

Global Aerospace Design Corp.



FANS 1/A White Paper

October 9, 2014

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Future Air Navigation System (FANS)

FANS was developed in 1983 by the International Civil Aviation Organization (ICAO) in partnership with Boeing, Airbus, Honeywell and others in the air transport industry to allow more aircraft to safely and efficiently utilize a given volume of airspace. FANS is used primarily in the oceanic regions taking advantage of both satellite communication and navigation to create a virtual radar environment for safe passage of aircraft.



- **FANS-1 – standard used on Boeing aircraft.**
- **FANS-A – standard used on Airbus aircraft**
- **Routes:**
 - To alleviate route congestion, primarily in the North Atlantic routes, it is necessary to Reduce the aircraft Lateral Separation Minimums (RLSM). Certain routes, designated as “FANS routes,” reserves the best airspace for the best equipped aircraft. Refer to charts in the “Mandates” paragraph for affected routes.
 - Airspace not included in FANS:
 - ATS Surveillance Airspace – provided by radar and/or Automatic Dependent Surveillance – Broadcast (ADS-B).
 - Airspace north of 80° North.
 - The New York Oceanic Flight Information Region (FIR).
- **Communication:**
 - FANS utilizes Aircraft Communications Addressing and Reporting System (ACARS) over VHF and/or Satellite Communication (SATCOM) for message transmissions. Inmarsat and Iridium are approved for SATCOM FANS communication.
 - The use of VHF ACARS restricts the amount of air traffic on the system due to bandwidth limitations of the technology. The Federal Aviation Administration (FAA) is currently planning to utilize FANS 1/A+ over U.S. continental airspace in the initial ATC data link phase, but will require operators to utilize VHF Data Link (VDL) Mode 2 radios for increased bandwidth.

- **Required components:**

- **Flight Management System (FMS) / Control Display Unit (CDU)** – software updates/features necessary for FANS 1/A compliance.
 - Required Navigational Performance (RNP) – Global Position System (GPS) and Inertial Reference System (IRS) combined with FMS provide compliance with RNP mandates. RNP 4 and 10 are required to comply with FANS 1/A.
 - Required Time of Arrival (RTA) – gives the flight crew the ability to assign a time constraint to a waypoint. The cruise speed is automatically adjusted to achieve an accuracy of +/- 30 seconds.
 - Flight Plan Updates – FMS has the ability to update the flight plan based on revised clearances received by ATC via Controller-Pilot Data Link Communications (CPDLC). The flight crew would acknowledge the clearance and the active flight plan would be updated.
- **Communication Management Unit (CMU)** – must be FANS compliant and will interface with the FMS. Unit may include an internal VHF VDL Mode 2 radio, supporting full ACARS messaging (ACARS over VDL).
 - **ADS-C** – Automatic Dependent Surveillance – Contract. Transmits the position of the aircraft (via SATCOM or VHF data link) every one to five minutes to an ATC listening station. ADS-C maintains surveillance continuity through automatic handover across Flight Information Region (FIR) boundaries.
 - Data link application controlled by FMS.
 - Areas of Operation – Oceanic / Remote (North Atlantic, North Pacific, South Pacific).
 - Network – SATCOM and/or VDL ACARS
 - Equipment Requirements – FMS, SATCOM, VHF VDL (ACARS)
 - ADS-C is designed to be completely automated (except for emergency operations) with minimal input from the pilot and controller.
 - **CPDLC** – Controller/Pilot Data Link Communication.
 - Data link application controlled by FMS.
 - Enables two way communications between the cockpit and the ATC. It contains the set of predefined text messages for clearances, requests and routine message traffic. Hands-on crew tool.
 - CPDLC is designed to use the Aircraft Communications Addressing and Reporting System (ACARS) network and is routed from the cockpit to



ATC based on handling instructions within the aircraft Communications Management Unit (CMU).

- CPDLC data link software can be contained within the FMS.

