

Duncan Aviation ADS-B and FANS 1/A + Seminar

Toluca, Mexico

11/16/2016

ADS-B and Mandates Overview-English Version

Mark Francetic, Duncan Aviation

ADS-B and Mandates Overview-Spanish Version

Mark Francetic, Duncan Aviation

FDF and FANS

Gladys Rossbacher, Satcom Direct

Innovative Solutions for NextGen-English Version

Tom Lippincott, L-3 Aviation Products

Innovative Solutions for NextGen-Spanish Version

Tom Lippincott, L-3 Aviation Products

Mandates for 2020

Hudson Rodrigues, Rockwell Collins



DUNCAN
AVIATION

ADS-B

Automatic Dependent Surveillance-Broadcast



Mark Francetic

Regional Avionics Sales Manager

mark.francetic@duncanaviation.com

402.470.4507 office

702.303.4888 cell

Get the latest NextGen developments at
www.duncanaviation.aero/nextgen



Mandates

ADS-B Out DO-260/260A Dec 12, 2013

- Hudson Bay, Hong Kong, Australia & Singapore

LINK 2000+ Europe date moved to Feb 5, 2020

TCAS II version 7.1 EASA Dec 1, 2015

TCAS II version 7.1 ICAO Jan 1, 2017

Originally ADS-B Out DO-260A Europe changed to DO-260B and moved to June 8, 2020

ADS-B Out DO-260B United States & Worldwide Jan 1, 2020

FANS 1/A+

- ICAO NAT (North Atlantic) region
- FL360-390, two tracks in OTS Feb 7, 2013
- FL350-390, all tracks in OTS Feb 5, 2015
- FL350-390, NAT region Dec 7, 2017
- FL290 & above, NAT region Jan 30, 2020

United States ADS-B

STCs are being revised daily, including those by Rockwell Collins, Freightliner, QNT Flight Solutions & L-3 Business Aviation Services. Garmin has an AML for Part 23 aircraft that are approved for DO-260B-out.

- The FAA mandates in AC 20-162A that all ADS-B systems require an STC.
- Rockwell Collins has the TDR-94D system (\$90K-\$110K) that meets all of the US mandates for ADS-B out.

Do I have ADS-B?
• ADS-B is a new technology for
• ADS-B is a new technology for
• ADS-B is a new technology for
• ADS-B is a new technology for
• ADS-B is a new technology for

ADS-B Out
• ADS-B Out is a new technology for
• ADS-B Out is a new technology for
• ADS-B Out is a new technology for
• ADS-B Out is a new technology for
• ADS-B Out is a new technology for

ADS-B In
• ADS-B In is a new technology for
• ADS-B In is a new technology for
• ADS-B In is a new technology for
• ADS-B In is a new technology for
• ADS-B In is a new technology for

ADS-B
• ADS-B is a new technology for
• ADS-B is a new technology for
• ADS-B is a new technology for
• ADS-B is a new technology for
• ADS-B is a new technology for

Benefits

- Aircraft with ADS-B get priority over non-ADS-B-equipped aircraft
- No need for position reports
- More flexible continuous routes to flight levels
- Reduced runway incursions
- Improved safety in areas that previously had no surveillance coverage

History & Development

- Developed to fit multiple aircraft in a fixed position **horizontally**
- RVSM established a baseline by providing highly accurate separation **vertically**

History & Development

- Developed to fit multiple aircraft in a fixed position **horizontally**
- RVSM established a baseline by providing highly accurate separation **vertically**

Acronyms

- **ADS-B** Automatic Dependent Surveillance-Broadcast
- **ARINC** Aeronautical Radio Inc
- **CASA** Civil Aviation Safety Authority
- **GNSS** Global Navigation Satellite System
- **FDE** Fault Detection and Exclusion
- **NAC** Navigation Accuracy Category
- **NAC (p)** Navigation Accuracy for Position
- **NIC** Navigation Integrity Category
- **NUC** Navigation Uncertainty Category
- **SA** Selective Awareness
- **SPI** Special Position Indication (Ident)
- **LOA** Letter of Approval

Documents

- Singapore CAA Advisory Circular AC
ACAC-2112
- Transport Canada AC 001
- Australia CAO 30-10-2009
- United States AC 0-115, AC20-195A,
AC20-273A, AC20-105
- EASA AM20-24, ETSO-2C112



Un

- STCs are those by CMD Flie Aviation for Part 2 for DO-2
- The FAA all ADS-B
- Rockwell system (the US m

Documents

- Singapore CAAS Advisory Circular AC AOC-21(0)
- Hong Kong AIC 09/11
- Australia CAO 20.18-2009
- United States AC-90-114, AC20-165a, AC20-172a, 14CFR91.225
- EASA AMC20-24, ETSO-2C112a



Three Levels of DO-260?

DO-260

- Tested but position accuracies did not meet predicted forecast

DO-260A

- Developed to add accuracy missing from DO-260. It usually incorporates upgraded GPS WAAS receivers. Installed & tested by airlines, but the results were still outside the range of desired accuracies

DO-260B

- Incorporates GPS accuracies from DO-260A but adds position forecast (from position & velocity) to predict and broadcast position. Adds cockpit annunciators and procedures

DO-260B

- United States, Jan 1, 2020
- Is the world-wide standard
- Uses the advantages of ADS-B DO-260 and DO-260A but requires parameters and addresses latency and annunciation issues

DO-260

- Hudson Bay, now in effect
- Australia, Dec 12, 2013. Any flight operating at or above FL290 in or through Australian airspace
- Hong Kong, Dec 12, 2013 for ATS routes M771 and L642 and by Dec 2014 for entire Hong Kong FIR
- Indonesia, Dec 12, 2013. Any flight operating at or above FL290.
- Singapore, Dec 12, 2013. Any flight operating at or above FL290.

DO-260B

- Europe, June 8, 2016 for new production aircraft*
- Europe, June 8, 2020 for all retrofit aircraft*

* Amendment to regulation
No 1207/2011 approved
Aug 6, 2014

DO-260

- Hudson Bay, now in effect
- Australia, Dec 12, 2013. Any flight operating at or above FL290 in or through Australian airspace
- Hong Kong, Dec 12, 2013 for ATS routes M771 and L642 and by Dec 2014 for entire Hong Kong FIR
- Indonesia, Dec 12, 2013. Any flight operating at or above FL290.
- Singapore, Dec 12, 2013. Any flight operating at or above FL290.

DO-260B

- Europe, June 8, 2016
for new production
aircraft*
- Europe, June 8, 2020
for all retrofit aircraft*

*** Amendment to regulation
No 1207/2011 approved
Aug 6, 2014**

desired

position
broadcast

DO-260B

- United States, Jan 1, 2020
- Is the world-wide standard
- Uses the advantages of ADS-B DO-260 and DO-260A but requires parameters and addresses latency and annunciation issues



FAA NextGen

The FAA began implementing **NextGen** in 2009, starting with ADS-B, and plans to have the infrastructure operational by the end of 2014. The mandate for ADS-B-Out compliance is Jan. 1, 2020. On May 27, 2010, the FAA published new rules (14 CFR §91.225 and §91.227) mandating airspace and avionics performance requirements after Jan. 1, 2020. AC 20-165A (Nov. 2012) provides guidance for the installation and airworthiness approval of ADS-B Out systems in aircraft. The mandated avionics perform the ADS-B Out function, which transmits the precise location and other information about the aircraft to ground stations and ADS-B-In-equipped aircraft.

FAA NextGen

The mandate does not require ADS-B In equipment, which would enable other services available with ADS-B. Flight decks of aircraft outfitted with ADS-B In can take advantage of data broadcast services for graphical and text-based weather, traffic advisories and other aeronautical information.

The ADS-B mandate requires ADS-B Out avionics when operating in designated airspace, and aircraft owners have less than **3 years** to equip their aircraft. The ADS-B rule, like current transponder operating requirements, specifies that operators have ADS-B Out avionics installed and operating in order to fly their aircraft in the busiest airspace.

Transponder Evolution

Used as a baseline for ADS-B upgrades

- Mode A transponder
- Mode C transponder
- Mode S transponder
- Flight ID transponder/system
- EHS transponder/system
- ADS-B (DO-260, DO-260A, DO-260B)

FAA NextGen

The mandate does not require ADS-B In equipment, which would enable other services available with ADS-B. Flight decks of aircraft outfitted with ADS-B In can take advantage of data broadcast services for graphical and text-based weather, traffic advisories and other aeronautical information.

The ADS-B mandate requires ADSB-Out avionics when operating in designated airspace, and aircraft owners have less than **5 years** to equip their aircraft. The ADS-B rule, like current transponder operating requirements, specifies that operators have ADS-B Out avionics installed and operating in order to fly their aircraft in the busiest airspace.

Transponder Evolution

Used as a baseline for ADS-B upgrades

- Mode A transponder
- Mode C transponder
- Mode S transponder
- Flight ID transponder/system
- EHS transponder/system
- ADS-B (DO-260, DO-260A, DO-260B)

ADS-B Specifics

- Class A, B & C airspace
- All airspace at and above **10,000 feet** MSL (Mean Sea Level) over the contiguous United States and the District of Columbia
- Within **30 nautical miles** of airports listed in 14 CFR §91.225, from the surface up to **10,000 ft MSL**.
- For Class E airspace over the Gulf of Mexico from the U.S. coastline out to **12 nautical miles**, at and above **3,000 ft MSL**.
- Neither current transponder nor RVSM maintenance requirements have changed or been affected by the ADS-B rule.
- FAA TSOs (Technical Service Orders) describe the equipment specifications approved for ADS-B operations. The ADS-B rule states that avionics must meet the standards of either TSO-C166b (for **1090MHz ES** link equipment) or TSO-C154c (for **978MHz UAT** link equipment). TSO-C166b is required in Class A airspace and either link can be used in all other airspace.

