Straight Talk About
FANS 1/A

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Editors' Notes

As the aviation community continues to implement Next Generation Air Transportation System (NextGen) initiatives, operators want to know what the initiatives are and how they affect individual operators. The question always comes down to value: If I upgrade my aircraft, what will I get for the often substantial investment?

The ultimate value a NextGen upgrade may bring to your aircraft depends on a number of factors (age of the aircraft, condition of the interior, etc.); however, there's no question that replacing an aging or obsolete Air Traffic Control (ATC) communication system will make your aircraft safer and bring it into compliance with current mandates.

No single communication system fits every aircraft, so we'll clarify the types of NextGen systems available and note how each system is used, so you can make an informed decision regarding the Federal Aviation Administration (FAA) and European Aviation Safety Agency (EASA) mandates.

The FAA needs to roll out a NextGen ATC system, and EASA has mandated upgrades for aircraft flying in its airspace. Additionally, in keeping with the unstated principle that the best-equipped equals the best-served, the best oceanic routes frequently go to FANS-compliant aircraft. This is because the new systems feature components that enhance communication between flight crews and ATCs and provide accurate global positioning system (GPS) reporting, which makes it possible to fly aircraft closer together. The tracking allows ATCs to seamlessly track aircraft over land or ocean routes or as they transition from one to the other.

Legacy avionics systems don't provide tracking data, so aircraft that lack NextGen systems may spend more time on the ground or flying less efficient routes because ATCs have to build a bigger pocket of airspace to accommodate them. These factors have many operators wondering what NextGen systems are and how they're used, the implications of cost and even if there is a system for their aircraft. Although there are no easy answers in the retrofit market, this publication is meant to help clarify Future Air Navigation System 1/A (FANS 1/A) for those operators.

Straight Talk About FANS 1/A

At Duncan Aviation, we're on the cutting edge of avionics technology, and we've thoroughly researched FANS 1/A and Aeronautical Telecommunication Network-B1 (ATN-B1). After talking to hundreds of customers, we feel we've developed the most valuable information we can provide.

In addition to this FANS 1/A publication, our team of avionics experts has developed Straight Talk booklets for NextGen systems and others, including Reduced Vertical Separation Minimums (RVSM) and Automatic Dependent Surveillance-Broadcast (ADS-B).

Visit www.DuncanAviation.aero/straighttalk for more information.
As always, we look to improve ourselves and our knowledge. Feel free to contact our avionics experts to answer any of your questions and talk about your challenges when the subject arises.

Duncan Aviation Avionics Sales Team

Technology Snapshot & Considerations

Many readers of this Straight Talk guide have asked for a brief summary of the datalink initiatives around the world that simplifies the technology functions. For those of you who have asked for it, this brief section is for you.

__FANS__—FANS is a datalink technology that provides two functions: text messaging between the flight deck and air traffic control and position reporting. Both functions can be used through a long-range communication system (high frequency or Satcom) and are particularly useful in areas, such as in oceanic airspace, where there is no ground surveillance. FANS can be used through the ground network if an aircraft is within range of a very high frequency (VHF) Aircraft Communications Addressing and Reporting Systems (ACARS) ground station. Because these areas are already covered by ground radar surveillance, the position reporting function is not as useful.

__ATN-B1__—Operators are often confused by the term ATN because several companies have developed variations of the technology standard and have given it different names. International Civil Aviation Organization (ICAO) calls the standard ATN-B1, and manufacturers that have developed products have called their versions Link 2000+, PMCPDLC, Datacomm and CPDLC. Regardless of what it is called, the standard refers only to text messaging between the flight deck and air traffic control; there is no surveillance component. This standard is meant to be used only over land and is used only through a VHF link called a very high frequency datalink (VDL) Mode 2 radio.

There are mandates regarding both technologies. The North Atlantic Track (NAT) system issued a mandate for FANS in the center two tracks and is expected to broaden its requirements in the coming years. EASA has issued a mandate for ATN effective February 2015, but many non-production aircraft are exempt from the mandate.

Once the mandate takes effect, most of the aircraft in EASA airspace will be equipped with ATN or FANS; ATC will handle aircraft that lack either technology differently from the majority of aircraft which will be compliant. Operators of aircraft that lack ATN or FANS may face delays or disadvantages regarding best routes. The upgrades are often costly, so operators have to weigh the pros and cons to see if it makes sense for them to upgrade.

STRAIGHT TALK ABOUT
FANS 1/A

What is FANS 1/A?

What is FANS 1/A?

Developed by the International Civil Aviation Organization (ICAO), Boeing, Airbus, Honeywell and others, Future Air Navigation System (FANS) is a protocol for safely managing the expected increases in the volume of air traffic in the coming years. FANS 1 was developed by Boeing and later adopted by Airbus (FANS A). FANS 1/A uses an early version of both systems. Airlines have used it for 15 years, and it contains two parts.

Controller Pilot Data Link Communication (CPDLC) allows two-way, digital communication between a controller and a pilot when an aircraft is out of range of traditional analog very high frequency (VHF) or high frequency (HF) voice-radio communications. As with terrestrial-based messaging between cell phones, the ATCs and the flight crews communicate via text messages. The CPDLC application has three primary functions:

- Facilitates the exchange of messages between the pilot and the ATC who is currently in control of the aircraft.
- Clarifies dialogue between ATC and the aircraft crew who speak different languages (removes the accent from the picture because all communication is text-based).
- Allows the crew to review ATC instructions.

