

CLAY LACY AVIATION > AVIONICS

Future Air Navigation System (FANS)

STC Program for GIV - GIVSP - GV Aircraft

FANS STC includes CPDLC, ADS-C and provisioning
for Link 2000+ and ADS-B

WHITE PAPER | JULY 2015

FANS Mandates

2017*

Phase 2B, FANS 1/A+ required throughout the ICAO NAT region FL350-FL390 (inclusive)

2020*

Phase 2C, FANS 1/A+ required throughout the ICAO NAT region FL290 and above

**Will not apply if surveillance is available by radar or ADS-B, or if above 80 degrees north, or in the NY Oceanic FIR.*

**Oceanic Centers Gander and Shanwick have also stated they will not allow "shadowing" over the OTS without FANS 1/A+ equipment.*

Executive Summary

Clay Lacy Aviation has developed a FAA Approved FANS 1/A+ STC for the Gulfstream GIV and GIVSP. (STC - ST03423CH) An amendment to include the GV type is in process. The Universal Avionics FANS 1/A+ solution includes CPDLC, ADS-C with provisioning for Link 2000+ and ADS-B.

This new technology will:

- > Improve safety;
- > Reduce operating costs and flight time;
- > Comply with equipment mandates being phased in between February 2013 and 2020;
- > Reduce pilot fatigue and remove language barriers; and
- > Provide aircraft access to the most desirable North Atlantic crossing tracks

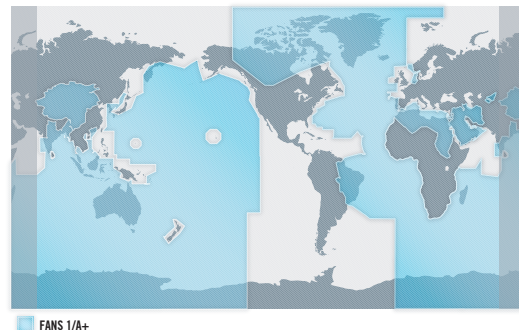
Clay Lacy Aviation will install and sell the STC solution at our Van Nuys, Calif. class 3 and 4 FAA repair station, as well as make it available to Universal Avionics authorized dealers.

FANS Airspace

FANS is required equipment to operate in specific countries and oceanic areas around the globe. In airspace where FANS is not yet required, ATC is utilizing the practice of "best equipped, best served" giving priority routing and altitudes to FANS equipped aircraft.

Where is FANS required now?

- > Australia
- > Hong Kong
- > Singapore
- > Vietnam
- > North Atlantic all organized tracks OTS FL350-390 inclusive
- > Most Oceanic routes



Not using the track system?

Oceanic centers Gander and Shanwick have stated they will not allow "shadowing" or "transitioning" of airspace without FANS 1/A+ equipment.

What is
FANS 1/A, CPDLC,
and ADS-C?

FANS Background

The Future Air Navigation System (FANS) provides direct datalink communication between the pilot and air traffic control (ATC). Radio or satellite technology (SatCom) is used to enable digital transmission of short, relatively simple messages between the aircraft and ground stations. Communications typically include air traffic control clearances, pilot requests and position reporting.

What is FANS 1/A, CPDLC, and ADS-C?

Developed by the International Civil Aviation Organization (ICAO), Boeing, Airbus, Honeywell and others, FANS is a protocol for safely managing the separation of aircraft during 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 and has been used for 15 years by the airlines and contains two parts.

PART 1 — CPDLC

Controller Pilot Data Link Communication (CPDLC) allows two-way, text-based, digital communication between the controller and 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 controller and flight crew communicate via text messages. The CPDLC application has three primary functions:

- 1 It facilitates the exchange of messages between the pilot and air traffic control (ATC), who is currently in control of the aircraft.
- 2 It clarifies dialogue between the controller and aircraft crew who speak different languages (removes human accents to avoid confusion and improve accuracy, because all communication is text-based).
- 3 It allows the crew to review ATC instructions.

What is
FANS 1/A, CPDLC,
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PART 2 — 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:

- 1 **Periodic** — ATC can set or alter the update rate as needed (a higher update rate is usually required in high traffic areas).
- 2 **Event** — A change in vertical rate, lateral deviation or altitude automatically triggers a report.
- 3 **Demand** — ATC can request an update as needed, and this does not affect an existing contact preset rate.

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

Note 1

STC will accommodate ADS-B out (DO-260-B) functionality with appropriate transponder upgrade or modification and failure display annunciation.

Note 2

The Link-2000+ function of the UL-801 will require a software update available from Universal Avionics 2016.

Link 2000+ and Datacomm

Link 2000 is a datalink service that allows text-based communication between 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.

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, 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.

Benefits of FANS

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 ATC on both sides of the oceanic tracks, particularly when an aircraft is handed off to another air traffic control 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 must call ATC to give verbal updates on the aircraft's position without ground surveillance support. This lack of accurate position data is problematic because it requires ATC to maintain greater distance between aircraft. With FANS, ATC can track aircraft along the entire route and safely and efficiently 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.

