July 31, 2006

Mr. Nicholas Sabatini
Associate Administrator for Aviation Safety (AVS-1)
Federal Aviation Administration
800 Independence Avenue, S.W. Washington, D.C. 20591

Dear Nick:

The Performance-Based Operations Aviation Rulemaking Committee (PARC) is pleased to submit the enclosed Roadmap for Data Link.

At your request, PARC tasked its Communications Working Group (CWG) to develop this Roadmap that could be used as the basis for developing a government/industry consensus on the FAA's programs for data link implementation. This Roadmap provides a strategy to initiate an FAA plan and program to implement air traffic data link services in domestic (en route and terminal) airspace, and to resolve issues with two existing and different data link technologies, the Future Air Navigation System (FANS) 1/A and the Aeronautical Telecommunication Network (ATN). It is intended to be used to attain consensus among aviation stakeholders, to assess cost, benefits, and investments, and to measure the success of the FAA's data link implementation programs.

While data link presents challenges for both the industry and the FAA, it has already proven to increase airspace/airport capacity, efficiency, and effectiveness while meeting safety needs. In oceanic airspace data link has enabled user preferred routes (UPR), reroutes, reduced separations, and increased airspace capacity. It has mitigated the risk of operational errors and pilot deviations. Data link is seen as a complement to Area Navigation (RNAV)/Required Navigation Performance (RNP) procedures, and will provide a more comprehensive approach to the solutions for performance-based operations. Data link will also be a fundamental component to migrate to 4-dimensional trajectory management and control-by-exception capabilities, planned for the Next Generation Air Transportation System (NGATS).

This roadmap activity was especially challenging from the viewpoint of its schedule and the number of involved specialists and organizations. The results, in concert with the Roadmap for Performance based Navigation, represent another significant milestone in the NAS evolution. I would like to acknowledge the efforts of the working group chairs, Tom Kraft and Arnold Oldach, and the other members of the Communication Working Group for their accomplishments in this effort.

PARC appreciates your continued support of our activities and invites you to join us in a discussion of this Roadmap at your convenience. Please call me if you have any questions or would like to set up a discussion.

Sincerely,

Dave Nakamura
Chairman
Performance-based operations Aviation
Rulemaking Committee

Enclosure

Industry Coordination Draft

Roadmap for Data Link

present — 2025

Final Draft, 25-Jul-06

Foreword

The Performance-Based Operations Aviation Rulemaking Committee (PARC) prepared this *Roadmap* to provide recommendations to initiate an FAA program to implement air traffic data link services in domestic (en route and terminal) airspace, and to resolve issues with two existing and different data link technologies, Future Air Navigation System (FANS) 1/A and the Aeronautical Telecommunication Network (ATN). This *Roadmap* provides recommendations for data link implementation based on a data link strategy, which is provided in the section, "**About this Roadmap for Data Link**," and a performance-based communications approach, which is provided in "**Key Terms and Concepts**." It is intended to be used to attain consensus among aviation stakeholders, to assess cost, benefits, and investments, and to measure the success of the FAA's data link implementation programs.

The data link implementation initiatives described herein directly support operational capabilities, which are summarized for the near term in **Table 1** for the Tailored Arrival Procedure (TAP), **Table 2** for operational capabilities exclusive in the terminal area, and **Table 3** for operational capabilities exclusive in the U.S. oceanic and remote airspace. Each operational capability in these tables is assigned either a Priority 1 (high) or Priority 2. Priority 1 is assigned to the operational capability if it is part of a continuing and funded program with clear benefits. **Figure 2** provides an overview for migrating from near term operational capabilities to the mid and far terms. In the mid term, operational ATC data communications is expected to occur in domestic airspace by 2012 with high priority. The domestic ATC data communications will need to be globally seamless and accommodate data link-capable aircraft, including a significant fleet of FANS 1/A aircraft that will exist at the time of implementation.

The highest priority recommendation within the Roadmap is for the FAA to establish a **Performance-Based Communications Office** dedicated to:

- ❒ Coordinate, oversee, and ensure timely implementation of near term operational capabilities supported by communications;
- ❒ By end of 2007, implement a performance–based communications approach that supports near term initiatives;
- ❒ Oversee application of the approach to any change in ATM and/or flight operations, including the implementation of a reduced separation minimum or a new procedure, when the operation is predicated on communication performance; and
- ❒ By mid 2008, based on the performance-based approach, define the migration path and implementation strategy for implementation initiatives.

The Roadmap includes topics to address in the migration path and implementation strategy. For example: policies on incentives and/or mandates for aircraft equipage, operating costs, and security; business models used to assess cost/benefit, priorities, investments, milestones, and commitment; process for defining air traffic communication applications and determining viable technologies and architectures, such as a shared broadband Internet Protocol (IP) network; strategy for integration into the National Airspace System (NAS) and accommodation for dissimilar--capability, performance, and technology—aircraft equipage; research and development; enabling criteria; and harmonization initiatives. **Figure 3** provides an overview of these implementation considerations for data link.

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Introduction

Challenges to the NAS

Over the past two decades, air-traffic growth in the National Airspace System (NAS) has outpaced airport and airspace capacity and is expected to continue its historic growth. In 2005, airspace users experienced record delays, confirming predictions of gridlock made in the mid 1990s. Concurrent with the expected growth in traffic, economic factors such as increasing fuel costs, will force more efficient operations.

The aviation industry, Department of Defense (DOD), and the Federal Aviation Administration (FAA) are looking at solutions to overcome these challenges, avoid the growing delays, enhance safety and meet the future needs of the aviation community. Meeting these challenges necessitates a migration to new operating concepts with enabling technologies taking into account the balance between human factors and automation; the need to accelerate the standards development process; and, look beyond technology-centric stovepipes to take a "system-of-systems" performance perspective.

It is envisioned that Air Traffic Management (ATM) will evolve into more strategic management of airspace with reduced separations, four-dimensional (4-D) trajectories, self-separation, and "control-by-exception" concepts of operations. Pilots, controllers, and other aviation decision-makers will have integrated decision support tools that share real-time airport, airspace, aircraft performance, and 4-D flight path definition obtained from a common information infrastructure. To achieve this future state, the aviation community will need to provide solutions that consider the performance, functionality, and capability of all elements of the NAS, including communication, navigation, surveillance, ATM, and human performance.

Data Link Contributes to the Solution

Today, for the most part, ATM relies on voice communications between the pilot and controller. Voice communications will continue to be used; however, where beneficial, routine communications for ATM will be by exchanging data between the aircraft and air traffic facilities, or flight operations — commonly referred to as data link. Data link is seen to be beneficial for some segments of the airspace user community and in certain portions of the NAS. At least initially, data link will provide operational benefits in certain airspace for those who are already equipped or can readily equip, and the airspace will continue to provide basic air traffic service (ATS) for those that are not equipped. In such instances, ATM will move away from a predominantly voice communication capability. Data link will be an important part of the solutions to overcome the challenges to the NAS.

The aviation community has already successfully implemented data link. **Figure 1** provides a global view of air traffic data link services in 2006. Below are samples of data link benefits already being realized.

- Controller-Pilot Data Link Communications (CPDLC) and Automatic Dependent Surveillance — Contract (ADS-C) based on the Future Air Navigation System 1/A (FANS 1/A) technology have improved air traffic control (ATC) in oceanic and remote operations since 1995. Also, the Flight Management Computer (FMC) Waypoint Position Reporting (WPR) capability on the aircraft is being used with a Centralized Automatic Dependent Service (CADS) provided by the communication service provider to automatically provide position reports to the controller. Together with area navigation (RNAV), Required Navigation Performance (RNP)[1], and other capabilities, data link services have enabled reduced separations, dynamic reroutes, user-preferred routes (UPRs), new routes, and higher oceanic traffic densities.

- CPDLC is also available based on the Aeronautical Telecommunication Network (ATN) and FANS 1/A technologies in some domestic European Flight Information Regions (FIRs). Based on this implementation, the European Union is planning to issue an implementing rule for data link services to begin around 2014. The current plan indicates that the ATN technology will be compulsory, though ATS providers may also accommodate data link capable aircraft based on the FANS 1/A technology. FANS 1/A technology aircraft will be exempt from any aircraft equipage requirements based on the ATN technology that may be imposed by the implementing rule.