1) Automatic Dependent Surveillance-Contract (ADS-C)— ADS-C is both a standard and an application that automatically sends reports from an aircraft to an air traffic services unit (ATSU) and requires no action from the pilot. The report includes data, such as the aircraft identification and address, air vector, ground vector, projected profile, meteorological data, min/max ETA and Extended Projected Profile (EPP) data. When operating in normal mode, the system generates three types of reports:

Periodic—The ATC can set or alter the update rate as needed (a higher update rate is usually required in high traffic areas).

Event—A change in vertical rate, lateral deviation or altitude automatically triggers a report.

Demand—An ATC can request an update as needed, and this does not affect an existing contact preset rate.

There is a fourth type of contract; unlike the previous three, it is initiated and cancelled by the pilot, not the controller. This Emergency Contract is automatically triggered by a MAYDAY message.

2) CPDLC—Facilitates communication between an ATC and a flight crew.

ATN-BI—(PM CPDLC, Link 2000+ and Datacomm) is the ICAO engineering designation for this technology standard. It refers to just text messaging. It's a datalink service that allows text-based communication between an ATC and the flight crew but doesn't include a surveillance component. Equipment using this standard is intended for use in areas where ground surveillance already exists.

Protected Mode CPDLC is Honeywell's term for the same technology standard. In Europe, Link 2000+ (EASA's term for the technology) is the Eurocontrol Program that coordinates the implementation of operational CPDLC. Datacomm is the FAA's term for the technology. Although Link 2000+ is similar to the FANS/CPDLC system used in North Atlantic Airspace, Link 2000+ uses VDL Mode 2 datalink and Aeronautical Telecommunications Network (ATN) instead of Aircraft Communications Addressing and Reporting System (ACARS) and is meant to be used in areas where ground surveillance already exists. There is no surveillance component to this technology.

There are currently more than 1,000 FANS 1/A-equipped commercial, business and military aircraft operating around the world.

Datalink services are available in most of the world's oceanic routes and in some domestic airspace, as well. The services provide invaluable support at transfer points where aircraft enter or exit domestic airspace and enter oceanic. The enhanced communication abilities aid the ATC on both sides of tracks and particularly when a controller at one center hands off an aircraft to another ATC center because with a FANS-equipped aircraft, the handoff occurs seamlessly behind the scenes.

Along the routes that have not yet been mandated for FANS, the flight crew has to call an ATC and give verbal updates as to their whereabouts with no support from ground surveillance. This lack of accurate position data is a problem because if an ATC doesn't know exactly where an aircraft is, the ATC has to maintain greater distance between aircraft. With FANS, an ATC can track aircraft along the entire route and safely and efficiently track and accommodate more aircraft in the airspace. The majority of these enhanced services are available to FANS 1/A-equipped aircraft. Ground facilities around the world are upgrading to FANS work stations.

Which datalink service a particular operator selects depends entirely on what equipment is available for the type of aircraft.

FANS 1/A Overview

FANS 1/A Overview

Development of FANS

In the early 1980s, ICAO expressed concern about the aging infrastructure and inherent faults with traditional air traffic management methods. In an effort to increase aircraft safety and limit human error, ICAO developed a council to investigate ways to increase safety. This council was charged with studying new technologies and operational concepts for the future of air traffic management and future air navigation systems (FANS).

Traditional air traffic control systems use antiquated analog radio systems, such as very high frequency (VHF) and high frequency (HF) radios, inertial navigation systems and transponder and radar to provide positive or procedural control. FANS relies on digital communication and navigation systems (CNS), which feature global positioning systems (GPS) and improved surveillance. Enhancing communication, navigation and surveillance equipment allows authorities to safely reduce separation distances between aircraft, allowing aircraft to fly at their most favorable altitude and consume less fuel.

Reduced Vertical Separation Minimums (RVSM) reduced the vertical separation of aircraft. One of the goals of FANS 1/A+ is to reduce separation between aircraft from 100 nm laterally and 10 minutes trailing to 30 nm laterally and five minutes trailing.

Communication Upgrades

Digital communications equipment that facilitates exchanging messages between aircraft and air traffic controllers is replacing analog radios. CPDLC will become the preferred method of communication. CPDLC lets an air traffic controller exchange information with an aircraft when it is out of the range of traditional VHF communications and radar tracking.

CPDLC has a predefined set of text messages for clearances, requests and routine message traffic. CPDLC reduces the crew's

workload by replacing voice communications with a quicker and less intrusive text-based system.

Another improvement in aircraft-to-ground communication is safety voice services, which allow an ATC to communicate with an aircraft through Inmarsat Satcoms. Unlike traditional Satcom phone systems, safety voice service integrates into the pilot and copilot's headsets, for hands-free operation. Inmarsat has the only safety voice service currently available that can be certified; Iridium doesn't currently support safety voice services. Inmarsat's service allows priority preempt, which lets an ATC interrupt an in-progress phone call placed by anyone in the aircraft.

