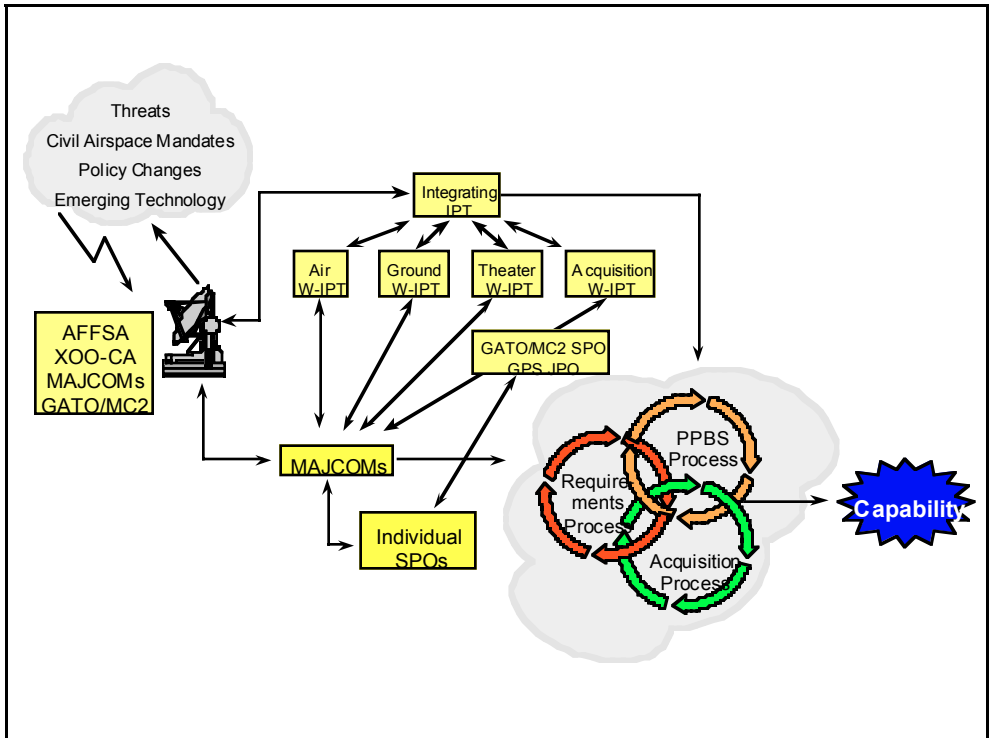
Organization	GANS Roles and Responsibilities
AF/XOR	GANS I-IPT Co-chair
SAF/AQQ	GANS I-IPT Co-chair
Air Force Program Executive Officer for Airlift and Trainers (AFPEO/AT)	Air Force lead for acquisition execution of GATM, JPALS, and ATCALS/ DATCALS
Commander, Air Force Space and Missile Systems Center (SMC/CC)	Air Force lead for acquisition execution of GPS/NavWar
Dir of Operational Requirements, GATM Division (AF/XOR-GATM)	GANS I-IPT Secretariat and Co-Lead of I-IPT Executive Board. Joint responsibilities as GATM Executive Agent
SAF/AQQ Mobility Division (SAF/AQQM)	Co-Lead of I-IPT Executive Board
Global Air Traffic Operations/Mobility Command and Control System Program Office (GATO/MC2 SPO)	Acquisition W-IPT chair and executing agent for GATM, Nav/Safety, ATCALS/DATCALS, and JPALS. Member of GANS I-IPT Executive Board
Global Positioning System Joint Program Office (GPS JPO)	Executing agent for GPS 2000/2005, GPS UE modernization/ NavWar
Air Force Major Commands (MAJCOMS)	Generate requirements, program, and budget inputs for all GANS-related acquisitions. Members of GANS IPT structure
Air Mobility Command (AMC/XPRN)	Air W-IPT chair. Member of GANS I-IPT Executive Board
Air Combat Command (ACC/DRS)	Theater Ops W-IPT chair and GANS coordinator for the combat air forces (CAF). Member of GANS I-IPT Executive Board
Individual Air Force Material Command (AFMC) SPOs and System Program Directors (SPDs)	Responsible for acquisition execution at the platform level and provide members for the acquisition W-IPT
Air Force Directorate of Operations and Training, Civil Aviation Division (AF/XOO-CA)	Dual OSD and Air Force responsibilities. Executive Director of the DoD Policy Board on Federal Aviation (PBFA). Presents Air Force and DoD positions on airspace issues through the IGIA. Facilitates information flow from civil aviation agencies to the Air Force and other Services.
Air Force Flight Standards Agency (AFFSA/XR)	Ground W-IPT chair. Member of GANS I-IPT Executive Board. Air Force Program Manager for JPALS, ATCALS/DATCALS.

Organization	GANS Roles and Responsibilities
Air Force Flight Standards Agency, Civil/Military Aviation Issues Division (AFFSA/XA/XAX)	Primary sensor for potential civil aviation policy changes. Orchestrates operational AF participation in civil aviation meetings. Engages civil authorities to ensure military missions receive adequate priority and access to global airspace, and CNS/ATM solutions maximize military capabilities.
Air Force Frequency Management Agency (AFFMA)	On behalf of the AF Frequency Manager, ensures that GANS program management personnel are aware of, and to the maximum practical extent, comply with applicable AF, DoD, national, international, and host nation spectrum policies and procedures.

4.3 ORGANIZATIONAL CONCEPT

Exhibit 4-3 shows the GANS organizational concept. The GANS IPTs bring together the requirements, PPBS, and acquisition communities in a common effort to achieve GANS goals and objectives. GANS participants have a functional role within their own organizations in one or more of the standard Air Force requirements generation, PPBS, or acquisition processes.

Exhibit 4-3 GANS Organizational Concept



The GANS IPT structure provides a forum for sharing information, building consensus, identifying issues, solving issues at the lowest possible level, and elevating issues that require the attention of senior Air Force leadership. The IPT structure enhances the ability of the participants to move toward common GANS goals and objectives in their functional roles while representing their individual organizations. The IPT structure may also be called upon as a collective GANS

organization to provide information or recommendations on GANS-related issues by the Air Force corporate structure.

4.4 BUSINESS PROCESSES

This section describes how the GANS IPT structure interfaces with standard Air Force requirements generation, PPBS, and acquisition processes.

4.4.1 Requirements Generation Process

Air Force requirements are generated by operational commands based upon mission need. This need can be generated to respond to a new threat, to take advantage of new technology for enhanced mission performance, or to respond to a policy change. The seven GANS programs and initiatives span all of these categories. For example, Nav/Safety, GPS 2000/2005, and NavWar were driven by policy changes resulting from SECDEF, congressional, and presidential mandates, respectively. JPALS and avionics modernization exploit emerging technology. GATM responds to emerging CNS/ATM requirements–a threat to global airspace access. ATCALS/ DATCALS couples military air traffic control equipment modernization with a corresponding modernization in the civil sector.

Because many of the GANS programs and initiatives are related to developments in the civil airspace management sector, the methods by which the Air Force engages civil aviation authorities is a critical component of the GANS effort. This military/civil engagement is particularly important because the CNS/ATM technical solutions are still evolving. Implementation timelines for new procedures based on some CNS/ATM capabilities are also questionable. These uncertainties, coupled with the high cost and long lead times required to field new aircraft and ground equipment, call for active engagement with the civil sector on CNS/ATM development.

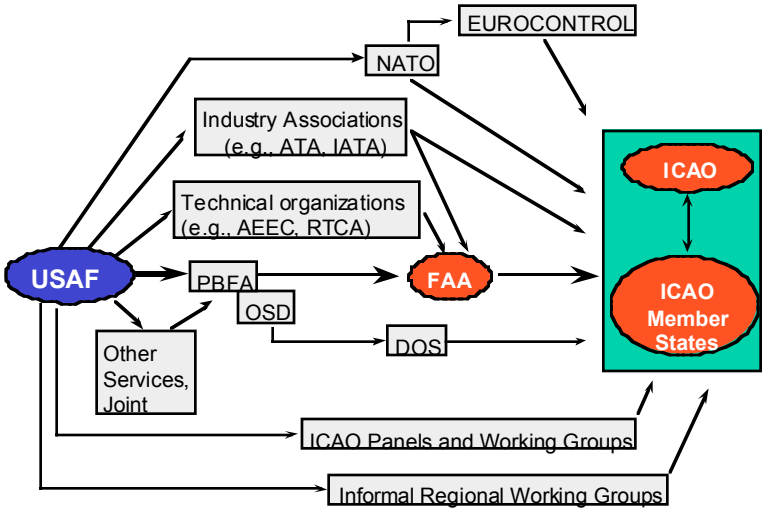
ICAO standards are developed based on inputs from individual member states, groups of states, regional planning groups, ATC provider organizations, and user organizations. In the U.S., ICAO interacts with the FAA representative of the Interagency Group on International Aviation (IGIA). The IGIA facilitates coordination of U.S. policy on international aviation matters. All matters involving U.S. aviation policy, or positions on aviation technical matters, that impact two or more agencies, must clear the IGIA. FAA is responsible for distributing proposed ICAO changes to the DoD for comment.

Within DoD, the Air Force Associate Director for Civil Aviation (AF/XOO-CA) is the IGIA point-of-contact. XOO-CA has dual Air Force and OSD responsibilities. The office is the Air Staff point of contact for civil aviation affairs. In its DoD role, XOO-CA serves as the Executive Director of the DoD PBFA. The PBFA coordinates DoD positions on civil aviation policy and technical matters and represents DoD during IGIA deliberations. The IGIA considers the inputs from all agencies on a proposed change before taking final action. After ICAO receives input from the member states, it takes action on the proposed change. This process can be lengthy. Once ICAO approves the change, an ICAO member state can still implement a unique solution by registering a difference with ICAO. For U.S. aircraft, FAA regulations specify that compliance with international operating procedures is the responsibility of the operator.

In addition to the PBFA/IGIA process, the Air Force can attempt to influence CNS/ATM development and implementation schedules by requesting (through the PBFA and FAA) to attend an ICAO panel or regional working group as an observer. FAA has an open door policy concerning DoD attendees at ICAO meetings. The panel working groups are where potential CNS/ATM operating concepts are initially developed and constitute the best opportunity for influencing their development. Real-time interaction with the working groups can provide the Air Force with the ability to identify issues and provide enough advance warning to influence a DoD position on specific CNS/ATM developments. As new CNS/ATM developments move through the ICAO system, the Air Force, in close coordination with OSD, can interact at increasingly senior levels to maximize influence.

In addition to these formal avenues of influence, the Air Force can pursue its objectives through several less formal paths. Exhibit 4-4 shows several of the paths that can be used to influence CNS/ATM development.

Exhibit 4-4 Paths to Influence CNS/ATM Developments



Because of the large numbers of meetings and the widespread Air Force interest in CNS/ATM developments, AFFSA and the GATO/MC2 SPO have the responsibility to ensure a focused approach is used to engage civil aviation authorities. Acting for the AF/XO, AFFSA is the Air Force representative on the PBFA and orchestrates all operational Air Force participation in civil aviation meetings. The GATO/MC2 SPO orchestrates all Air Force technical participation at external CNS/ATM-related meetings.

Despite best efforts to orchestrate in advance, Air Force representatives will continue to be asked to attend CNS/ATM-related meetings on short notice. To ensure that they are able to promote Air Force positions at these meetings, a process is needed that allows them to quickly find out the Air Force position on issues that will be discussed and, if necessary, allows quick development of an Air Force position.

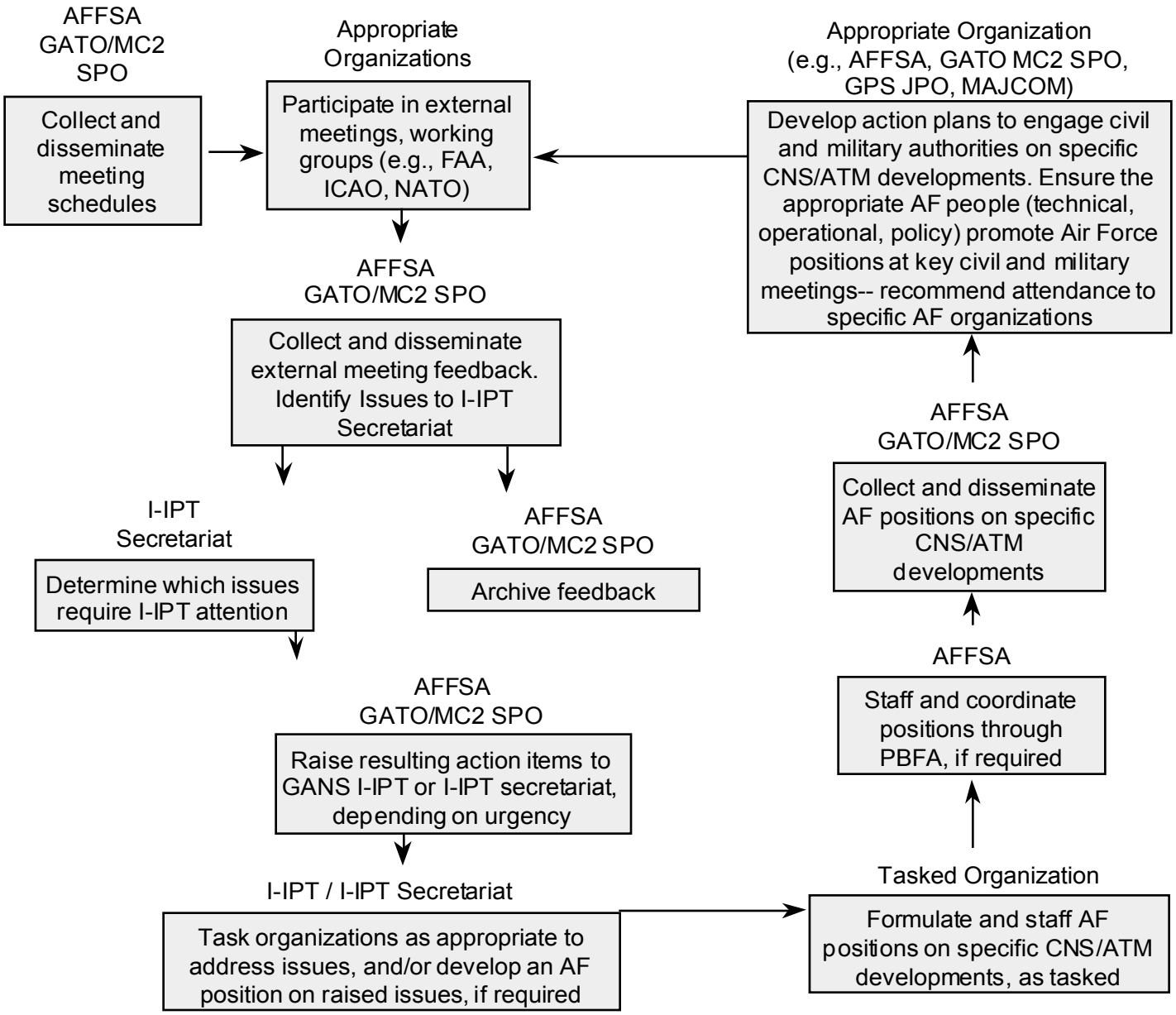
Engagement with civil authorities is a critical first step in the requirements generation process for GANS programs and initiatives. It is necessary to know the civil direction before assessing whether that direction will impact the mission enough to generate a military requirement. Exhibit 4-5 shows the relationship between GANS goals and objectives and the tasks required for the GANS structure to effectively engage civil aviation authorities on CNS/ATM issues. Exhibit 4-6 maps the internal Air Force process to engage civil aviation authorities on CNS/ATM developments and identifies the office of primary responsibility (OPR) for each task.

Exhibit 4-5 Goals, Objectives, and Tasks Related to External Engagement

Goals	Objectives	Tasks
Engage civil authorities to bring about airspace access solutions that maximize military capabilities in support of Global Engagement at affordable costs	Establish coordinated Air Force positions on specific civil airspace technical and operational requirements and implementation timelines Work closely with the Office of the Secretary of Defense, other Services, and Joint organizations to establish supporting Department of Defense positions on specific civil airspace technical and operational requirements and implementation timelines Ensure the proper Air Force people (technical, operational, policy) participate in key civil meetings and actively promote Department of Defense positions. Engage at senior leadership levels, when appropriate Establish a mechanism to enhance the collection, storage, and dissemination of civil airspace information	Collect and disseminate meeting schedules Participate in external meetings, working groups (e.g. FAA, ICAO, NATO) Collect and disseminate external meeting feedback Identify issues to I-IPT secretariat Determine which issues require I-IPT attention Archive feedback Raise resulting action items to GANS I-IPT or I-IPT secretariat, depending on urgency Task organizations as appropriate to address issues and/or develop an AF position on raised issues, if required Formulate and staff AF positions on specific CNS/ATM developments, as tasked Staff and coordinate positions through PBFA, if required Collect and disseminate AF positions on specific CNS/ATM developments Develop action plans to engage civil and military authorities on specific CNS/ATM developments Ensure the appropriate AF people (technical, operational, policy) promote AF positions at key civil and military meetings–recommend attendance to specific AF organizations

Pursue parallel upgrade of related air, ground, and space air traffic management infrastructure to achieve compatibility and interoperability for seamless global operations and enhanced warfighting capability	Maintain interoperability with domestic and foreign civil air traffic control authorities in fixed and deployable ground systems Ensure airborne C4ISR assets take full advantage of the mission implications of emerging GANS related capabilities.	

Exhibit 4-6 Process to Engage Civil Aviation Authorities



The process illustrated in Exhibit 4-6 will eventually develop Air Force position papers on most CNS/ATM issues. These position papers must be kept up to date and made easily available to Air Force representatives who plan to attend external meetings/working groups. It is critical that each position paper identify a point-of-contact (POC) for additional information, that the POC information be kept up-to-date, and that the responsible organization have a back-up plan for times when that POC is not available.

In the case where an Air Force position has not yet been defined, a streamlined version of the process shown in Exhibit 4-6 is needed. It is unlikely that a totally new issue will surface without any warning, so this process will be used mostly for developing variations on existing positions. Since official DoD positions on civil aviation matters must be cleared through AF/XOO-CA in its PBFA role, this process should be orchestrated by XOO-CA. XOO-CA should develop several agreed-to "short lists" of appropriate organizations to be consulted when quick reaction positions must be developed, for issue categories (e.g., oceanic navigation, tactical communications). XOO-CA should then designate POCs (from its own organization, AFFSA, or others, as appropriate) to carry out this process when called on. As noted above, contact information must be up to date and readily available, and a back-up plan must be in place. This should in many cases allow rapid development of Air Force positions via teleconference, video teleconferencing (VTC), and/or e-mail exchanges.

Once a particular CNS/ATM development is recognized, MAJCOMs must determine if the mission impacts require changes in operating procedures or justify establishing a new military equipment requirement. Although civil aviation authorities cannot mandate system capability for the military, failure to equip for civil compliance can force aircraft to fly non-optimum profiles, experience delays, or be denied entry to specific airspace. The GANS IPT structure provides a forum for information sharing and identifying common solutions as the MAJCOMs go through the requirements generation process. In addition, the GANS IPT structure provides a repository of related information that can be provided to decision makers [e.g. Air Force Requirements Oversight Council (AFROC), Joint Resources Oversight Council (JROC)], if requested. Exhibit 4-7 shows the relationship between GANS goals and objectives and the tasks required for the GANS structure to interface with the requirements generation process. Exhibit 4-8 maps the GANS interface with the requirements generation process and identifies the OPR for each task.