- Pre-departure clearance (PDC) and Data link – Automatic Terminal Information Service (D-ATIS) via the Aircraft Communications Addressing and Reporting System (ACARS) have effectively reduced departure delays caused by voice congestion at the busiest airports in the NAS. ATC tower staffing has been significantly reduced because of the implementation of these services.

- In addition to air traffic data link services, pilots have been effectively using data link for business and air carrier flight operations, such as Aeronautical Operational Control (AOC), for several decades.

[1] See Update to Roadmap for Performance-Based Navigation for definitions of RNAV and RNP.

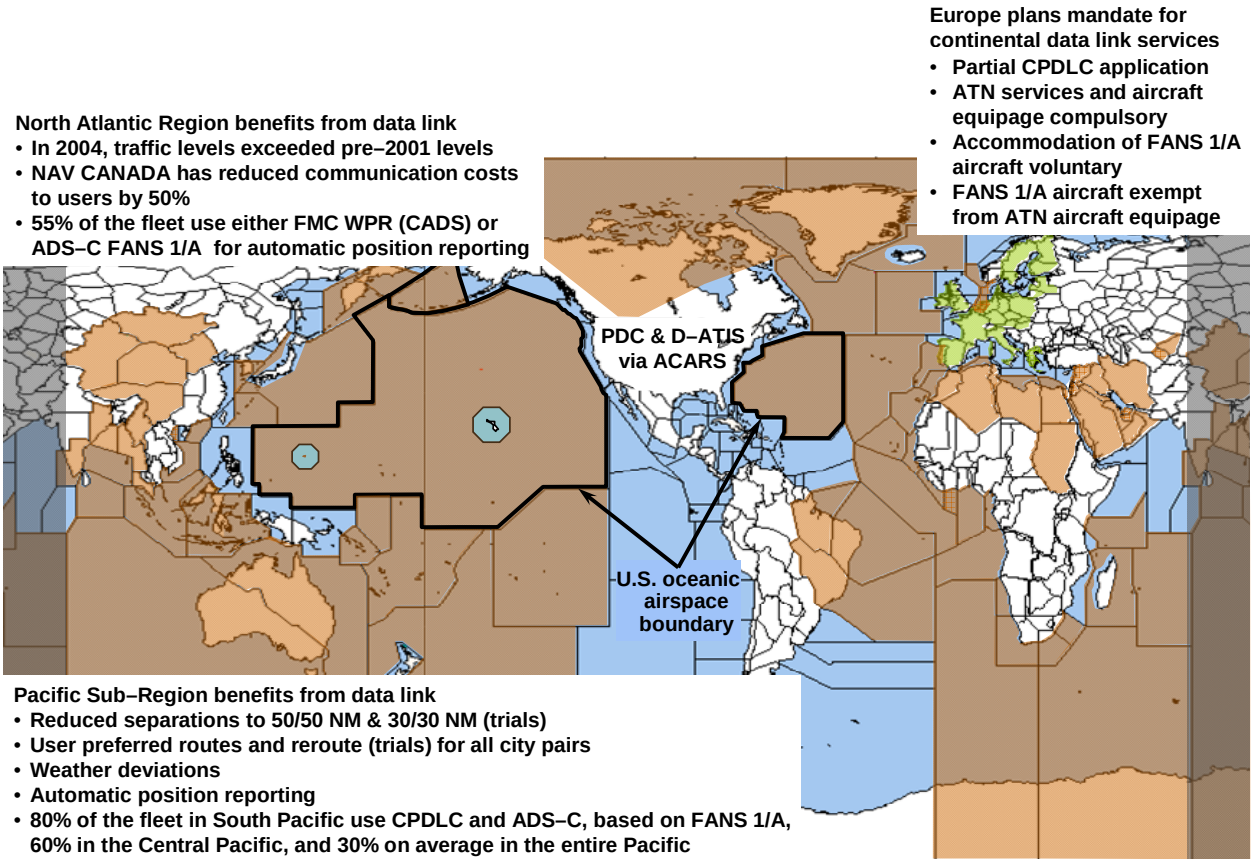

Figure 1 2006 worldwide coverage area for air traffic data link services

Data link has proven to increase airspace/airport capacity, efficiency, and effectiveness while meeting safety needs. It has mitigated the risk of operational errors and pilot deviations. Data link complements RNAV/RNP, and is essential to the solutions for performance-based operations. Data link will be fundamental to migrate to 4-D trajectory management and "control-by-exception" capabilities, planned for the Next Generation Air Transportation System (NGATS).

About this Roadmap for Data Link

The *Roadmap* has been developed as part of a collaborative government-industry process and is intended to assist the broad aviation stakeholder community with planning a smoother transition strategy. The aviation community stakeholders to benefit from this planning include:

- ❒ Airspace users and/or operators
- ❒ ATS providers
- ❒ Regulators and standards organizations
- ❒ Aircraft and avionics manufacturers

This *Roadmap* provides a strategy to initiate an FAA program to implement air traffic data link services in domestic (en route and terminal) airspace, and to resolve issues with two existing and different data link technologies, FANS 1/A and ATN. Implementations of domestic air traffic data link services will need to be globally harmonized with existing and planned applications of data link to achieve global seamless operations in oceanic, en route, and terminal airspace. These applications include U.S. oceanic airspace implementation initiatives evolving under the Advanced Technologies and Oceanic Procedures (ATOP) Program, the European implementation initiatives and planned mandate for data link services, and implementation initiatives in other regions of the world. Initially, simple data link services will be expanded across oceanic, en route, and terminal airspace, and as confidence is gained, more complex data link applications will be introduced.

This *Roadmap* is based on a data link strategy that has three key features:

- ❒ Expediting implementation of data link by leveraging the large base of qualified aircraft and existing NAS infrastructure to provide operational capabilities, where it has been determined to be beneficial;
- ❒ Continuing voice communications capability; and
- ❒ Establishing target dates to implement operational capabilities supported by air traffic data link services (e.g., infrastructure, applications), aircraft capability, and procedures.

This *Roadmap* is consistent with the RTCA's *NAS Concept of Operations and Vision for the Future of Aviation*, considers and provides recommendations to the *FAA Flight Plan* and *Operational Evolution Plan,* and takes into account the Joint Planning and Development Office's (JPDO) vision for the *NGATS.* It supports the *Roadmap for Performance-Based Communication,* which complements the *Roadmap for Performance-Based Navigation,* as the aviation community moves toward a more comprehensive performance-based NAS.

This *Roadmap* describes key terms and concepts, benefits, and implementation of operational capabilities supported by data link. The roadmap describes operational capabilities supported by air traffic data link services within three planning periods: the near term is between the present and 2010; the mid term is between 2011 and 2017; and the far term is between 2018 and 2025. Target dates for specific operational capabilities are described in the near term period. More general operational capabilities are described in the mid term period and operational capabilities for the far term period will be determined pending

further development of the migration path and implementation strategy, which is expected to be completed in the near term period.

Operational capabilities supported by the ADS-C data link application are included in this *Roadmap* because ADS-C is part of an integrated communication, navigation, and surveillance (CNS) package (i.e., FANS 1/A) and is currently used to migrate away from voice position reporting. ADS-Broadcast (ADS-B) is not taken into account in this *Roadmap* because it is currently being reviewed in other forums and should be assessed against operational criteria determined from a performance-based surveillance approach that applies the concept of Required Surveillance Performance (RSP).

The FAA, DOD, and industry will update this *Roadmap* periodically, or it may become part of a more comprehensive performance-based operations implementation plan, based on the evolution of aircraft and NAS capabilities, lessons learned, global harmonization, key decisions, and further collaboration. Future versions will document more detailed plans for the mid and far term implementations, while maintaining the overall strategy and vision of this version.

Key Terms and Concepts

Before presenting the data link strategy, it is important to define key terms and concepts as they are used in this *Roadmap*. Various forums and standards organizations (e.g., International Civil Aviation Organization [ICAO], RTCA/EUROCAE, FAA, EUROCONTROL) have developed terms; some of these terms articulate broad concepts while others connote functional requirements and standards. The aviation industry broadly recognizes that there is a need to harmonize these terms and concepts to ensure successful implementation of an international data link strategy.