Navigation Upgrades
With the introduction of Required Navigation Performance (RNP), operators have been advocating for systems that provide greater navigational accuracy. RNP allows an aircraft to fly a specific path between two three-dimensionally defined points in space and is required in certain regions (such as North Atlantic tracks and heavily trafficked areas in the northeastern United States) throughout the globe.

Any navigation system can be used in conjunction with RNP, provided it meets the required navigation performance accuracy. RNAV equipment automatically determines the aircraft position by using inputs from a combination of sources, such as VOR, DME and GPS.

Transitioning from Inertial Navigation Systems (INS) to the more accurate GPS is a major facet of the navigational upgrades. Upgraded GPS combined with equipment upgraded for RVSM can dramatically reduce minimums and errors.

Surveillance Upgrades

One of the most important improvements FANS will usher in is the transition from voice reporting to automatic position reporting. ADS-C generates automatic downlink reports from an aircraft's avionics equipment when predetermined or specific events occur or when defined time periods are reached.

RVSM equipment also plays a part. With aircraft not equipped with FANS systems, the ATC and flight crew rely on analog voice communication and crew-reported position reports. Crews of non-FANS-equipped aircraft have to communicate with ATC via HF radio, and an exchange between the flight crew and the ATC can take as long as 20 minutes.

Therefore, it's difficult for an ATC to determine an exact location or position. As a result of potential errors in voice communication and self-reporting, ATC have to build in greater distances of airspace separation between aircraft. In aircraft with FANS-compliant equipment, however, surveillance reports with actual positions and intent information are automatically transmitted at intervals set by an ATC. Usually, the more aircraft in an area, the more frequent the reports.

Equipment

Equipment

It sounds as though FANS 1/A and CPDLC should be housed in a tidy little box. However, what you find with FANS 1/A is each manufacturer has its own version of the unit, which integrates differently with existing navigation equipment on an aircraft. These equipment differences undoubtedly affect multiple sub-systems. Upgrades to existing datalink equipment to obtain FANS compliance can be primarily software based, especially for newer avionics equipment; however, there may be significant hardware requirements as well. What follows is a brief overview of the equipment affected by FANS.

Rockwell Collins Pro Line Fusion/Honeywell Epic

Rockwell Collins Pro Line Fusion and Honeywell Epic (to include Planeview and EASy platforms) are being addressed by OEM service bulletins, Supplemental Type Certificates (STCs) and Aircraft Service Centers (ASCs) on late model aircraft. Because service bulletins and STCs stipulate a path to certification, we will going to forego a conversation about equipment on those aircraft. Some service bulletins, such as Falcon's EASy II platform, are available to Duncan Aviation and other service centers. Some, such as Gulfstream's Cert Foxtrot, are not.

Currently, ATN-B1 and FANS are options for aircraft equipped with EASy II software on the Falcons and with Cert Foxtrot on the Gulfstream PlaneView line.

AFIS/ACARS/Datalink

 The most obvious system affected by FANS 1/A is your datalink communications management component.

Honeywell is releasing a standalone datalink unit known as the Mark III Communications Management Unit (MK III CMU). Although installation guidelines have not been released, the MK III CMU is the replacement for the AFIS

DMU that Honeywell has manufactured for many years. It will interface with FMSs equipped with 6.1 software (WAAS and beyond). At publication time, the full technical details of the MK III CMU were not available.

Rockwell Collins' FANS-compliant CMU-4000 features NextGen architecture that interfaces with FMSs to provide FANS and/or ATN-B1 functionality. For aircraft fitted with a Pro Line suite, this will be a logical upgrade. Rockwell Collins has also received approval for installation of an existing CMU-4000 model as part of its Pro Line 4 to 21 retrofit program. Using previously validated equipment may simplify future FANS STCs.

Universal Avionics offers UniLink® 800/801 FANS 1/ACMU. UniLink® 800/801 is now available and is compatible with all Universal WAAS/SBAS FMSs. Universal also offers an upgrade path for all existing non-WAAS/SBAS Universal FMSs to a compliant system. UniLink® 801 incorporates an internal VHF VDL Mode 2 radio in the line replaceable unit (LRU), supporting full ACARS messaging.

The Unilink option is especially beneficial for aircraft that are already fitted with Universal FMS systems, such as the Astra SPX or Lear 60.

CVR
EASA and the FAA consider CPDLC texts to be a communications feature. As such, it is mandated that their recording will be done by the Cockpit Voice Recorder. Older voice recorders, including many digital voice recorders, do not meet the specification required (TSO-C177) to record datalink communications. Universal, L3 and Honeywell all make CVRs that comply with the newer datalink communication recording requirement.

VHF Transceiver

ATN-B1 requires a VHF Data Link (VDL) specification. Although ICAO has defined four VDL modes, VDL Mode 2 is the only specification pertinent to FANS 1/A. ICAO has designated VDL Mode 2 for the ATN-B1 part of FANS.

Rockwell Collins has incorporated VDL Mode 2 into its VHF-4000 platform. The older VHF-22/422 lines currently have no upgrade path (nor is one planned) to incorporate VDL Mode 2 software. This unit is also being incorporated into several Pro Line 4 to 21 upgrade STCs, again reducing certification time and effort.

Honeywell will require an external, VDL Mode 2-compliant radio with an MK III CMU installation. Honeywell communications units that are part of the Honeywell Epic Radio package require a radio upgrade in order to incorporate VDL Mode 2 capability.