Exhibit 4-7 Goals, Objectives, and Tasks Related to Requirements Generation

Goals	Objectives	Tasks
Preserve and enhance combat capability by reducing cost and aircraft down time through the consolidation of requirements among programs and initiatives	Identify overlapping requirements and minimize redundant solutions among GANS programs and initiatives Examine other military programs and initiatives to determine if GANS requirements can be met or combined with existing or planned capabilities Examine GANS modifications to determine if the enhanced communications and navigational capabilities can be used to meet other military requirements	Provide MAJCOMS with information on potential technical solutions Provide MAJCOMS with information on external operational and technical issues Provide MAJCOMS with information on other AF and joint programs/ initiatives relevant to GANS Programs
Pursue parallel upgrade of related air, ground, and space air traffic management infrastructure to achieve compatibility and interoperability for seamless global operations and enhanced warfighting capability	Maintain interoperability with domestic and foreign civil air traffic control authorities in fixed and deployable ground systems Ensure airborne C4ISR assets take full advantage of the mission implications of emerging GANS-related capabilities	Provide information to decision making bodies (e.g. AFROC, corporate structure, JROC), if tasked

4.4.2 PPBS Process

As GANS programs and initiatives move through the PPBS process for funding, the GANS structure provides a forum for information sharing and consensus building. Each of the key organizations in the GANS IPT structure has a functional role to play within PPBS. By participating in the GANS process, these organizations acquire a broad understanding of the critical issues effecting the seven GANS programs and initiatives. The IPT structure can facilitate the building of consensus on cross-MAJCOM and cross-program priorities. Where consensus cannot be reached, the IPT structure provides a forum to document all sides of the issue and provide information and recommendations to the Air Force Corporate Structure, if required.

Exhibit 4-8 GANS Requirements Generation Interface

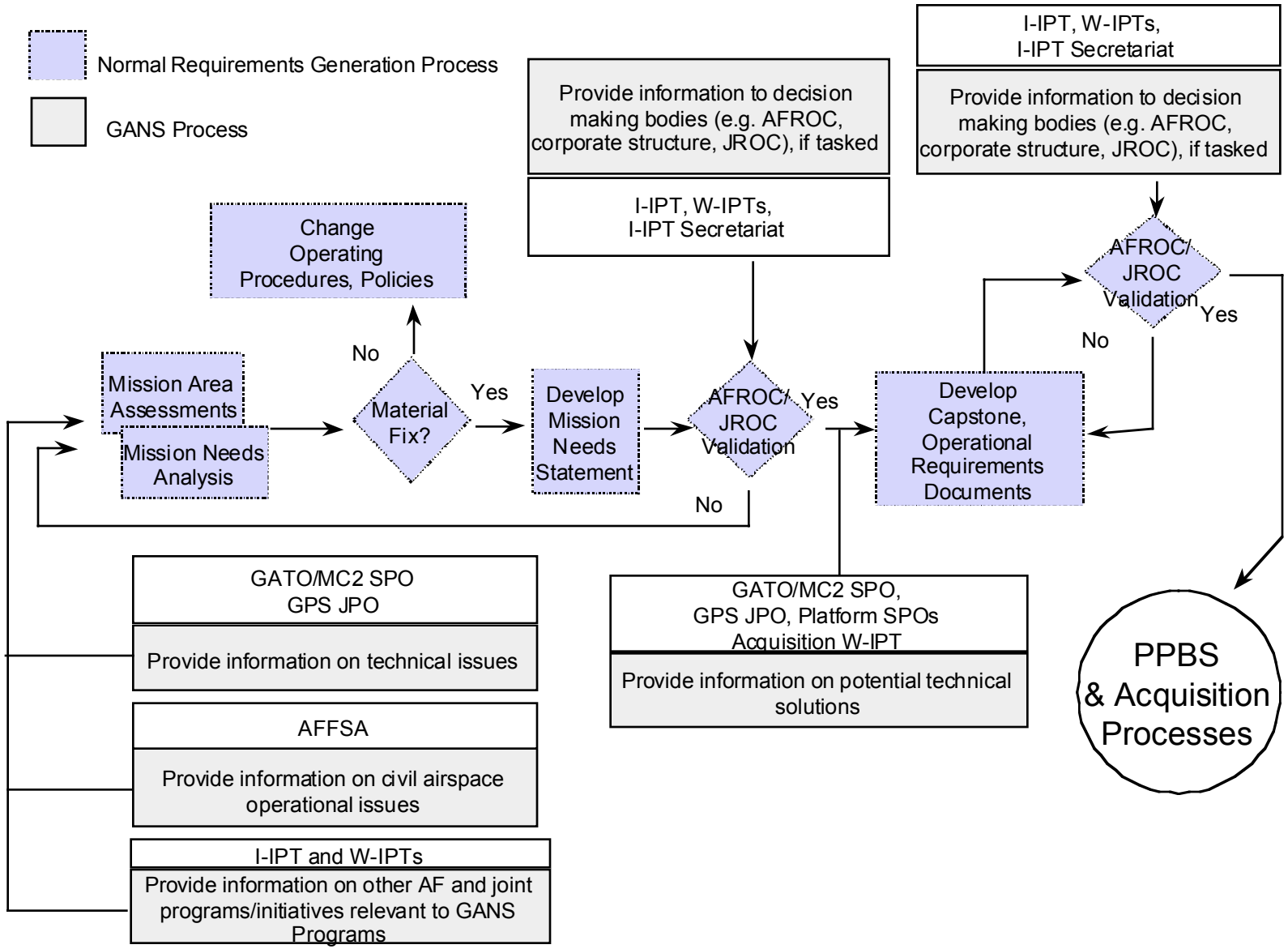
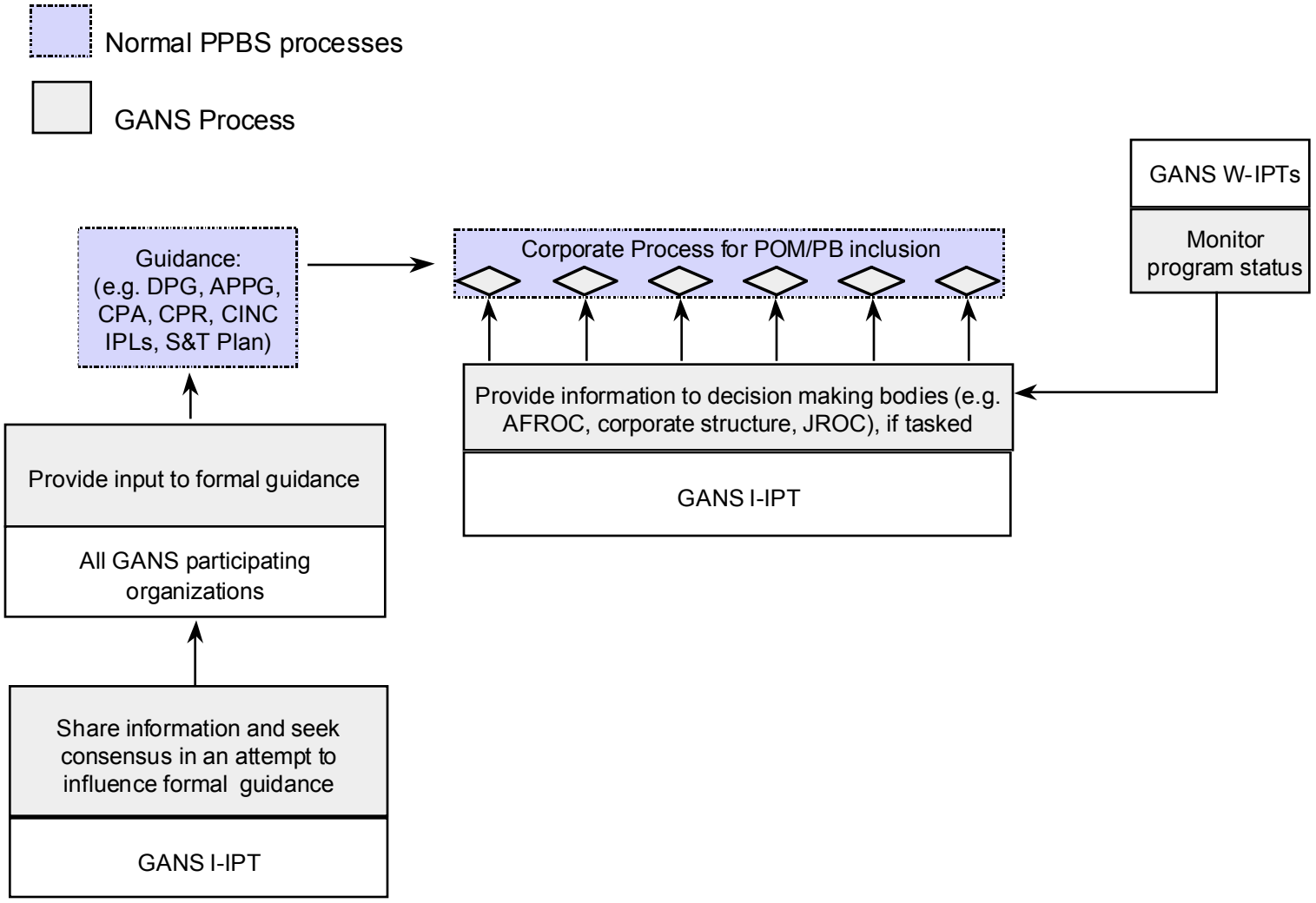


Exhibit 4-9 shows the relationship between GANS goals and objectives and the tasks required for the GANS structure to interface with the PPBS process. Exhibit 4-10 maps the GANS interface with the PPBS process and identifies the OPR for each task.

Exhibit 4-9 Goals, Objectives, and Tasks Related to PPBS

Goals	Objectives	Tasks
Preserve and enhance combat capability by reducing cost and aircraft down time through the consolidation of requirements among programs and initiatives	Identify overlapping requirements and minimize redundant solutions among GANS programs and initiatives Examine other military programs and initiatives to determine if GANS requirements can be met or combined with existing or planned capabilities Examine GANS modifications to determine if the enhanced communications and navigational capabilities can be used to meet other military requirements	Share information and seek consensus in an attempt to influence formal guidance Provide input to formal guidance Provide information to decision making bodies (e.g. AFROC, corporate structure, JROC), if required Monitor program status
Field operational capabilities that support Global Engagement mission needs through timely, affordable, flexible acquisition approaches	Pursue a phased fielding strategy based on weapon system-specific mission impact resulting from the phased implementation of civil airspace access criteria Maintain the integrity of weapon system-specific acquisition processes while promoting common acquisition mechanisms Pursue flexible architectures that minimize hardware upgrades as requirements evolve Leverage commercial technology, when possible Employ efficient spectrum utilization approaches when implementing GANS solutions	
Pursue parallel upgrade of related air, ground, and space air traffic management infrastructure to achieve compatibility and interoperability for seamless global operations and enhanced warfighting capability	Maintain interoperability with domestic and foreign civil air traffic control authorities in fixed and deployable ground systems Ensure airborne C4ISR assets take full advantage of the mission implications of emerging GANS-related capabilities	

Exhibit 4-10 GANS PPBS Interface



4.4.3 Acquisition Process

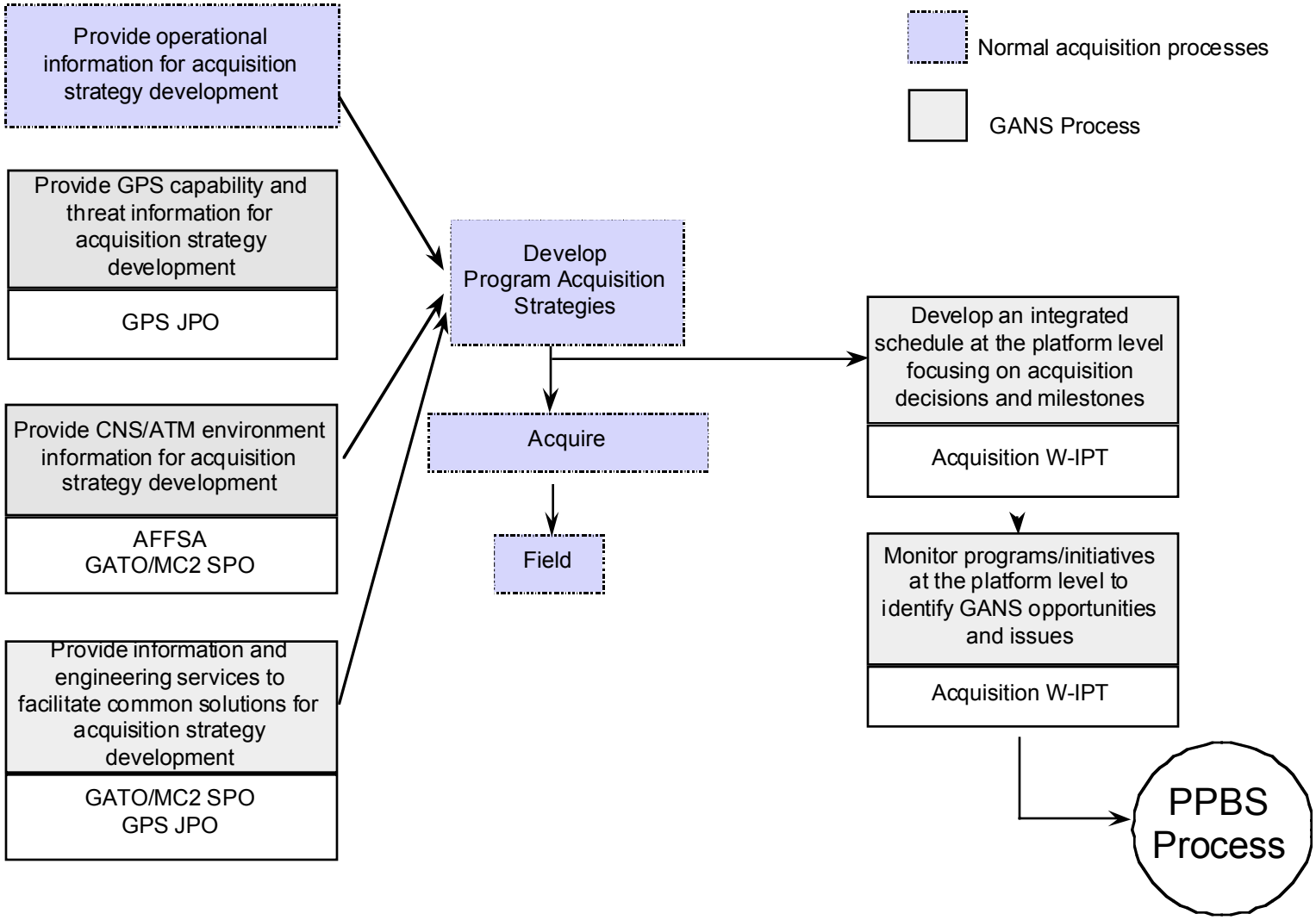
Acquisition execution of GANS programs and initiatives occurs at the platform level. The GATO/MC2 SPO has been charged to identify, facilitate, and optimize common acquisition of CNS/ATM components and ground infrastructure and to assist platform single managers in developing and documenting technical architecture requirements utilizing CNS/ATM products approved by the GATO/MC2 SPO. The GPS JPO's mission is to acquire and sustain survivable, effective, affordable global positioning services for its customers. The GPS JPO provides technical and programmatic support to over forty AF GPS integration programs and acts as the single focal point for all DoD GPS UE quantity requirements. The GANS acquisition challenge is to forge a strong partnership between the GATO/MC2 SPO, the GPS JPO, and the weapon system SPOs to meet user requirements while reducing costs by seeking commonality across platforms. Commonality reduces logistics tails, configuration management, and training costs, promotes software reuse, and enables economies of scale. The spectrum of acquisition strategies runs from centralized component purchase and integration through a common SPO to decentralized purchase and integration through the individual platform program offices. The GATO/MC2 SPO is implementing a flexible acquisition process through centralized purchase with decentralized integration. Under this strategy, equipment is acquired via an indefinite delivery/indefinite quantity (ID/IQ) vehicle with products identified in a product catalog. The platform SPO selects the product from the catalog. The product is then integrated into the platform architecture by a systems integrator selected by the platform SPO.

As chair of the Acquisition W-IPT, the GATO/MC2 SPO will work closely with the GPS JPO and the weapon system SPOs to identify opportunities and issues involving common solutions. The Acquisition W-IPT will also monitor GANS-related program execution at the platform level. Exhibit 4-11 shows the relationship between GANS goals and objectives and the tasks required to interface the GANS structure with the acquisition process. Exhibit 4-12 maps the GANS interface with the acquisition process and identifies the OPR for each task.

Exhibit 4-11 Goals, Objectives, and Tasks Related to Acquisition

Goals	Objectives	Tasks
Preserve and enhance combat capability by reducing cost and aircraft down time through the consolidation of requirements among programs and initiatives	Identify overlapping requirements and minimize redundant solutions among GANS programs and initiatives Examine other military programs and initiatives to determine if GANS requirements can be met or combined with existing or planned capabilities Examine GANS modifications to determine if the enhanced communications and navigational capabilities can be used to meet other military requirements	Provide CNS/ATM environment information for acquisition strategy development Provide GPS capability and threat information for acquisition strategy development Provide information and engineering services to facilitate common solutions for acquisition strategy development Develop an integrated schedule at the platform level focusing on acquisition decisions and milestones Monitor programs/ initiatives at the platform level to identify GANS opportunities
Field operational capabilities that support Global Engagement mission needs through timely, affordable, flexible acquisition approaches	Identify overlapping requirements and minimize redundant solutions among GANS programs and initiatives Examine other military programs and initiatives to determine if GANS requirements can be met or combined with existing or planned capabilities Examine GANS modifications to determine if the enhanced communications and navigational capabilities can be used to meet other military requirements	
Pursue parallel upgrade of related air, ground, and space air traffic management infrastructure to achieve compatibility and interoperability for seamless global operations and enhanced warfighting capability	Maintain interoperability with domestic and foreign civil air traffic control authorities in fixed and deployable ground systems Ensure airborne C4ISR assets take full advantage of the mission implications of emerging GANS-related capabilities	

Exhibit 4-12 GANS Acquisition Interfa



4.5 MEASURING PROGRESS

The processes described in the preceding sections are designed to move the Air Force toward its GANS vision. The mechanisms to measure how well the Air Force is moving toward the vision will need to be developed and refined. The performance measures should provide a meaningful measurement for decision making or action. In general, they should answer the question "Are we doing the right things the right way?" Exhibit 4-13 shows how GANS performance measures will be developed.

Exhibit 4-13 Developing GANS Performance Measures

GANS GOAL	Questions	Mechanism	Implementing Action	POC
Preserve and enhance combat capability by reducing cost and aircraft down time through the consolidation of requirements among programs and initiatives	Are we achieving desired efficiencies? Are there new threats to be considered?	GANS Annunciator Panel	Develop metrics that depict degree of consolidation and mission impact of consolidation efforts Construction of the integrated GANS schedule	GATO/MC2 SPO Acquisition W-IPT
Field operational capabilities that support Global Engagement mission needs through timely, affordable, flexible acquisition approaches	Are capabilities being fielded to enhance mission performance? If not, what are the constraints?	GANS Annunciator Panel	Population of the GANS Annunciator Panel	GATO/ MC2 SPO MAJCOMs
Pursue parallel upgrade of related air, ground, and space air traffic management infrastructure to achieve compatibility and interoperability for seamless global operations and enhanced warfighting capability	Are there emerging discrepancies among ground, air, and space system capabilities that degrade mission requirements?	To be determined	Develop mechanism and metrics in coordination with the GANS community	GANS Secretariat
Engage civil authorities to bring about airspace access solutions that maximize military capabilities in support of Global Engagement at affordable costs	Have we predicted the right airspace access criteria and implementation timelines? Are the evolving civil airspace access criteria having the mission impact that we anticipated?	AFFSA tracking of airspace access criteria MAJCOM reports through Air W-IPT	Quarterly updates of specific CNS/ATM developments by region Quarterly updates of mission impacts through Air W-IPT	AFFSA Air W-IPT

The GANS Annunciator Panel will be a critical component of the performance measurement process.