The FAA and industry will document, via standards publications, the airworthiness and operational approval requirements for data link in the context of a performance-based communications approach. The aims of a performance-based communications approach are to:

- Promote a competitive market for aeronautical communication services enabling cost-effective alternatives, including different technologies, that meet business needs in a more timely manner;

- Provide a basis to demonstrate communication performance using a variety of acceptable methods in lieu of time consuming data collection and empirical analyses;

- Define "needed" operations based on communication performance levels that are not yet obtainable with current technology; and

- Enable varying service levels in common airspace to a fleet of aircraft with varying communication capabilities and performances.

This *Roadmap* defines performance-based communications as communications that have functional and performance characteristics, which are evaluated against operational criteria. The operational criteria are determined from an assessment of the intended operations in all types of airspace, i.e., oceanic, en route, terminal, and airport domains, and are not based on any particular technology. The criteria include Required Communication Performance (RCP) and other relevant operational factors, taking into consideration global seamless operations. The criteria are used to determine the viability of a particular technology, to qualify, certify, and approve various parts of an implementation, and to manage performance levels needed to provide varying service levels to a fleet of aircraft with different capabilities in common airspace.

An RCP type is used to specify the operational criteria in terms of communication transaction time, continuity, availability, and integrity. It may be relevant to specify additional operational criteria to include functional capability, – for example, the need for certain messages, phraseology, and transaction types; the need for an interactive capability of a voice communication or the air-ground integration capability of a data communication; the need for performance monitoring and alerts, indicating non-compliant performance and time to execute contingency procedures; and the need for party-line and/or broadcast capability and multiple recipients of the same communication, such as receiving on Guard channel.

This *Roadmap* defines data link as a form of communication by which information is exchanged in a data format (e.g., text or graphics) between the aircraft and air traffic facilities, or flight operations. Data link provides pilots, controllers, and other aviation decision-makers a capability to send and receive clearances, control instructions, requests, active route information and advisories. Different from voice

communication, data link enables sharing the task of communicating with aircraft across a sector team or flight crew, and automating highly repetitive actions.

This *Roadmap* defines integration with data link as the capability of aircraft and ATS provider systems to automatically exchange data without the human needing to directly manipulate the information either for transmission (e.g., ATM communication) or for use with other systems (e.g., navigation, conflict detection, decision support tools). When data link integrates ATM functionality, human-in-the-loop management will be necessary, which includes awareness and control of information exchange. The degree to which the human-in-the-loop will be necessary will be defined in appropriate standards and guidance material.

Benefits of Data Link

The primary benefits of data link are to enable operational capabilities that will increase airspace/airport capacity and efficiency while meeting safety needs. Data link is the linchpin to address a number of interrelated factors that will lower the unit operating cost for the airspace user and the ATS provider. Data link is essential to enable performance-based operations, including the provision of varying service levels to allow airspace users to equip based on their business needs, and to realize the NGATS vision.

- In oceanic airspace, data link is enabling more efficient operations and increased capacity in some FIRs. During the summer of 2004, levels of traffic in the North Atlantic exceeded pre-2001 traffic levels and most likely exceeded high frequency (HF) voice capabilities. Controllers were able to handle these traffic levels because of the efficiencies realized by the use of automatic position reporting via data link. NAVCANADA has decreased communications charges by 50 percent due to the increased efficiency in their operations using data link. In the South Pacific Sub-Region, data link has enabled reduced separations, UPRs, and reroutes, for more efficient operations. Additionally, the FAA expects to reap communication cost savings as the percentage of data link-equipped aircraft flying oceanic routes increases, and the reliance on HF voice communication decreases.

- In terminal airspace, PDC has reduced departure delays at our busiest airports due to congestion on clearance delivery frequencies and D-ATIS has provided effective arrival/departure information.

- In en route airspace, numerous studies, demonstrations, and trials conducted by the FAA and EUROCONTROL have shown more flexible and efficient operations enabling a significant increase in airspace capacity.

Data link is expected to continue to improve decision support tools to increase controller efficiency and productivity, ultimately leading to higher airspace capacities and a lower cost per operation. By integrating the aircraft systems with the FAA's flight data processing systems, the information used by the decision support tools can be effectively processed in a more timely and accurate manner. For example, routine tasks, which can account for as much as half of a radar controller's workload in the en route environment, can be automated and processed among a sector control team. By reducing radar controller workload, data link enables air traffic operations to accommodate higher levels of en route traffic without adding sectors. The increase in productivity will lead to more capacity that can be handled by the same staffing levels and reduce the unit cost per air traffic operation. In effect, more capacity can be produced for the same cost. EUROCONTROL projects an overall 10 percent reduction in its en route cost basis through realization of the implementing rule for data link services within Europe.

Data link is expected to improve the use of spectrum and reduce voice channel congestion. Data link allows the controller and pilot to move routine and often lengthy non-time-critical communications off of the congested voice channels. It eliminates the need for pilots to read back the instruction and ensures that the voice channel is consistently available. By increasing controller team productivity, sector capacity can be increased thereby decreasing the need for new sectors and the voice frequencies required for those new sectors.

With improved decision support tools, increased productivity, and more efficient use of spectrum, data link can reduce delays, allowing more efficient scheduling of flights by airspace users and increase

predictability. Weather is a major cause of delays in the NAS. Data link can effectively disseminate and process weather information for the controller and flight crew to make better decisions on weather deviations. Additionally, data link will enable future NAS concepts of operations, such as "control-by-exception" based on aircraft intent data and 4-D trajectory-based clearances.

Data link is necessary to enable UPRs, reroutes, reduced separations, and more flexible use of airspace, which saves fuel thereby reducing noise exposure and fuel emissions. For oceanic operations, the FAA estimates over $1 billion cost savings to airspace users over 10 years with the implementation of Oceanic 21 under the ATOP program[2] This cost savings is based on fuel savings gained by reducing oceanic separation standards to 30 nautical miles laterally and longitudinally (30/30 NM) thus allowing more access to optimized routes. In the terminal area, data link enables the use of environmentally beneficial arrival and departure procedures that allow the aircraft systems to manage flight performance (climb, descent, engine performance, etc.). Benefits include reduced fuel emissions and environmentally-tailored noise footprints. Boeing and Airbus estimate that the use of a Tailored Arrival Procedure (TAP) will result in fuel savings of up to 400 gallons per flight.

Data link has reduced operational errors and pilot deviations. Pilot, flight operations, or traffic management unit (TMU) requests for reroutes, or crossing restrictions and fix crossing times for arrival aircraft can be monitored for flight plan conformance and clearances for the aircraft can be automatically processed. Hearing-related transposition errors, garbling-induced errors, requests to repeat the message, transcription errors, and data entry errors can be reduced. Through integration using data link technology, the aircraft's flight path and intent data can be correlated with its cleared flight plan data and other air traffic flight path and intent data, with minimal workload for flight crew and air traffic personnel, enabling more flexible and timely flight plan updates. Data link is a key enabler for new operational capabilities to meet the safety needs.

The data link strategy offers a variety of opportunities to realize benefits for the user community. These benefits are being realized today in certain parts of the NAS, in Europe and in many regions of the world and benefits will accrue as we expand the data link services in the NAS.

[2] Advanced Technologies and Oceanic Procedures Acquisition Program Baseline, dated May 1, 2001.

Implementation of Data Link

In this *Roadmap*, we organize implementation initiatives for operational capabilities supported by data link into three planning periods: near term (present-2010), mid term (2010-2017) and far term (2018-2025).

For the near term planning period, we describe operational capabilities for oceanic, en route, and terminal area operations, and include milestones for specific airports and airspace. For the mid term planning period, operational capabilities and milestones are provided; however, it is expected that the mid term planning period will be reviewed and updated prior to the end of the near term. The far term is reserved pending the definition of data link applications for operations supporting NGATS, the results of the joint FAA/EUROCONTROL Future Communication Study, and further coordination among stakeholders.