The Universal UniLink® Model 801 is currently available and integrates a VDL Mode 2-compliant transceiver in the unit.

Satcom

One function of FANS 1/A is that it permits ATCs to monitor aircraft outside the range of ground-based radar. Traditionally, flight crews report their positions via HF radio. HF radio systems are costly and require a great deal of power. The radios can be unreliable because atmospheric conditions may affect their performance, causing interference and noise.

Incorporating a FANS 1/A-compliant Satcom (level D certification) addresses these concerns by providing a more reliable and dedicated voice and datalink channel that is available regardless of the aircraft's distance from a ground station. The two satellite networks available for FANS 1/A are the Inmarsat and Iridium networks.

Although Inmarsat has no coverage at the far northern and southern latitudes, it lets you incorporate high speed internet

for passengers while overseas and is now certified for voice safety services.

Iridium Solutions
Iridium's FANS 1/A-compliant units offer true global coverage. This is important if you're flying a global aircraft, for instance, and want to take advantage of polar routing. Iridium units are inexpensive to install compared to Inmarsat systems. Although Iridium is not currently voice compliant for safety services, the datalink portion has been approved for some products.

The ICG-120A/220A is a FANS 1/A-compliant Iridium transceiver that will interface with a Universal Unilink® or a Collins CMU-4000. Although ICG has received Level D software certification, it is worth noting that Aircell is pursuing Level D software certification for its DIU product for its popular Axxess line. Aircell says it is testing a Honeywell DMU product using SITA as a service provider.

AC 20-140B places a new requirement on Iridium Satcoms when they're part of a FANS installation. This requirement is TSO C159A. At the time of publication, no Iridium Satcom met this requirement, but various manufacturers of Iridium products are testing several units to meet this new requirement.

Inmarsat Solutions
Although more expensive than an Iridium system, Inmarsat systems are usually more flexible. Several manufacturers are selling FANS 1/A-compliant units that also incorporate SwiftBroadband (SBB) terminals for worldwide internet access.

The Honeywell HD-710 is a favorite of OEMs for both ACARS and SBB. The HD-710 has a FANS 1/A-compliant, four-channel SBB terminal. The HD-710 is used by Dassault and Gulfstream.

Rockwell Collins has a powerful Inmarsat FANS 1/A satellite communications system in the Sat-6100. This FANS 1/A-compliant Satcom also supports an SBB terminal for worldwide internet access. Although it's not installed as often as the HD-710, the Sat-6100 is a good choice for customers who are looking to keep all of their avionics under a single manufacturer for parts programs, such as CASP (Corporate Aircraft Services Program).

Thrane and Thrane produces the Aviator 700, which is an Inmarsat system that can be upgraded to an Aviator 700D to comply with FANS 1/A and incorporates worldwide, high speed internet connectivity.

FMS MCDU
An FMS Control Display Unit (CDU) is the user interface for most FANS 1/A systems. FANS 1/A FMSs also incorporate options such as Satcom telephone dialers, so pilots or flight decks can more easily connect to ATCs. An FMS that was installed as part of a WAAS upgrade is likely to have an upgrade path to FANS 1/A. Honeywell, Collins and Universal have all stated that FANS will require a minimum of a WAAS/LPV FMS.

Honeywell's CD-820 is a FANS 1/A-compliant CDU. Currently, this unit does not incorporate an internal telephone dialer, meaning that it is not fully capable of providing seamless voice and datalink services and will likely require an external dialer.

Rockwell Collins has a FANS-compliant MCDU with its Pro Line 21 Fusion. Universal also currently manufactures a FANS-compliant MCDU, and all of its WAAS-level FMSs are FANS 1/A-compatible.
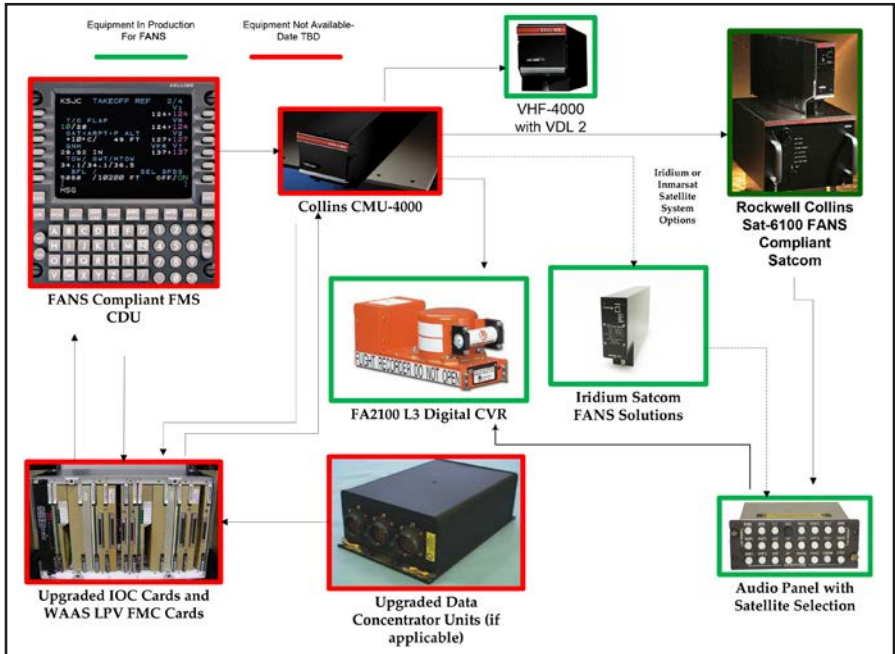
Straight Talk About FANS 1/A