DO-260B ADS-B Parameters

A. Position

- Latitude and longitude

B. Horizontal velocity

- Set from the position source in the air
- Set from HDG, ground speed or track in ground mode

C. Source Integrity Level (SIL)

- Set at installation from the position source
- Can change if alternate source is selected

D. SIL Supplement

- Programmed at the transponder during installation
- Based on source sampling rate from the position source

E. Navigation Integrity Category (NIC)

- Defines the error integrity of the position source

F. Navigation Accuracy Category for Position (NACp)

- Defines the accuracy of the position source

G. Navigation Accuracy Category for Velocity (NACv)

- Defines the velocity accuracy of the position source

H. Geometric Altitude

- Defines the geometric altitude of the position source

DO-260B ADS-B Parameters

I. Geometric Vertical Accuracy (GVA)

- Sets the vertical accuracy of the position source

J. Heading Source

- True of magnetic heading from the aircraft source

K. Ground Track Angle

- Used for systems that do not have a heading source

L. Altitude Source

Can be derived from the following:

- Pressure Altimeter (TSO-C10)
- Air Data Computer (TSO-C106)
- Encoder or digitizer (TSO-C88)

This source must be from the same source that is sent to the transponder & if the aircraft is RVSM-certified, this altitude source must be used

M. Barometric Altitude

- Set from the aircraft barometric source

N. TCAS Status

- Set from TCAS II source
- TCAS I system not required for this status message

DO-260B ADS-B Parameters

O. System Annunciation

- Must visually display the status of the ADS-B system
- Must use **at least two** annunciators
 1. ADS-B failure
 2. Position source or interface failure

P. ICAO Address

- Programmed from **the tail number** of the aircraft through the 24-bit address

Q. Flight ID

- Set as **the aircraft registration** or the **Flight ID code**

R. Vertical Rate

- Set from **the source** at installation
 - A. No accuracy status message required
 - B. Hybrid, blended, GNSS or barometric

S. Air vs. Ground mode

- Aircraft **length and width** code
- Air or ground status

Flight Manual Changes

- Must describe the annunciators used for ADS-B and how to respond to malfunctions
- Explain how to disable ADS-B equipment
- Leave on ADS-B systems in taxi operations to facilitate ground movements

Operators who meet the **Australian** requirements for ADS-B operations must indicate ADS-B capability in the flight notification (ATS flight plan) of all approved ADS-B-equipped aircraft when planning to operate in **Australian** airspace.



Do I have ADS-B?

GNSS TSO

- Other systems can be approved but must show FDE, SA, barometric confirmation and must be approved through ground and/or flight test.
- C-145a, C-146a, or C196 or later versions

Message Format

- ICAO Annex 10, Volume III & IV Amendment 85
- DO-260, DO-260A or TSO C188 or TSO-C166a
- DO-260B or TSO C166b

Do I have ADS-B?

Transmitter Characteristics

- ATSO-C1004b
- ATSO-1C74c
- TSO-C112d and compliant with RTCA/DO-181e
- ETSO-C112b
- ED73B or DO-181e
- ATSO C1005b

Do I have ADS-B?

Transmitter Characteristics

- ATSO-C1004b
- ATSO-1C74c
- TSO-C112d and compliant with RTCA/DO-181e
- ETSO-C112b
- ED73B or DO-181e
- ATSO C1005b

Do I have ADS-B?

- HPL to ADS-B transmitter on same interface as GNSS position data
- Suitable barometric encoder
- Flight ID installed and tested
- Tested with results to verify

Do I Have ADS-B?

- Do I have a statement of compliance in my AFM or POH?
- Do I have flight crew training?
- Has my MEL been revised to show ADS-B system dispatch capability?
- Has it been tested recently?

Do I Have ADS-B?

- Do I have a statement of compliance in my AFM or POH?
- Do I have flight crew training?
- Has my MEL been revised to show ADS-B system dispatch capability?
- Has it been tested recently?

Transponder Compliance

- ARINC 718A
- TSO-C112
- EUROCAE ED-73B
- JTSO-2c112a
- ETSO-2C112a

Approved Systems

Part Number Specific

- Honeywell TRA-67A
- ACSS XS-950*
- ACSS NXT-700
- Garmin GTX-335/345
- Honeywell ISP-80A
- Honeywell XS-858A
- Rockwell Collins TDR-94/94D*
- Rockwell Collins TRP-901*

*Not all part numbers are approved

Non-Approved Systems

- Honeywell KT-73
- ACSS XS-950 PN 7517800-1005/6
- Litton LTN2001MK1
- Rockwell Collins TDR 94/94D pre-108
- Rockwell Collins TPR901 P/N 822-1338-003
SB503 must be added to fix Flight ID reporting.
737-400 only

Non-Approved Systems

- Honeywell KT-73
- ACSS XS-950 PN 7517800-1005/6
- Litton LTN2001MK1
- Rockwell Collins TDR 94/94D
pre-108
- Rockwell Collins TPR901
P/N 822-1338-003

SB503 must be added to
fix Flight ID reporting,
737-400 only

United States ADS-B

- STCs are being revised daily, including those by Rockwell Collins, Freeflight, CMD Flight Solutions & L-3 Business Aviation Services. Garmin has an AML for Part 23 aircraft that are approved for DO-260B-out
- The FAA mandates in AC 20-165A that all ADS-B systems require an STC
- Rockwell Collins has the TDR-94D system (-500/-501) that meets all of the US mandates for ADS-B out

ADS-B Solutions

Duncan Aviation and SAFRAN Engineering are developing an AML STC on the following models:

- Challenger 601-3A/3R, Learjet 60, Gulfstream G100 & G200 and the Textron 800-Series aircraft

Duncan Aviation has also performed the STC launch on the Beechcraft 200/300 King Air series for Rockwell Collins on the Proline 21 avionics suite

- Aircraft v
- aircraft
- No need
- More flex
- Reduced
- Improved surveillance

ADS-B Solutions, continued

Duncan Aviation has developed an AML STC for the Honeywell Primus system for Hawkers and Citation Ultra, XL, XLS, and Encores

We have an ongoing STC launch program with ACSS on the NXT-700 for 52 AML models, including the Learjet 31A

Duncan Aviation and SAFRAN are developing a solution with Universal Avionics for the Learjet 60

Affected Aircraft

- The FAA estimates that **150,000** aircraft still need to be equipped for the mandate
- There are approximately **18,684** corporate aircraft (jets & turboprops--AMSTAT May 2015) that will require this equipment to fly in their best performance range.

FAA Asserts 2020 Deadline

A June 25, 2014 statement to the U.S. Senate by Michael A. Whitaker, FAA Deputy Administrator reiterated the **2020 deadline**:

"Let me be very clear. The **2020 deadline** is not going to change. We are in a position to achieve this important milestone on time. The cost of equipment has come down considerably. There is sufficient maintenance capacity to allow all equipage to occur -- in fact, waiting to equip might cost more if aircraft owners crowd repair stations to get the work done on the eve of the deadline."

starting
r ADS-B-
the FAA
7)

v. 2012)
rthiness
mandated

ation
-In-

FAA Exceptions For ADS-B

- Reference regulatory document #FAA-2015-0971
- Allows air carriers an exception for implementation for up to 4 years (December 31, 2024) from 14 CFR 91.227
- The exception is meant to help with the scheduling of the aircraft and to allow the manufacturers time to develop new sensors for the air carrier fleet
- Each air carrier must apply and be approved under this program prior to August 1, 2018
- ADS-B transponders must still be installed and operational by January 1, 2020
- Each GPS sensor or MMR must be evaluated by its TSO under the program to see if it qualifies

ADS-B

Automatic Dependent Surveillance-Broadcast



Mark Francetic

Regional Avionics Sales Manager

mark.francetic@duncanaviation.com

402.470.4507 office

702.303.4888 cell

Get the latest NextGen developments at
www.duncanaviation.aero/nextgen



ADS-B

Automatic Dependent Surveillance-Broadcast



Mark Francetic

Gerente regional de ventas de Aviónicas

mark.francetic@duncanaviation.com

402.470.4507 oficina

702.303.4888 celular

Obtenga los desarrollos de NextGen mas nuevos en

www.duncanaviation.aero/nextgen



Automatic Dependent Surveillance-Broadcast



Gerente regional de ventas de Aviónicas

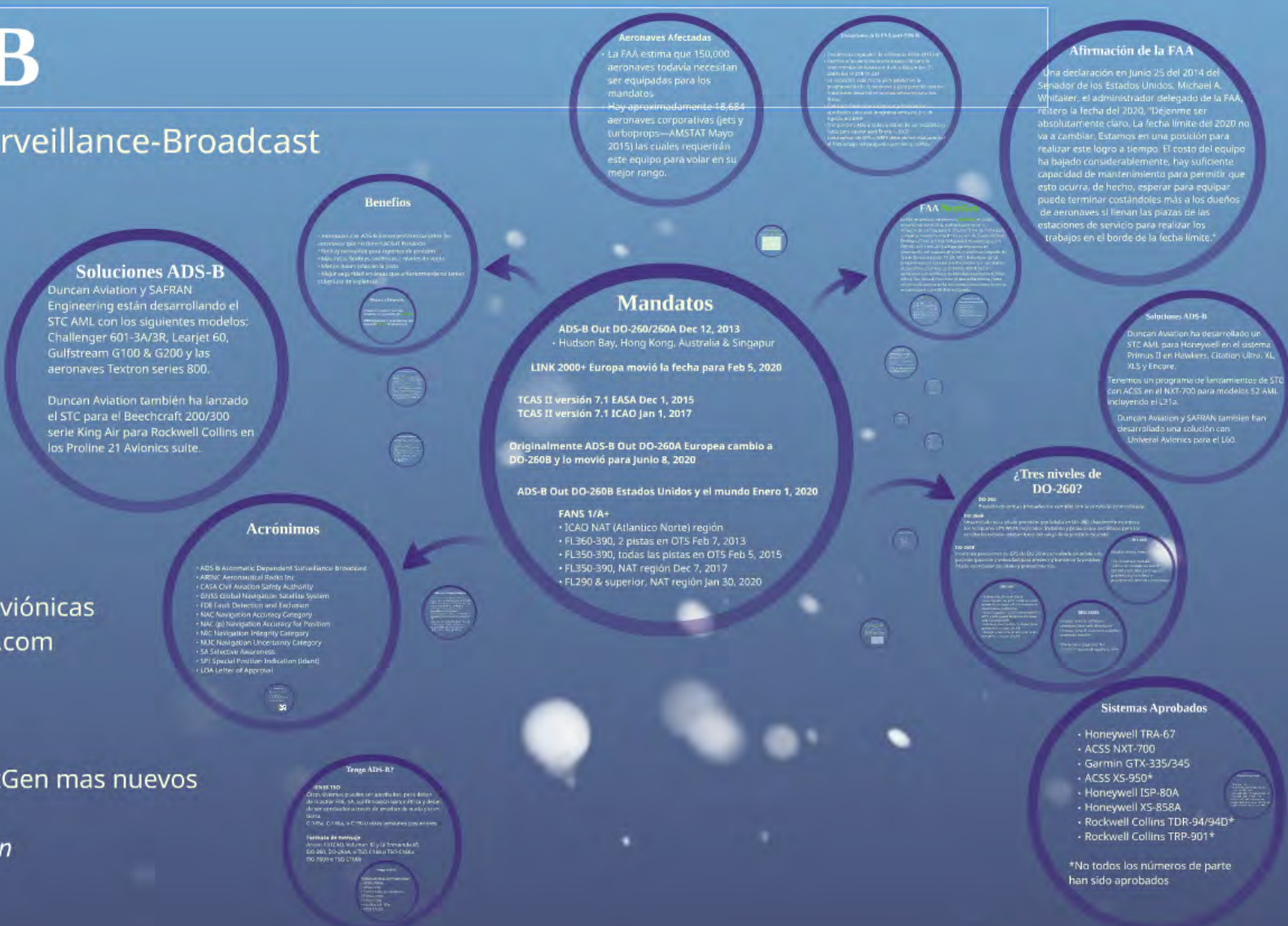
mark.francetic@duncanaviation.com

402.470.4507 oficina

702.303.4888 celular

Obtenga los desarrollos de NextGen mas nuevos en

www.duncanaviation.aero/nextgen



Mandatos

ADS-B Out DO-260/260A Dec 12, 2013

- Hudson Bay, Hong Kong, Australia & Singapur

LINK 2000+ Europa movió la fecha para Feb 5, 2020

TCAS II versión 7.1 EASA Dec 1, 2015

TCAS II versión 7.1 ICAO Jan 1, 2017

Originalmente ADS-B Out DO-260A Europea cambio a DO-260B y lo movió para Junio 8, 2020