The data link strategy includes implementation considerations, enabling criteria, regulatory and guidance actions, harmonization initiatives and milestones to effectively realize new operational capabilities supported by data link throughout all planning periods.

Operational Capabilities

Near Term (present-2010)

The near term will mark a beneficial change in operations as the FAA expands the implementation of data link into domestic operations through new procedures taking advantage of existing infrastructure and aircraft equipage, and plans for mid term and far term.

Operational Capabilities spanning Oceanic, En Route, and Terminal Area

The Tailored Arrival Procedure (TAP) trial using data link is the first step in a process leading to the provision of optimal flight paths based upon RNAV/RNP capabilities and dynamically defined top-of-descent and standard arrival (STAR) fixes. While users may benefit from participating in the trial, the trial will also address issues with inter-facility collaboration, decision-support tool integration, and procedure development. The TAP will promote seamless operations across all airspace domains and expose en route and terminal area controllers to data link operations in the near term.

Initially, the TAP trial will take advantage of existing infrastructure and aircraft equipage based on FANS 1/A technology. This approach affords early opportunities to take advantage of the experience with data link in oceanic airspace and enable data link applications to be used with minimal risk in adjacent en route airspace and the terminal area. The TAP will begin in oceanic airspace and cross en route airspace to enter the terminal area for approach and landing. Operators who wish to participate in the trial will be able to request via ATC data link, a TAP prior to the top of descent in oceanic airspace. The oceanic controller will send to the aircraft, a tailored arrival route clearance, which can be automatically loaded into the flight management system and reviewed with updated forecast winds obtained via AOC data link. The oceanic controller will issue pilot's discretion descent using VHF voice communication. The en route and terminal area controllers will clear the aircraft to continue the descent and the terminal area controller will issue the approach clearance in accordance with the TAP.

The FAA will conduct TAP trials as shown in **Table 1**.

Table 1 Tailored Arrival Procedure (TAP)

Priority	Oceanic, En Route, and Terminal Area Data Link Opportunities	Operational Benefit	Milestone/Airport
1	TAP Trials	Enables more efficient operations Reduces fuel cost, emissions	Early 2007 – SFO Trial End 2007 – LAX Trial End 2007 – JFK Trial End 2008 – ANC Trial

As experience is gained, the TAP will be reviewed, updated, and enhanced to provide the basis for defining the infrastructure needed to expand optimal flight paths in the mid term planning period.

Terminal Operational Capabilities

As air traffic congestion increases, the FAA will continue to deploy proven services and add new functionality with minimal program risk to modify in-service infrastructure, including operator host computer and aircraft equipage. **Table 2** provides operational capabilities in terminal area operations planned for the near term.

Table 2: Operational capabilities in terminal control area

Priority	Terminal Control Area Data Link Opportunities	Operational Benefit	Milestone/Selected Airports
1	Expand PDC and D-ATIS to other NAS airports	Eliminates read back/hear back errors. Reduces voice congestion and delay at selected airports. Increases communication efficiency thereby improving operational predictability throughout the NAS. Other: Expanding existing PDC and D-ATIS to other locations is low risk with known payback. No changes to existing aircraft equipage.	End of 2007 – HNL, OMA, DAL, LIT, ANC, HPN, JAX, HOU, PVD, PBI, BOI, RNO, ALB, OKC
2	Issue a revision to a previously issued PDC message	Benefits same as for initial clearance. Other: Modifications to FAA infrastructure and airline host are low risk with projected payback.	End of 2009 – All airports providing PDC service
2	Issue multiple PDC messages per day to a given aircraft	Benefits same as for initial clearance. Other: Modifications to FAA infrastructure and airline host are low risk with projected payback.	End of 2009 – All airports providing PDC service
2	Issue full route clearance to a given aircraft	Eliminates omission of intermediate waypoints Other: Modifications to FAA infrastructure and aircraft equipage are low risk with a projected payback	End of 2009 – All airports providing PDC service
2	Taxi clearance via data link trials	Reduces voice congestion and delay at selected airports. Improves operational predictability	End of 2009 – at airports to be determined
2	Assess viability to standardize PDC and D-ATIS, for example with Europe, using ARINC 623 standard	Standardizes procedures leading to global seamless operations.	End of 2007

Oceanic Operational Capabilities

Today, the FAA provides air traffic data link services supported by CPDLC and ADS-C applications for a significant number of qualified aircraft operating in Oakland (ZOA), New York (ZNY), and Anchorage (ZAN) oceanic FIRs. Overall, about 30 percent of the aircraft that operate in the Oakland FIR are actively using CPDLC and ADS-C. The South Pacific (SOPAC) traffic flow is over 80 percent and the Central Pacific (CENPAC) traffic usually runs around 55 percent. These percentages are expected to increase as more products, based on the FANS 1/A technology, become available for operators, including those who operate business and corporate jets, and as operational capabilities expand throughout the U.S. FIRs[3].

The FAA's Ocean 21 system provides improved operational capabilities in oceanic and remote airspace. These capabilities are supported by air traffic data link services based on FANS 1/A technology. Ocean 21 will expand the data link services it provides today and develop new operational capabilities. These capabilities are proving to reduce operational errors and pilot deviations, increase efficiency of oceanic operations and airspace capacity, enable the reduction of separations, handle higher air traffic densities, and reduce environmental impacts. The Ocean 21 system provides automation that enables the provision of multiple levels of ATS for airspace users depending on the operational capability and performance of the aircraft and the infrastructure. Airspace users that do not have data link capabilities based on the FANS 1/A technology will continue to be served by voice communication and provided basic operational capabilities. The airspace will not be exclusionary to any airspace user that qualifies to minimum airspace requirements.

Table 3 provides the operational capabilities provided today and planned for the near term in the U.S. NAS oceanic and remote airspace.

[3] FAA Technical Center,
23-March-06.

Table 3 Operational capabilities in U.S. NAS oceanic and remote airspace

Priority	Operational Capability	Operational Benefit	Milestones/FIR
1	Improved ATC communications	Reduces effects of navigational data base and charting errors, pilot deviations and operational errors, reduces controller workload to enable reduced separation and higher traffic densities.	Operational – ZOA, ZNY, ZAN
1	Data Link position reporting	Reduces controller workload to enable UPRs, reduced separation, and higher traffic densities.	Operational – ZOA, ZNY Start 2007 - ZAN
1	UPRs	Enables more efficient operations	Operational – ZOA (SOPAC) Mid 2009, ZOA, ZAN (All city pairs)
1	Reroute	Enables more efficient operations	Trials - ZOA Mid 2007 – ZOA, ZAN (Expand trials) Mid 2008 – ZOA, ZAN (implement)
1	Reduced separations	Enables more efficient operations.	Operational – ZOA, ZAN (50/50 NM) Trials – ZOA OC3 (30/30 NM) Mid 2007 – ZOA, all sectors (30/30 NM) End 2008 – ZAN (30/30 NM)
1	MEL Dispatch Relief	Reduces operating costs, more efficient operations	End 2007 – plan to regress HF voice and promote MEL dispatch relief
2	In trail procedure (ITP) using ADS-C	More efficient operations	Mid 2007 – Assess viability to implement in trail procedures using ADS-C
2	Oceanic slot entry time	Enables more efficient operations.	2009 – ZOA, ZNY, ZAN

Mid Term (2011-2017)

By the start of the mid term, the migration path and implementation strategy, developed and coordinated among stakeholders, will define and govern the implementation of operational capabilities. Where opportunities exist to develop procedures and leverage existing infrastructure and aircraft equipage, operational capabilities will be implemented. Additionally, for domestic en route and terminal airspace, new infrastructure and aircraft capability will be acquired, with high priority, that will enable operational capabilities leading to 4-D trajectory management in oceanic and domestic airspace.

To ensure global seamless operations, it will be important to rely on global standards for system acquisition and procedures development. The European implementing rule for data link services is based on RTCA DO-290/EUROCAE ED-120, Safety and Performance Requirements Standard For Air Traffic Data Link Services in Continental Airspace (Continental SPR Standard). This standard, coordination with the European programs, and other existing data link programs, will provide the basis for mid term implementation initiatives for domestic en route and terminal area.