Displays

In order to fully comply with FANS, electronic flight instrument systems (EFIS) will require an upgrade for the annunciation of the datalink messaging component; installing an external annunciator will also satisfy the requirement. Rockwell Collins' flat-panel display for its Pro Line 21 unit, for instance, may require additional modification to handle the CPDLC annunciation expected as part of a FANS STC. There are similar requirements for Honeywell's and Universal's EFIS products.
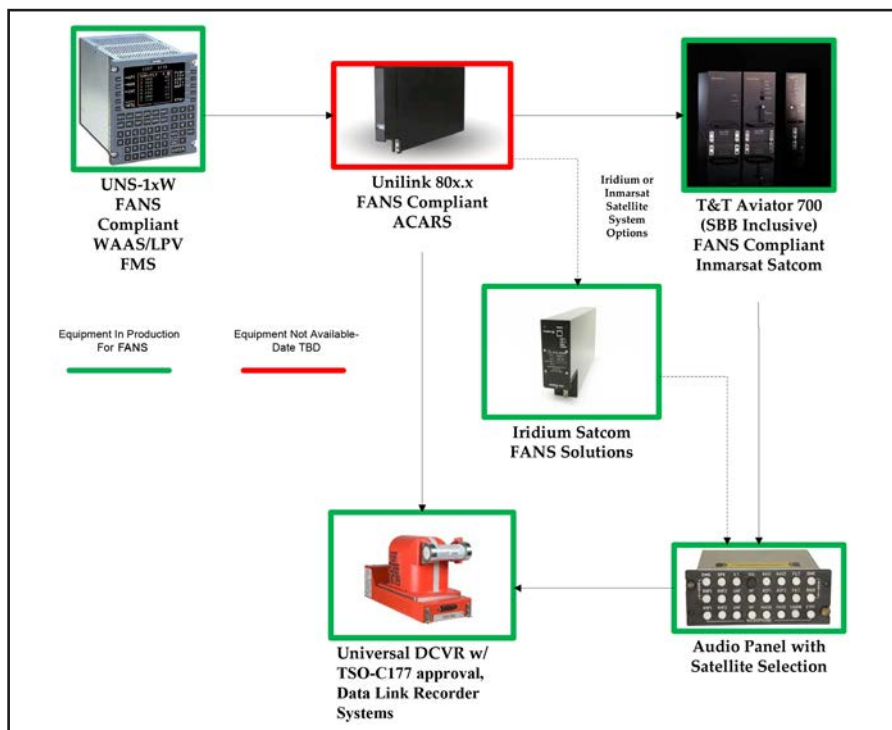
Equipment Diagrams

The following equipment slides are meant to be examples of possible aircraft solutions for FANS 1/A. These are not all inclusive and will vary depending upon aircraft equipage.
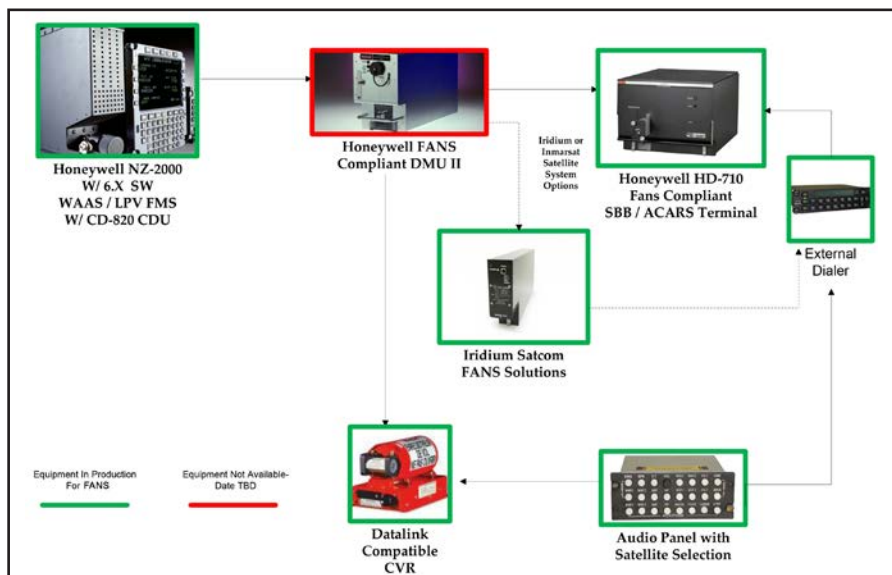
Rockwell Collins FANS 1/A Solution for Pro Line 4 or 21

Universal Based FANS 1/A Solution

UNS-1xW FANS Compliant WAAS/LPV FMS → **Unilink 80x.x FANS Compliant ACARS** → **T&T Aviator 700 (SBB Inclusive) FANS Compliant Inmarsat Satcom**