> The GANS Annunciator Panel is the link between this strategic plan and the operational planning and execution of GANS-related platform modifications. The Annunciator Panel will be a web-based tool that displays detailed information on GANS-related acquisitions by platform. MAJCOMs will determine when requirements, funding, systems architecture, acquisition decisions, technical architecture, certification plans, or fielding issues are causing a negative mission impact that requires attention. The Annunciator Panel will contain the ability to drill down to the programmatic level, and include details such as key performance parameter (KPP) definitions, platform master schedules, and links to requirements, funding, and acquisition documents. The information contained in the Annunciator Panel will be updated quarterly.

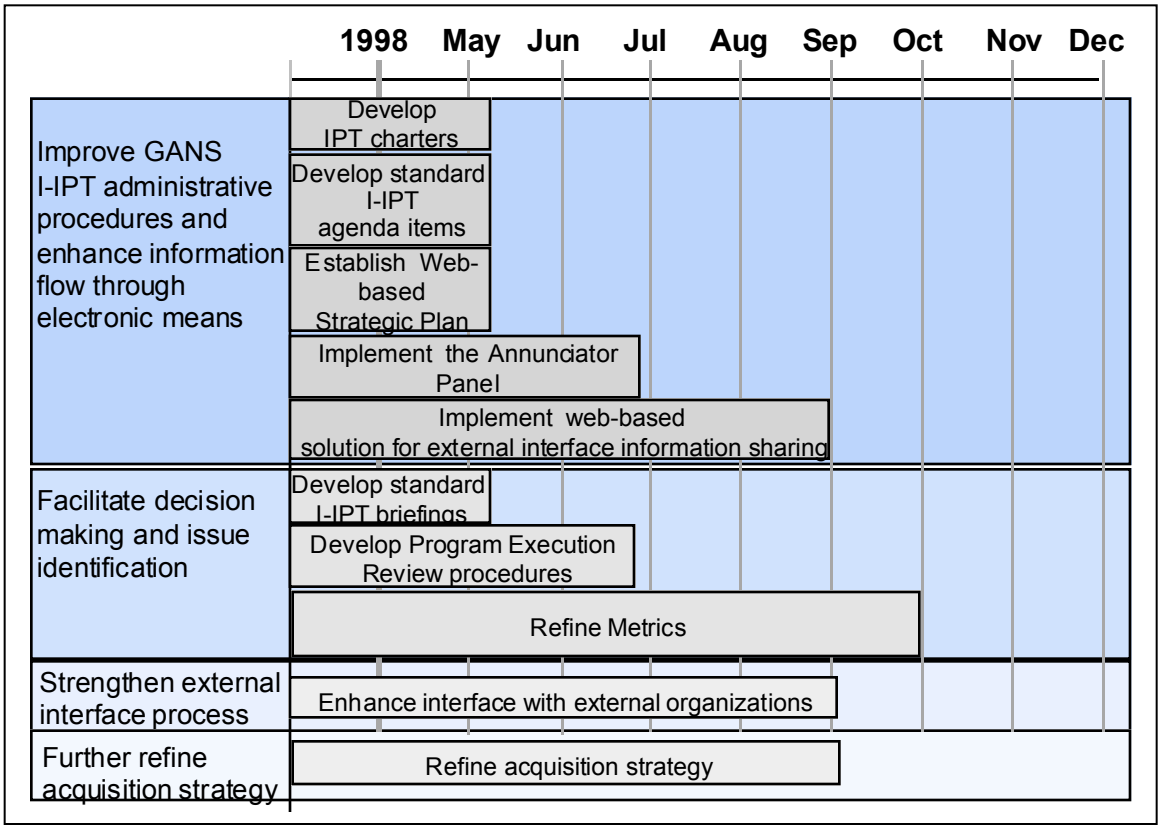
4.6 BUSINESS PROCESS ROADMAP

In its first six months of existence, the GANS management structure concentrated on requirements–the Air, Ground, and Theater Operations Working IPTs were tasked to accomplish a total review and definition of each program's requirements. The establishment of the acquisition W-IPT in December 1997, provided increased focus on acquisition issues. The roadmap depicted in exhibit 4-14 shows the actions being taken to further enhance the effectiveness of the GANS management structure as it moves towards the achievement of GANS goals and objectives. These actions can be categorized as follows:

- Improve GANS I-IPT administrative procedures and enhance information flow through electronic means
- Facilitate decision making, issue identification, and performance measurement
- Strengthen the process through which the Air Force engages with civil aviation authorities and other external organizations
- Further refining the acquisition strategy governing the relationship between the GATO/MC2 SPO, the GPS JPO, and the individual platform managers.

Status of specific business process roadmap implementing actions are contained in Appendix C.

Exhibit 4-14 Business Process Roadmap



4.7 STRATEGIC PLAN UPDATE PROCESS

This plan is meant to be a "living document," managed through distributed, interactive participation within the GANS community. It provides a framework to raise issues, take actions, and document those actions and their impact on achieving the GANS goals. The GANS I-IPT secretariat will conduct the administrative upkeep of the plan. The plan will be reviewed quarterly. Changes will be coordinated with the full I-IPT membership and approved by the I-IPT co-chairs.

A specialized worldwide web-based project management tool will be used to facilitate interaction among GANS participants. This tool will allow the diverse GANS community to interact, monitor recent military and civil developments, update status of tasks and the strategic plan, and have access to a common schedule and a broad library of common documents. Access to the GANS project management site will be granted by AF/XOR-GATM.

5.0 CONCLUSION

This plan looks at the GANS challenge from several perspectives.

- The civil airspace architecture perspective provides an understanding of the external drivers for GATM.
- The GANS program/initiative perspective provides an understanding of the interrelationships between GATM and the other GANS components.
- The platform category perspective provides a roadmap for the Air Force transition to the CNS/ATM end state, currently being defined as some derivative of the free flight concept.
- The business process perspective provides a structured approach with corresponding implementation actions to achieve the GANS goals and objectives.

The GANS Strategic Management Plan provides a "way ahead" for an effort that will:

- Speed response during peacetime engagement and contingency deployment
  - Access to most effective routes
  - Avoidance of air traffic delays
  - Deployable precision landing capability
- Enhance mission performance
  - Protected, accurate position, velocity, timing
  - Communications (SATCOM, Datalink)
- Minimize aircraft mishaps
  - Enhances aircraft safety capabilities
  - Reduces aircrew workload and mission duration
- Conserves resources during day-to-day operations & training
  - Efficient routing, avoidance of ATC delays.

This plan

- Tells the Air Force GANS story
- States the GANS vision, goals, and objectives
- Provides an integrated strategy for GANS programs and initiatives and lays out roadmaps for three platform categories linked to emerging civil airspace architecture developments
- Provides a plan to enhance the effectiveness of the GANS management processes.

GANS seeks to increase management effectiveness over diverse, yet interrelated, programs and initiatives within the context of an extremely dynamic military and civil environment. This is only a start to a long, and challenging process. The rewards, however, are great–an Air Force with unfettered access fully ready to support the full range of missions dictated by the National Military Strategy.

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APPENDIX A

CIVIL AIRSPACE ACCESS REQUIREMENTS

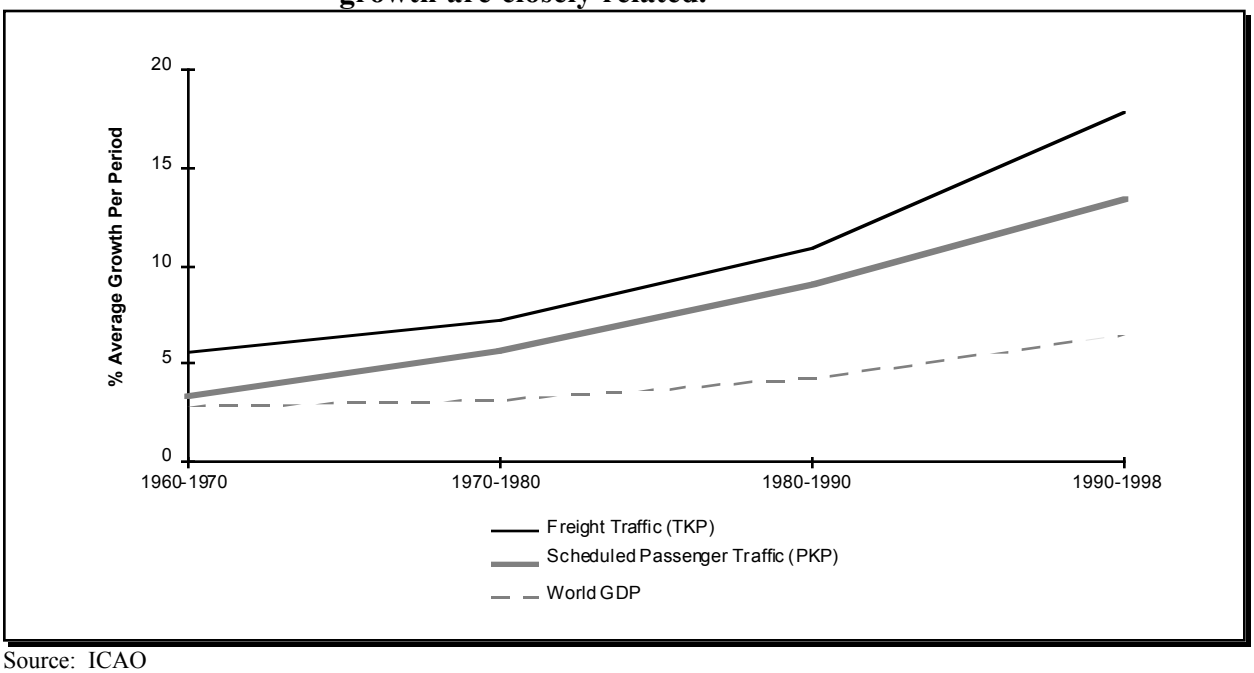
A.1 CNS/ATM Background

A.1.1 CNS/ATM System Evolution and Driving Forces

CNS/ATM developments are driven by the need to enhance safety, increase airspace capacity, reduce air carrier operating costs, and reduce capital and operations/maintenance (O&M) costs of air traffic control (ATC) service providers. Until approximately 1990, there was not much change in global airspace operational procedures or ATC technology. Since that time, several events have occurred that have driven a radical change in ATC concepts of operation and technologies designed to support those concepts of operation.

The first significant event and primary driver is the shift from regional economies to a global economy. The fall of the Soviet Union, liberalization of trade polices through the World Trade Organization (WTO), and the need for industrialized countries of the world to use one country's comparative advantage to achieve competitive advantage continue to fuel rapid global economic growth. Air travel demand is highly sensitive to changes in economic activity. Growth in global GDP per capita has resulted in rapid increases in worldwide air passenger and cargo operations. Exhibit A-1 indicates that small gains in GPD per capita growth have resulted in large gains in air traffic growth.

Exhibit A-1 Historically, GDP per capita growth and air traffic growth are closely related.

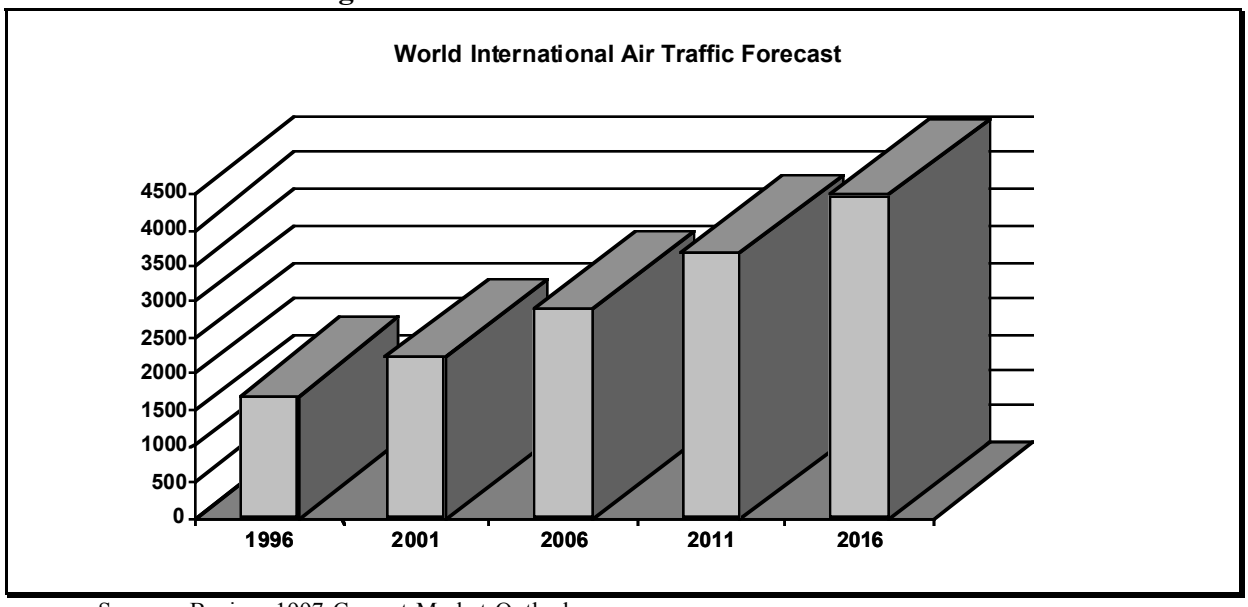


Source: ICAO

Given the high sensitivity of air travel demand to the level of economic activity, relatively small differences in overall economic growth should have considerable impact on the air travel demand component. World air travel is expected to increase 5-6% on average, although its geographic spread will be uneven. This 5-6% average growth per year, when projected out ten years, equates to a total compounded increase in air traffic of 70-80%. This projected growth

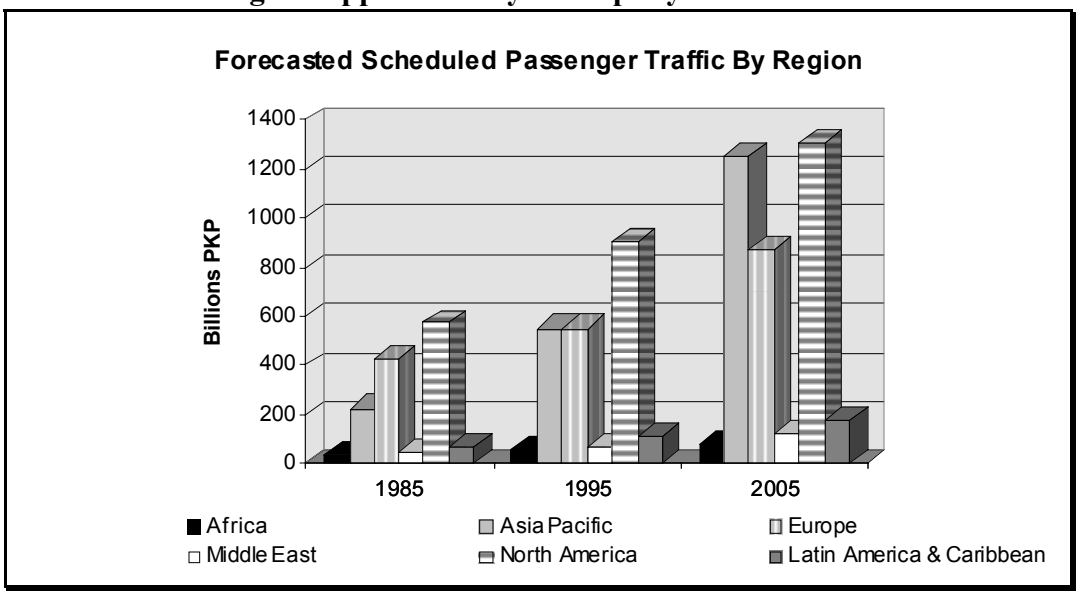
factor is a major driver that is resulting in significant changes to global CNS/ATM developments and efforts to enhance safety and increase capacity. Exhibits A-2 and A-3 depict long-term forecast growth in world international air traffic up to the year 2016 and forecast schedule passenger traffic for each ICAO region up to 2005, respectively.

Exhibit A-2 World international air traffic forecasts indicate high growth rates.



Source: Boeing, 1997 Current Market Outlook

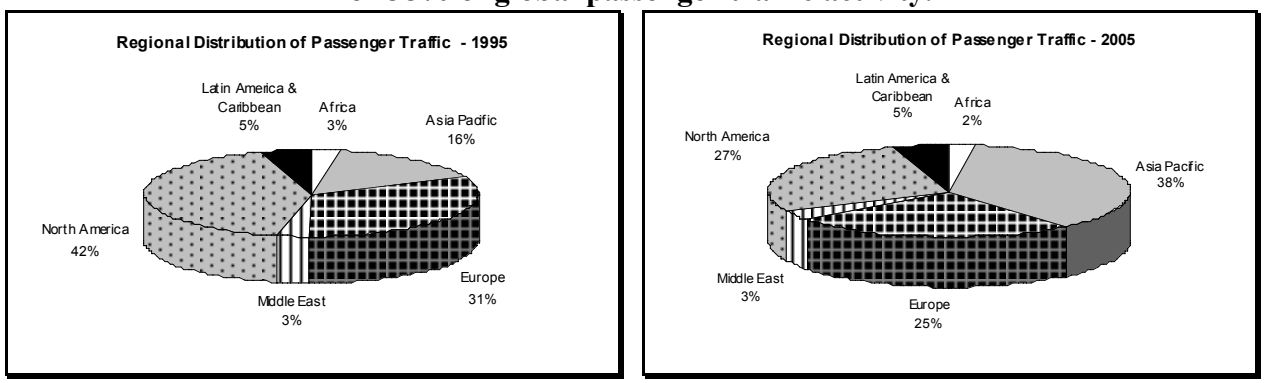
Exhibit A-3 Globally, scheduled passenger traffic is forecast to grow approximately 5-6% per year.



Source: ICAO

The Asia/Pacific region, a region which has shown significant economic growth, is expected to account for 38% of the world's scheduled passenger traffic by 2005. Exhibit A-4 indicates forecast shifts in the world's scheduled passenger traffic.

Exhibit A-4 By 2005, the Asia/Pacific region is expected to account for 38% of global passenger traffic activity.



Source: ICAO

Deregulation, liberalization, and improved airplane range capabilities together are giving airlines increased flexibility, enabling them to accommodate traffic growth by selecting the best mix of flight frequencies and airplane capacities for their route systems. History shows that airlines have found it more valuable to accommodate growth through added flight frequencies and new city-pair services than by adopting larger-capacity airplanes with their lower seat-mile costs. Industry analysis conducted by the International Air Transport Association (IATA) shows that airlines are continuing to favor frequency over airplane size, but as load-factors reach capacity, airplane size will increase. The high load factors that airlines are experiencing suggest the industry may be on the verge of a capacity shortage–implying that part of the solution may be to increase airspace capacity.

In recognition of the challenges to increase airspace capacity while maintaining or increasing safety, the International Civil Aviation Organization (ICAO) Special Committee on Future Navigation Systems (FANS) developed the FANS concept, which later became known as the communications, navigation, surveillance, and air traffic management (CNS/ATM) system concept. The CNS/ATM concept [called global air traffic management (GATM) by the DoD] is based on the premise that air traffic management exists to provide dynamic allocation of user-preferred flight trajectories, while maintaining or increasing existing levels of safety. Full implementation of CNS/ATM systems would give pilots the flexibility to optimize flight paths in real time without compromising safety or efficiency of the overall system. The use of CNS/ATM technologies in an integrated, global ATM system that provides freedom to airspace users is being advocated in a term called "free flight."