ADS-B Out DO-260B Estados Unidos y el mundo Enero 1, 2020

FANS 1/A+

- ICAO NAT (Atlantico Norte) región
- FL360-390, 2 pistas en OTS Feb 7, 2013
- FL350-390, todas las pistas en OTS Feb 5, 2015
- FL350-390, NAT región Dec 7, 2017
- FL290 & superior, NAT región Jan 30, 2020

ADS-B de Estados Unidos

- Los STCs son revisados periódicamente, incluyendo los de Rockwell Collins, Honeywell, CMO Flight Solutions y L-3 Business Aviation Services. Garmin tiene un AML para aeronaves de Parte 23 que han sido aprobados para DO-260B out.
- Los mandatos de la FAA en AC 00-165A avisa que todos los sistemas ADS-B requieren un STC.
- Rockwell Collins tiene el sistema TDR-94D (5000-501) que cumple con todos los requisitos mínimos de los mandatos de Estados Unidos para ADS-B Out.

Benefios

- Aeronaves con ADS-B tienen preferencia sobre las aeronaves que no tienen ADS-B instalado
- No hay necesidad para reportes de posición.
- Mas rutas flexibles continuas a niveles de vuelo.
- Menos incursiones en la pista
- Mejor seguridad en áreas que anteriormente no tenían cobertura de vigilancia.

Historia y Desarrollo

- Creado para caber en múltiples aeronaves en una posición fija **horizontal**.
- RVSM estableció un base al proveer una separación **vertical** de alta precisión

Historia y Desarrollo

- Creado para caber en múltiples aeronaves en una posición fija **horizontal**.
- RVSM estableció un base al proveer una separación **vertical** de alta precisión.

Acrónimos

- ADS-B Automatic Dependent Surveillance-Broadcast
- ARINC Aeronautical Radio Inc
- CASA Civil Aviation Safety Authority
- GNSS Global Navigation Satellite System
- FDE Fault Detection and Exclusion
- NAC Navigation Accuracy Category
- NAC (p) Navigation Accuracy for Position
- NIC Navigation Integrity Category
- NUC Navigation Uncertainty Category
- SA Selective Awareness
- SPI Special Position Indication (Ident)
- LOA Letter of Approval

Documentos

- Seguridad CASR, Advisory Circular AC
- MIL-STD-1782
- Norma de la FAA AC 135-11
- Norma de la FAA AC 135-100
- Norma de la FAA AC 135-100
- Norma de la FAA AC 135-100
- Norma de la FAA AC 135-100



ADS-B

- Los STCs
Incluyendo
CMD Flight
Services, G
aeronaves
aprobados
• Los man
que todos
STC
• Rockwell
(-500/-501)
requerimie
Estados U

Documentos

- Singapur CAAS Advisory Circular AC AOC-21(0)
- Hong Kong AIC 09/11
- Australia CAO 20.18-2009
- Estados Unidos AC-90-114, AC20-165a, AC20-172a, 14CFR91.225
- EASA AMC20-24, ETSO-2C112a



¿Tres niveles de DO-260?

DO-260

Posición de ventas probadas no cumplió con la previsión pronosticada.

DO-260A

Desarrollado para añadir precisión que faltaba en DO-260. Usualmente incorpora los receptores GPS WAAS mejorados. Instalado y probado por aerolíneas, pero los resultados todavía estaban fuera del rango de la precisión deseada.

DO-260B

Incorpora precisiones de GPS del DO-260A pero añade pronóstico de posición (posición y velocidad) para predecir y transmitir la posición. Añade anunciador de cabina y procedimientos.

DO-260B

Estados Unidos, Enero 1, 2020

- Es el estándar mundial.
- Utiliza las ventajas de ADS-B, DO-260 y DO-260A pero requiere parámetros y se enfoca en problemas de latencia y anunciador.

DO-260

- Hudson Bay, ahora en efecto
- Australia, Dec 12, 2013. Cualquier vuelo operando a o mayor a FL290 mediante el espacio aéreo Australiano.
- Hong Kong, Dec 12, 2013. Para rutas ATS, M771 y L642 y para Diciembre 2014 para todo Hong Kong FIR
- Indonesia, Dec 12 2013. Cualquier vuelo operando a o mayor a FL290
- Singapur, Dec 12 2013. Cualquier vuelo operando a o mayor a FL290

DO-260B

- Europa, Junio 8, 2016 para aeronaves de producción nueva*
- Europe, Junio 8, 2020 para todas las aeronaves retrofit*

*Enmienda a regulación No 1207/2011 aprobada Agosto 6, 2014

DO-260

- Hudson Bay, ahora en efecto
- Australia, Dec 12, 2013. Cualquier vuelo operando a o mayor a FL290 mediante el espacio aéreo Australiano.
- Hong Kong, Dec 12, 2013. Para rutas ATS, M771 y L642 y para Diciembre 2014 para todo Hong Kong FIR
- Indonesia, Dec 12 2013. Cualquier vuelo operando a o mayor a FL290
- Singapur, Dec 12 2013. Cualquier vuelo operando a o mayor a FL290

DO-260B

- Europa, Junio 8, 2016 para aeronaves de producción nueva*
- Europe, Junio 8, 2020 para todas las aeronaves retrofit*

*Enmienda a regulación No 1207/2011 aprobada Agosto 6, 2014

deseada.

DO-260B

co de
ción.

Estados Unidos, Enero 1, 2020

- Es el estándar mundial.
- Utiliza las ventajas de ADS-B, DO-260 y DO-260A pero requiere parámetros y se enfoca en problemas de latencia y anunciador.

Aprende que hay de nuevo
con **NEXTGEN**
www.DuncanAviation.aero/nextgen



FAA NextGen

La FAA empezó a implementar **NextGen** en 2009, empezando con ADS-B, y planes para tener la infraestructura lista para el final del 2014. La fecha para cumplir el mandato ADS-B Out es el 1 de Enero del 2020. En Mayo 27 del 2010, la FAA publico nuevas reglas (14 CFR §91.225 y §91.227) obligando requisitos de desempeño del espacio de vuelo y aviónicas después del 1ro de Enero del 2020. AC 20-165^a (Noviembre 2012) proporciona una guía para la instalación y la aprobación de aeronavegabilidad de sistemas ADS-B Out en aeronaves. Las aviónicas de mandato realizan la función ADS-B Out, la cual transmite la ubicación exacta y otra información acerca de la aeronave a estaciones en tierra en aeronaves con ADS-B-In instalado.

FAA NextGen

El mandato no requiere equipo ADS-B-In, la cual habilita otros servicios disponibles con ADS-B. Las cubiertas de vuelo con ADS-B-In pueden tomar ventaja de servicios de difusión de datos para clima a base de gráficos y/o texto, avisos de tráfico y otra información aeronáutica.

El mandato ADS-B requiere aviónicas ADS-B Out cuando se opera en espacio aéreo designado, y los dueños de aeronaves tienen menos de 4 años para preparar sus aeronaves. La regla ADS-B, como los actuales requisitos operativos del transponder, especifica que los operadores requieren aviónicas ADS-B Out instaladas y operando para poder volar su aeronave en los espacios de vuelo más ocupados.

Evolución de Transponder

Usado como base para mejoras de ADS-B

- Transponder Modo A
- Transponder Modo C
- Transponder Modo S
- Flight ID Transponder/sistema
- EHS transponder/sistema
- ADS-B (DO-260, DO-260A, DO-260B)

FAA NextGen

El mandato no requiere equipo ADS-B-In, la cual habilita otros servicios disponibles con ADS-B. Las cubiertas de vuelo con ADS-B-In pueden tomar ventaja de servicios de difusión de datos para clima a base de gráficos y/o texto, avisos de tráfico, y otra información aeronáutica.

El mandato ADS-B requiere aviónicas ADS-B Out cuando se opera en espacio aéreo designado, y los dueños de aeronaves tienen menos de 4 años para preparar sus aeronaves. La regla ADS-B, como los actuales requisitos operativos del transponder, especifica que los operadores requieren aviónicas ADS-B Out instalados y operando para poder volar su aeronave en los espacios de vuelo más ocupados.

Evolución de Transponder

Usado como base para mejoras de ADS-B

- Transponder Modo A
- Transponder Modo C
- Transponder Modo S
- Flight ID Transponder/sistema
- EHS transponder/sistema
- ADS-B (DO-260, DO-260A, DO-260B)

ADS-B Detalles especificos

- Espacio aéreo clase A, B y C
- Todo el espacio aéreo a **10,000** pies de altura arriba del nivel del mar sobre los Estados Unidos contiguo y el distrito de Columbia
- Dentro de **30 millas náuticas** de aeropuertos listados en 14 CFR §91.225, desde la superficie hasta **10,000** pies de altura sobre el nivel del mar
- Para espacio aéreo de clase E sobre el Golfo de México a partir de la costa de los Estados Unidos hasta **12** millas náuticas afuera, a y arriba de **3,000** pies sobre el nivel del mar
- Por ahora, ningún requerimiento de mantenimiento de transponder o RVSM ha cambiado o ha sido afectado por la regla de ADS-B.
- Ordenes de Servicios Técnicos de la FAA (TSO) describen las especificaciones del equipo aprobados para operaciones ADS-B. La regla ADS-B especifica que las aviónicas deben de cumplir con los estándares de TSO-C166b (para equipo ES link 1090MHz) o TSO C154c (para equipo UAT Link 978MHz). TSO-C166b es requerido en espacio aéreo de clase A y cualquier link puede ser usado en cualquier otro espacio aéreo.