By 2012, air traffic data link services in en route airspace and terminal area will be provided using globally standardized procedures and leveraging existing aircraft capabilities, including aircraft based on the FANS 1/A technology. As a minimum, the air traffic data link services will include:

- ATC communication management (ACM), which is used to establish and terminate CPDLC between the aircraft and the air traffic facility, to transfer voice communications and CPDLC for an aircraft from one sector team to another, and to issue a change of frequency; and

- ATC clearance (ACL), which is used to request clearances, issue clearances and expect clearances, issue requests for the current or future status of the flight, provide advisories regarding meteorological or operational conditions that may impact the flight and associated responses, and provide flight status notifications.

Other supporting capabilities will be considered, such as the capability to obtain aircraft state and intent information for route conformance monitoring, conflict detection and resolution, and the capability to load clearances into the aircraft's flight management system. These capabilities will be in place, as necessary, to implement procedures for user preferred routes, reroutes, TAP, and other forms of 4-D trajectory management before the end of the mid term.

Far Term (2018-2025)

In the far term, operational capabilities will be implemented to fully realize the NGATS vision. The migration path and implementation strategy will include the definition of data link applications for operational capabilities leading to NGATS. The data link applications will be based on the ICAO agreements, including the results of the joint FAA/EUROCONTROL Future Communication Study, other standards, and performance-based enabling criteria.

Implementation Considerations

Figure 2 provides an overview of operational capabilities supported by data link.

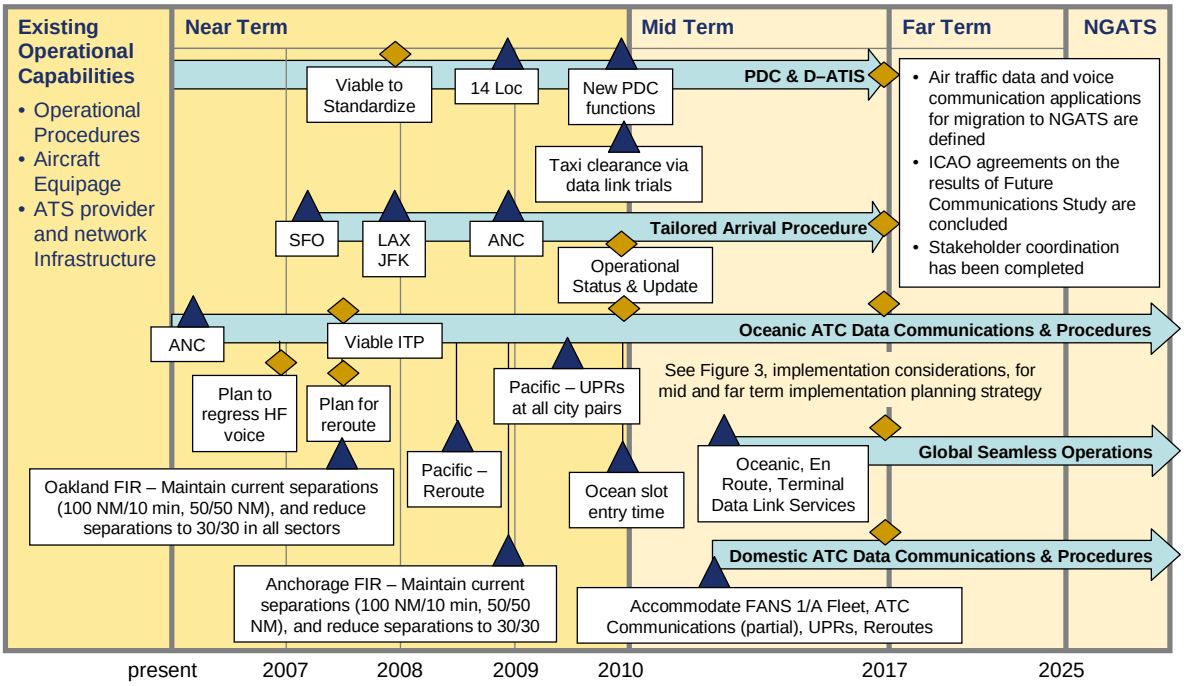

Figure 2: Operational Capabilities Supported by Data Link

The near term presents opportunities to airspace users who have invested in advanced capabilities and training and who expect to participate in new operational capabilities. However, the FAA and industry will also need to collaboratively plan for the future. The longer term envisions significant changes in which a data link communication capability will be fundamental to ATM concepts. The FAA will need a mechanism to ensure timely and effective implementation of operational capabilities in the near term and to overcome the challenges to implement mid and far term initiatives that will lead to the NGATS.

As the highest priority, establish an FAA Performance-Based Communications Office dedicated to:

- ❒ Coordinate, oversee, and ensure timely implementation of near term operational capabilities supported by communications;

- ❒ By end of 2007, implement a performance–based communications approach that supports near term initiatives;

- ❒ Oversee application of the approach to any change in ATM and/or flight operations, including the implementation of a reduced separation minimum or a new procedure, when the operation is predicated on communication performance; and

- ❒ By mid 2008, based on the performance-based approach, define the migration path and implementation strategy for implementation initiatives.

Migration Path and Implementation Strategy

The migration path and implementation strategy should be based on the performance-based communications approach and identify:

- ❒ *Working relationships, roles and responsibilities*. By early 2007, establish working relationships, roles and responsibilities to effectively coordinate data link programs among relevant FAA Lines of Business, industry, military, ATS providers, international organizations, standards making bodies, and other stakeholders.

- ❒ *Policies for implementation*, for example,

  a) *Aircraft equipage* incentives and/or regulation. While there will be a continuing role for voice communications, to realize the full benefits of operational capabilities to meet the increasing demands in some portions of the NAS, there will be a need for a ubiquitous equipage of data link. Considerations for all types of operations, including general aviation, vertical flight, and military, and strategies for equipage objectives will need to be defined for the airspace (e.g., high altitude en route) in which operators will be required to equip. To move forward with data Link, it will be essential to address how all potential users of data link will participate to ensure that a "critical mass" of users is reached. Consider the need for mandatory carriage of data link capability or the use of financial and/or operational incentives. By mid 2008, FAA and industry stakeholders agree on aircraft equipage requirements and strategies to influence fleet equipage rates.

  b) *Operating costs*, including message costs. In 1999, the FAA decided that it would pay for all domestic en route ATC messaging costs. The FAA is now reassessing its decision and considering alternative options, for example, cost sharing and use of capital assets. The airspace users, FAA, and communications service providers will need to work together to determine the best business model and policies for all stakeholders. Business models and new policies should align with a performance-based communications approach that enables a competitive market for providing communication services. This can be accomplished by prescribing an RCP type and other operational considerations, as necessary, and interface requirements to the facility with which one would need to communicate. The FAA may also consider providing one or more communication services, but also allow options for the airspace user to choose cost-effective alternatives based on specific business needs, provided they show that the alternative can meet the RCP, operational criteria, and interface requirements. By mid 2008, the FAA and industry stakeholders agree on the business model for communication service costs

  c) *Security*. By mid 2008, the FAA, industry stakeholders, and others, as appropriate, agree on the policies for information security for ATM.

- *Cost/benefit, commitment, investment, priorities, & milestones*. Expansion of data link services to the domestic environment will require the commitment of both the FAA and the airspace user community. To implement operational capabilities, the FAA will need to deploy data link services and some segments of the airspace user community will need to equip their aircraft, on a compatible and economically justified schedule. Once commitments are made, funding delays will increase opportunity costs and degrade the business cases for both the airspace user and the FAA. The FAA and the user community must work together to mitigate program risks. By mid 2008, FAA and industry need to identify program risks and a management strategy, and establish milestones and a schedule to implement operational capabilities requiring domestic data link in the NAS by 2012.

- *Opportunities for use of existing aircraft capability and air traffic data link services*. Today, the ACARS and VDL-2 sub-networks are operational in the U.S. and globally to provide communications for flight operations, such as AOC. These sub-networks already support air traffic data link services and are potential candidates for providing viable options for expanding data link services in the near term for en route and terminal operations. Also, INMARSAT and Iridium are available and some operators are equipped to use these capabilities for air traffic data link services in oceanic airspace and adjacent en route and terminal areas. By mid 2008, define opportunities for new and expanded operational capabilities supported by data link.