A.1.2 CNS/ATM Technical and Operational Concepts

The CNS/ATM concept relies on extensive use of technology such as satellite-based navigation systems, data links, automation, and new operating concepts. Evolving CNS/ATM

concepts and systems are designed to overcome the limitations of the current ATC system, including:

- Propagation limitations of current line of site systems produce wide variations in capacity, limit the range of operations, accuracy, and availability. Due to terrain limitations in many regions of the world, it is difficult if not impractical, for current terrestrial-based ATC systems to be used safely and effectively
- Severe limitations of voice communications, the principle media for ATC and ATM, and the lack of high-capacity, real-time, reliable digital air-to-ground data interchange
- The institutional difficulty of integrating, operating, and maintaining a variety of different systems, many of which perform the same or similar functions
- Insufficient number of terrestrial surveillance systems over large regions of the globe, many of which require relief from congestion
- Air route availability constrained by terrestrial navigation aids which create bottlenecks due to their location or density
- Air traffic control procedures which are dissimilar, requiring modification of flight profiles
- Separation standards which are dissimilar, requiring modification of flight profiles
- A lack of appropriate parallel route structures to relieve route congestion
- Poor quality and incompatible communications facilities
- International language difficulties.

An overview of key CNS/ATM technologies, operations concepts, safety-related equipment and their corresponding links to AF GANS programs and initiatives are described in Exhibit A-5. A more detailed description of CNS/ATM technologies and issues is available in the *Air Mobility Command CNS/ATM Study: CNS/ATM Interoperability Requirements Report* prepared by the MITRE Corporation through the AF Electronics Systems Center, Hanscom AFB.

Exhibit A-5 Key CNS/ATM Technologies, Operations Concepts, and Safety Equipment

CNS/ATM Element	Description	GANS Link
Communications		
Data Link	Consists of HF, VHF, Satellite, and Mode S data link communications. Data link supports ADS and CPDLC,	ATCALS/DATCALS, GATM, Avionics

CNS/ATM Element	Description	GANS Link
	critical enabling technologies for reduced aircraft separation minima. Data link standards have not been fully developed.	Modernization
UHF Radio	The primary method for military air-to-air and air-to-ground communications. Civil air operations do not use UHF radio, but current civil airspace supports military UHF operations. Continued support of military UHF operations in civil airspace is a major issue that is still in contention.	ATCALS/DATCALS, GATM, Avionics Modernization
25 kHz VHF Radio	The primary method of civilian air traffic control and aviation communications. VHF communications will transition from analog to digital systems. The Federal Aviation Administration's (FAAs) NEXCOM radio program describes the transition from analog to digital VHF communications. The NEXCOM radio will support both voice and data communications over a digital link. Due to frequency congestion in Europe, the standard 25 kHz radio frequency was split to 8.33 kHz to support European airspace. The VHF data link standard is still being developed. However, ICAO has established VDL-3 time division multiple access (TDMA) as the long term voice and data communications solution. The Europeans favor a TDMA concept, with some parts of Europe favoring the Swedish Self-Organizing TDMA (STDMA) system. The FAA has adopted the ICAO standard system, VDL Mode 3.	ATCALS/DATCALS, GATM, Avionics Modernization
HF Radio	HF radio supports civil air-to-ground communications over oceanic regions and remote land areas. Civil HF communications are relayed from the pilot through an Aeronautical Radio Incorporated (ARINC) radio operator to an appropriate FAA or international ground controller.	ATCALS/DATCALS, GATM, Avionics Modernization
Satellite Communications (SATCOM)	Satellite communications supports direct pilot to controller voice communications over oceanic and remote land areas. Satellite data link is also used to support ADS operations via FANS-1 or future CNS/ATM-1 implementations.	ATCALS/DATCALS, GATM, Avionics Modernization
Mode S data link	Mode S is a special type of secondary surveillance radar that has an inherent data link capability. Mode S currently provides enhanced surveillance and supports TCAS. Future changes in European air traffic structure will require the ability to integrate Mode S as a data link source (Mode S Level 4 required if FMS equipped). The Mode S data link may be used to support ADS operations or to provide various types of air traffic services, such as weather or clearance information.	GATM
Aeronautical Telecommunications Network (ATN)	The ATN will provide the standards and protocols used to support voice and data link communications in the future CNS/ATM environment. ATN standards are still under development.	ATCALS/DATCALS, Avionics Modernization
Navigation		
GNSS	GNSS, based on the Global Positioning System (GPS), Global Orbiting Navigation Satellite System (GLONASS) or other systems that are not yet defined, is a key enabling technology that will provide users with the capability to navigate with a high degree of accuracy anywhere in the world. GNSS overcomes the limitations of current terrestrial based navigation systems which are limited by line of sight and other geographic factors (limited oceanic and remote area coverage) and provides better navigation	GPS 2000/2005, NavWar, GATM, Navigation and Safety, JPALS, ATCALS/DATCALS, Avionics Modernization

CNS/ATM Element	Description	GANS Link
	accuracy. The availability of a highly accurate navigation signal is essential in order for the CNS/ATM concept to reach its full potential. The FAA is implementing differential GPS via ground based infrastructure called the Wide Area Augmentation System (WAAS) and local area augmentation system (LAAS). The WAAS is being developed primary to enhance en route navigation over the U.S. The LAAS concept is targeted at providing precision approach capability. The Europeans and Japanese are implementing similar systems called the European Geostationary Navigation Overlay Service (EGNOS) and MTSAT, respectively.	
Navigation Aids (NAVAIDS)	NAVAIDS consist of ground-based navigation aids that provide nonprecision approach and en route navigation capability (except over oceanic areas), including very high frequency omni-direction and ranging (VOR), distance measuring equipment (DME), tactical air navigation (TACAN), VORTAC, and nondirectional beacon (NDB) which is used to fly automatic direction finding (ADF) approaches. CNS/ATM implementation plans indicate that these systems should be phased out (in lieu of GNSS navigation) approximately in the 2008-2012 time frame. However, some of these systems may be used as an alternate or backup to GNSS navigation.	ATCALS/DATCALS
Precision Approach	Precision approach systems include the instrument landing system (ILS), microwave landing system (MLS), and differential GNSS (e.g., LAAS). Military users also include precision approach radar (PAR) to support this function. Frequency congestion problems in Europe have resulted in the use of Protected ILS receivers (protected from FM broadcast interference) and the use of MLS in the core area of Europe. ILS Category I (CAT I) systems are scheduled to be decommissioned in CONUS in the 2008-2012 time frame. ILS CAT II/III systems are scheduled to be decommissioned in CONUS in the 2010-2015 time frame.	ATCALS/DATCALS, JPALS, GATM, GPS 2000/2005, Navigation and Safety, Avionics Modernization, NavWar
Surveillance		
Secondary Surveillance Radar (SSR)	SSRs are dependent surveillance systems that transmit a signal that is received and responded to by an aircraft transponder. SSR returns enhance the information provided by primary radars by furnishing aircraft transponder code and altitude information.	ATCALS/DATCALS
Mode S	Mode S is a type of SSR that is based on monopulse processing techniques and has an inherent data link. Mode S provides enhanced surveillance capabilities for ground controllers. Current FAA and ICAO guidance requires Mode-S transponder capability be resident in any TCAS II equipment installations. The Mode S data link can support ADS operations.	ATCALS/DATCALS, GATM, Navigation and Safety
Primary Surveillance Radar	Primary radars are independent surveillance systems that transmit a signal which is reflected from targets such as aircraft, flocks of birds or weather. Primary radars provide "skin paint" position information. Civil en route radars will most likely be decommissioned as ADS operations are able to provide similar coverage. Terminal area primary radars	ATCALS/DATCALS

CNS/ATM Element	Description	GANS Link
	are forecast to remain in operation. The AF is in the process of procuring new Digital Airport Surveillance Radars (DASR) that will provide an integrated primary and secondary radar, with preplanned product improvements to permit upgrade to Mode S.	
ADS	ADS is a surveillance technique in which aircraft automatically provide, via a data link, data derived from on-board navigation and position-fixing systems. Although the application of ADS does not specifically encompass ATC communications, automation or procedures, all of these elements must be tailored to support the ADS function. Therefore, it is critical to consider airborne and ground-based automation [e.g., cockpit display of traffic information (CDTI) and standard automation replacement system (STARS)] and communications systems (satellite, UHF, VHF, and HF voice and data systems) as the foundation upon which ADS operations rely upon. Implementation of ADS will overcome limitations found today in procedural ATC systems based on pilot-reported position reports. The introduction of air-ground data links through which ADS reports and associated messages will be transmitted, together with accurate and reliable aircraft navigation systems, is designed to improve surveillance of aircraft in oceanic, remote land, and continental airspace.	ATCALS/DATCALS, GATM, Avionics Modernization
Traffic Alert and Collision Avoidance System (TCAS)	Enhances safety by providing the aircrew a warning when in conflict with other air traffic. TCAS II is required on all civil air carriers (FAR 121.356). In addition, it is anticipated that changes in the air traffic architecture will require the installation of this equipment on all aircraft operating in the European theater in the year 2003 and in Japan and the Far East in the year 2001. TCAS is known as the Airborne Collision Avoidance System (ACAS) outside the U.S.	Navigation and Safety, GATM, Avionics Modernization
ATM		
Airborne	Airborne automation includes the use of Cockpit Display of Traffic Information (CDTI), the aircraft's FMS, and data link to automate certain flight operations (e.g., aircraft avoidance using the CDTI, TCAS, and FMS). Human factors issues involving cockpit automation issues are still being analyzed.	GATM, Avionics Modernization
Ground	ATC automation systems consist of: 1) computers that process radar data and correlate flight plan information with radar targets, and 2) controller workstations that display aircraft position and flight information to controllers. Controllers use this information to separate and sequence aircraft. Future automation systems will be required to process radar and ADS surveillance information. Automation systems and analog displays in use today do not have the capacity to process or display all of the flight information from aircraft operating in the airspace delegated to AF ATC facilities. Automation systems also cannot accept radar data from adjacent locations to use when their designated radar "goes down." Additionally, current automation systems do not interface with some civil ATC systems.	ATCALS/DATCALS
Operations Concepts		

CNS/ATM Element	Description	GANS Link
Required Navigation Performance (RNP)	A key part of CNS/ATM is the required navigation performance (RNP) concept that recognizes that airspace planning is dependent on measured performance rather than designed in capability (also that with the advent of newer technology, it is more appropriate to specify a performance requirement rather than a specific equipment mandate). RNP describes the minimum navigation performance accuracy necessary for operation within a defined airspace. The RNP types specify the minimum navigation performance accuracy of all the user and navigation system combinations within an airspace. The development of the RNP concept recognizes that current aircraft navigation systems are capable of achieving a predictable level of navigation performance accuracy and that a more efficient use of available airspace can be realized on the basis of this navigation capability. The State must ensure that CNS services within a given airspace provide safe separation for a defined set of separation standards. The aircraft operator (and State of Registry) must in turn ensure that the aircraft intending to operate in a specified RNP airspace is equipped to achieve the required navigation performance. Various RNP levels are being implemented in different regions. European plans call for RNP-1 by approximately 2005.	GATM, Avionics Modernization, GPS 2000/2005, NavWar
Reduced Vertical Separation Minimum (RVSM)	RVSM increases airspace capacity by reducing the vertical separation standards in a designated airspace. Aircraft that do not have RVSM capability will be denied access to RVSM airspace due to safety reasons. RVSM hardware requirements include dual independent air data computers, an altitude reporting system, autopilot +/- 65 feet accuracy, and an altitude reporting transponder.	GATM, Avionics Modernization, GPS 2000/2005, NavWar
Reduced Horizontal Separation Minimum (RHSM)	RHSM increases airspace capacity by reducing separation from 50 nautical miles (nm) lateral, 50 nm longitudinal separation to 30 nm lateral, 30 nm longitudinal separation. In addition, various reduced longitudinal separation minima are being evaluated including 7 minute and 5 minute based minima.	GATM, Avionics Modernization, GPS 2000/2005, NavWar
In-Trail Climb/ In-Trail Descent (ITC/ITD)	The ITC/ITD initiative uses the traffic alert and collision avoidance system (TCAS), air-to-air very high frequency (VHF) communications, and high frequency (HF) communications. ITC/ITD provides a procedural mechanism whereby an aircraft desiring an altitude climb/descent may do so with as little as 15 nm longitudinal separation from a leading aircraft. Aircraft flying behind and 2000 feet above or below the other aircraft along the same oceanic route may request a climb or descent through the altitude of the lead aircraft as long as the distance between them is 15 nm, as observed on the TCAS, and the ground speed closure rate is 20 knots or less.	GATM, Avionics Modernization, GPS 2000/2005, NavWar
Area Navigation (RNAV)	RNAV capability allows aircraft to fly more efficient flight profiles by allowing flights from waypoint to waypoint, versus VORTAC to VORTAC.	GATM, Avionics Modernization, GPS 2000/2005, NavWar
Safety Equipment		
Emergency Locator Transmitter (ELT)	Provides expeditious rescue in the event of an aircraft crash, ditching, or other mishap. It increases chances of survival of accident victims due to rapid recovery and minimizes	Navigation and Safety

CNS/ATM Element	Description	GANS Link
	vulnerability of rescuers–required on civil air carriers (FAR 121.353).	
Flight Data Recorder (FDR)/ Cockpit Voice Recorder (CVR)	Provides the ability to reconstruct events and occurrences in the event of aircraft crash, ditching, or other mishaps. Allows procedures and systems to be modified to prevent a reoccurrence, required on civil air carriers (FAR 121.343/359).	Navigation and Safety
Windshear (reactive or predictive)	Enhances safety by providing the aircrew warning of windshear. Several aviation accidents have occurred in the past due to an aircraft inadvertently being flown into windshear conditions, required on civil air carriers (FAR 121.358).	Navigation and Safety
Weather Radar	Provides the aircrew the ability to avoid and navigate around severe weather, required on civil air carriers (FAR 121.357).	Navigation and Safety
Terrain Awareness and Warning System (TAWS)	Enhances safety by providing the aircrew warning when inadvertently in close proximity to the ground. TAWS decreases the potential for controlled flight into terrain (CFIT) and is required on civil air carriers (FAR 121.360). Enhanced TAWS with digital terrain database provides a "look ahead" capability greatly increasing crew members' situational awareness and flight safety. In March 1997, TAWS wash directed for all passenger and troop-carrying aircraft by 2005.	Navigation and Safety

A.1.3 CNS/ATM End-State (Free Flight)

For airspace users, the maximum utility to be derived from the new CNS/ATM system is embodied in a modern air traffic management concept called "free flight," which will dramatically increase system capacity and flexibility. The present system has been in use for approximately 40 years. It was conceived while radar was a nascent technology, and the volume of air traffic was significantly less than today's levels. Repeated attempts to increase capacity in order to meet rising demand in the absence of modern automation or new operational concepts proved to be unsuccessful. Consequently, the flexibility to operate efficiently in global airspace has thus far been inadequately addressed.

In the current ATC concept of operation, route of flight and altitude information is provided to airline operators via flight instrument flight rules (IFR) flight plans and positive (radar) control, which often times results in significant operational and economic inefficiencies. Flight plans, when used in conjunction with surveillance radar, provide controllers with predictable flight path data for each aircraft in their sector. With this knowledge, controllers are able to manage traffic and resolve potential flight path conflicts. The problem with this concept is that it is highly inflexible and inefficient, particularly as air traffic growth continues to increase.

The free flight concept permits airspace operations concepts to shift from strategic (flight path based) separation to one of tactical (near-term) separation. The flight management system (FMS) flight plan will be shared with the air traffic service provider and be used for flow planning purposes. The flight plan will no longer be necessary as the basis for aircraft

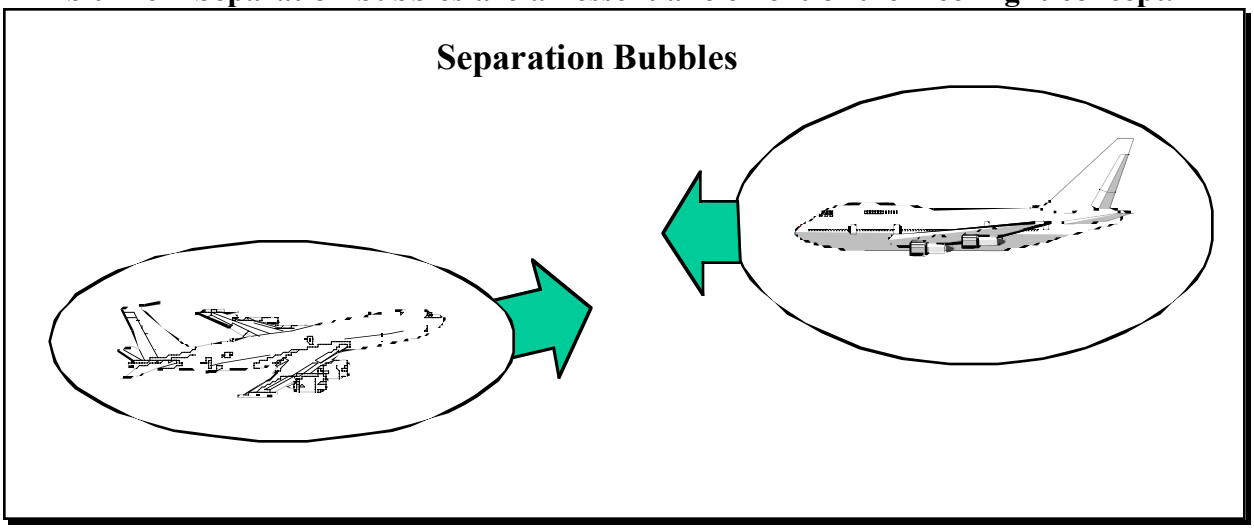
separation. Automatic dependent surveillance (ADS) messages will provide highly accurate aircraft position and velocity vector data. This new information and data exchange between the aircraft and air traffic service provider will facilitate a shift from strategic to tactical separation, resulting in optimized, real-time flight path and trajectory planning.

In order to separate aircraft during "free flight," ATC/ATM restrictions will be applied only to prevent potential conflicts, or to resolve instances where near-term predictions indicate a loss of aircraft separation. These restrictions or required maneuvers will be of very small duration in comparison to today's flight plan clearances.

Automation is an essential part of the new air traffic management system. For example, new automation technologies will identify conflicting, or potentially conflicting aircraft, and provide an appropriate restrictions or resolution maneuvers. With proper notification to controllers and involved aircraft, tactical separation– within minutes of the point of closest approach, becomes feasible. Flight path geometries that require intervention in today's system rules will not require any action in the free flight system. In the future system, the air traffic service provider will place an aircraft under restriction or direct a maneuver only to: resolve a tactical conflict, manage traffic flow to the end of the runway, or to ensure safety of flight. Under the free flight concept, the restrictions of fixed routes, flight path clearances, tunnels or required four dimensional flight paths will be unnecessary except in extreme circumstances.