DO-260B ADS-B Parameters

A. Posición: Latitud y Longitud

B. Velocidad horizontal: Puesto desde la posición de Fuente en el aire. Puesto desde HDG, velocidad en tierra o modo de rastreo en tierra

C. SIL (Source Integrity Level [Nivel de Integridad de fuente]). Puesto en la instalación desde la posición de fuente. Puede cambiar si alguna Fuente alterna es seleccionada

D. Suplemento SIL. Programado en el transponder durante la instalación. Basado en la velocidad de muestra desde la posición de fuente

E. NIC (Navigation Integrity Category [Categoría de Navegación Integral]). Define la integridad de error de la posición de fuente

F. NACp (Navigation Accuracy Category for Position [Categoría de Navegación Precisa para Posición]) Define la precisión de la posición de fuente

G. NACv (Navigation Accuracy Category for Velocity [Categoría de Navegación Precisa para Velocidad])

Define la precisión de la velocidad de la posición de fuente

Parámetros DO-260B ADS-B

H. Altitud Geométrica. Define la altitud geométrica de la posición de fuente

I. GVA (Geometric Vertical Accuracy [Precisión Vertical Geométrica]). Establece la precisión vertical para la posición de fuente

J. Fuente de rumbo. Posición de rumbo magnético de la Fuente de la aeronave

K. Angulo de Pista en Tierra. Usado en sistemas que no tienen una fuente de rumbo

L. Fuente de Altitud. Puede derivarse de los siguientes:

Altímetro de Presión (TSO-C10)

Computadora de información aérea (TSO-C106)

Codificador y digitalizador (TSO-C88)

Esta Fuente debe de ser de la misma fuente que se le manda al transponder y, si la aeronave es certificada RVSM, la altitud de fuente debe ser utilizada.

M. Altitud barométrica. Establecido de la fuente barométrica de la aeronave

N. Estatus TCAS. Establecido de la fuente de TCAS II
Sistema TCAS I no es requerido para este mensaje

Parámetros DO-260B ADS-B

O. Anuncio del Sistema. Debe mostrar visualmente el estatus del Sistema ADS-B. Debe de utilizar por lo menos **dos anuncios**

1. Fallo ADS-B
2. Posición de fuente o fallo de interface

P. Dirección ICAO. Programado por **el número de matrícula de la aeronave** a través de una dirección de 24 bits

Q. Flight ID. Establecido como el registro de la aeronave o del código del **Flight ID**

R. Tasa Vertical. Establecido desde la fuente durante la instalación

1. No requiere mensaje del estatus de precisión
2. Híbrido, mezclado, GNSS o barométrico

S. Modo de aire vs. de tierra

Longitud de la aeronave y código de anchura

Estatus de aire o tierra

Cambios de Manual de Vuelo

Debe de describir a los anunciadores usados para ADS-B y como responder a malos funcionamientos.

Explica como desactivar el equipo ADS-B

Dejar en sistemas ADS-B en operaciones de taxi para facilitar movimientos en tierra

Operadores que cumplan con los requerimientos **australianos** para operaciones ADS-B deben de indicar capacidad ADS-B en la notificación de vuelo (Plan de vuelo ATS) de todas las aeronaves con equipo ADS-B cuando planeen operar en espacio de vuelo **australiano**.



Tengo ADS-B?

GNSS TSO

Otros sistemas pueden ser aprobados, pero deben de mostrar FDE, SA, confirmación barométrica y deben de ser aprobados a través de pruebas de vuelo y/o en tierra.

C-145a, C-146a, o C196 u otras versiones posteriores

Formato de mensaje

Anexo 10 ICAO, Volumen III y IV Enmienda 85
DO-260, DO-260A, o TSO C188 o TSO-C166a
DO-260B o TSO C166b

Tengo ADS-B?

Características del Transmisor

- ATSO-C1004b
- ATSO-1C74c
- TSO-C112d y que obedezca RTCA/DO-181e
- ETSO-C112b
- ED73B o DO-181e
- ATSO C1005b

Tengo ADS-B?

Características del Transmisor

- ATSO-C1004b
- ATSO-1C74c
- TSO-C112d y que obedezca RTCA/DO-181e
- ETSO-C112b
- ED73B o DO-181e
- ATSO C1005b

Tengo ADS-B?

Características del Transmisor

- Transmisor HPL a ADS-B en la misma interface de posición de información GNSS
- Codificador barométrico adecuado
- Flight ID instalado y probado
- Probado con resultados para verificar
- Tengo una declaración de cumplimiento en mi AFM o POH?
- Tengo entrenamiento en mi tripulación de vuelo?
- Mi MEL ha sido revisado para demostrar que tiene capacidad de Sistema de envío ADS-B?
- Ha sido probado recientemente?

Conformidad Transponder

- ARINC 718A
- TSO-C112
- EUROCAE ED-73B
- JTSO-2c112a
- ETSO-2C112a

Sistemas Aprobados

- Honeywell TRA-67
- ACSS NXT-700
- Garmin GTX-335/345
- ACSS XS-950*
- Honeywell ISP-80A
- Honeywell XS-858A
- Rockwell Collins TDR-94/94D*
- Rockwell Collins TRP-901*

*No todos los números de parte han sido aprobados

Sistemas No Aprobados

- Honeywell KT-73
- ACSS XS-950 PN 7517800-1005/6
- Litton LTN2001MK1
- Rockwell Collins TDR 94/94D pre-108
- Rockwell Collins TPR901 P/N 822-1338-003 SB503 debe de ser añadido para arreglar los reportes del Flight ID, solamente para 737-400

Sistemas No Aprobados

- Honeywell KT-73
- ACSS XS-950 PN 7517800-1005/6
- Litton LTN2001MK1
- Rockwell Collins TDR 94/94D pre-108
- Rockwell Collins TPR901 P/N 822-1338-003 SB503 debe de ser añadido para arreglar los reportes del Flight ID, solamente para 737-400

ADS-B de Estados Unidos

- Los STCs son revisados diariamente, incluyendo los de Rockwell Collins, Freeflight, CMD Flight Solutions y L-3 Business Aviation Services. Garmin tiene un AML para aeronaves de Parte 23 que han sido aprobados para DO-260B-out
- Los mandatos de la FAA en AC 20-165A avisa que todos los sistemas ADS-B requieren un STC
- Rockwell Collins tiene el sistema TDR-94D (-500/-501) que cumple con todos los requerimientos de los mandatos de Estados Unidos para ADS-B Out

Soluciones ADS-B

Duncan Aviation y SAFRAN Engineering están desarrollando el STC AML con los siguientes modelos: Challenger 601-3A/3R, Learjet 60, Gulfstream G100 & G200 y las aeronaves Textron series 800.

Duncan Aviation también ha lanzado el STC para el Beechcraft 200/300 serie King Air para Rockwell Collins en los Proline 21 Avionics suite.

- Aeron
- aerona
- No ha
- Mas r
- Meno
- Mejor
- cobertu

Soluciones ADS-B

Duncan Aviation ha desarrollado un STC AML para Honeywell en el sistema Primus II en Hawkers, Citation Ultra, XL, XLS y Encore.

Tenemos un programa de lanzamientos de STC con ACSS en el NXT-700 para modelos 52 AML incluyendo el L31a.

Duncan Aviation y SAFRAN también han desarrollado una solución con Univeral Avionics para el L60.

Aeronaves Afectadas

- La FAA estima que 150,000 aeronaves todavía necesitan ser equipadas para los mandatos
- Hay aproximadamente 18,684 aeronaves corporativas (jets y turboprops—AMSTAT Mayo 2015) las cuales requerirán este equipo para volar en su mejor rango.

Afirmación de la FAA

Una declaración en Junio 25 del 2014 del Senador de los Estados Unidos, Michael A. Whitaker, el administrador delegado de la FAA, reitero la fecha del 2020, "Déjenme ser absolutamente claro. La fecha límite del 2020 no va a cambiar. Estamos en una posición para realizar este logro a tiempo. El costo del equipo ha bajado considerablemente, hay suficiente capacidad de mantenimiento para permitir que esto ocurra, de hecho, esperar para equipar puede terminar costándoles más a los dueños de aeronaves si llenan las plazas de las estaciones de servicio para realizar los trabajos en el borde de la fecha límite."

NextGen

ar NextGen en 2009,
nes para tener la
nal del 2014. La fecha para
ut es el 1 de Enero del 2020.
publico nuevas reglas (14
ando requisitos de
uelo y aviónicas después del
165" (Noviembre 2012)
instalación y la aprobación
emas ADS-B Out en
mandato realizan la función
a ubicación exacta y otra
onave a estaciones en tierra

Excepciones de la FAA para ADS-B

- Documento regulador de referencia #FAA-2015-0971
- Permite a las aerolíneas una excepción para la implementación hasta por 4 años (Diciembre 31, 2024) del 14 CFR 91.227
- La excepción está hecha para ayudar en la programación de la aeronave y para permitir que los fabricantes desarrollen nuevos sensores para sus flotas.
- Cada aerolínea debe de aplicar y debe de ser aprobados para este programa antes del 1ro de Agosto del 2018
- Tranponders ADS-B todavía deben de ser instalados y listos para operar para Enero 1, 2020
- Cada sensor de GPS o MMR debe de ser evaluado por el TSO debajo del programa para ver si califica.