Scope of Work

In order to configure your aircraft in a fully FANS 1/A+ / CPDLC / ADS-C and provisions for Link-2000 / ADS-B out configuration, Clay Lacy Aviation will engineer, install and certify per the Clay Lacy Aviation FAA approved STC.

1

A Universal Avionics UNS-1Espw SBAS-Flight Management System (FMS) installed as a third FMS with the following features and functions:

- > Full CPDLC / ADS-C out capability when coupled with the Unilink® UL-801 (listed below)
- > FAA TSO-C146c approved Universal Avionics' SBAS-FMS meets the requirement for the navigation source part of an aircraft's Automatic Dependent Surveillance-Broadcast (ADS-B) out installation and approval (See Note 1)
- > Full color LCD display with full function keyboard
- > Fully laterally coupled third FMS with independent worldwide data base and independent data loader

2

A Universal Avionics UniLink® UL-801 Communications Management Unit (CMU), provides advanced air-to-ground, two-way datalink capabilities with:

- > Imbedded VHF Datalink (VDL) for sending information between aircraft and ground stations
- > Controller Pilot Datalink Communications (CPDLC) functionality
- > Automatic Dependent Surveillance-Contract (ADS-C) functionality
- > Compliant with European Link2000+ Program mandates (See Note 2)
- > Compliant with FANS-1A requirements

3

A Universal Avionics CVR-120A Cockpit Voice Recorder with:

- > Solid State recording and memory
- > 120 minutes of cockpit voice and ambient audio recording
- > 120 minutes of data link messaging recording, required for FANS-1A / CPDLC
- > Meets all published and emerging regulations for Cockpit Voice and data link recording with the convenience of a small, lightweight unit

Benefits & Functionality of Clay Lacy's FANS STC



**LOWEST
COST**



**SHORTEST
DOWNTIME**



**FEATURE
RICH**

FEATURES	CLAY LACY AVIATION STC
Certified FANS 1/A+ solution for international operations	✓
CPDLC	✓
ADS-C	✓
ADS-B out	✓ ¹
European Link 2000+	✓ ²
Third Flight Management System <i>(Fully independent, stand-alone, WAAS SBAS compliant)</i>	✓
Lateral autopilot coupling <i>(with selective display on either pilot's primary flight display)</i>	✓ ³
Supports existing AFIS functions & high resolution graphical weather display	✓ ⁴
Utilizes existing Honeywell MCS-6000 Aero H SatCom <i>(optional certification with stand-alone Iridium Data Link connection with TSO approval)</i>	✓
Dual simultaneous AFIS data link connections <i>(Honeywell AFIS and UL-801)</i>	✓ ⁵
Two-year factory parts and labor warranty	✓ ⁶
Installation workmanship warranty	✓ ⁷

1. STC will accommodate ADS-B out (DO-260-B) functionality with appropriate transponder upgrade or modification and failure display annunciation.
2. Requires software update from Universal Avionics, expected Q3 2015.
3. Autopilot coupling only available on GIVSP and GV aircraft.
4. Graphics display option available at additional cost.
5. May require installation of additional data link transceiver and/or VHF antenna with data services subscription.
6. LRUs are covered by a two-year factory parts and labor warranty. Other assorted installation materials covered by Clay Lacy Aviation two-year warranty.
7. Installation workmanship provided by Clay Lacy Aviation warrantied to be free of defects for 10 years from date of installation.

For more information



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Clay Lacy Aviation
is an authorized dealer for



Clay Lacy Aviation

Founded in 1968 by an aviation legend, Clay Lacy Aviation is distinguished as the most experienced operator of private jets in the world, with one of the most diverse fleets of charter and managed aircraft available. The company provides a comprehensive set of aviation services including aircraft management, charter, sales, acquisitions, FBO, maintenance, avionics, interiors and aerial cinematography. It's also an authorized service center for the Embraer Phenom 100 and 300. Clay Lacy Aviation operates two full-service private jet facilities at Los Angeles' Van Nuys Airport and Seattle's Boeing Field, with regional offices and aircraft operations based at 10 additional U.S. cities. Its experienced team is globally recognized for providing aircraft owners and jet travelers unequalled safety, service and value.

Clay Lacy Aviation is the recipient of numerous industry awards, including: "Best of the Best" Jet Charter Service and Aviation Management Company – Robb Report; Diamond Award for Excellence in Maintenance Training/Proficiency – Federal Aviation Administration; Best Pilot Training Program and Platinum Rating – Aviation Research Group/U.S.; IS-BAO Stage 2 Certification – International Business Aviation Council; and Wingman Rating – The Wyvern Standard. For more information, visit www.claylacy.com

Universal Avionics

Universal Avionics manufactures and markets an extensive line of advanced avionics equipment. Product lines include the UNS-1 SBAS-enabled (WAAS) Flight Management Systems; the EFI-890R/890H Flat Panel Display; a line of Integrated Cockpit Displays; Vision-1® Synthetic Vision System; Terrain Awareness and Warning System; UniLink® Communications Management Unit; Radio Control Units; Cockpit Voice and Flight Data Recorders; Attitude Heading Reference System (AHRS); and the Application Server Unit which integrates charts, electronic documents and checklists with displays systems. For more information about Universal Avionics, visit www.uasc.com.



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