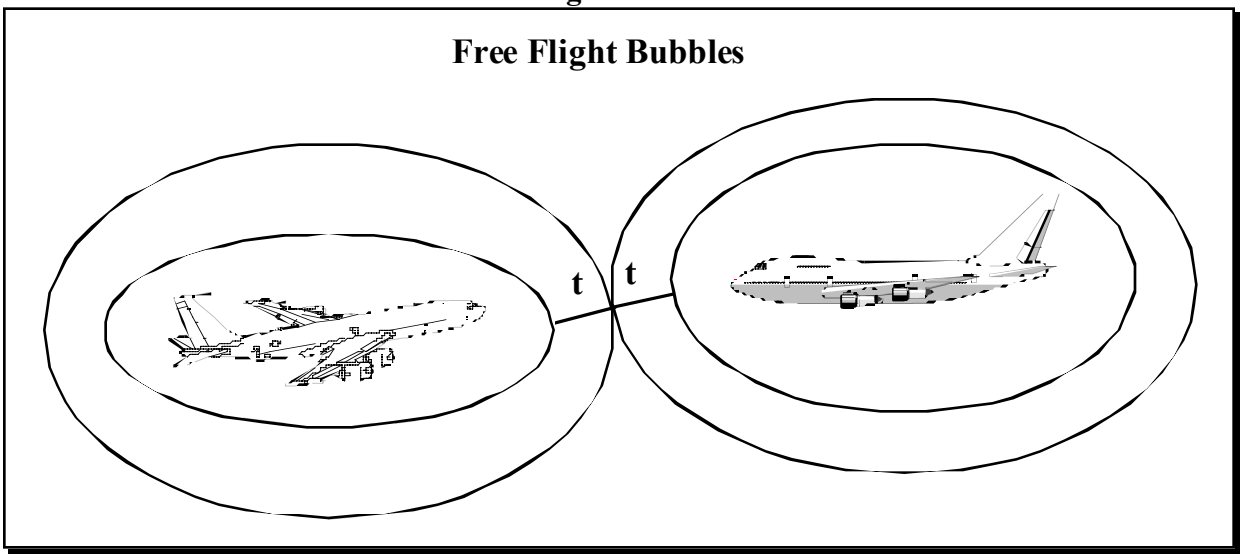
The essential factors affecting conflict rate in en route and terminal airspace are traffic density, complexity of flow, and separation standards. It is expected that reducing the separation standard, through the increased accuracy of Global Navigation Satellite Systems (GNSS) and ADS reporting, will have a very powerful affect on reducing the conflict rate. However, there are some minimum allowable distances to separate aircraft. In the free flight concept, this minimum allowable distance is called the "bubble in space," or separation bubble. The bubble in space is the area that surrounds an aircraft and whose size is defined by a level of position uncertainty. To ensure positive separation, aircraft separation bubbles are not allowed to touch. Exhibit A-6 depicts aircraft surrounded by their separation bubbles.

Exhibit A-6 Separation bubbles are an essential element of the free flight concept.



In order to deconflict approaching aircraft a second bubble, called the free flight bubble, is introduced and depicted in Exhibit A-7.

Exhibit A-7 Conflict resolution maneuvers will be performed by aircraft as they near each others free flight bubbles.



The time required to identify, resolve, communicate and react to a potential conflict with extremely high confidence is indicated by a lower case "t" in Exhibit 2-11. The time "t" will be a function of communications, navigation, surveillance capabilities, and pilot controller reaction time with a reasonable period for additional safety. Until both free flight bubbles touch, each aircraft is permitted to maneuver freely.

The incursion of two free flight bubbles will precipitate several events. Automated systems will determine an exact position and velocity for each aircraft and may request higher than normal ADS reporting rates. The automated systems will then project the flight paths of

both aircraft using the velocity vector to determine if the smaller separation bubbles will eventually touch and if so, suggest preventative actions. Once the distance between the two aircraft begins to increase, both would again be permitted to maneuver freely.

Aircraft with different CNS performance capabilities will have different separation and free flight bubbles, with the less capable aircraft protected by a larger bubble. The requirement for mixed operations would be accommodated by individual bubbles of the appropriate size. Resolution maneuvers, when required, could reflect onboard systems capability to provide a benefit incentive to offset required flight system investments. For example, aircraft with larger separation and free flight bubbles (less capable CNS systems) might be required to execute proportionately larger maneuvers. This way maximum benefit would accrue to the most capable aircraft, but aircraft with lesser capabilities could still enjoy substantial free flight benefits. This concept could be vitally important to AF aircraft that may not be as fully capable as state-of-the-art airline cockpits.

A significant DoD issue related to free flight is the flexible use of DoD special use airspace by the civilian community. Free flight capability will allow pilots to fly preferred trajectories and as a result, may increase pressure from the commercial air carriers on the DoD to allow more frequent use of DoD special use airspace. Increasing use of DoD airspace by commercial carriers will require a greater degree of flexibility of special use airspace and drive requirements for near-,and real-time coordination and planning between the DoD and civil aviation community.

A.1.4 CNS/ATM Implementation

Although ICAO CNS/ATM implementation plans are global, it is the responsibility of ICAO member States to develop their own implementation plans. ICAO has stated that global CNS/ATM implementation will most likely occur on a regional basis due to unique regional circumstances, including: geographic factors, air traffic growth rates, and the ability of States in the region to finance CNS/ATM infrastructure. For example, user groups in the Pacific have urgent needs to implement CNS/ATM in order to increase airspace capacity in a region experiencing high air traffic growth rates due to the expanding regional economies. The nations of the Pacific Region also have the ability to finance the required CNS/ATM infrastructure modernization.

This is in contrast to Africa which, although has vastly remote land areas with very limited air traffic control coverage, has a very low rate of air traffic growth, and lacks the ability to finance CNS/ATM infrastructure development. Additionally, some regions may have unique problems which require implementation of regional-specific CNS/ATM solutions. This is evident in Europe in the form of the 8.33 kHz VHF radio, protected ILS receiver, and MLS. Therefore, although CNS/ATM implementation is planned globally, implementation will most likely continue to occur regionally, and each region, such as Europe, may have special circumstances that warrant unique solutions.

Regional CNS/ATM implementation implies several challenges for the various user groups. Users must maintain their ability to operate using present systems while upgrading to CNS/ATM capability–for which not all technical and procedural standards have been fully developed, such as data link, free flight operating procedures, and other factors. This means that users must make decisions concerning operational and cost impacts based on subjective data (e.g., when will CNS/ATM standards be fully developed, in what regions, and to what schedule) as well as known, quantifiable data. These factors, compounded with special regionalized CNS/ATM requirements, such as the 8.33 kHz VHF radio in Europe, present significant implementation challenges for user groups. This is especially true for the USAF which has a global mission and cannot regionalize their fleet like the airlines, but must adapt to the highest denominator.

What is especially challenging for the USAF is that, unlike the airlines, AF CNS/ATM planning must be accomplished within the PPBS structure. The PPBS structure limits AF ability to plan for and implement CNS/ATM solutions within the reality of a dynamic and evolving global CNS/ATM architecture. Therefore, the Air Force must not only react to the rapidly changing CNS/ATM environment, but must also be proactive by trying to influence CNS/ATM requirements as they develop in formal and informal ICAO and other working groups, or–as a last resort–through the DoD PBFA process. Exhibit A-9 presents a CNS/ATM regional requirements implementation and situational assessment that defines regional CNS/ATM implementation timelines and related issues.

Exhibit A-9 CNS/ATM Regional Requirements Implementation and Situational Assessment.

NORTH ATLANTIC REGION		
Category	**Civil Requirement**	**Situational Assessment**
Communications	• Oceanic data link that can support controller-pilot data link communications (CPDLC) and automatic dependent surveillance (ADS) applications	• Communications requirements are not mandatory but direct benefits will only be offered to aircraft equipped with CPDLC and ADS. • Data link solution is dependent on data link infrastructure development in Europe and the U.S. (FANS-1 versus CNS/ATM-1). • A Reduced Separation Standard Implementation Group (RSSIG) safety assessment study due in early 1998 should provide direction on the use of FANS-1 versus CNS/ATM-1 (main concerns are infrastructure, integrity, and reliability). • The ADS and CPDLC applications defined in the ICAO Standards and Recommended Practices (SARPs) for CNS/ATM-1 are intended for use with the Aeronautical Telecommunications Network (ATN) and are significantly different from the ADS and CPDLC applications implemented in the FANS-1 system which uses the aircraft communications addressing and reporting system (ACARS). • The ICAO ADS Panel is now investigating FANS-1 to CNS/ATM transition issues. • Dual independent data links (primary and backup) will most likely be required for access to reduced separation oceanic tracks and inflight rerouting procedures (dual satellite, combination satellite/high frequency (HF), or dual HF) • The issue of HF data link (HFDL) as primary and/or secondary data link is still unresolved. • Inmarsat is currently approved as primary ATC data link. • Inmarsat is the only system currently approved for direct pilot-to-controller voice communications • North Atlantic Systems Planning Group (NATSPG) is beginning a safety assessment study (due early 1998) that will evaluate the issue of direct controller pilot communications over voice for emergency and non routine modes when accessing certain oceanic tracks with reduced separations. HF voice will not satisfy the requirement since HF voice communications are not direct, but forwarded to the air traffic services provider through ARINC operators. • ATN Systems Inc. (ATNSI) is developing the enabling technology (ATN router) to support data link applications and plans to begin certification of installed avionics and ground systems in early 2000. • U.K. is committed to implementing CNS/ATM-1 data link and opposes FANS-1 solution.

NORTH ATLANTIC REGION		
Category	**Civil Requirement**	**Situational Assessment**
		• FAA plans to implement a FANS-1 capability at New York Oceanic Center (CPDLC in late 1998 and ADS in 2000) and has no plans or funding to install ATN routers at New York or any other oceanic center. • NAVCANADA intends to implement ATN in 4th quarter 1999 and is also investigating the possibility of implementing FANS-1 at Gander oceanic center.
Navigation	• Current: Required Navigation Performance (RNP) 12.6 for minimum navigation performance specifications (MNSP) airspace between flight level (FL)285-420. • 27 March 1997: RVSM; FL 330-370. • 8 Oct 1998: Expansion of RVSM to FL 310-390. • 2000: Expansion of RVSM possible (FL290-410); longitudinal separation for crossing traffic reduced from 15 to 10 minutes; in-trail separation reduced from 10 to 7 minutes. • Beyond 2000: reduced lateral separation from 60 to 30 nmi; further reduces in-trail separation to 5 minutes, RNP 4	• State of registry approval is now required to operate in reduced vertical separation minima (RVSM) in North Atlantic (NAT) MNSP airspace. In practice, air traffic controllers often reserve FL390 for business jets and FLs 290 and 310 for crossing traffic, which is resulting in unapproved operators not only being excluded from RVSM airspace (FL330-370), but also being excluded from FLs 290, 310, and 390. • Reduced separation standards in the Atlantic are dependent on the ATN infrastructure and the CNS/ATM-1 package as defined by ICAO. • Operators must meet required altitude sensing and holding capabilities specified in RVSM minimum aviation system performance standards (MASPS). • Airborne requirements (e.g., displays and human-machine interface) have not been fully defined to support horizontal (longitudinal and lateral) separations for crossing traffic from 15 to 10 minutes. • Plans for further reduction of horizontal separations, especially based on the use of data link, are in the conceptual stage. • Current NAT air traffic management plans calls for full implementation of the 1992 NAT Air Navigation Plan (ANP) between 2010 and 2015. • Free flight phased implementation will not happen in the NAT before 2005. • Reduced Horizontal Separation Minimum (RHSM) requires ADS and CPDLC capability. • RHSM may require RNP 4 capability.
Surveillance		• NATSPG is considering the possible use of the traffic alert and collision avoidance system (TCAS) for increased situational awareness in oceanic airspace.

PACIFIC REGION		
Category	**Civil Requirement**	**Situational Assessment**
Communications	• 2003: Oceanic data link communications system that can support CPDLC and ADS applications	• MASPS for required communications performance (RCP), including availability, delay, and accuracy are still in development • MASPS will not define the RCP parameters needed to support safe operations in different airspace types (e.g., oceanic, en route, terminal) • Direct pilot-to-controller voice communications will most likely be required for reduction of aircraft separations to 30 nmi • The International Federation of Air Traffic Controllers Association (IFATCA) and the International Federation of Airline Pilots Associations (IFALPA) believe that only satellite voice gives the response time needed for controller intervention with less than 50 nmi separations • FAA believes that satellite voice is not needed for 50/50 separations, by may be for 30/30 • Disagreements exist within ICAO about the necessity of a direct pilot-to-controller voice link for safe reduction of separations; ICAO ADS panel support direct voice link, Review of the General Concept of Separation Panel (RGCSP) does not • The only system approved for beyond-line-of-site direct pilot-to-controller voice communication is the Inmarsat Aero-H high-gain system. • FANS-1 system only supports one data link and HF voice backup • Motorola has stated its intention of providing a full range of aeronautical services, including ATC, over the Iridium low-earth orbit (LEO) satellite system and has filed with the FCC for the appropriate spectrum in the aeronautical mobile satellite (route) service [AMS(R)S] band. ICAO will decide whether to develop SARPs for next-generation satellite systems in spring 1998. • Dual independent data links (primary and backup) will most likely be required for access to reduced separation oceanic tracks and inflight rerouting procedures (dual satellite, combination satellite/HF, or dual HF)
Navigation	• 23 Apr 98: RNP-10 in North Pacific (NOPAC) and Pacific Organized Track System (PACOTS). Affects FL310-410 for ATS routes R220 and G344, including all offshore and oceanic airspace between those routes. • 23 April 1998: IPACG is actively planning for implementation of RNP 10 and 50 nmi lateral separations on the	• CENPAC Notice to Airmen (NOTAM) cannot be issued without resolution of the direct pilot-to-controller communications issue. • Requirement for RNP-4 by 2003 cannot be accomplished without ATN compliant CPDLC and ADS; the resolution of the primary and backup data link issues; and the issue of direct pilot-to-controller voice communications. RNP 4 will most likely call for compliance with the RNP MASPS (RTCA DO-236).

PACIFIC REGION		
Category	**Civil Requirement**	**Situational Assessment**
	North Pacific (NOPAC) and Central East Pacific (CEPAC) routes. In CEPAC, RNP 10 approval required for FL310-410 for ATS routes R463, R464, R465, R585, R576, R577, and R578 and all airspace within the Oakland FIR between 100 nmi north of Air Traffic Services (ATS) route R463 and 100 nmi south of ATS route R578. • Late 1998: Japanese Civil Aviation Bureau (JCAB) planning for implementation of RNP 10 and 50 nmi lateral separations on the Pacific Organized Track System (PACOTS) of the Central Pacific (CENPAC) • 2000: RNP-10 in all Pacific airspace • 24 Feb 2000: RVSM in the North and Central Pacific (possible altitudes from FL290-410) • 2003: 30 nmi separations, RNP-4	
Surveillance	• Mid 1999: ADS at Oakland Center • TBD: ADS at Anchorage Center • 2003: CNS capability (CPDLC, RNP-4, ADS) in dense oceanic airspace	• Various user groups have diverse opinions on the data link requirements to support ADS operations • ADS is expected to be supported using the same data link communications equipment that supports the CPDLC application • TCAS cockpit display of traffic information (CDTI) is a possible requirement although no plans for TCAS currently exist

CONUS		
Category	**Civil Requirement**	**Situational Assessment**
Communications	• 2003: limited data link operational service [VHF digital link (VDL) Mode 2; carrier sense multiple access (CSMA) 25 kHz] will be implemented in the high-altitude en route sectors and will evolve over time to include high-density terminal areas • 2003: NEXCOM radios will start to be installed in all high-altitude and en route sectors and high density terminal sectors but still operate in analog mode • 2005: certain high altitude and high density terminal sectors will change to digital mode to provide voice and data on the same frequency • 2006-2010: Existing data services will migrate from VDL Mode-2 to NEXCOM and new data services will be provided directly by the FAA. Installation of NEXCOM radios completed by 2010 and all high altitude en route sectors and major terminal sectors will have transitioned to digital NEXCOM service. • 2015-Beyond: low earth orbit satellite (LEOS) and medium earth orbit satellite (MEOS) networks may accommodate new data communications applications for domestic and oceanic airspace.	• The FAA NEXCOM investment analysis team is scheduled to internally brief that the preferred VHF alternative is VDL-3 TDMA. • By 2015, all civilian aircraft will be required to equip with NEXCOM radios in order to fly in domestic, controlled airspace. Ultra-high frequency (UHF) radios will be maintained until the DOD can equip all military aircraft with NEXCOM radios. • Transition to domestic air-to-ground satellite service is dependent on performance, equipage, and competitive pricing for service.
Navigation	• Present: Area Navigation (RNAV):	• Participation in NRP (which is a gradual introduction to free flight) requires

CONUS		
Category	**Civil Requirement**	**Situational Assessment**
	Point-to-point operations above FL 290 in accordance with National Route Program (NRP) • 1999-2002: Implementation of the Wide Area Augmentation System (WAAS) • 2003-2006: Implementation of the Local Area Augmentation System (LAAS) • 2005-Beyond: Phase out of ground-based navaids [very high frequency omni-directional ranging (VOR), distance measuring equipment (DME), VORTACAN (VORTAC), instrument landing system (ILS), non-directional beacon (NDB)]	aircraft certified for IFR operations and capable of area navigation (FAA Advisory Circular 90-91A) • WAAS/LAAS as a sole means navigation systems presents risks associated with reliance on a single navigation system. FAA is just starting to analyze those risks and has indicated that a limited set of ground-based navaids may be retained to provide back-up to satellite-based navigation systems. • FAA operates more than 600 tactical air navigation (TACAN) systems as the primary means of tactical air navigation for most military aircraft. Agreements between the FAA and DOD concerning the operation and maintenance of TACAN systems may have to be negotiated if DOD requirements specify continued use of the TACAN system in CONUS. • Studies need to be conducted to study the operational and technical impacts of using a second and possibly third civil GPS frequency on civil and military GPS operations.
Surveillance	• 2001-2005: FAA will start to decommission the en route (long-range) primary radars not required in accordance with FAA/DOD joint agreements. The long-range radars that DOD uses will remain operational until the end of their service lives (approximately 2017) • 2000-2008: Based upon air-to-air surveillance, provide enhanced terminal approach/departure and oceanic maneuvering services • 2008-2012: Full implementation of ADS-B:	• FAA-funded replacement of long-range radars used for national defense is currently not contemplated. • FAA has not comprehensively analyzed the cost benefits of ADS-B in CONUS. • FAAs Flight 2000 Program is supposed to show ADS-B and free-flight benefits, but the program is currently unfunded. Initial funding may occur in 1999 or 2000. • Implementation of ADS will be based on Mode S "extended squitter." • Mode S transponders must be upgraded [ground-initiated Comm B (GICB) message] to make them ADS-B compatible. Mode A/C transponders must be replaced with ADS-B transponders to support ADS-B operations. • The ADS-B transponder, in conjunction with a CDTI, will support air-to-air (i.e., TCAS functionality) • Considerable research in human-machine interface must be accomplished before CDTI certification and operation FAA must upgrade the Air Route Traffic Control Center (ARTCC) automation system before GICB and ADS data can be processed and fused.