- **Datalink**

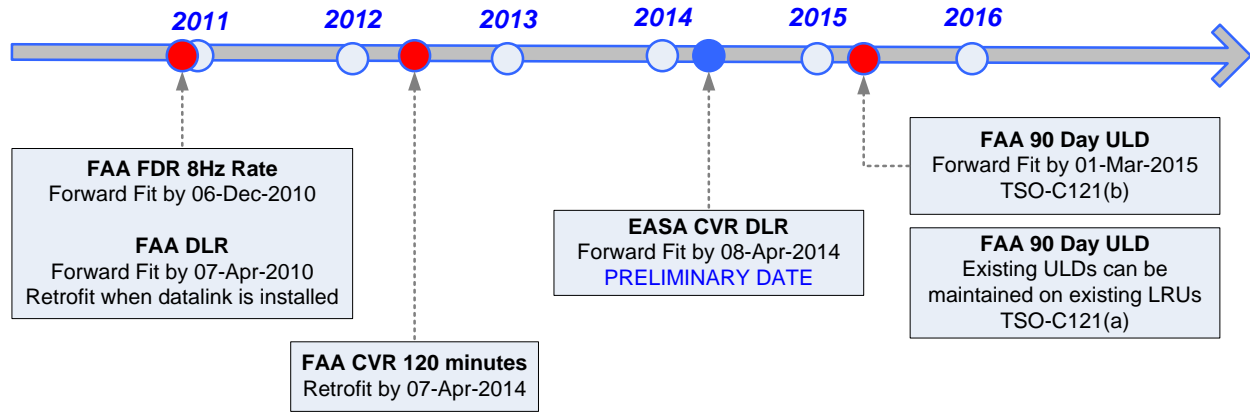
- **VHF Transceiver** – Must include the VHF Data Link (VDL) specification. VDL Mode 2 is the specification that is relevant to FANS compliance.
 - **SATCOM** – approved by the FAA to ensure ATCs can monitor aircraft outside the range of ground-based radar. The two available satellite networks available for FANS compliance are the Inmarsat (TSO-C132) and Iridium (TSO-C159a) networks. The FAA has stated that an Alternate Means of Compliance (AMOC) will be accepted for the short term for capable SATCOM systems without TSO approval. Reference AC 20-140(B) and 120-70(B) as guidance on recommended paths to achieving approvals for a Data Link system within the various sub-networks.
- **Annunciators** – FANS solutions may also require annunciation for datalink messages on EFIS displays or separate annunciator in the forward field of view.
 - **Cockpit Voice Recorder (CVR)** – must be compliant with TSO-C177 to record datalink communications.



Mandates

- CVR (FDR/ULD included for reference)