Automatic Dependent Surveillance-Broadcast



Gerente regional de ventas de Aviónicas

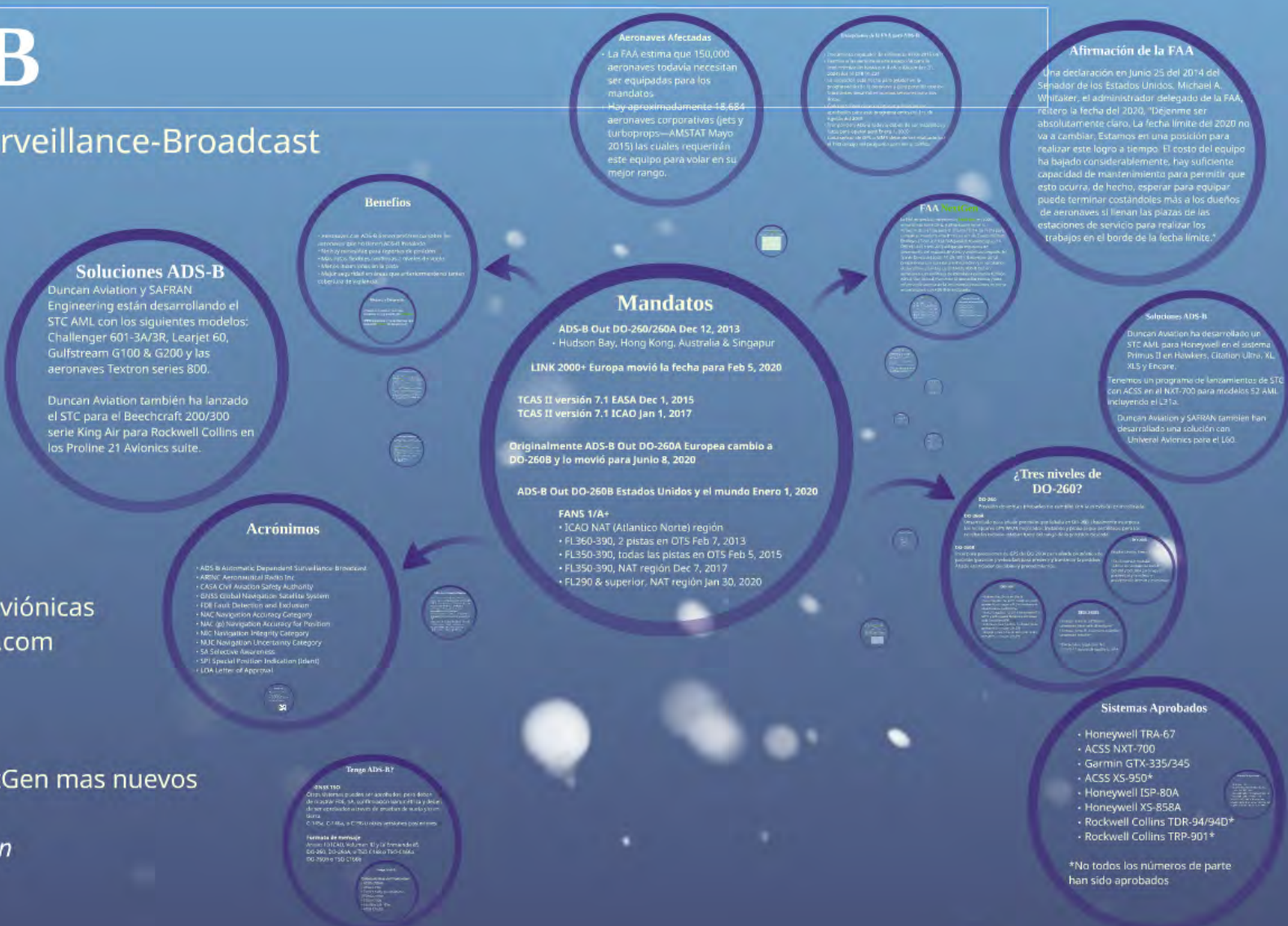
mark.francetic@duncanaviation.com

402.470.4507 oficina

702.303.4888 celular

Obtenga los desarrollos de NextGen mas nuevos en

www.duncanaviation.aero/nextgen





FlightDeck freedom[®] and FANS

Gladys Rossbacher

Satcom Direct

Latin America Regional Sales Manager



Agenda

- SD Overview
- FlightDeck Freedom (FDF)
- FDF and FANS
- Unique to FDF
- APG & FDF
- FD 360
- SD Tracker
- SD Pro
- TrueNorth





SD Overview



Company Overview

SATCOM DIRECT – SINCE 1997

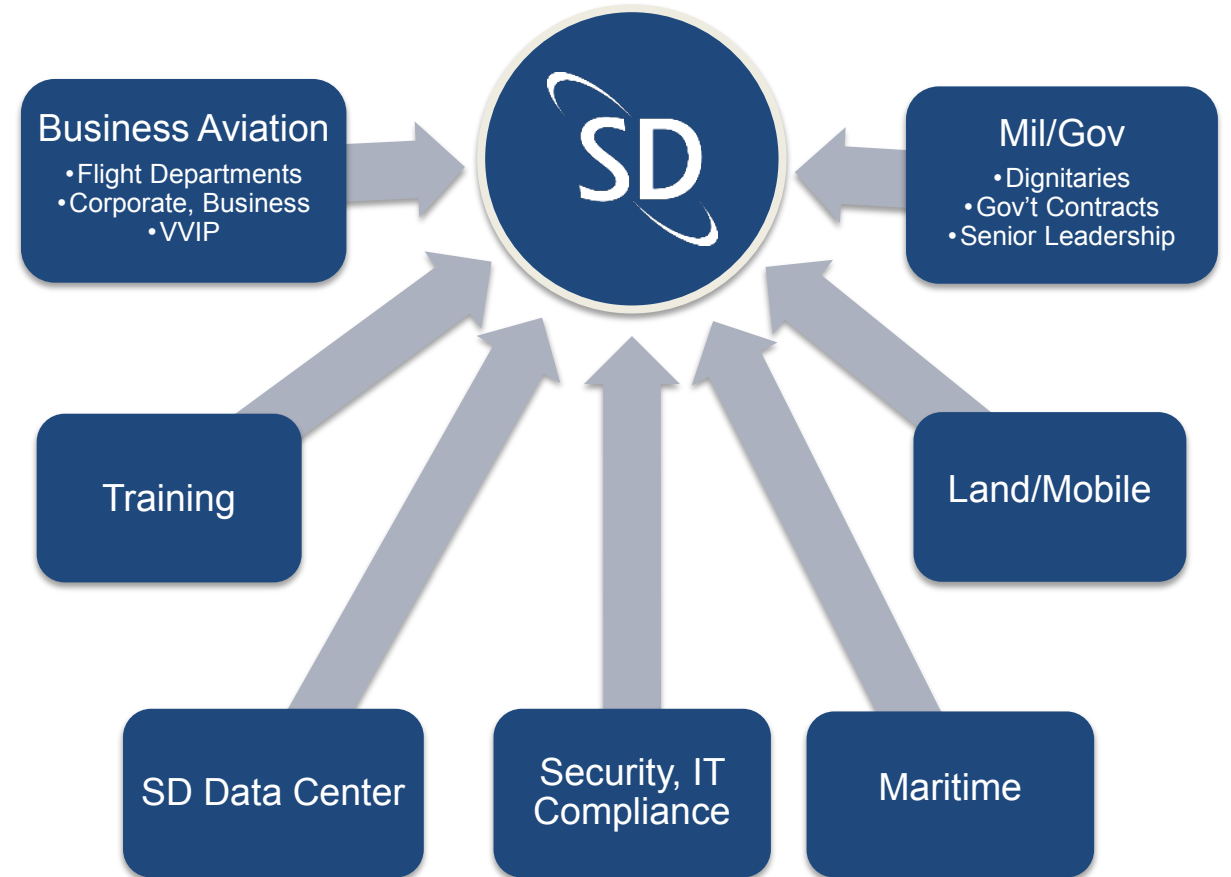


- By the Numbers:

- 297 Employees
- 10 Countries
- 17 Offices

- Business Sectors:

- Military / Government
- Business and Private Aviation
- Land / Mobile
- Maritime
- Security and IT / Corporate Compliance
- Data Solutions: SD Data Center
- Training



New Global Headquarters



- LEED Certified
- 24/7 Network Operations Center
- Testing and Validation Lab
- Research and Development Center
- Customer Events
- Private Tours