- *Air traffic communication applications*, including data link, for mid term and far term leading to NGATS. Consider implications of global seamless operations, aircraft equipage requirements, and all types of operations, including non ATC but NAS related operations such as UNICOM/Multi-com operations at non-towered airports and flight services (e.g., flight plan changes and NAVAID status). By mid 2008, the FAA and industry stakeholders will need to agree on their investments for the realization of data link applications.

- *Viable technologies*. Assess and define viable technologies (e.g., Iridium, Satellite Communications (SATCOM) voice/data, HF Data Link (HFDL), broadband), for ATM. Consider performance-based enabling criteria and harmonization initiatives, such as the ICAO agreements on the results of the joint FAA/Eurocontrol Future Communications Study. By mid 2008, identify candidate technologies for air traffic data link services. By the end of 2009, complete an evaluation of a shared broadband Internet Protocol (IP) network (e.g., ATS and AOC), to determine what might be needed for global harmonization (e.g., ICAO agreement and technical provisions), certification of equipment, and approval of its use, and what are realistic timelines for implementation.

- *Strategy for integration into the NAS architecture*. By mid 2008, consider air-ground integration, automation, and decision support requirements for En Route Automation Modernization (ERAM), Automated Radar Terminal System (ARTS)/Standard Terminal Automation Replacement System (STARS), FANS 1/A, ATN, and other viable technologies.

- *Accommodation strategy* for dissimilar–capability, performance, and technology–aircraft equipage. By mid 2008, identify economic and technical matters, and develop an operationally feasible solution in the context of a complete communication, navigation, and surveillance package.

- *Research and development*. Identify the strategy for data link environments to maintain situational awareness inherent in traditional voice and party line concepts. Evaluate the use of data link in the context of a CNS environment and determine criteria to establish an acceptable level of situational awareness, considering all types of civil operations, e.g., general aviation, commuter. By mid 2008, define research for the future controller workstations and flight deck, considering changes in the controller tasks and automated processes, implications of integrating aircraft and ATS provider systems, and decision support tools.

- *Enabling criteria.* Enabling criteria are needed for safety management, qualification, certification, and approval in time to provide a basis for cost/benefit and definition of the migration path. Considerations for these criteria are recommended in the Enabling Criteria section of this *Roadmap*. By mid 2008, and thereafter, define and update areas where criteria are needed and milestones to support data link implementation.

- *Harmonization initiatives*. Data link services that support global seamless operations will need to be defined in standards through collaboration at ICAO and other international venues in a timely manner to support operational capabilities on the migration path. Considerations for harmonization are recommended in the Harmonization Initiatives section of this *Roadmap*. By mid 2008, and thereafter, define and update the migration path and implementation path, which is harmonized with other ATS providers, leading to an integrated and compatible global capability for providing data link services.

Figure 3 provides an overview of the implementation considerations for data link.

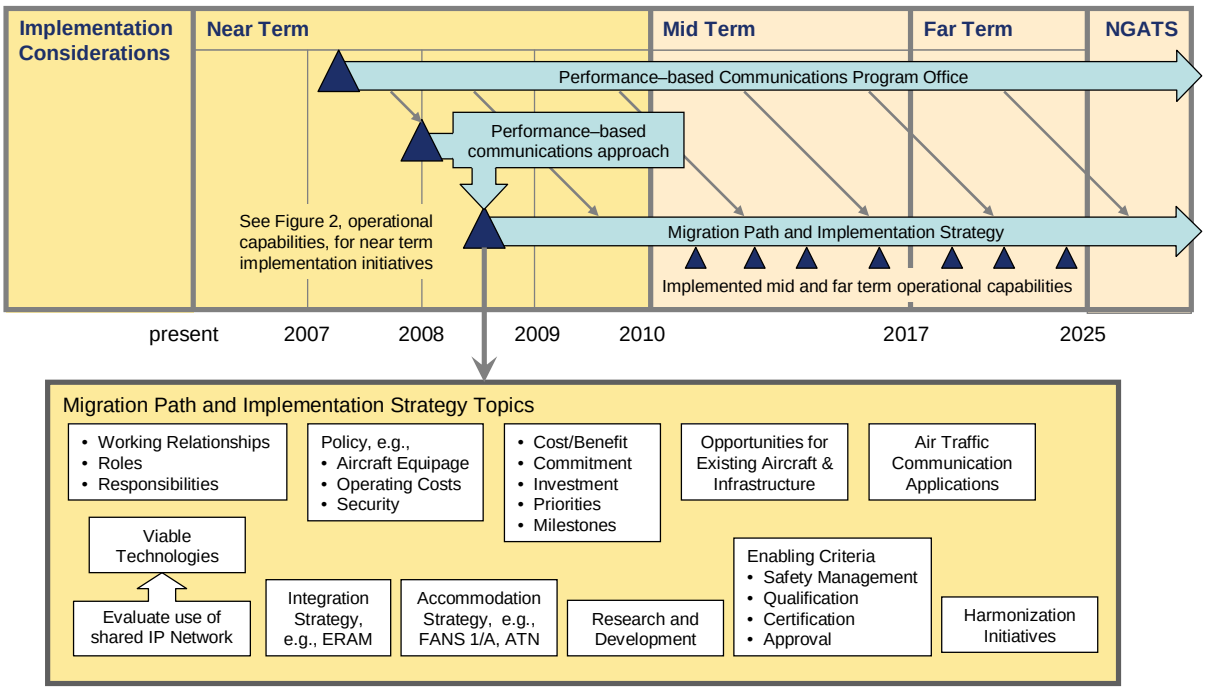

Figure 3 Implementation Considerations for Data Link

Enabling Criteria – Rules and Guidance Material

To implement data link throughout the NAS, FAA and industry need to develop enabling criteria, which is promulgated through rules and guidance material. The enabling criteria will need to be harmonized through appropriate international forums and the resulting standards and guidance material will need to be available, adopted, and recognized in appropriate FAA documents, such as Advisory Circulars, Orders, Handbooks, etc., in time to support implementation of operational capabilities as described in this *Roadmap*.

The FAA is adopting a performance-based regulatory approach that will promote innovation, flexibility, and timely approvals for changes to the aircraft, ATS, and operational capabilities needed to meet the demands on the NAS. Operators will be able to make choices in flight operations and aircraft equipage, while maintaining the highest safety goals with measurable and validated capacity, efficiency and environmental performance expectations. Approval processes can be developed within the context of existing rules to support performance-based operations. However, to realize the full benefits of a performance-based approach, the FAA and industry may need to agree on rulemaking initiatives.

Some rulemaking initiatives can effectively minimize the regulatory burden while maintaining acceptable levels of safety. For example, commercial systems such as the INMARSAT satellite communication system can provide communication services to meet reduced separation standards for oceanic operations. The reduced separation standards defined in the ICAO Procedures for Air Navigation Services — Air Traffic Management (PANS/ATM, Doc 4444) also require an "alternative means" of communication, which was based on the existing HF voice communication to execute contingency procedures if the satellite communication fails. Maintaining HF voice communication is costly and other technologies, such as Iridium, could potentially provide a viable backup to the INMARSAT system and allow regression of HF voice communication services. However, the existing rules are equipment-based and do not promote innovative solutions, such as suggested above, that exploit cost-effective technologies. Rule changes that align with performance-based concepts will promote a competitive market for innovative solutions that can meet performance criteria based on the intended operation rather than the technology that is used at the time the rule was promulgated.

By early 2007, determine rule changes (and milestones) needed to support implementation of performance–based operations on the migration path leading to NGATS Identify operating rules, taking into account varying service levels in common airspace, recording of data communications for accident/incident investigations, and information security. Eliminate equipment (technology–based) rules and use advisory circulars, handbooks, and other more timely documents, to provide guidance material on applying the operating rules to the use of specific technology and equipment.