Iridium or Inmarsat Satellite System Options

Iridium Satcom FANS Solutions

Equipment In Production For FANS

Equipment Not Available- Date TBD

Universal DCVR w/ TSO-C177 approval, Data Link Recorder Systems

Audio Panel with Satellite Selection

Non-Epic Honeywell Based FANS 1/A

Honeywell NZ-2000 W/ 6.X SW WAAS / LPV FMS W/ CD-820 CDU → **Honeywell FANS Compliant DMU II** → **Honeywell HD-710 Fans Compliant SBB / ACARS Terminal**

Iridium or Inmarsat Satellite System Options

External Dialer

Iridium Satcom FANS Solutions

Equipment In Production For FANS

Equipment Not Available- Date TBD

Datalink Compatible CVR

Audio Panel with Satellite Selection

Operational Facts

Operational Facts

Craig Roberts, of ATC Data Link News, provides the operational information on the use of FANS-1/A in this Operational Facts chapter. Visit *http://members.optusnet.com.au/~cjr/introduction.htm* for more information from ATC Data Link News.

Communications Media
Datalink messages can be sent by the flight crew via a VHF, HF or satellite network. VDL Mode 2, an advanced digital VHF data network, can also provide FANS 1/A services. There are two types of VHF networks for FANS 1/A services: POA (Plain Old ACARS) and AOA (ACARS Over AVLC (VDL Mode2)). The central processing system's software automatically decides the most efficient and cost-effective path for delivering the message, depending on the location of the aircraft. ARINC has a service called high frequency datalink (HFDL). Although transit times for messages sent by HFDL are too slow to meet the current return communications protocol RCP reduced separation (30/30nm), HFDL provides communication in polar regions where neither VHF nor Inmarsat satellite networks are available.

ATC messages are delivered along the same path as other messages, such as AOC flight plan uplinks. ATC messages are not given priority, although longer messages are split and delivered in discrete chunks or blocks.

When in VHF range, it is possible for a datalink-equipped aircraft to downlink information simultaneously via the satellite and the VHF networks if one of the channels is receiving a large block of data.

Inter-Networking
Several components (hardware, software and service providers) make up the datalink system.

ATS providers supply some of the infrastructure, but the current datalink system relies on the networks of communications service

providers (CSPs), such as SITA and ARINC, for the delivery of datalink messages. Other CSPs are Avicom Japan and Aerothai. The CSPs are commercial entities that offer similar services but configure their networks differently.

ATS providers, airlines and operators often subscribe to datalink services from competing CSPs. For example, SITA provides the datalink services for the Australian ATC system (TAAATS). ARINC provides datalink services to commercial airlines United Airlines.

Obviously, it is imperative that airlines and operators are able to communicate with ATCs regardless of who provides the datalink services. To ensure that messages carried by one network are delivered to customers on a different network, SITA and ARINC have an internetworking agreement and a system of network connections. However, SITA is the only CSP that's certified to work directly with ATCs. Internetworking agreements also allow messages to pass seamlessly from ATC to SITA and on to other networks that communicate with aircraft. FANS 1/A routers process uplink messages, determining who receives the message (customer) and delivering it.

This diagram represents internetworking between the SITA and ARINC networks. It shows an ATS Unit that is a SITA customer exchanging messages with an ARINC airline customer.
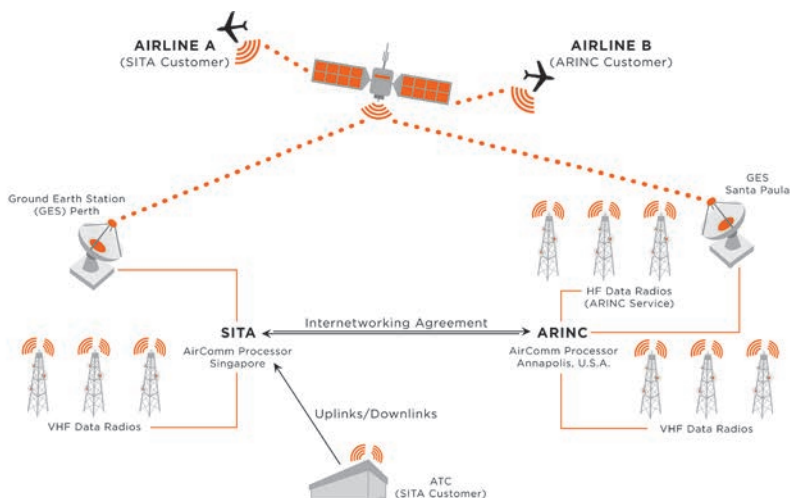
Benefits of FANS 1/A

Benefits of CPDLC

FANS 1/A greatly improves communication capabilities in oceanic areas, especially in situations where controllers and pilots have previously had to rely on a third-party HF communications relay.

Apart from the direct link, FANS 1/A adds a number of other benefits to the ATS system, such as:

• Allows the flight crew to print messages if an onboard printer is available.

• Autoloads certain uplink messages into the Flight Management System (FMS), reducing crew-input errors.

• Allows the crew to downlink a complex route clearance request, which the controller can re-send when approved without typing a string of coordinates.

• Arms the FMS with specific uplink messages to automatically downlink a report when an event, such as crossing a waypoint, occurs. This automation assists the crew and ATC with workload management.

The ADS-C contracts define the type of reporting required, the timing of these reports, the information contained in the reports and the frequency of reporting.