EUROPEAN REGION		
Category	**Civil Requirement**	**Situational Assessment**
Communications	• TBD 1999: 8.33 kHz VHF radio in upper airspace of core area of Europe (Austria, Belgium, France, Germany, Luxembourg, the Netherlands, Switzerland, and the U.K.). The general European requirement applies above FL245; in France the floor is set at FL195. • 2003: 8.33 kHz VHF expected to be extended to FL195 in all implementing areas. • Unkown: Mode S data link • Unknown: VHF data link	• States implementing 8.33 kHz are expected to maintain and/or establish adequate UHF coverage and to adapt their procedures as necessary to provide ATC services to State aircraft that are not equipped with 8.33. This information will be published in State aeronautical information publications (AIPs). If UHF coverage is not available, a state aircraft that is not equipped with 8.33 "must be denied entry into airspace of mandatory carriage and must be (re)cleared outside such airspace….it is essential that State transport aircraft which are frequent users of 8.33 kHz airspace be fitted with 8.33 capability." • Introduction of 8.33 kHz in channel spacing below FL200 would eventually require military airfields and ships to be re-equipped. • Consensus on Mode S data link are eroding in Europe, raising its use uncertain as an air-ground data link. • The use of S-TDMA or TDMA to support data link operations has not been resolved
Navigation	• 1 January 1998: Basic RNAV (BRNAV) will be introduced above FL 245 throughout Europe • 1 Jan 98: all ILS localizer receivers must be protected from VHF frequency modulation (FM) broadcast stations (Protected ILS). • 29 Jan 98: mandatory carriage of RNAV equipment approved for RNP 5 [Basic RNAV (BRNAV)] operations on the entire Air Traffic Service (ATS) route network in the European Civil Aviation Conference (ECAC) area. • Nov 2001: Europe plans to implement RVSM in continental airspace between FL290 and 410. • 2002: The European Geostationary Navigation Overlay Service (EGNOS), which is the European equivalent to the WAAS, is	• EUROCONTROL Standard Document 003-93, Amendment 1, *Area Navigation (RNAV) Equipment Operational Requirements and Functional Requirements* notes that State aircraft are exempt when they are not operating under ICAO provisions and that tactical military aircraft are exempted from the provisions of the standard. • In addition to BRNAV, some conventional routes using ground-based navaids will be maintained and published. There is a specific exemption for military aircraft that are supposed to operate on a limited number of conventional routes. • Eurocontrol will approve GPS-based BRNAV. • The Major NATO Command (MNC) position paper states that military aircraft normally operating as general air traffic (GAT) must be equipped for BRNAV, but also states that "special procedures allowing minimum restrictions should be provided to military aircraft occasionally operating GAT." • GNSS is currently not authorized for sole-means BRNAV use in European airspace. • Existing TACAN avionics can be used for DME/DME or VOR/DME BRNAV because the ranging function of the TACAN is compatible with DME • The Direction Générale de l'Aviation Civile (DGAC) has stated that FM immunity will be mandatory but the application date could be postponed to 2001 in some countries, such as France.

EUROPEAN REGION		
Category	**Civil Requirement**	**Situational Assessment**
	supposed to reach final operational capability (FOC). • Beyond 2005: RNP 1	• The U.K. Civil Aviation Authority (CAA) plans to provide a limited degree of operational work-around for unequipped users through 1 Jan 2001; it will notify users of areas where interference to unprotected receivers is know to exist and, if necessary, limit the categories of operation available to those operators.
Surveillance	• 1 January 1999: Flight Management System (FMS)-equipped aircraft conducting instrument flight rules (IFR) flights in the European Air Navigation Region must be equipped with Level 4 Mode S transponders. Non-FMS aircraft conducting IFR flights must have Level 3 Mode S transponders. • 1 January 2000: ACAS for all civil fixed-wing turbine-engined aircraft having maximum take-off mass exceeding 15,000 kg. or with more than 30 passenger seats. • 1 January 2000: Level II Mode S transponder with downlink aircraft parameters (DAP) capability, for new aircraft. • 1 January 2003: Level II Mode S transponder with DAP capability, for all aircraft. • 1 January 2005: ACAS for all civil fixed-wing turbine-engined aircraft having a maximum take-off mass exceeding 6700 kg. or with more than 19 passenger seats.	• It is anticipated that all of Europe will adopt the requirement for Mode S transponder equipage. • European countries are adopting TCAS [airborne collision avoidance system (ACAS)] requirements based not only on passenger capacity but also on weight. • For military transport aircraft that regularly access the civil route structure, the MNCs "view the fitment of Mode S transponders to these types of aircraft as a civil-military requirement to which nations will need to comply to retain operational efficiency." For tactical aircraft, the MNC position is that waivers to the Mode S requirement will likely be acceptable in the early stages of implementation but that eventually they will have to comply with the requirement to avoid operational restrictions. The MNC paper also states, "in order to enter the civil route structures, military aircraft that can be so fitted, will need to comply with a level of Mode S carriage that is acceptable to civilian ATC authorities, while remaining attuned to military requirements." Mode S functions must be, as a minimum, on-off selectable from the cockpit or the appropriate aircrew station.

Other Significant Regions		
Region	**Civil Requirement**	**Situational Assessment**
Africa	• 1 January 2000: Mandatory carriage	• The African Region is heavily influenced by Europe. CNS/ATM requirements

	and operation of existing ACAS and pressure-altitude reporting transponders	for Africa will most likely mirror that of Europe. • Africa has the least amount of air traffic, but the highest rate of aviation accidents. This has lead ICAO to mandate carriage of ACAS equipment on board all commercial flights over the African continent.
Asia, Pacific Rim, Indian Ocean	• FANS-1	• Informal Pacific ATS Group (IPACG) is implementing FANS-1 systems in the North and Central Pacific based on heavy pressure from airlines operators who fly those routes frequently. FANS-1 technology enables the airlines to achieve operational benefits now.
Latin America and the Caribbean	• N/A	• Latin America and the Caribbean are heavily influenced by what occurs in the U.S. • This region will most likely adopt CNS/ATM systems based on the U.S. WAAS and ADS-B concepts. Implementation of these systems will come years after FOC of U.S. CNS/ATM systems, primarily due to financial considerations.

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APPENDIX B

GANS PROGRAMS/INITIATIVES

B.1 GANS PROGRAMS/INITIATIVES

The GANS management concept seeks to identify similar requirements across GANS programs and initiatives in order to eliminate redundant solutions by harmonizing and synchronizing overlapping efforts among programs/initiatives and weapons platforms. Exhibit B-1 illustrates similar requirements across GANS programs and initiatives.

Exhibit B-1 Similar Requirements Across GANS Programs and Initiatives

GANS Program/Initiative	GATM: 8.33 kHz radio	VHF Data Link	HF Data Link	SATCOM	CMU	CPDLC	GPS	ILS	Mode S	TCAS	ADS	FMS	MMR	RNP	RVSM	RNAV	Navigation & Safety: GPS Receiver	FDR	CVR	ELT	TCAS	TAWS	Windshear	Wx Radar	Mode S	VOR/DME	Protected ILS	ADS	TACAN	RNAV	Avionics Modernization: FMS	CMU	INS	Flat Panel Displays	Integrated Dig. Av.	PACER CRAG	Avionics Up. Prog.	All Wx Flt Cnt Sys	IDAS/MATT	GPS-2000: GPS System	NavWar: GPS System	JPALS: PLSR	PAR	ICLS	TTLS	OMAR	ACLS	ATCALS/DATCALS: Dig. Vx Switches	Surv. Radar	Terminal Aut. Sys.	Navigation	Approach
GATM																																																						
8.33 kHz radio																																																	X			
VHF Data Link																																																X			
HF Data Link																																																X			
SATCOM																																																X			
Comm Mgt Unit (CMU)																															X																					
CPDLC																																																X			
GPS																	■																									■	■	■							■	■
ILS																											X																	X								X
Mode S																									X																								X			
TCAS																					X																														
ADS																												X																						X		
FMS																															X																					
MMR																	■																									X								X
RNP																																																			
RVSM																																																			
RNAV																													X																							
Nav & Safety																																																			
GPS Receiver																																																			
FDR																																																			
CVR																																																			
ELT																																																			
TCAS																																																		
TAWS																																																			
Windshear																																																		
Wx Radar																																																			
Mode S																																																		
VOR/DME																																																			
Protected ILS																																																			
NDB																																																			
TACAN																																																		
RNAV																																	X																	
Avionics Modernization																																																		
FMS																																																		
CMU																																																		
INS																																																		
Flat Panel Displays																																																		
Integrated Digital Avionics																																																		
PACER CRAG																																																		
Avionics Upgrade Program																																																		
AWFCS																																																		
IDAS/MATT																																																		
GPS-2000																																																		
GPS Receiver																																																		
NavWar																																																		
NavWar GPS																																																		
JPALS																																																		
PLSR (ILS, MLS, DGPS)																																																		X
PAR, ILS, MLS, DGPS																																																		X
ICLS																																																		
TTLS																																																		
OMAR																																																		
ACLS																																																		

X = Denotes identical or similar capabilities across GANS Programs/Initiatives

■ = Denotes identical or similar GPS capabilities across GANS Programs/Initiatives

APPENDIX C

BUSINESS PROCESS IMPLEMENTATION ACTIONS

C.1 BUSINESS PROCESS IMPLEMENTATION ACTIONS

Exhibit C-1 includes the business process tasks described in Section 4 of this plan. Associated with each task are implementing actions, the office of primary responsibility, suspense dates, and the status. This chart will form the basis for tracking action items for the GANS I-IPT and will be updated quarterly and briefed at each GANS I-IPT meeting.

Exhibit C-1 Business Process Tasks

GANS Task	Implementing Actions	OPR	Suspense	Status
Collect and disseminate meeting schedules	Coordinate on web-based solution, develop single integrated schedule to identify primary points of contact	AFFSA GATO/MC2 SPO	Brief solution and present initial schedule during May I-IPT	Open
Participate in external meetings, working groups	Populate the integrated schedule with list of attendees	AFFSA GATO/MC2 SPO	1 Aug	Open
Collect and disseminate external meeting feedback	Develop common format for meeting feedback and incorporate in web-based solution. Format should highlight recommended action items	AFFSA GATO/MC2 SPO	1 Aug	Open
Archive feedback	Incorporate archive procedures in web-based solution	AFFSA GATO/MC2 SPO	1 Sep	Open
Raise resulting action items to GANS I-IPT Secretariat working on behalf of the I-IPT Chairman	Filter actions recommended from meeting feedback, design standard presentation format, and raise issues to GANS secretariat for appropriate action	AFFSA GATO/MC2 SPO	1 Sep	Open
Task organizations as appropriate to address issues and/or develop an AF position on raised issues, if required	Incorporate a standing agenda item in GANS I-IPT. I-IPT make collective decision on which organization should take action. I-IPT secretariat will administer between I-IPT meetings. Incorporate tasking procedures in I-IPT charter	I-IPT Secretariat	1 Sep	Open
Collect and disseminate AF and/or DOD positions on specific CNS/ATM developments	Incorporate in web-based solution	AFFSA GATO/MC2 SPO	1 Sep	Open
Provide information on potential technical solutions	Include in process in charter of Acquisition W-IPT	GATO/MC2 SPO	Brief during May I-IPT	Open
Provide information on external operational and technical issues	Develop standard formats and incorporate in web-based solution	AFFSA GATO/MC2 SPO	Brief solution during May	Open

GANS Task	Implementing Actions	OPR	Suspense	Status
			I-IPT	
Provide information on other AF and joint programs/initiatives relevant to GANS programs	Develop standard briefing template Gather information from appropriate sources Incorporate as a standard I-IPT agenda item Schedule detailed I-IPT briefings as appropriate	I-IPT Secretariat	Brief during May I-IPT	Open
Provide information and attempt to influence formal guidance (e.g. DPG, APPG, CPA, CPR, CINC IPLs, S&T Plan)	Provide a strategy briefing to the I-IPT the quarter prior to input suspense for appropriate document	I-IPT Secretariat	Quarterly, as required	Open
Provide information to decision making bodies (e.g. AFROC, corporate structure, JROC), if tasked	Complete Annunciator Panel Provide information through annunciator panel and IPT meetings and seek to build consensus	GATO/MC2 SPO	Brief Annunciator Panel template at May I-IPT	Open
Monitor Program status at the platform level	Acquisition W-IPT work with program element monitors (PEMs) and design procedures for a GANS Program Status Review Conduct a GANS Program Status Review using the GANS Annunciator Panel	GATO/MC2 SPO	Show template by 1May. Start populating by 1 Jun.	Open
Ensure efficient use of spectrum and obtaining spectrum dependent equipment supportability coordination in all intended electromagnetic environments	Forward and help articulate GANS spectrum requirements to the National Telecommunications and Information Administration (NTIA), international organizations, and host nations, etc., to ensure adequate spectrum exists for all GANS RF dependent equipment	AFFMA	Brief as required	Open

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APPENDIX D

GANS IPT Charters

D.1 GANS IPT CHARTERS

This appendix contains the Charter for the GANS I-IPT, and the Air, Ground, Theater, and Acquisition W-IPTs.

GLOBAL ACCESS, NAVIGATION, AND SAFETY (GANS)

INTEGRATING-INTEGRATED PROCESS TEAM (I-IPT) CHARTER

1. PURPOSE: This charter establishes the GANS I-IPT as a formal body that oversees GANS management efforts throughout the Air Force.

2. MISSION: The mission of the GANS I-IPT is to serve as a focal point for Air Force requirements, acquisition, and funding policy recommendations for the following closely related mandates and initiatives:

a) Global Air Traffic Management (GATM)

b) SECDEF-directed Navigation/Safety Equipment Master Plan

c) Congressionally-mandated Global Positioning System (GPS) Project 2000/2005

d) Joint Precision Approach and Landing System (JPALS)

e) GPS modernization/Navigation Warfare (NavWar) Program

f) Avionics Modernization (numerous R&M/upgrades)

g) Modernization of military ground based Air Traffic Control and Landing Systems (ATCALS) and Deployable ATCALS (DATCALS)

3. COMPOSITION: The I-IPT is co-chaired by AF/XOR and SAF/AQQ. Membership by organization is listed below.

I-IPT Members

Air Staff	MAJCOM	Other Organizations
AFFSA/XA	ACC/DRS - Theater W-IPT Chair	AFFMA
AFFSA/XAX	AETC/XPR	ANG
AFFSA/XR - Ground W-IPT Chair	AFMC/DRB	GATO/MC2 SPO - Acquisition W-IPT Chair
AFFSA/XRC	AFRC/XPR	GPS JPO
AF/REX	AFSOC/DOX	Military Representative to FAA
AFPEO/AT	AFSPC/DRF	NASA
AQID	AMC/XPR - Air W-IPT Chair	
AQPB, AQPF, AQPS, AQPT	PACAF/DOQ	
AQQ (Co-chair)	USAFE/DOY	
AQQM (Co-Lead)		
AQSS		

Air Staff	MAJCOM	Other Organizations
XOJR XOO-CA XOOR XOR (Co-chair) XOR-GATM (Co-Lead) XPPM		

a) The I-IPT Executive Board consists of the I-IPT co-leads and W-IPT chairs.

b) The I-IPT Secretariat is an Air Staff function.

4. ROLES AND RESPONSIBILITIES:

a) The I-IPT will:

i) Serve as an umbrella organization managing four working IPTs (W-IPTs):

a) Air W-IPT

b) Ground W-IPT

c) Theater Operations W-IPT

d) Acquisition W-IPT

ii) Review CNS/ATM developments and initiate appropriate action to bring about airspace access solutions that maximize military capabilities in support of Global Engagement at affordable costs

iii) Review potential threats to achieving the GANS vision

iv) Provide a forum for information sharing and consensus building to:

a) reduce cost and aircraft down time by consolidating requirements to comply with mission essential civil CNS/ATM mandates with other military requirements, and

b) pursue parallel upgrade of all related air, ground, and space air traffic management infrastructure to achieve compatibility and interoperability for seamless global operations

v) Identify cross-MAJCOM or cross-program issues and seek to resolve at lowest level possible

vi) Elevate unresolved issues and recommended action to senior decision makers, as required.

b) I-IPT Executive Board will approve meeting agendas and schedules and coordinate any out of cycle actions required.

c) I-IPT Secretariat

i) The I-IPT secretariat will provide administrative support to the I-IPT. Update status of action items, schedule meetings, set agenda, and staff packages within the Air Staff, Joint Staff, and OSD. The I-IPT secretariat will be the primary point of contact for the I-IPT.

5. PROCEDURES:

a) Schedule: The I-IPT will meet quarterly, or as directed by the I-IPT co-chairs.

b) Standard Agenda Items: The following items will be covered at each meeting of the I-IPT.

i) Status review of previous action items (OPR: GANS Secretariat)

ii) Civil Airspace Access Requirements Update (OPR: AFFSA/XAX, GATO/MC2 SPO)

iii) W-IPT updates to include applicable program briefings. Updates will highlight threats to achieving the GANS vision, harmonization/ synchronization issues, and opportunities identified since the last I-IPT meeting. (OPR: W-IPT chairs)

iv) Upcoming joint/OSD events/issues (OPR: GANS Secretariat)

v) Briefings of interest

vi) Summary of new action items

vii) General officer summary briefings highlighting issues, opportunities, status of action items, and recommendations.

c) Information exchange and issue identification: The GANS secretariat is responsible to arrange for briefings of general interest. Any I-IPT member can propose a briefing of interest or raise an issue to the I-IPT for information or action.

d) Tasking: New tasks shall be discussed during I-IPT deliberations and formalized upon review by the I-IPT co-chairs. The GANS secretariat will monitor the status of open GANS tasks.

e) Out-of cycle-issues: Issues that cannot wait for the next quarterly I-IPT meeting will be administratively handled by the GANS secretariat and overseen by the GANS executive board. Out of cycle tasking will be handled through normal channels. All out-of-cycle tasks will be added to the GANS action item list and status will be reported at the next I-IPT meeting.

f) Issue resolution: Issues will be resolved at the lowest possible level among GANS IPT participants. The I-IPT executive board will elevate issues that cannot be resolved within the GANS structure to the appropriate level for decision.

g) Reports: The I-IPT secretariat will publish minutes within five days of an I-IPT meeting. The Secretariat will coordinate any request for information or recommendations with the I-IPT executive board.

GLOBAL ACCESS, NAVIGATION, AND SAFETY (GANS)
AIR WORKING INTEGRATED PROCESS TEAM (W-IPT)
CHARTER

1. **PURPOSE:** This charter establishes the GANS Air W-IPT as a formal body which oversees specific requirements and funding actions related to the GANS effort.

2. **MISSION:** The mission of the GANS Air W-IPT is to serve as a focal point for Air Force requirements and funding policy recommendations for the following GANS programs and initiatives:

   a. Global Air Traffic Management (GATM)

   b. SECDEF-directed Navigation/Safety Equipment Master Plan

   c. Platform Avionics Modernization Initiatives

3. **COMPOSITION:** The Air W-IPT is chaired by AMC/XPRN. Membership by organization is listed below.

Air W-IPT Members

Air Staff	MAJCOM	Other Organizations
AFFSA/XAX/XRC	ACC/DRS	ANG
AF/REX	AETC/XPR	ASC2A
AQID	AFMC/DRB	GATO/MC2 SPO
AQPS	AFRC/XPR	Mil Rep to FAA
AQQM	AFSOC/DOX	NASA
AQQU	AFSPC/DRF	
XOO-CA	AMC/XPRN (Lead)	
XORBI	PACAF/DOQ	
XORFC	USAFE/DOQ	
XOR-GATM		

4. **ROLES AND RESPONSIBILITIES:**

   a. The Air W-IPT will:

      (i) Serve as the primary GANS organization to consolidate and monitor aircraft requirements and funding across all MAJCOMs for GATM, Nav/Safety, and avionics modernization

(ii) Civil Airspace Access Criteria Update (OPR: AFFSA/XAX, GATO/MC2 SPO).

(iii) Provide a forum for information sharing and consensus building to reduce cost and aircraft down time by consolidating requirements to comply with mission essential civil CNS/ATM mandates with other military requirements

(iv) Identify cross-MAJCOM or cross-program requirements and funding issues and seek to resolve at lowest level possible

(v) Elevate unresolved issues to the GANS I-IPT

(vi) Update the GATM, Nav/Safety, and avionics modernization section of the GANS strategic plan at least quarterly, immediately prior to the quarterly I-IPT meeting

(vii) Brief the GANS I-IPT quarterly on developments and issues relating to GATM, Nav/Safety, and avionics modernization

(viii) Respond to taskings from the GANS I-IPT

5. PROCEDURES:

a. Schedule: The Air W-IPT will meet as directed by the W-IPT chair.

b. Standard Agenda Items: The following items will be covered at each meeting of the Air W-IPT.