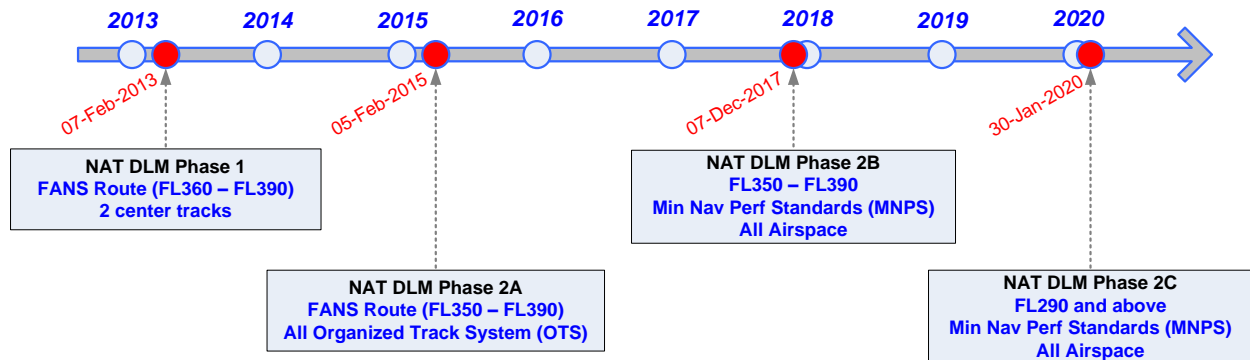
CVR (FDR) Timeline



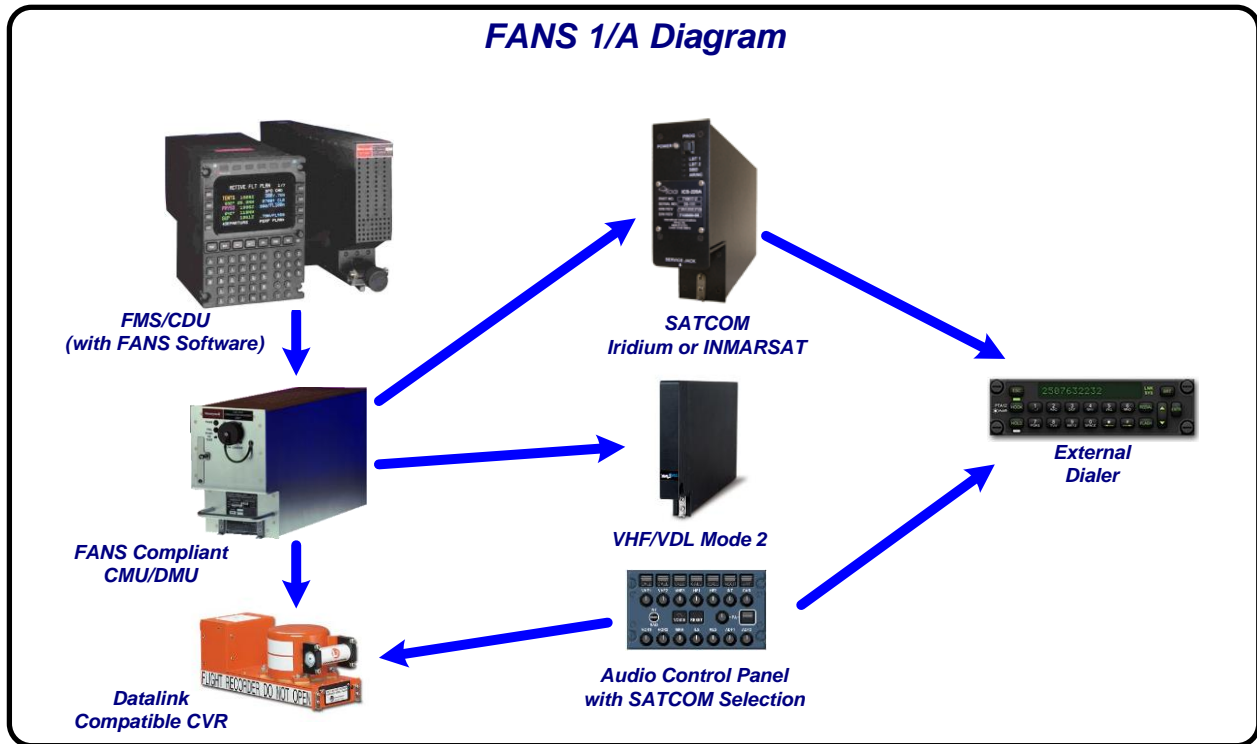
DLR = Datalink Recording
 ULD = Underwater Locator Device

- FANS/1A – mandates for the FANS/1A is intended to limit access to unequipped aircraft for specific North Atlantic (NAT) Regional tracks. It is anticipated that: by 2018, 90% of aircraft operating in the NAT Region airspace at FL290 and above will be equipped with FANS 1/A (ADS-C and CPDLC) systems; and by 2020, 95% of aircraft will be operating in that airspace will be so equipped. The following timeline represents the North Atlantic Data Link Mandate (DLM) for FANS 1/A.

FANS 1/A Timeline



- Upgrade Path



Global Aerospace Design Corp. can provide you with a technical solution that provides an alternative to the currently cost challenging OEM solution.

Contact us today for a cost effective FANS 1/A solution for your fleet – large or small!