The FAA already has established guidance material within the existing regulatory framework:

- ❒ FAA AC 120-70A. *"Initial Operational Approval Process for use of Air Traffic Data Link Services"* Includes criteria for operational approval to use digital communications systems, including data link and voice communication (e.g., via satellite), for ATS and related capabilities for operators conducting operations under Title 14 of the Code of Federal Regulations (14 CFR), parts 121, 125, 129, and 135.

- ❒ FAA AC 20-140, *"Guidelines For Design Approval of Aircraft Data Communications Systems."* Includes criteria for aircraft and avionics manufacturers to obtain type design approval of aircraft equipped with data communication systems and applications. The criteria is applicable to type design approvals in accordance with Title 14 CFR, parts 23, 25, 27, and 29, which are considered when determining the certification basis for approving aircraft data communications systems and the applications.

- ❒ Policy letter, *"High Frequency (HF) Communications Master Minimum Equipment List (MMEL) Requirements."* Includes criteria for MMEL relief for HF communication systems. The criteria allow one HF voice radio to be inoperative while conducting operations that require two Long Range Communication Systems (LRCS) provided that a SATCOM (High or Low Gain) Data Link system and associated communication capability operate normally over the intended route of flight.

In addition to the above documents, there are other enabling documents that provide standards and guidelines to facilitate implementation. These documents address applications and selected technologies. For example, FAA Orders and Handbooks provide guidelines to principal operating and maintenance inspectors, certification engineers, and flight test pilots to facilitate the standard application of approval criteria.

By mid 2007, determine the need for revisions and additional guidance material (and milestones) for qualification, certification, and approval criteria, to address

- ❒ Application of performance–based communications approach to voice and data

- ❒ Update existing guidance material for implementing performance-based communications. The guidance material should provide criteria for use by operators, their principal operating inspectors, and approval authorities, as well as criteria for type design approval of aircraft that aligns with the criteria for performance-based operations. The performance-based criteria should be based on an RCP type, the results of safety management that considers data link in the context of all CNS elements, and apportioned to the aircraft, communication services, ATS provider, and the operator. The guidance material should include criteria for operators and the ATS providers that hold contracts with communication service providers.

- ❒ Operating requirements for intended uses

  Criteria are needed to use data link for specific operations that are predicated on communication capability and performance, such as reducing separations and coordinating in-flight changes to procedures between air traffic personnel and the operator. The criteria should also address intended use of standardized and free text data link messages, contingency and emergency procedures for situations such as degraded communication performance, loss of communications, system failures, weather deviations, training, qualification, and approval for use.

- ❒ Safety oversight of ATS provider

  Criteria are needed for ATS provider systems, including contracts for communication services, automation, and procedures. For example, criteria are needed to enable the provision of varying service levels to a fleet of aircraft with mixed capabilities, performances, and technologies. Air and ground automation can process revised flight plan suffixes and exchange information, such as the actual performance capability, via data link to determine the eligibility of the aircraft for the optimum

service level associated with an RCP type. The data link can also exchange aircraft state and intent data to ensure compatible flight plans between aircraft and ATS provider systems.

- ❒ Recording of data link communications for accident/incident investigations

  Criteria for recording data link communications for accident/incident investigations and information security will be needed to support any regulatory actions needed to comply with ICAO annexes and other requirements imposed by ATS providers. For example, ICAO requirements for recording data link communications provided in Annex 6 is open to misinterpretation

- ❒ Information security

  Criteria for information security are needed to ensure that aircraft equipage can meet the airspace requirements imposed by ATS providers in accordance with ICAO requirements. For example, when using the SATCOM voice for ATC in the North Atlantic Region, Personal Identification Number (PIN) and Caller Line Identification (CLI) are being imposed in the North Atlantic to guarantee secure access of ground to air calling. Securing information over the data link is being evaluated.

- ❒ Using particular technologies for "required" communications

  By end of 2007, clarify performance–based criteria for dispatch (MEL) of long range communication systems (LRCS), for example, provide operational criteria to enable qualification and approval to use viable technologies such as Inmarsat, Iridium, and HFDL in place of "required" HF voice

- ❒ Sharing communication services such as between AOC and ATS applications

  The certification and approval criteria for AOC, aeronautical administrative communications (AAC), and aeronautical passenger communications (APC) should remain separate from the certification and approval criteria for ATS communications. Performance standards, certification and prioritization of ATS communications should reflect the nature and criticality of ATS. Separate criteria need to allow for ATS to share communications infrastructure with other types of communications, such as AOC communications, which have performance standards, certification requirements, and priorities different from those of ATS communications

Harmonization Initiatives

The year 1995 marks a major milestone for data link implementation for the aviation community throughout the world — in this year, based on the FANS 1/A technology, ATC data link capabilities were implemented in the South Pacific. Today, Australia is leading in the development of this technology providing ATC data link capabilities in both oceanic and their domestic airspace with The Australian Advanced Air Traffic System (TAAATS). The TAATS is enabling reduced separations in the Tasman Sea, UPRs, and TAPs. Other States throughout the world, including Canada and the United Kingdom have implemented data link services in the North Atlantic Region. The FAA is participating in these global efforts and is providing data link services in its oceanic airspace.

The implementation of new and enhanced operational capabilities, based on CPDLC, ADS-C, and other CNS capabilities, such as RNAV/RNP, is typically harmonized either as part of a worldwide ICAO-coordinated effort or in cooperation with other ATS providers intending to implement similar capabilities. For example, Airservices Australia and Luchtverkeersleiding Nederland (LVNL), the ATC

organization of The Netherlands, are conducting TAP trials at Sydney's and Amsterdam's airports, respectively.

In Europe, the Single European Sky Committee, which operates under the auspices of the European Commission, agreed to a mandate for EUROCONTROL to develop Draft Implementing Rules; among these is a Draft Implementing Rule for Interoperability on Data Link Services (DLS). This implementing rule proposes to implement data link services and mandate their use in airspace under the jurisdiction of Member States of the European Union. While the data link services will be based on the ATN technology, developed by ICAO, the implementing rule will allow Member States to accommodate aircraft with data link capability based on the FANS 1/A technology. EUROCONTROL is providing financial support to pioneer operators and is developing incentives for equipage prior to a mandate. However, mandates for aircraft equipage are proposed to be effective in 2009 for new aircraft and in 2014 for retrofit, with no additional aircraft equipage requirements for FANS 1/A technology-based aircraft for the life of the airframe.

FAA data link implementation will be made in concert with the cost-effective, worldwide deployment of common data link ground systems and avionics and will facilitate harmonization of operational procedures across national and international airspace domains. This approach will leverage the economies of scale for data-link-related capital and training investments by the FAA and for airspace users.

To ensure that implementation initiatives within the U.S. NAS are consistent with those throughout the world, the FAA is participating in a number of harmonization efforts:

- The Aeronautical Communications Panel (ACP) is reviewing and updating the ICAO annexes and technical provisions for data link. The FAA is supporting the panel work on a number of items to harmonize efforts for data link implementation within the NAS. To support the panel's work, a joint FAA/EUROCONTROL Future Communications Study is underway to investigate a variety of technologies to support future air traffic data link services.

  By end of 2007, address the results of the Joint FAA/Eurocontrol Future Communication Study for incorporation into appropriate ICAO material and complete revisions to the ICAO technical provisions

- The Operational Data Link Panel (OPLINKP) has developed Standards and Recommended Practices (SARPs), procedures and guidance material relating to the use of RCP in the provision of ATS. The SARPS, procedures and guidance material were endorsed by the panel in 2005. The OPLINKP, which also developed operational requirements for air-ground and ground-ground data link applications, has completed its work. However, operational requirements for data link applications not yet defined for the NGATS vision will need to be internationally standardized.

  By the end of 2007, establish a new venue to define and internationally standardize data link applications and changes to support the global ATM concept and NGATS.

- The Separation Assurance and Safety Panel (SASP) provides standards, recommended practices, and guidance material for airspace planning, collision risk modeling and safety assessment methods, and separation standards. Current separation standards are based on technologies and assumptions made about the performance characteristics of those technologies. The separation standards should be aligned with performance-based concepts to support near term implementation initiatives.

  By the end of 2007, establish communication requirements based on the performance-based communications approach and revise the separation standards.