(i) Status review of previous action items (OPR: AMC/XPRN)

(ii) CNS/ATM and external interface issues/update (OPR: AFFSA, GATO/MC2 SPO)

(iii) MAJCOM updates to include GATM, Nav/Safety, and avionics modernization developments and funding flows by platform. Updates will highlight harmonization/synchronization issues and opportunities identified since the last Air W-IPT meeting. (OPR: MAJCOM representatives)

(iv) Briefings of interest

(v) Summary of new action items

c. Information exchange and issue identification: AMC/XPRN is responsible to arrange for briefings of general interest. Any Air W-IPT member can propose a briefing of interest or raise an issue to the W-IPT for information or action.

d. Tasking: New tasks shall be formalized during W-IPT deliberations. AMC/XPRN will monitor the status of open tasks directed by the Air W-IPT and the status of Air W-IPT tasks directed by the I-IPT.

e. Out-of-cycle issues: Issues that cannot wait for the next quarterly I-IPT meeting will be administratively handled by AMC/XPRN and coordinated with Air W-IPT members through normal channels. All out-of-cycle tasks will be added to the GANS action item list and status will be reported at the next W-IPT meeting.

f. Issue resolution: Issues will be resolved at the lowest possible level among Air W-IPT participants. Issues that cannot be resolved within the Air W-IPT structure will be elevated to the I-IPT.

g. Reports: AMC/XPRN shall publish minutes within five days of an Air W-IPT meeting.

GLOBAL ACCESS, NAVIGATION, AND SAFETY (GANS)
GROUND WORKING INTEGRATED PROCESS TEAM (W-IPT)
CHARTER

1. **PURPOSE:** This charter establishes the GANS Ground W-IPT as a formal body which oversees specific requirements and funding actions related to the GANS effort.

2. **MISSION:** The mission of the GANS Ground W-IPT is to serve as a focal point for Air Force requirements and funding policy recommendations for the following GANS programs and initiatives:

   a. Air Traffic Control and Landing Systems (ATCALS) and Deployable Air Traffic Control and Landing Systems (DATCALS)

   b. Joint Precision Approach and Landing System (JPALS)

3. **COMPOSITION:** The Ground W-IPT is chaired by AFFSA/XR. Membership by organization is listed below.

Ground W-IPT Members

Air Staff	MAJCOM	Other Organizations
AFFSA/XAX AFFSA/XR (Lead) AFFSA/XRC AF/REX AQID AQSS XOO-CA XOOR XORBR XOR-GATM	ACC/DRS AETC/XPRF AFMC/DRB AFRC/XPR AFSOC/DOX AFSPC/DRF AMC/XPRN PACAF/DOQ USAFE/DOQ	ANG ASC2A GATO/MC2 SPO GPS JPO

4. **ROLES AND RESPONSIBILITIES:**

   a. The Ground W-IPT will:

      (i) Serve as the primary GANS organization to consolidate, identify and advocate requirements across all AF organizations for ATCALS/DATCALS and JPALS

      (ii) Civil Airspace Access Criteria Update (OPR: AFFSA/XAX, GATO/MC2 SPO).

(iii) Provide a forum for information sharing and consensus building to reduce costs by consolidating requirements, synchronizing schedules, plans, and avoidance of duplication of effort while pursuing parallel upgrade of all related air, ground, and space air traffic management infrastructure

(iv) Identify cross-program issues and seek to resolve at lowest level possible

(v) Elevate unresolved issues to the GANS I-IPT

(vi) Update the ATCALS/DATCALS and JPALS sections of the GANS strategic plan at least quarterly, immediately prior to the quarterly I-IPT meeting

(vii) Brief the GANS I-IPT quarterly on developments and issues relating to ATCALS/DATCALS and JPALS

(viii) Respond to taskings from the GANS I-IPT

5. PROCEDURES:

a. Schedule: The Ground W-IPT will meet as directed by the W-IPT chair.

b. Standard Agenda Items: The following items will be covered at each meeting of the Ground W-IPT.

(i) Status review of previous action items (OPR: AFFSA/XRC)

(ii) CNS/ATM and external interface issues/update (OPR: AFFSA, GATO/MC2 SPO)

(iii) Program updates to include ATCALS/DATCALS and JPALS developments and funding flows. Updates will highlight harmonization/synchronization issues and opportunities identified since the last W-IPT meeting. (OPR: Program Managers)

(iv) Briefings of interest

(v) Summary of new action items

c. Information exchange and issue identification: AFFSA/XRC is responsible to arrange for briefings of general interest. Any Ground W-IPT member can propose a briefing of interest or raise an issue to the W-IPT for information or action.

d. Tasking: New tasks shall be formalized during W-IPT deliberations. AFFSA/XRC will monitor the status of open tasks directed by the Ground W-IPT and the status of Ground W-IPT tasks directed by the I-IPT.

e. Out-of-cycle issues: Issues that cannot wait for the next quarterly I-IPT meeting will be administratively handled by AFFSA/XRC and coordinated with Ground W-IPT members

through normal channels. All out-of-cycle tasks will be added to the GANS action item list and status will be reported at the next Ground W-IPT meeting.

f. Issue resolution: Issues will be resolved at the lowest possible level among the Ground W IPT participants. Issues that cannot be resolved within the Ground W-IPT structure will be elevated to the I-IPT.

g. Reports: AFFSA/XRC shall publish minutes within five days of a Ground W-IPT meeting.

GLOBAL ACCESS, NAVIGATION, AND SAFETY (GANS)
THEATER OPERATIONS WORKING INTEGRATED PROCESS TEAM (W-IPT)
CHARTER

1. **PURPOSE:** This charter establishes the GANS Theater Operations W-IPT as a formal body which oversees specific requirements and funding actions related to the GANS effort.

2. **MISSION:** The mission of the GANS Theater Operations W-IPT is to serve as a focal point for Air Force requirements and funding policy recommendations for the following GANS programs and initiatives:

   a. Global Positioning System (GPS) Project 2000/2005

   b. GPS User Equipment (UE) modernization/Navigation Warfare (NavWar)

3. **COMPOSITION:** The Theater Operations W-IPT is chaired by ACC/DRS. Membership by organization is listed below.

Theater Operations W-IPT Members

Air Staff	MAJCOM	Other Organizations
AFFSA/XAX/XRC	ACC/DRS (Lead)	ANG
AF/REX	AETC/XPRF	ASC2A
AQID	AFMC/DRB	GATO/MC2 SPO
AQPS	AFRC/XPR	GPS JPO
AQQU	AFSOC/DOX	NRO
AQSS	AFSPC/DRF	
XORBR	AMC/XPRN	
XORFC	PACAF/DOQ	
XOR-GATM	USAFE/DOQ	

4. **ROLES AND RESPONSIBILITIES:**

   a. The Theater Operations W-IPT will:

      (i) Serve as the primary GANS organization to consolidate and monitor requirements and funding across all AF organizations for GPS 2000/2005 and GPS Modernization/NavWar

(ii) Civil Airspace Access Criteria Update (OPR: AFFSA/XAX, GATO/MC2 SPO).

(iii) Review developments in warfighting doctrine and tactics and identify potential impacts for GPS 2000/2005 and GPS Modernization/NavWar

(iv) Provide a forum for information sharing and consensus building to minimize aircraft down time and reduce costs by consolidating GANS requirements

(v) Identify cross-MAJCOM and cross-program issues and seek to resolve at lowest level possible

(vi) Elevate unresolved issues to the GANS I-IPT

(vii) Update the GPS 2000/2005 and GPS Modernization/NavWar sections of the GANS strategic plan at least quarterly, immediately prior to the quarterly I-IPT meeting.

(viii) Brief the GANS I-IPT quarterly on developments and issues relating to GPS 2000/2005 and GPS Modernization/NavWar

(ix) Respond to taskings from the GANS I-IPT

5. PROCEDURES:

a. Schedule: The Theater OperationsW-IPT will meet as directed by the W-IPT chair.

b. Standard Agenda Items: The following items will be covered at each meeting of the Theater Operations W-IPT.

(i) Status review of previous action items (OPR; ACC/DRS)

(ii) CNS/ATM and external interface issues/update (OPR: AFFSA, GATO/MC2 SPO)

(iii) Program updates to include GPS 2000/2005 and GPS UE modernization/ NavWar developments and funding flows. Updates will highlight new threats, harmonization/synchronization issues and opportunities identified since the last Theater Operations W-IPT meeting. (OPR: Program Managers)

(iv) Briefings of interest

(v) Summary of new action items

c. Information exchange and issue identification: ACC/DRS is responsible to arrange for briefings of general interest. Any Theater Operations W-IPT member can propose a briefing of interest or raise an issue to the W-IPT for information or action.

d. Tasking: New tasks shall be formalized during Theater Operations W-IPT deliberations. ACC/DRS will monitor the status of open tasks directed by the Theater Operations W-IPT and the status of Theater Operations W-IPT tasks directed by the I-IPT.

e. Out-of cycle-issues: Issues that cannot wait for the next quarterly I-IPT meeting will be administratively handled by ACC/DRS and coordinated with W-IPT members through normal channels. All out-of-cycle tasks will be added to the GANS action item list and status will be reported at the next W-IPT meeting.

f. Issue resolution: Issues will be resolved at the lowest possible level among the Theater Operations W-IPT participants. Issues that cannot be resolved within the Theater Operations W-IPT structure will be elevated to the I-IPT.

g. Reports: ACC/DRS shall publish minutes within five days of a Theater Operations W-IPT meeting.

GLOBAL ACCESS, NAVIGATION, AND SAFETY (GANS)
ACQUISITION WORKING INTEGRATED PROCESS TEAM (W-IPT)
CHARTER

1. **PURPOSE:** This charter establishes the GANS Acquisition W-IPT as a formal body, which oversees specific acquisition actions related to the GANS effort.

2. **MISSION:** The mission of the GANS Acquisition W-IPT is to serve as a focal point for Air Force acquisition policy recommendations for the following GANS programs and initiatives:

   a. Global Air Traffic Management (GATM)

   b. SECDEF-directed Navigation/Safety Equipment Master Plan

   c. Avionics Modernization (numerous R&M/upgrades)

   d. Air Traffic Control and Landing Systems (ATCALS) and Deployable Air Traffic Control and Landing Systems (DATCALS)

   e. Joint Precision Approach and Landing System (JPALS)

   f. Global Positioning System (GPS) Project 2000/2005 and GPS User Equipment (UE) modernization

   g. Navigation Warfare (NavWar)

3. **COMPOSITION:** The Acquisition W-IPT is chaired by the GATO/MC2 SPO. Membership by organization is listed below.

Acquisition W-IPT Members

Air Staff	MAJCOM	Other Organizations

AFFSA/XAX/XRC AFPEO/AT AF/REX AQID AQQM/AQQS/AQQU AQPS XORFC XOR-GATM	ACC/DRS AETC/XPR AFMC/DRB AFRC/XPR AFSOC/DOX AFSPC/DRF AMC/XPRN PACAF/DOQ USAFE/DOQ	AFMC Platform Manager Organizations ANG ASC2A GATO/MC2 SPO (Lead) GPS JPO

4. ROLES AND RESPONSIBILITIES:

a. The Acquisition W-IPT will:

(i) Serve as the primary GANS organization to monitor aircraft and ground system acquisition status across all Air Force organizations for GANS programs and initiatives

(ii) Civil Airspace Access Criteria Update (OPR: AFFSA/XAX, GATO/MC2 SPO)

(iii) Provide a forum for information sharing and consensus building to reduce cost and aircraft down time by consolidating solutions to comply with mission essential civil CNS/ATM mandates and other military requirements

(iv) Identify cross-MAJCOM or cross-program issues and seek to resolve at lowest level possible

(v) Elevate unresolved issues to the GANS I-IPT

(vi) Update GANS Annunciator Panel at least quarterly, immediately prior to the quarterly I-IPT meeting

(vii) Brief the GANS I-IPT quarterly on developments and issues relating to GANS program and initiative acquisition

(viii) Respond to taskings from the GANS I-IPT

5. PROCEDURES:

a. Schedule: The Acquisition W-IPT will meet as directed by the W-IPT chair.

b. Standard Agenda Items: The following items will be covered at each meeting of the Acquisition W-IPT.

(i) Status review of previous action items (OPR: GATO/MC2 SPO)

(ii) CNS/ATM and external interface issues/update (OPR: GATO/MC2 SPO)

(iii) Platform updates to include explanation of "red" and "yellow"entries in the GANS Annunciator Panel. Updates will highlight acquisition issues that are having an operational impact on the MAJCOMS as well as harmonization/synchronization issues and opportunities identified since the last Acquisition W-IPT meeting. (OPR: Platform Manager representatives)

(iv) Briefings of interest

(v) Summary of new action items

c. Information exchange and issue identification: GATO/MC2 SPO is responsible to arrange for briefings of general interest. Any Acquisition W-IPT member can propose a briefing of interest or raise an issue to the W-IPT for information or action.

d. Tasking: New tasks shall be formalized during Acquisition W-IPT deliberations. GATO/MC2 SPO will monitor the status of open tasks directed by the Acquisition W-IPT and the status of Acquisition W-IPT tasks directed by the I-IPT.

e. Out-of-cycle issues: Issues that cannot wait for the next quarterly I-IPT meeting will be administratively handled by GATO/MC2 SPO and coordinated with W-IPT members through normal channels. All out-of-cycle tasks will be added to the GANS action item list and status will be reported at the next Acquisition W-IPT meeting.

f. Issue resolution: Issues will be resolved at the lowest possible level among Acquisition W-IPT participants. Issues that cannot be resolved within the Acquisition W-IPT structure will be elevated to the I-IPT.

g. Reports: GATO/MC2 SPO shall publish minutes within five days of an Acquisition W-IPT meeting.

APPENDIX E

STANDARD FORMATS

E.1 STANDARD FORMATS

This appendix contains standard briefing formats that should be used for presentations to the GANS I-IPT. The formats are designed to focus GANS-related issues and topics for discussion at I-IPT meetings. Formats include:

- **Standard Agenda Items**: Designed to guide I-IPT meetings

- **Action Item Tracker**: Designed to identify and track items that require action on the part of GANS I-IPT participants. This standard format documents the status of action items through assignment of action item tracking numbers, an office of primary responsibility (OPR), status, and relevant remarks**.**

- **Civil Airspace Access Criteria**: Focuses on CNS/ATM developments. The format contains areas to identify and prioritize current civil airspace access issues and developments, recommend Air Force positions concerning the requirements issues, and identifies if Air Force action is required by assigning priority numbers.

- **GANS Programs W-IPT Updates**: Focuses on the status of program requirements and funding, overlapping impact between programs, issues for I-IPT consideration, and recommendations concerning GANS programs and initiatives. The format focuses on issues relevant to harmonization or synchronization issues, or other relevant items which cut across more than one GANS programs and/or initiative.

- **Upcoming Joint/OSD Events/Issues**: This format focuses I-IPT efforts to potentially develop draft language used in upcoming Joint or OSD events such as the APPG, DPG, AFLRP or other major events. Working language through the I-IPT will foster Air Force consensus concerning appropriate issues.

Exhibit E-1 Standard Agenda Items

Standard Agenda Items

- GANS W-IPT Update Briefing Session
- Action Item Briefing Session
- W-IPT Updates and GANS Issues Briefing Session
  - Civil Airspace Access Criteria Update
  - Upcoming Joint/OSD Events/Issues
  - Annunciator Panel Review
- GANS I-IPT Executive Planning Session

Exhibit E-2 Action Items

GANS I-IPT Action Item Tacker

Tracking # Date & Source	Item	OPR	Suspense & Status	Remarks

Exhibit E-3 Civil Airspace Access Criteria Update

Civil Airspace Access Criteria Update

Priority *	CNS/ATM Issue	Implementation Date	Recent Developments	Recommended Action
	RNP-10 (PAC)	98-00		
	RVSM (ATL)	98		
	WAAS IOC (US)	98		
	RNP-5 BRNAV (EUR)	98		
	RVSM (PAC)	00		
	ATN	00		
	Flight 2000 (US)	00		

* **1:** Action required in next 3 months **2:** Action required in next 12 months **3:** No action required at this time

Exhibit E-3 Civil Airspace Access Criteria Update (cont'd)

Civil Airspace Access Criteria Update

Priority *	CNS/ATM Issue	Implementation Date	Recent Developments	Recommended Action
	RVSM (US)	00		
	TCAS (EUR)	00-05		
	Prot ILS (EUR)	01		
	GPS Landing	01+		
	CNS/ATM 1 (PAC)	03		
	HFDL (PAC)	03		
	SATCOM (PAC, US)	03		

* **1:** Action required in next 3 months **2:** Action required in next 12 months **3:** No action required at this time

Exhibit E-3 Civil Airspace Access Criteria Update (cont'd)

Civil Airspace Access Criteria Update

Priority *	CNS/ATM Issue	Implementation Date	Recent Developments	Recommended Action
	CPDLC (PAC)	03		
	ADS-A (PAC)	03		
	RNP-4 PAC	03+		
	Mode S, lev 2 (EUR)	03		
	NEXCOM (US)	04-10		
	VHF DL (EUR, US)	05		
	RNP-I (EUR)	05+		

* **1:** Action required in next 3 months **2:** Action required in next 12 months **3:** No action required at this time

Exhibit E-3 Civil Airspace Access Criteria Update (cont'd)

Civil Airspace Access Criteria Update

Priority *	CNS/ATM Issue	Implementation Date	Recent Developments	Recommended Action
	NAVAID CAT I decomm (US)	08		
	ADS-B	08-12		
	Cat II, III decomm	10		
	Mode S, lev 3,4	10+		

* **1:** Action required in next 3 months **2:** Action required in next 12 months **3:** No action required at this time

Exhibit E-4 GANS Programs W-IPT Updates

Global Air Traffic Management (GATM)

Status of Requirements Documents (MNS, ORDs, CRDs, 1067s)

Impact on Other GANS Programs (Overlapping GANS Requirements)

Issues for Consideration

Programmed Funding (By MAJCOM, as Applicable)

Current PB	FY99	FY00	FY01	FY02	FY03	FY04	FY05
ACC							
AETC							
AFFSA							
AFMC							
AFSOC							
AMC							

Exhibit E-4 GANS Programs W-PT Updates (cont'd)

Navigation/Safety (Nav/Safety)

Status of Requirements Documents (MNS, ORDs, CRDs, 1067s)

Impact on Other GANS Programs (Overlapping GANS Requirements)

Issues for Consideration

Programmed Funding (By MAJCOM, as Applicable)

Current PB	FY99	FY00	FY01	FY02	FY03	FY04	FY05
ACC							
AETC							
AFFSA							
AFMC							
AFSOC							
AMC							

Exhibit E-4 GANS Programs W-IPT Updates (cont'd)

JPALS

Status of Requirements Documents (MNS, ORDs, CRDs, 1067s)

Impact on Other GANS Programs (Overlapping GANS Requirements)

Issues for Consideration

Programmed Funding (By MAJCOM, as Applicable)

Current PB	FY99	FY00	FY01	FY02	FY03	FY04	FY05
ACC							
AETC							
AFFSA							
AFMC							
AFSOC							
AMC							

Exhibit E-4 GANS Programs W-IPT Updates (cont'd)

ATCALS

Status of Requirements Documents (MNS, ORDs, CRDs, 1067s)

Impact on Other GANS Programs (Overlapping GANS Requirements)

Issues for Consideration

Programmed Funding (By MAJCOM, as Applicable)

Current PB	FY99	FY00	FY01	FY02	FY03	FY04	FY05
ACC							
AETC							
AFFSA							
AFMC							
AFSOC							
AMC							

Exhibit E-4 GANS Programs W-IPT Updates (cont'd)

DATCALS

Status of Requirements Documents (MNS, ORDs, CRDs, 1067s)

Impact on Other GANS Programs (Overlapping GANS Requirements)

Issues for Consideration

Programmed Funding (By MAJCOM, as Applicable)

Current PB	FY99	FY00	FY01	FY02	FY03	FY04	FY05
ACC							
AETC							
AFFSA							
AFMC							
AFSOC							
AMC							

Exhibit E-4 GANS Programs W-IPT Updates (cont'd)

NavWar

Status of Requirements Documents (MNS, ORDs, CRDs, 1067s)

Impact on Other GANS Programs (Overlapping GANS Requirements)

Issues for Consideration

Programmed Funding (By MAJCOM, as Applicable)

Current PB	FY99	FY00	FY01	FY02	FY03	FY04	FY05
ACC							
AETC							
AFFSA							
AFMC							
AFSOC							
AMC							

Exhibit E-4 GANS Programs W-IPT Updates (cont'd)

GPS UE

Status of Requirements Documents (MNS, ORDs, CRDs, 1067s)

Impact on Other GANS Programs (Overlapping GANS Requirements)

Issues for Consideration

Programmed Funding (By MAJCOM, as Applicable)

Current PB	FY99	FY00	FY01	FY02	FY03	FY04	FY05
ACC							
AETC							
AFFSA							
AFMC							
AFSOC							
AMC							

Exhibit E-5 Upcoming Joint/OSD Events/Issues

Upcoming Joint/OSD Events/Issues

Date	Event	GANS Issues	Recommendation

APPENDIX F

POINTS-OF-CONTACT

F.1 POINTS-OF-CONTACT

This appendix contains points-of-contact (POCs) from members of the GANS I-IPT, Air W-IPT, Theater Ops W-IPT, Ground W-IPT, Acquisition W-IPT, and the GATM Executive Agent. Because POCs change often, this POCs list should be updated by members of the IPTs via the GANS Web Site, as appropriate. The lists provided here were accurate at publication only and will not be regularly updated; see the GANS Web Site for current POC lists.