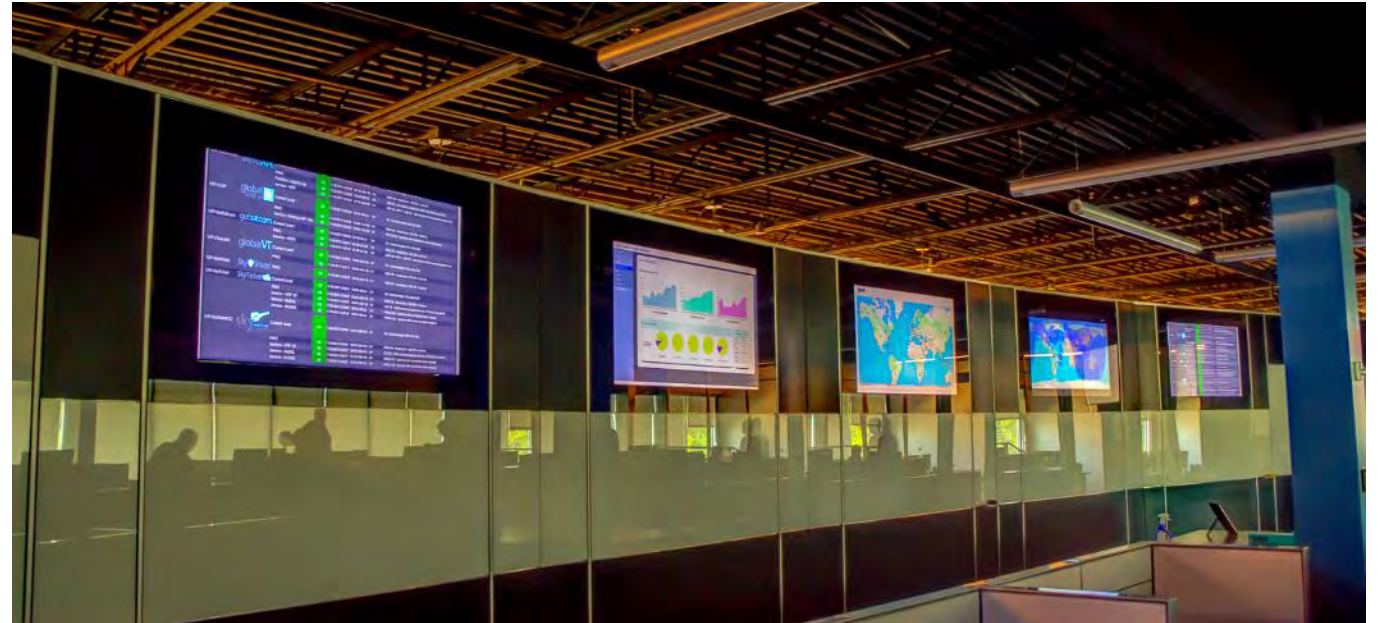


SD Network Operations Center

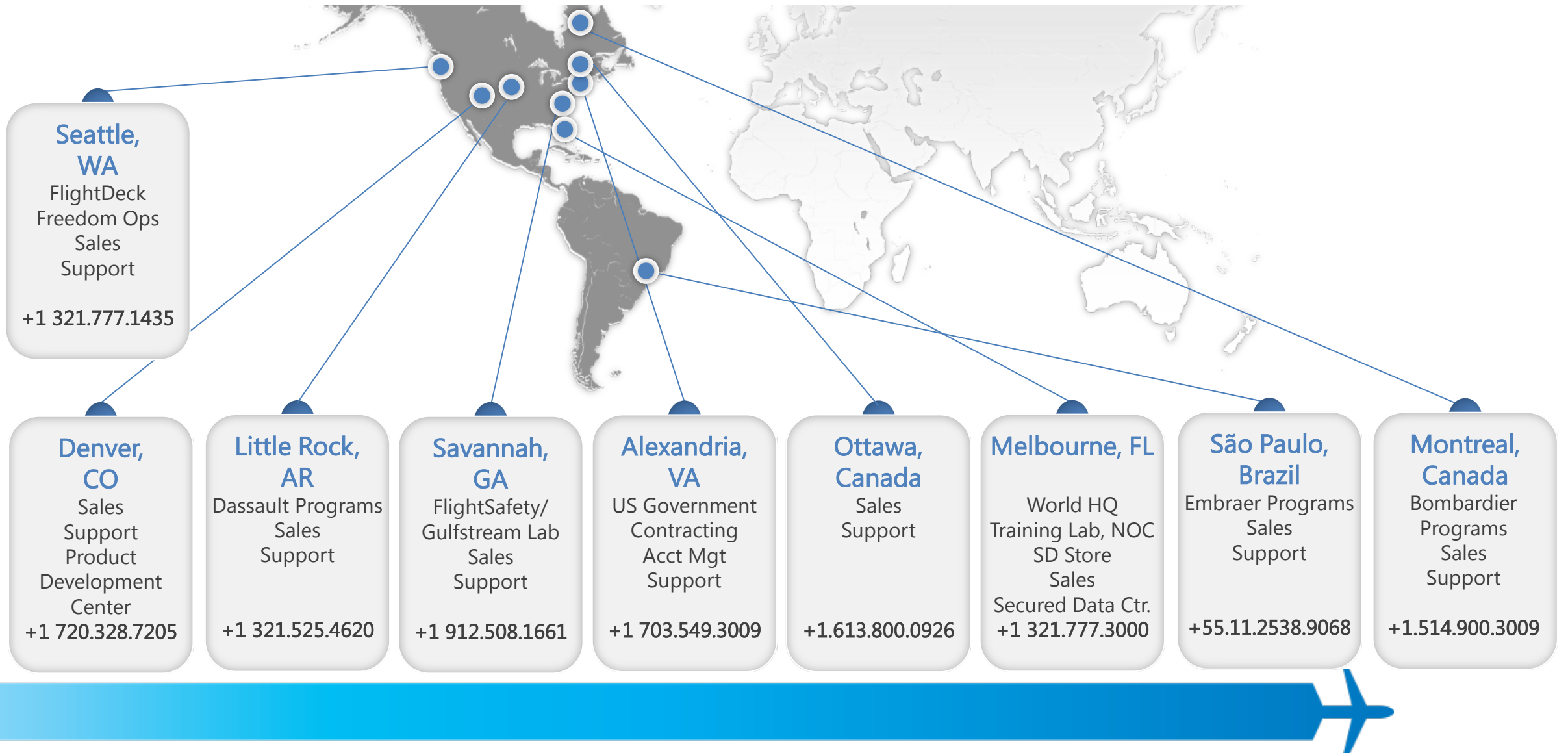


ACTIVATIONS AND 24/7 SUPPORT

- Proactively monitoring network outages
- Tracking weather
- Monitoring failed authentications through our networks
- Flight monitoring
- Global support team certifications include but not limited to
 - Cisco CCNA's
 - CompTIA Network+, AeroIT, Security +
 - A&P
- Currently employing over 45 support employees globally to ensure rapid responses to our customers