- The Flight Plan Study Group is reviewing updates to flight plan suffixes. However, current and planned revisions to the suffixes continue to have technological dependencies that compromise the benefits of a performance-based approach. For example, for communication, the use of /S, /H, are used to signify satellite or HFDL, respectively. Additionally, current flight plan criteria requires filing for specific RNP types, or communication and surveillance equipage; without consideration to varying performance criteria along a route of flight or for providing multiple levels of service within a single airspace. The flight plan study group should provide the forum to coordinate a consistent approach to establish flight plan suffixes suitable for CNS elements, and suitable for terminal, en route, and oceanic airspace. The approach should consider:

  a) Flight plan criteria for performance-based operations should be based on whether or not the information in the flight plan is actually used by the ATS providers.

  b) If the Aeronautical Information Publication (AIP) and/or Notice to Airmen (NOTAM) prescribes a specific set of operator/aircraft requirements for a single level of service within an airspace, it should be implicit that, per Annex 6, the operator meets the requirements for that level of service.

  c) If the AIP/NOTAM prescribes different sets of operator/aircraft requirements to support multiple levels of service within an airspace, (e.g., 30/30 NM, 50/50 NM, and current 100 NM/20 minutes in the same airspace) then the operator would need to file specific criteria only if they intend to use higher level service(s).

  d) When filing for performance-based operations, the flight plan criteria should consider a schema that is based on capability and performance, not based on any particular technology, and if necessary, any specific interface criteria (separate from capability and performance).

  By end of 2007, develop flight plan suffixes to support near term performance–based operations

  By 2009, develop a long term strategy for defining flight plan suffixes within the context of a Required Total System Performance (RTSP) framework

- The RTCA Special Committee 189/EUROCAE Working Group (WG) 53 is chartered to develop guidance material to define the safety, performance and interoperability requirements for air traffic data link services and guidance material to qualify related CNS/ATM systems. To complete this task, SC-189/WG-53 cooperates with the ICAO, regulatory authorities, regional planning groups, and States, to produce guidance material, operational standards and technical standards for the planning and implementation of air traffic data link services worldwide. To date, SC-189/WG-53 has completed the following guidance material and standards:

a) RTCA DO-264/EUROCAE ED-78A, *"Guidelines for Approval of the Provision and Use of Air Traffic Services Supported by Data Communications."* This guidance material recommends practices for approving the provision and use of air traffic data link services.

b) DO–290/ED–120, *"Operational, Safety, and Performance Standard for Continental Air Traffic Data Link Services."* This standard provides operational, safety and performance criteria for air traffic data link services in continental (domestic) airspace. It is recognized as a basis for the implementing rule for air traffic data link services planned in Europe.

c) DO–258A/ED–100A, *"Interoperability Requirements for ATS Applications Using ARINC 622 Data Communications."* This standard provides the minimum requirements to ensure that components based on the FANS 1/A technology are compatible.

d) DO–280A/ED–110A, "Minimum Interoperability Requirements Standard for ATN Baseline 1 (INTEROP ATN B1)." This standard provides the minimum requirements to ensure that components based on the ATN technology are compatible. It also defines the subset of the ICAO ATN technical provisions intended for initial domestic implementations of the ATN.

SC-189/WG-53 is continuing its work to complete the operational, safety, and performance standard for air traffic data link services in oceanic airspace, and the interoperability standard for ATS providers to provide air traffic data link services to aircraft equipped with either the FANS 1/A technology or the ATN technology. Additionally, DO-280A/ED-120A needs to be revised to incorporate interoperability criteria to support revisions to the ICAO technical provisions for ATN and to define an ATN baseline for air traffic data link services in oceanic airspace.

By end of 2006, complete the joint RTCA/EUROCAE standard for operational, safety, and performance criteria for oceanic air traffic data link services.

By end of 2007, revise DO–280A/ED–110A to incorporate the changes of the ICAO technical provisions and include an ATN baseline definition for oceanic use.

By end of 2007, complete the joint RTCA/EUROCAE standard for mixed FANS 1/A–ATN interoperability.

❒ The FAA participates in a number of regional planning groups, both formal and informal, such as the Informal South Pacific ATS Coordinating Group (ISPACG), the Informal Pacific ATC Co-ordinating Group (IPACG), and the North Atlantic Systems Planning Group (NAT SPG). These groups and subordinate groups develop and harmonize procedures, resolve issues, and establish monitoring criteria for operational data link services in the Pacific and Atlantic oceans. The FAA coordinates through these groups initiatives, such as implementing reduced separation minima, to ensure harmonization of implementation initiatives in oceanic airspace for which it has jurisdiction.

- The European Air Navigation Planning Group (EANPG) and the NAT SPG had identified the need to arrest diverging data link applications contributed mainly by the use of different technologies (FANS 1/A and ATN) between the European (EUR) and North Atlantic (NAT) Regions. As a result, the ICAO EUR/NAT Office established a joint EUR/NAT Data Link Steering Group (DLSG) which has been tasked to develop a 20-year data link strategy and an ATN definition for oceanic applications. The ATN definition is being coordinated with SC-189/WG-53 for inclusion in the RTCA/EUROCAE standard for mixed FANS 1/A–ATN interoperability. The FAA is an active member in the ICAO DLSG, which is expected to continue into 2008.

Acronyms

4-D	Four-Dimensional
AAC	Aeronautical Administrative Communication
ACARS	Aircraft Communications Addressing and Reporting System
ACL	ATC Clearance (data link service)
ACM	ATC Communication Management (data link service)
ACP	Aeronautical Communications Panel
ADS-B	Automatic Dependent Surveillance – Broadcast
ADS-C	Automatic Dependent Surveillance — Contract
AIP	Aeronautical Information Publication
AOC	Aeronautical Operational Control
APC	Aeronautical Passenger Communications
ARTS	Automated Radar Terminal System
ATC	Air Traffic Control
ATM	Air Traffic Management
ATN	Aeronautical Telecommunication Network
ATN B1	ATN Baseline 1
ATOP	Advanced Technologies and Oceanic Procedures
ATS	Air Traffic Service(s)
CADS	Centralized Automatic Dependent Service
CENPAC	Central Pacific (sub-region)
CFR	Code of Federal Regulations
CNS	Communication, Navigation, and Surveillance
CPDLC	Controller-Pilot Data Link Communications
D-ATIS	Data Link — Automatic Terminal Information Service
DLSG	Data Link Steering Group
DOD	Department of Defense
EANPG	European Air Navigation Planning Group
ERAM	En Route Automation Modernization
EUR	European (Region)
FAA	Federal Aviation Administration
FANS 1/A	Future Air Navigation System (FANS) 1/A
FIR	Flight Information Region
FMC	Flight Management Computer
HF	High Frequency
HFDL	HF Data Link
ICAO	International Civil Aviation Organization
IP	Internet Protocol
IPACG	Information Pacific ATC Co-ordinating Group

ISPACG	Information South Pacific ATS Coordinating Group
JPDO	Joint Planning and Development Office
MMEL	Master Minimum Equipment List
NAS	National Airspace System
NAT	North Atlantic (region)
NAT SPG	North Atlantic Systems Planning Group
NGATS	Next Generation Air Transportation System
NM	Nautical Miles
NOTAM	Notice to Airmen
OPLINKP	Operational Data Link Panel
PANS/ATM	Procedures for Air Navigation Services – Air Traffic Management
PDC	Pre-Departure Clearance
RCP	Required Communication Performance
RNAV	Area Navigation
RNP	Required Navigation Performance
RSP	Required Surveillance Performance
RTSP	Required Total System Performance
SASP	Separation Assurance and Safety Panel
SATCOM	Satellite Communications
SOPAC	South Pacific (sub-region)
SPR	Safety And Performance Requirements (Standard)
STAR	Standard Arrival (procedure)
STARS	Standard Terminal Automation Replacement System
TAAATS	The Australian Advanced Air Traffic System
TAP	Tailored Arrival Procedure
TMU	Traffic Management Unit
UPR	User Preferred Route
U.S.	United States
VDL-2	VHF Data Link – Mode 2
VHF	Very High Frequency
WPR	Waypoint Position Reporting