GANS I-IPT			
Organization	**Person**	**Phone**	**Email**
XOR (Co-chair)	Maj Gen Carlson, Bruce	703-695-3018	carlsonb@pentagon.af.mil
AQQ (Co-chair)	Brig Gen Lichte, Arthur	703-695-3020	arthurlich@pentagon.af.mil
AQQM (Co-lead)	Col Underwood, Michael	703-588-7757	underwom@pentagon.af.mil
XOR-GATM (Co-lead)	Lt Col Katsufrakis, Pete	703-602-9855	katsufrakp@pentagon.af.mil
Air Staff			
Organization	**Person**	**Phone**	**Email**
AFFMA	Mr. Kotler, Scott	703-428-1510	KotlerS@pentagon.af.mil
AFFSA/XA	Col Little, Craig	240-857-4743	littlec@andrews.af.mil
AFFSA/XR	Mr. Higgins, Michael P.	240-857-4308	higginsm@andrews.af.mil
AFPEO/AT	Col Chedister, Robert		chedistr@pentagon.af.mil
AQID	Col Mathews, Dennis	703-588-6430	matthewd@pentagon.af.mil
AQSS	Col Baird, Henry	703-588-7307	bairdh@pentagon.af.mil
NASA	Mr. Schlickenmaier, Herbert W.	202-358-4638	hschlick@hq.nasa.gov
XOJR	Col North, Gary	703-697-2889	northg@pentagon.af.mil
XOO-CA	Col Chelkowski, Ed		eddie.chelkowski@faa.dot.gov
XOO-CA Rep to FAA	Col Richard, Bill	202-358-5568	william.richard@faa.dot.gov
XOOR	Col Pease, Gerald	703-693-0674	peaseg@pentagon.af.mil
XPPM	Col Zamzow, Mark	703-695-7107	zamzowm@pentagon.af.mil
MAJCOM			
Organization	**Person**	**Phone**	**Email**
ACC/DRS	Col Kirkpatrick, Richard	757-764-5166	richard.kirkpatrick@langley.af.mil
AETC/XPR	Maj Young, John	210-652-8027	john.young@randolph.af.mil
AFMC/DRB	Col Willis, Ward	DSN 787-4055	willisw@wpgate1.af.mil
AFSOC/DOX	Lt Col Johnson, Brian	850-884-4077	johnsonb@hurlburt.af.mil
AFSPC/DRN	Col Canzano, Steve	719-554-3546	canzanos@spacecom.af.mil
AMC/XPRN	Maj Redmond, Andy	DSN 576-3519	Andrew.Redmond@scott.af.mil
PACAF/DOQ	Col Thorn, Phil		DOQ_Thorn@cidss.af.mil
USAFE/DOY	Col Garrison, Patrick	DSN 314-480-6263	patrick.garrison@ramstein.af.mil
SPOs			
Organization	**Person**	**Phone**	**Email**
GATO/MC2 SPO	Col Henry, Steve	DSN 478-4953	henrys@hanscom.af.mil
GPS JPO	Col Opel, Stephen	310-363-2922	stephen.opel@losangeles.af.mil
JPALS SPO	Lt Col Stevens, Mark	DSN 478-2445	stevensmb@hanscom.af.mil
ARC			
Organization	**Person**	**Phone**	**Email**

ANG/AQ	Maj Huard, Marcel	DSN 761-5806	huardm@ngb.ang.af.mil
AFRC/XPR	Maj Gretsch, Pete	912-327-1984	pete.gretsch@afrc.af.mil
AFRES	Col Januzzi, Bob	DSN 227-7023	robert.januzzi@re.hq.af.mil
W-IPT Leads			
Organization	**Person**	**Phone**	**Email**
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APPENDIX G

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    b) *Volume II (Communications Procedures including those with PANS status)*. 5th Edition, incorporating amendments 1-70, July 1995
        i) Amendment 71, November 11, 1996
        ii) Amendment 72, July 21, 1997
    c) *Volume III (Part I Digital Data Communication Systems; Part II Voice Communication Systems)*. 1st edition, July 1995
        i) Amendment 71, November 7, 1996

ii) Amendment 72, July 21, 1997

d) *Volume IV (Surveillance Radar and Collision Avoidance Systems)*. 1st edition, July 1995.
   i) Amendment 71, November 7, 1996

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APPENDIX H

GANS-RELATED WEB SITES

H.1 GANS-RELATED WEB SITES

The following world wide web sites are listed in order to provide an initial set of web links that can be used to find additional GANS-related information.

- **AF/XORFM** -- http://www.hq.af.mil/xo/xor/xorfm/gans.htm
- **Air Force Flight Standards Agency** -- http://www.andrews.af.mil/tenants/affsa/affsa.htm
- **Eurocontrol** -- http://www.eurocontrol.be/dgs/misc/index.html
- **FAA** -- http://www.faa.gov/
- **GATO/MC2** -- http://www.hanscom.af.mil/Orgs/Spo/GA/
- **ICAO** -- http://www.cam.org/~icao/
- **KC-135 GATM** -- http://www.pixs.wpafb.af.mil/pixslibr/KC135GATM/KC135GATM.ASP
- **GPS JPO** -- www.laafb.af.mil/SMC/CZ/homepage
- **JPALS GATM Industry Day Announcement** -- http://www.dtic.mil/c3i/c3ia/cbddec8.html
- **Avionics Modernization Program** -- http://c130.robins.af.mil/Public/Conferences/c130amp.htm
- **ESC Opportunities** -- http://herbb.hanscom.af.mil/rfp.asp
- **ATCALS Branch page** -- http://www.andrews.af.mil/tenants/affsa/atcals.htm
- **ATCALS Director of Resources and Requirements** -- http://www.andrews.af.mil/tenants/affsa/affsa_xr.htm
- **ATCALS Evaluation Division** -- http://www.andrews.af.mil/tenants/affsa/xaen.htm
- **ATCALS MNS** -- http://www.andrews.af.mil/tenants/affsa/atcalsmn.htm
- **ISO - Global Interoperability** -- http://ulabhp.gsfc.nasa.gov/~jpals/eogeo97/danko.html
- **C3IA Programs and Initiatives** -- http://www.dtic.mil/c3i/c3ia/alpha.html
- **JPALS IPT** -- http://www.dtic.mil/c3i/c3ia/jpals.html
- **Boeing** -- http://www.ssd.bna.boeing.com/whatsnew/1996/NavWar.htm
- **AFSPC/CC Congressional Statement** -- http://www.defenselink.mil/pubs/di97/di1215.html
- **Air Force Issues Page** -- http://www.af.mil/lib/afissues/1998/posture/page34.html
- **TCAS** -- http://vision.arc.nasa.gov/AFH/Brief/Auditory.S.T./3-D.A.T.html
- **TCAS Overview** -- http://www.rannoch.com/tcas.html
- **TCAS II** -- http://www.caasd.org/Research/TCAS/index.html
- **RVSM - 1997 Press Release** -- http://www.twoten.press.net/stories/97/03/27/headlines/AIR_New_System.html
- **RVSM** - Ops Notes -- http://www.nbaa.org/@@zAKiAmIiKgEC/nonmember/library/digest/mardi96/opnotes.htm
- **Jane's - CNS/ATM** -- http://www.janes.com/defence/editors/jav96/jav9602.html
- **Honeywell - CNS/ATM** -- http://www.cas.honeywell.com/ats/products/cns.html
- **Air Force GPS** - http://www.af.mil/news/Apr1996/n19960403_960300.html
- **B1B Bomber** - http://www.b1b.wpafb.af.mil/

APPENDIX I

ACRONYMS

I.1 ACRONYMS

ACARS	Aircraft Communications Addressing And Reporting System
ACAS	Airborne Collision Avoidance System
ACAT	Acquisition Category
ACC	Air Combat Command
ACLS	Automatic Carrier Landing System
ADF	Automatic Direction Finding
ADS	Automatic Dependent Surveillance
ADSP	Automatic Dependent Surveillance Panel
AEEC	Airline Electronic Engineering Committee
AETC	Air Education and Training Command
AF	Air Force
AF/CV	Vice Chief of Staff of the Air Force
AF/XO	Deputy Chief of Staff for Plans And Policy, Headquarters United States Air Force
AF/XOR-GATM	Global Air Traffic Management Division, Directorate Of Operational Requirements, Headquarters USAF
AFFMA	Air Force Frequency Management Agency
AFFSA	Air Force Flight Standards Agency
AFMC	Air Force Material Command
AFRC	Air Force Reserve Command
AFRES	Air Force Reserve
AFROC	Air Force Requirements Oversight Council
AFSPC	Air Force Space Command
AII	Accuracy Improvement Initiative
AIP	Aeronautical Information Publication
AMC	Air Mobility Command
AMCP	Aeronautical Mobile Communications Panel
AMP	Avionics Modernization Program
AMS(R)S	Aeronautical Mobile Satellite (Route) Service
ANC	Air Navigation Commission
ANG	Air National Guard
ANP	Air Navigation Plan
AoA	Analysis of Alternatives
AOO	Area of Operations
APOM	Amended Program Objective Memorandum
APPG	Annual Planning And Programming Guidance
ARINC	Aeronautical Radio Incorporated
ARTCC	Air Route Traffic Control Center
AT	Airlift And Trainers
ATA	Air Transport Association
ATC	Air Traffic Control
ATCALS	Air Traffic Control And Landing System

ATCT	Air Traffic Control Tower
ATIS	Automatic Terminal Information Service
ATM	Air Traffic Management
ATN	Aeronautical Telecommunications Network
ATNP	Aeronautical Telecommunications Network Panel
ATS	Air Traffic Services
AUP	Avionics Upgrade Program
AW	Air Wing
AWACS	Airborne Warning and Control System
AWFCS	All Weather Flight Control System
AWOP	All Weather Operations Panel
BRNAV	Basic Area Navigation
CAA	Civil Aviation Authority
CAF	Combat Air Forces
CAP	Continuing Airworthiness Panel
CAT I/II/III	Category I/II/III
CC	Command Center
CDMA	Code Division Multiple Access
CDR	Cockpit Data Recorder
CDTI	Cockpit Display Of Traffic Information
CENPAC	Central East Pacific
CEPAC	Central East Pacific
CFIT	Controlled Flight Into Terrain
C4ISR	Command, Control, Communication, Computers, Intelligence, Surveillance, and Reconnaissance
CINC	Commander-In-Chief
CJCS	Chairman Of The Joint Chiefs Of Staff
CMU	Communications Management Unit
CNS	Communications, Navigation, Surveillance
CNS/ATM	Communications, Navigation, Surveillance/Air Traffic Management
CONUS	Continental United States
COTS	Commercial Off-The-Shelf
CPA	Chairman's Program Assessment
CPDLC	Controller-Pilot Data Link Communications
CPR	Chairman's Program Recommendation
CRAF	Civil Reserve Air Fleet
CRD	Capstone Requirements Document
CSMA	Carrier Sense Multiple Access
CVR	Cockpit Voice Recorder
DAB	Defense Acquisition Board
DAP	Downlink Aircraft Parameters
DASR	Digital Airport Surveillance Radar
DATCALS	Deployable Air Traffic Control And Landing System
DBRITE	Digital Bright Radar Indicator Tower Equipment

DGAC	Direction Générale de l'Aviation Civile
DGP	Dangerous Goods Panel
DGPS	Differential GPS
DIRECT-Y	Direct Acquisition of the GPS Y Code
DL	Data Link
DME	Distance Measuring Equipment
DOC	Department of Commerce
DoD	Department of Defense
DOT	Department of Transportation
DPG	Defense Planning Guidance
DV	Distinguished Visitor
EA	Executive Agent
ECAC	European Civil Aviation Conference
EGNOS	European Geostationary Navigation Overlay Service
ELT	Emergency Locator Transmitter
ESC	Electronic Systems Center
ETVS	Enhanced Terminal Voice Switch
EW	Electronic Warfare
FAA	Federal Aviation Administration
FANS	Future Air Navigation System
FCC	Federal Communications Commission
FDR	Flight Data Recorder
FIR	Flight Information Region
FL	Flight Level
FLIREC	Flight Recorder Panel
FMS	Flight Management System
FM	Frequency Modulation
FOC	Full Operational Capability
GANS	Global Access, Navigation, and Safety
GAT	General Air Traffic
GATM	Global Air Traffic Management
GATO/MC2	Global Air Traffic Operations/Mobility Command And Control
GDP	Gross Domestic Product
GES	Ground Earth Station
GICB	Ground-Initiated Comm B
GLONASS	Global Orbiting Navigation Satellite System
GNSS	Global Navigation Satellite System
GNSSP	Global Navigation Satellite System Panel
GOTS	Government Off-The-Shelf
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
GRAM	GPS Receiver Applications Module
HFDL	High Frequency Data Link
IATA	International Air Transport Association

I-IPT	Integrating-Integrated Process Team
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
ICLS	Instrument Carrier Landing System
IDAS/MATT	Interactive Defense Avionics System/ Multi-Mission Advanced Tactical Terminal
ID/IQ	Indefinite Delivery/Indefinite Quantity
IFALPA	International Federation Of Airline Pilots Associations
IFATCA	International Federation Of Air Traffic Controllers Association
IFR	Instrument Flight Rules
IGIA	Interagency Group On International Aviation
ILS	Instrument Landing System
INS	Inertial Navigation System
IONO CORR	Ionospheric Corrections
IPACG	Informal Pacific ATS Group
IPL	Integrated Priority List
IPT	Integrated Process Team
ITC	In-Trail Climb
ITD	In-Trail Descent
JCAB	Japanese Civil Aviation Bureau
JPALS	Joint Precision Approach And Landing System
JPO	Joint Program Office
JROC	Joint Requirements Oversight Council
JTIDS	Joint Tactical Information Distribution System
kHz	kilohertz
KPP	Key Performance Parameter
LAAS	Local Area Augmentation System
LADGPS	Local Area Differential GPS
LEO	Low Earth Orbit
LEOS	Low Earth Orbit Satellite
MACS	Mobile Approach Control System
MAJCOM	Major Command
MAP	Mission Area Plan
MASPS	Minimum Aviation System Performance Standards
MEO	Medium Earth Orbit
MEOS	Medium Earth Orbit Satellite
MLS	Microwave Landing System
MMLS	Mobile MLS
MMR	Multi-Mode Receiver
MNC	Major NATO Command
MNS	Mission Needs Statement
MNSP	Minimum Navigation System Performance
MTSAT	Multipurpose Transportation Satellite
NAS	National Airspace System

NASA	National Aeronautics and Space Administration
NAT	North Atlantic
NATO	North Atlantic Treaty Organization
NATSPG	North Atlantic Systems Planning Group
NAVAID	Navigation Aid
Nav/Safety	Navigation and Safety
NavWar	Navigation Warfare
NDB	Non-Directional Beacon
nm	Nautical Miles
NOPAC	North Pacific
NOTAM	Notice To Airmen
NRP	National Route Program
NTSB	National Transportation Safety Board
O&M	Operations/Maintenance
OCP	Obstacle Clearance Panel
OMAR	Optical Microwave Approach and Ranging
OPR	Office of Primary Responsibility
ORD	Operational Requirements Document
OSA	Operational Support Aircraft
OSA	Open System Architecture
OSD	Office of The Secretary of Defense
PA&E	Program Analysis And Evaluation
PACAF	Pacific Air Forces
PACER CRAG	PACER Compass, Radar, and GPS
PACOTS	Pacific Organized Track System
PAR	Precision Approach Radar
PBFA	Policy Board on Federal Aviation
PDD	Presidential Decision Directive
PDRR	Preliminary Definition and Risk Reduction
PE	Program Element
PEM	Program Element Monitor
PEO	Program Executive Officer
P-ILS	Protected ILS
PLSR	Precision Landing System Receiver
PMD	Program Management Directive
POC	Point-of-Contact
POM	Program Objective Memorandum
PPBS	Planning, Programming, And Budgeting System
PRNAV	Precision RNAV
PVT	Position, Velocity, Timing
R&M	Reliability and Maintainability
RAIM	Receiver Autonomous Integrity Monitoring
RAPCON	Radar Approach Control
RCP	Required Communications Performance

RGCSP	Review Of The General Concept Of Separation Panel
RHSM	Reduced Horizontal Separation Minimum
RNAV	Area Navigation
RNP	Required Navigation Performance
RSP	Required System Performance
RSSIG	Reduced Separation Standard Implementation Group
RTCA	Requirements and Technical Concepts for Aviation
RVSM	Reduced Vertical Separation Minimum
S/A	Selective Availability
SAASM	Selective Availability Anti-Spoof Module
SAB	Scientific Advisory Board
SAF/AQ	Assistant Secretary Of The Air Force For Acquisition
SARPS	Standards And Recommended Practices
SATCOM	Satellite Communications
SECDEF	Secretary Of Defense
SICASP	Secondary Surveillance Radar Improvements & Collision Avoidance Systems Panel
SMC	Space and Missile Center
SPD	System Program Director
SPO	System Program Office
SRD	System Requirements Document
SSR	Secondary Surveillance Radar
S&T	Science and Technology
STARS	Standard Terminal Automation Replacement System
STDMA	Self-Organizing TDMA
TACAN	Tactical Air Navigation
TAWS	Terrain Awareness and Warning System
TCAS	Traffic Alert and Collision Avoidance System
TDMA	Time Division Multiple Access
T&E	Test and Evaluation
TOGW	Takeoff Gross Weight
TTLS	Tactical Transponder Landing System
UAV	Unmanned Aerial Vehicle
UE	User Equipment
UHF	Ultra High Frequency
US	United States
USAF	US Air Force
USAFE	US Air Forces in Europe
USTRANSCOM	US Transportation Command
VAP	Visual Aids Panel
VDL	Very High Frequency Digital Link
VHF	Very High Frequency
VOR	VHF Omni-directional and Ranging System
VORTAC	VOR and TACAN

VTC	Video Teleconference
WAGE	Wide Area GPS Enhancements
W-IPT	Working-Integrated Process Team
WAAS	Wide Area Augmentation System
WADGPS	Wide Area Differential GPS
WTO	World Trade Organization
XOO-CA	Director Of Operations-Civil Aviation, Headquarters United States Air Force

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