Global Sales, Support and Training – 24/7



Global Sales, Support and Training – 24/7

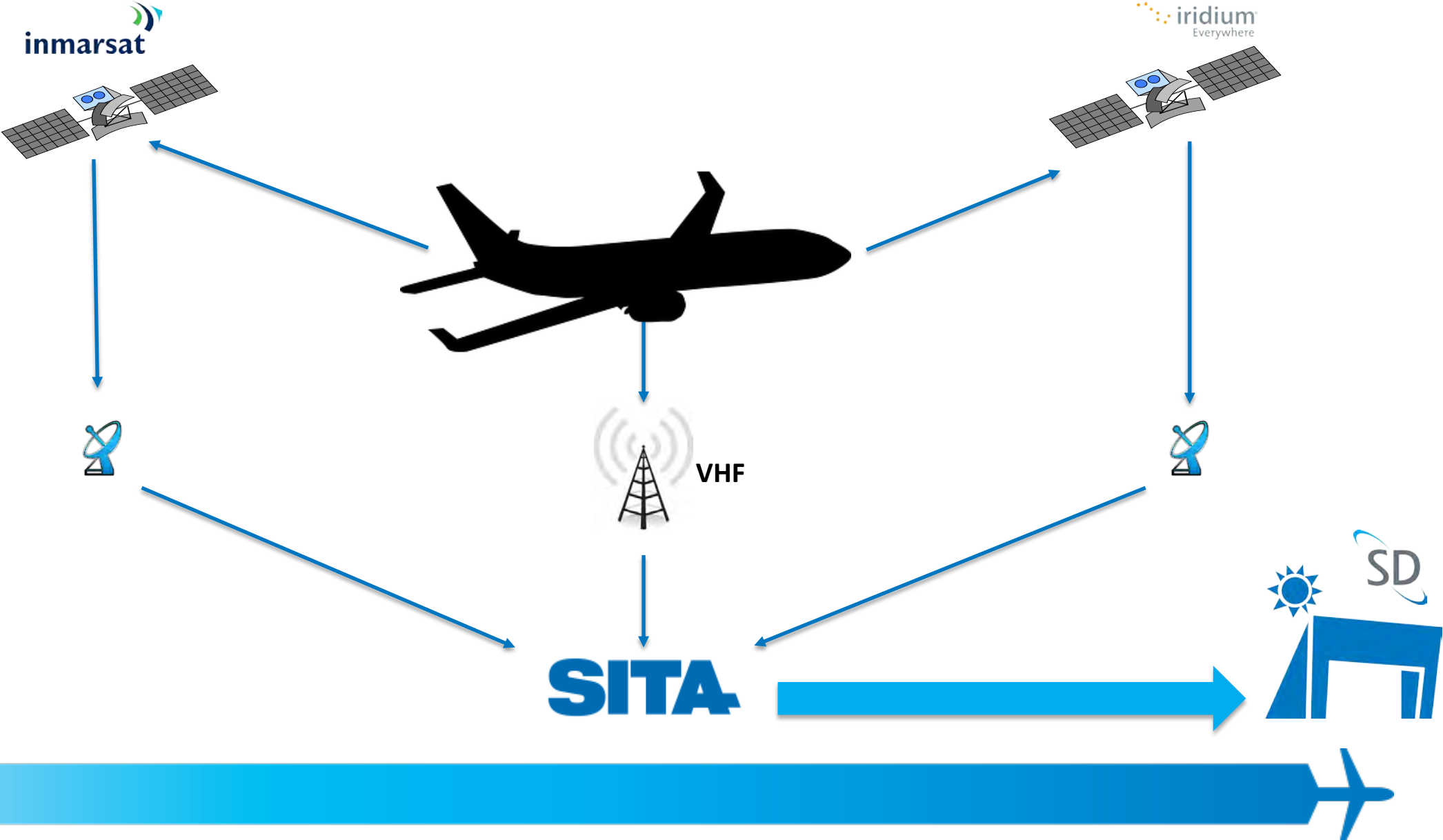




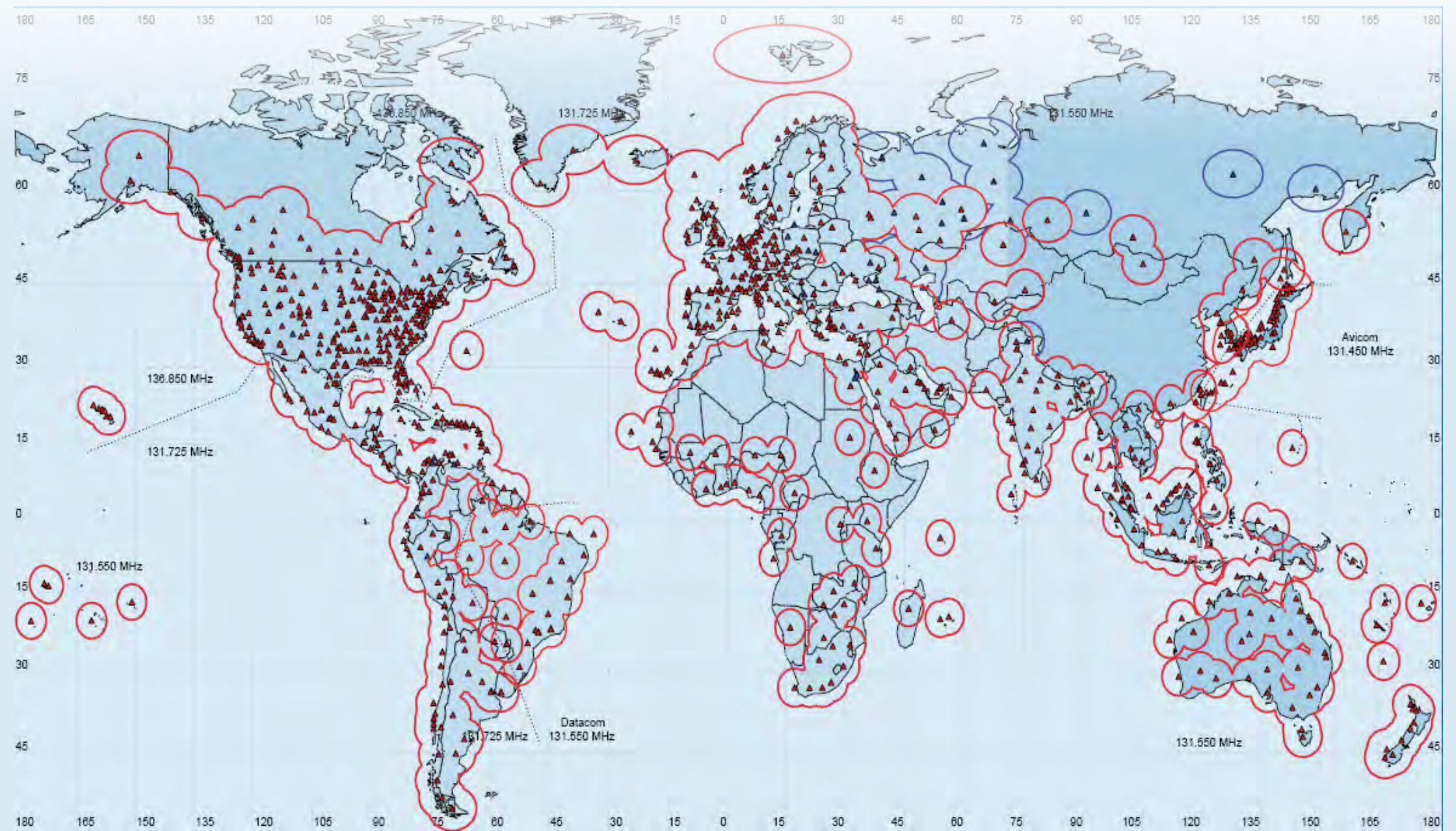
FlightDeck
freedom®



The Datalink Network



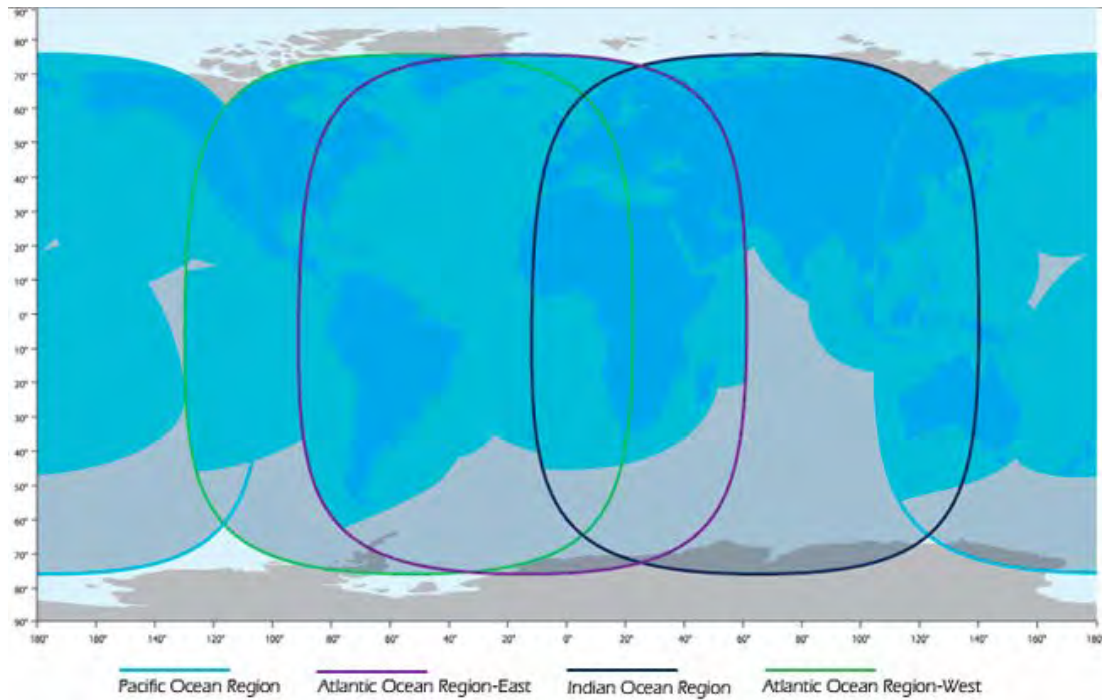
SITA VHF Coverage



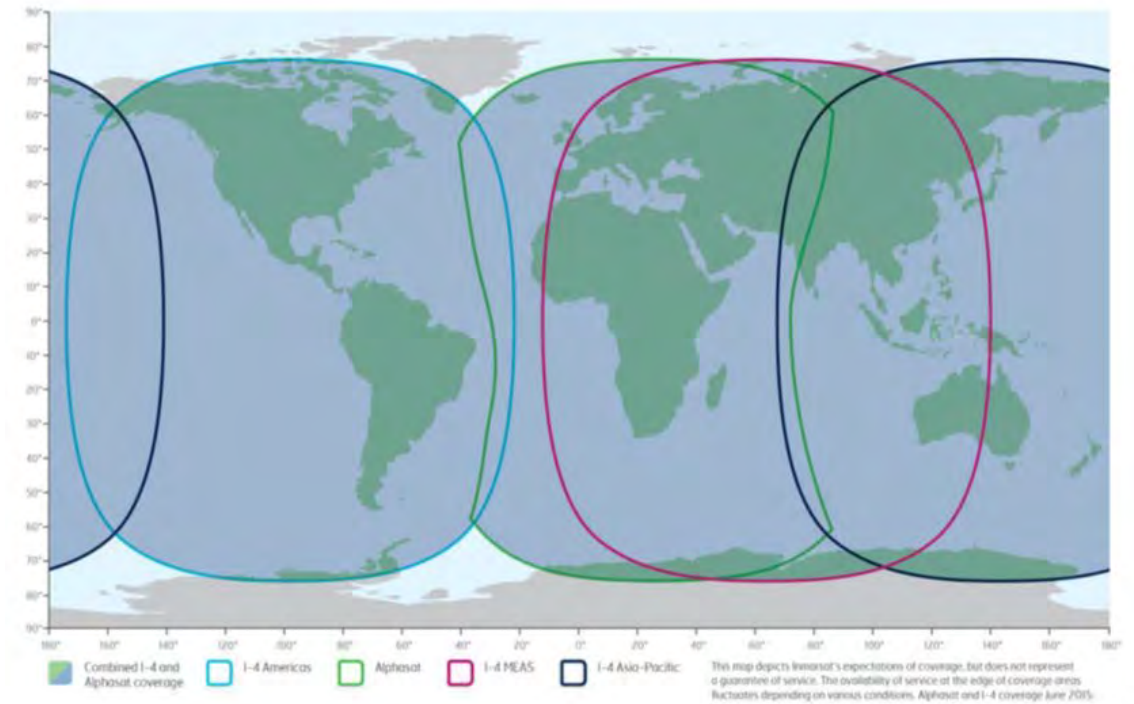
Inmarsat Coverage



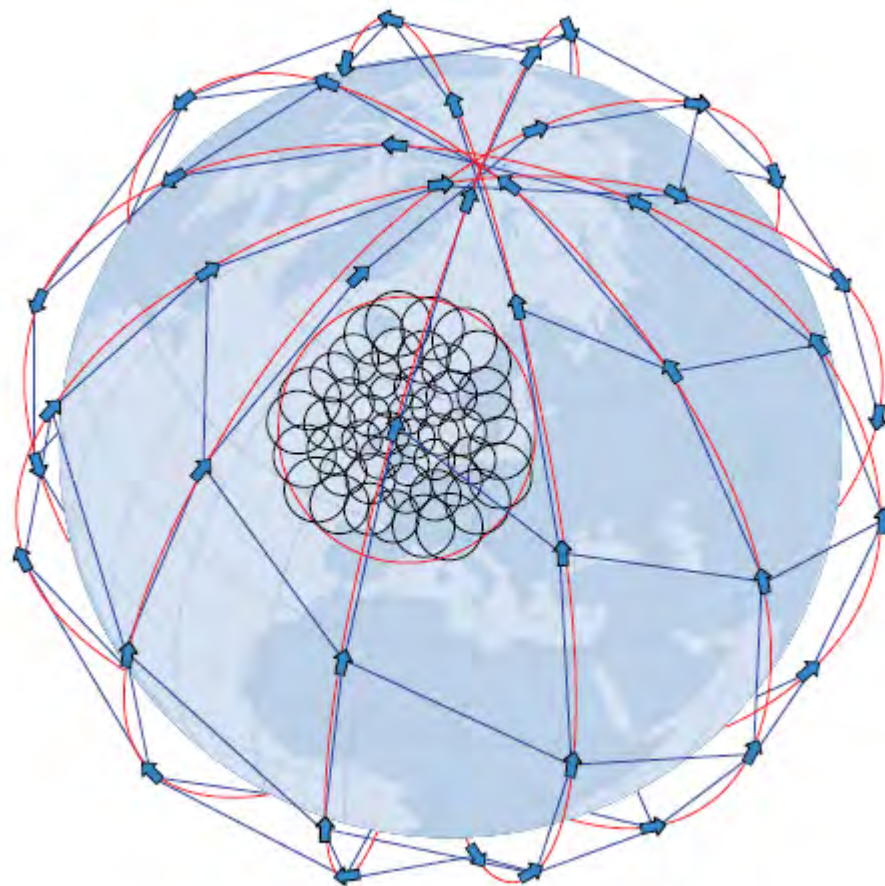
I-3 Coverage



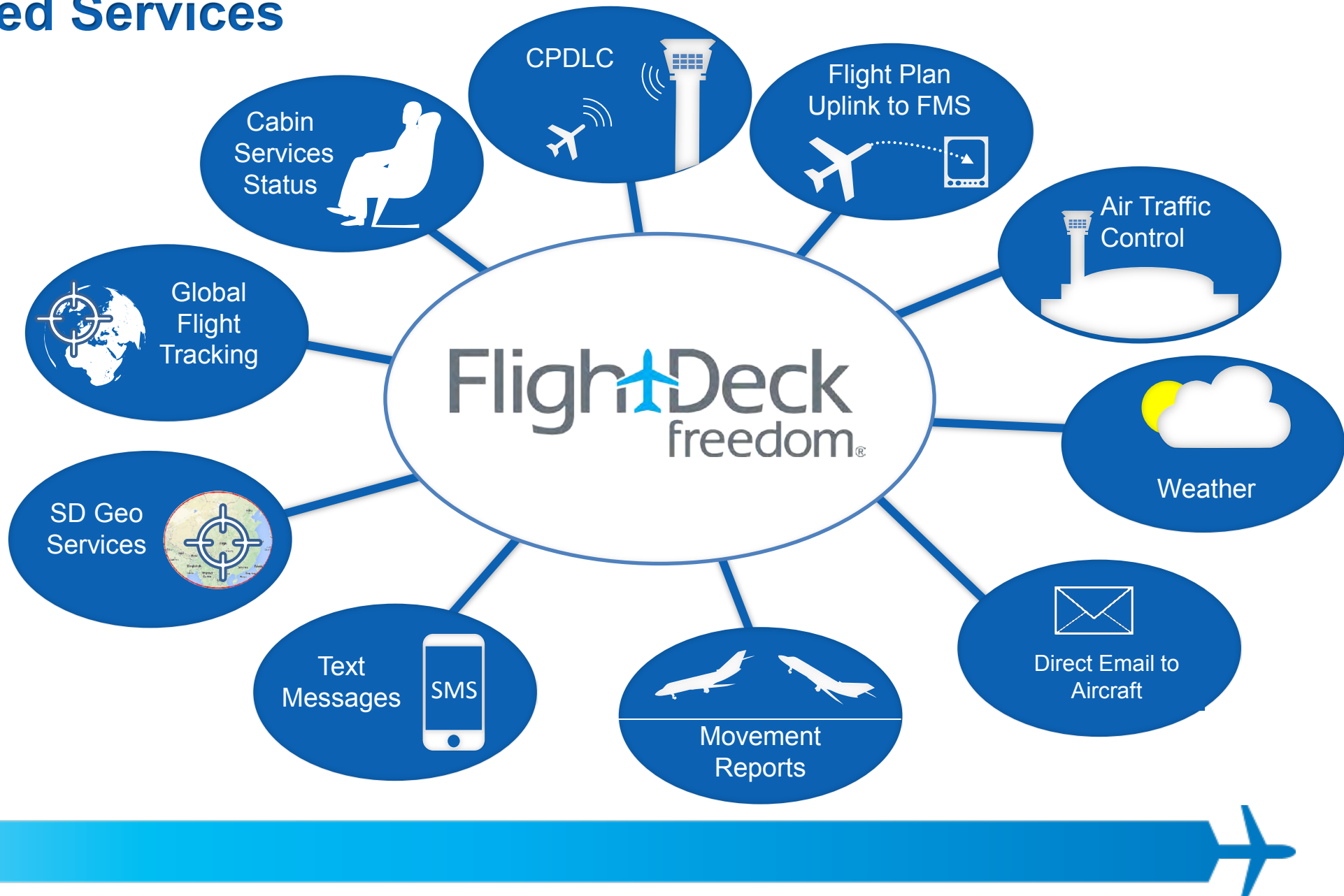
I-4 coverage



Iridium Coverage



Included Services



FDF Datalink Capabilities



Flight Plan Uplink to FMS	• 20+ trip planners supported • Flight plan winds
Weather	• Terminal weather • SIGMETS • Winds aloft • Graphical weather
Air Traffic Control	• Digital ATIS • Pre-departure clearances • Oceanic clearances
Movement Reports	• Takeoff / landing times
Text Messages	• To email addresses, fax • Aircraft unique email address, i.e. N321SD@FDFMail.com
Flight Tracking	• Weather overlay • VHF and sat coverage • Tracking via mobile device • GeoFence
Cabin Services Status	• Satellite network updates • Phone / internet usage • Outage notifications
FANS & Link 2000+	• ADS – C • CPDLC





FDF and FANS

FlightDeck
freedom[®]



Future Air Navigation System



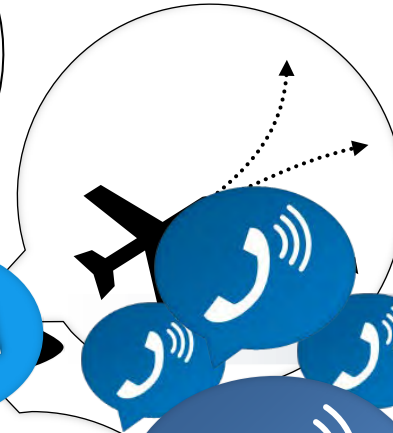
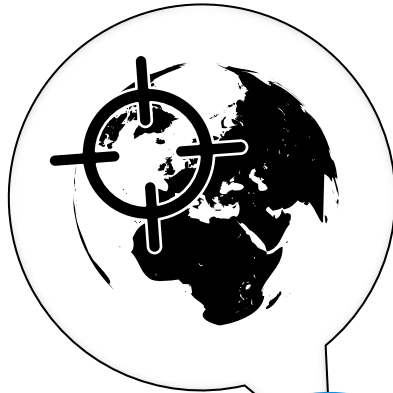
Follow most airspace efficient flight plan

ADS

Allows ATC to automatically query information from FMC

CPDLC

Text messages exchange between controller and pilot



Dramatically reduced frequency congestion



FANS Certification Testing

- STC Certification Testing now available
- Testing performed through SITA
- Requires advance notice to schedule with SITA
- One-time Fee:
 - Current FDF customers: \$1500
 - Non-FDF customers: \$2500
- Typically billed to the OEM or install facility conducting the testing/STC.



FANS Test Station

- System verification
- Crew familiarization
- Test Logon Process
 - Free-text messages
 - Altitude request
 - Speed requests
- No coordination required
- Worldwide use for testing and training

 **Technical Information Letter**
TIL-FDF-005-R1
FANS Aircraft Equipment Testing Procedure

Overview
This Technical Information Letter outlines the procedures required to utilize Satcom Direct's FANS test station for the purpose of validating FANS equipment.

Created By

Name	Date
David Buchart	03/10/2015

Record of Revisions

Revision	Date	Revised By	Description of Revision
1	7/27/2015	David Buchart	Added note for altitude request



FANS Reference Card



FANS/CPDLC Reference Guide



Country/Administration	FIR / OCA / CTA	Log On Code	FANS	ATN/CPDLC	Remarks
Algeria	Alger ACC	DAAA	Trial		8
Angola	Luanda	FNAN	Trial		8
Australia	Brisbane	YBBB	Y		3, 18
Australia	Honiara	YBBB	Y		
Australia	Melbourne	YMMM	Y		3, 18
Australia	Nauru	YBBB	Y		18
Austria	Wien ACC	LOVV		Y	
Brazil	Atlântico	SBAO	Y		
Cabo Verde	SAL Oceanic	GVSC	Y		
Canada	Edmonton FIR/CTA	CZEG	Y		
Canada	Gander OCA	CZQX	Y		1, 9
Canada	Gander FIR/CTA (Domestic)	CDQX	CPDLC Only		
Canada	Moncton FIR/CTA	CZQM	CPDLC Only		
Canada	Montreal FIR/CTA	CZUL	CPDLC Only		
Canada	Toronto FIR/CTA	CZYZ	CPDLC Only		
Canada	Vancouver FIR/CTA	CZVR	CPDLC Only		
Canada	Winnipeg FIR/CTA	CZWG	CPDLC Only		
Chad	N'Djamena	FTTT	Y		
Chile	All FIRs (SCFZ, SCEZ, SCTZ, SCIZ, SCCZ)	SCEZ	Y		