Locations Using
FANS 1A/CPDLC

North Atlantic Tracks (NAT)

- Phase 1 – February 2013
  - o Reduced lateral spacing of the two core center tracks, FL350-FL400.
- Phase 2 – 2015
  - o An expansion is expected.
- Phase 3 – 2017
  - o Potentially, reduced lateral spacing within all North Atlantic MNPS airspace, FL350-FL400.
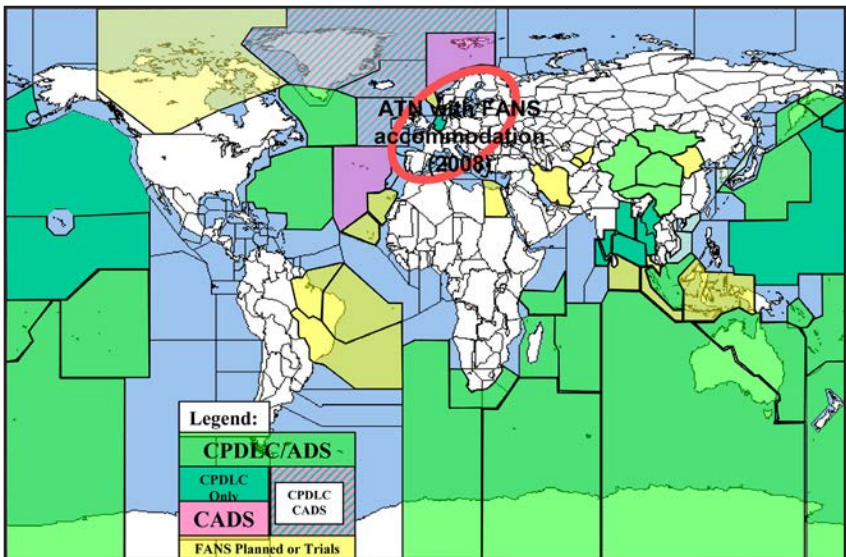
Courtesy of www.atnconference.com/downloadppt.php?id=322.

EASA Mandates (ATNB1 Requirement)

January 1, 2011 – All new aircraft operating above FL 285 must be delivered with a compliant system.

January 1, 2014 – Aircraft with individual airworthiness certificates before this date that are equipped with Future Air Navigation System (FANS) are exempt for the lifetime of the aircraft. Aircraft entering into service after January 1, 2014, shall comply with the rule.

February 5, 2015 – By this date, all aircraft flying above FL 285 must be delivered with a compliant ATN B1 datalink system.

December 31, 2017 – Aircraft that are at least 20 years old and that will cease operation in the concerned airspace before 31 December 2017 are exempt.

FANS 1/A
Regulation and Certification

FANS 1/A Regulation and Certification

This chapter provides recommendations and guidance materials for airlines to help prepare procedures and training programs for its pilots and dispatchers. It also outlines the engineering programs necessary to obtain operational approval to use FANS 1/A.

Design Approvals

FAA Advisory Circular AC 20-140B Guidelines for Design Approval of Aircraft Data Link Communication Systems Supporting Air Traffic Services (ATS) is guidance material to gain approval for type certificates (TC) and supplemental type certificates (STC) involving aircraft data link systems intended to support air traffic services. Numerous technical specifications are published for the design and certification of FANS 1/A as listed in AC 20-140B.

FAA AC 20-140B is the Guidelines for Design Approval of Aircraft Data Link Communications Systems Supporting Air Traffic Services). This AC provides a set of non-mandatory guidelines to obtain approval for TCs and STCs for aircraft with datalink systems. In addition to identifying the configurations for datalink systems, the AC sets out airworthiness requirements for obtaining design approval.

Operational Authorization

AC 120-70B (Operational Authorization Process for the use of Data Link Communication Systems) spells out the international standards that ICAO and regional airspace authorities established regarding the operation of different datalink systems.

The AC describes the process for obtaining operational authorization for datalink communication systems, acceptable methods for training and maintenance, and policies for use. In addition, it describes appropriate actions in the event of an ATC datalink communications event.

The operator's application to obtain authorization to use datalink must address and contain the following content from AC 120-70B, Appendix 5.

List of Source Documents Used:
- For generic datalink operations (Aircraft/Avionics Manufacturer Documents)
- For area of operations specific policy/procedures.

Description of aircraft datalink systems including certification documents and current configuration (e.g., current avionics load).

The aircraft should be configured in accordance with the approved certification configuration for FANS 1/A operations.

The list of the approved FANS aircraft configuration will be kept updated by the operator as the equipment configuration changes. Compliance to this list will have to be ensured.

Area of Operations/Routes Where Operator Intends To Use Data Link
- List of areas and/or routes where operator intends to conduct datalink operations
- List of Air Traffic Centers/Service Providers with which operator intends to communicate via datalink
- List policy/procedures source documents applicable to each area(s) of operations, such as:
  - o Operations Manuals for specific areas of operations (FANS Operations Manual (FOM) for operation in Asia Pacific FIR's)
  - o State Aeronautical Information Publications (AIP)
  - o State NOTAMS

    o FAA Chart Supplements
       (Pacific and Alaska Chart Supplement)

Flight Crew Qualification Programs
1) Academic Training
2) Operational Use Training
3) Currency (Recent Experience)
4) Line Checks and Route Checks

Approved Documentation
1) FANS 1/A Airworthiness Approval Summary
2) MEL
3) AFM

MMEL/MEL
The operator should submit its intended MEL for operation of
FANS 1/A routes to its airworthiness authority. In addition to
the MEL provisions taken for the navigation equipment, in the
frame of RNP/RVSM context (see AI/ST-F RNP/RVSM - a flight
operations view - document), provisions will have to be taken for
the digital communications equipment.

Reference to the MMEL and to the AFM is recommended to
establish the MEL. The MEL items for datalink communications
may depend on the considered FANS 1/A route (oceanic, continental,
remote areas). The operator should thus take provisions for
some specific operating systems at dispatch and consider the
consequences of their loss on the datalink communications.

Issues Unique To a Particular Operator

Maintenance Programs

To get its operation approval, the airline must demonstrate that an appropriate maintenance training program relative to the digital communications is given to its maintenance people. The aim is to train the maintenance personnel to properly implement, maintain or replace the AIM-FANS equipment (ATSU, DCDU, FMS, printer, VDR, etc.)

Airplane Flight Manual

The airplane flight manual shall reference the FANS 1/A Airworthiness Approval Summary document.

Operational Authorization Documents

Approval to use datalink in operations is granted through the issuance of OpSpec AO56. The CMO should coordinate the approval with AFS-400.

FAQs

How does service get set-up?

ARINC or SITA will be happy to help set up service with you. Please keep in mind that a specific service provider may be required as part of a group STC.

Is the FANS 1/A update required by EASA or the FAA?

For EASA, the mandate goes into effect February 3, 2015. The FAA has no mandate for FANS 1/A compliance. However, we are already seeing FANS 1/A-equipped aircraft getting preferential treatment in the oceanic routes, such as NAT.

How many aircraft are currently compliant?

The airlines and the military have been certifying aircraft for FANS 1/A since the 1980s. There are currently more than 1,000 FANS 1/A-compliant aircraft.

Does each aircraft type and serial number require an STC?

No. Although aircraft compliance for FANS 1/A will require an STC, we expect there to be group STCs developed to meet the demand. There may be one-off STCs done, but group STCs are expected to be created to cover most operators. Production aircraft are already covered by Service Bulletins at the aircraft OEMs.

What aircraft have FANS STCs being developed?

Each OEM and facility need to evaluate which aircraft it makes sense for them to tackle. Development of STCs is expensive, so it would stand to reason that each dealer/OEM will pick a cross-section of its core aircraft.

Are there certain steps that flight departments can take toward compliance or is a one-time retrofit more cost-effective?

Although STC packages can make provision installations an unreliable expenditure; equipment upgrades where possible can help amortize the cost of the installation across a couple of maintenance events. FMS upgrades make the most sense because WAAS-capable GPSs are required in a couple of mandates, and you will start seeing the benefit of having this advanced GPS in your aircraft immediately.

Key Terms

ACARS—Aircraft Communications Addressing and Reporting System

ACAS—Aircraft Collision Avoidance System (ICAO)

ADS—Automatic Dependent Surveillance

ADS-B—Automatic Dependent Surveillance-Broadcast

ADS-C—Automatic Dependent Surveillance-Contract (FANS)

ARINC—Aeronautical Radio Incorporate

ATC—Air Traffic Control

ATM—Air Traffic Management

ATN-B1—Aeronautical Telecommunications Network, level B1

ATS—Air Traffic Services

ATSU—Air Traffic Services Unit

CDU—Control Display Unit

CNS—Communications, Navigation, Surveillance

CPDLC—Controller Pilot Data Link Communications

CSP—Communications Service Providers

EFIS—Electronic Flight Instrument Systems

FANS—Future Air Navigation System

FIR—Flight Information Region

FMC—Flight Management Computer

FMS—Flight Management System

GPS—Global Positioning System (USA)

HF—High Frequency (3-30 Mhz)

HFDL—High Frequency Datalink

IATA—International Air Transport Association

ICAO—International Civil Aviation Organization

MCDU—Multipurpose Control Display Unit (ACARS & FMC)

NAT—North Atlantic Tracks

NDA—Next Data Authority

OCS—Oceanic Control System (datalink system for the Auckland FIR)

RNP—Required Navigation Performance

RVSM—Reduced Vertical Separation Minimum

SATCOM—Satellite Communication

SATVOICE—Satellite Voice Communication

SBB—SwiftBroadband

SITA—Société Internationale de Télécommunications Aéronautiques

UM—Uplink message

VDL—VHF Data Link

VHF—Very High Frequency

WAAS—Wide Area Augmentation System

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FANS 1/A Worksheet

Once you have filled this out, please call Duncan Aviation's avionics installation sales department at 800.228.4277 in LNK or 800.525.2376 in BTL to discuss your FANS 1/A options.

1. Company: _____

2. Location: _____

3. Contact Information
   Name: _____
   Phone: _____
   Cell: _____
   Email: _____

4. Aircraft make: _____
   Model: _____
   Serial #: _____
   Registration #: _____

5. Type and part number of FMS and software status:
   _____

6. Type and part number of Satcom installed:
   _____

7. Type and part number of CVR installed:
   _____

8. Type and part number of CMU installed:
   _____

9. Type and part number of audio panel installed:
   _____