China	Beijing	ZBAB	Y		

- For quick reference on the flight deck
- List of active regions & ATS facilities
- Definitions of services provided
- Special operating procedures or requirements



PDC, DCL, & ATIS Reference Card



FDF PDC, DCL, and ATIS Airports

United States		PDC	DCL	ATIS	TWIP
ABQ	Albuquerque International	X	X	X	
ACY	Atlantic City	X			
ADW	Andrews AFB	X		X	X
ALB	Albany International	X		X	
ANC	Anchorage International (PANC)	X		X	
ATL	Atlanta Hartsfield International	X	X	X	X
AUS	Austin Mueller Municipal	X	X	X	
BDL	Windsor Locks Bradley International	X	X	X	
BLV	Scott AFB			X	
BNA	Nashville International	X	X	X	X

United States (continued)		PDC	DCL	ATIS	TWIP
LTS	Altus AFB			X	
MCF	MacDill AFB			X	X
MCI	Kansas City International	X	X	X	X
MCO	Orlando International	X	X	X	X
MDW	Chicago Midway	X	X	X	X
MEM	Memphis International	X	X	X	X
MIA	Miami International	X	X	X	X
MKE	Milwaukee Mitchell International	X		X	X
MSP	Minneapolis Saint Paul International	X	X	X	X
MSY	New Orleans International/Moisant Field	X	X	X	

- PDC Airports
- DCL Airports
- Digital ATIS Airports
- Terminal Weather Information for Pilots

Proposed DCL Deployment Schedule



DCL Deployment Schedule

Key Sites			
Site Name	Site ID	ARTCC	IOC
KS 1: Salt Lake City	SLC	ZLC	08/07/15
KS 2: Houston Intl	IAH	ZHU	09/03/15
KS 3: Houston Hobby	HOU	ZHU	09/10/15

TDLS Color Key	
CPDLC DCL Site	
Site Operational	

Group A			
Site Name	Site ID	ARTCC	IOC
New Orleans	MSY	ZHU	01/21/16
Austin	AUS	ZHU	02/04/16
San Antonio	SAT	ZHU	02/19/16
Los Angeles	LAX	ZLA	03/14/16
Las Vegas	LAS	ZLA	03/28/16
San Diego	SAN	ZLA	04/11/16
John Wayne	SNA	ZLA	04/25/16
Burbank	BUR	ZLA	05/09/16
Ontario	ONT	ZLA	05/23/16
San Francisco	SFO	ZOA	06/14/16
Oakland	OAK	ZOA	06/28/16
San Jose	SJC	ZOA	07/13/16
Sacramento	SMF	ZOA	07/27/16
Phoenix	PHX	ZAB	08/17/16
Albuquerque	ABQ	ZAB	08/31/16
Portland	PDX	ZSE	09/22/16
Seattle	SEA	ZSE	09/22/16
Dallas Love	DAL	ZFW	10/13/16
Dallas Fort Worth	DFW	ZFW	10/27/16

Group B			
Site Name	Site ID	ARTCC	IOC
Louisville	SDF	ZID	02/10/16
Indianapolis	IND	ZID	03/07/16
Memphis	MEM	ZME	04/04/16
Nashville	BNA	ZME	04/18/16
Denver	DEN	ZDV	05/09/16
Atlanta	ATL	ZTL	05/23/16
Charlotte	CLT	ZTL	06/07/16
Jacksonville	JAX	ZJX	06/28/16
Orlando	MCO	ZJX	07/13/16
Miami	MIA	ZMA	08/03/16
Fort Lauderdale	FLL	ZMA	08/17/16
Tampa	TPA	ZMA	08/31/16
Palm Beach	PBI	ZMA	09/15/16
St Louis	STL	ZKC	10/06/16
Kansas City	MCI	ZKC	10/20/16
Minn.-St Paul	MSP	ZMP	11/10/16

Group C			
Site Name	Site ID	ARTCC	IOC
Newark	EWR	ZNY	02/12/16
John F Kennedy	JFK	ZNY	02/25/16
LaGuardia	LGA	ZNY	03/14/16
Teterboro	TEB	ZNY	03/28/16
Westchester	HPN	ZNY	04/11/16
Philadelphia	PHL	ZNY	04/25/16
Boston	BOS	ZBW	05/16/16
Bradley	BDL	ZBW	06/14/16
Detroit	DTW	ZOB	07/06/16
Cleveland	CLE	ZOB	07/20/16
Pittsburgh	PIT	ZOB	08/03/16
Balt/Wash Int'l	BWI	ZDC	08/24/16
Dulles	IAD	ZDC	09/08/16
Wash. Reagan	DCA	ZDC	09/22/16
Raleigh Durham	RDU	ZDC	10/06/16
Midway	MDW	ZAU	10/27/16
O'Hare	ORD	ZAU	11/10/16

Other Helpful Reference Information

- Datalink Oceanic Clearance: Procedures specific to aircraft having a designated Oceanic Clearance Request page (623 capable avionics).
- 623 Reference Card

Information Short Codes *(Enter short code in free-text message address field)*

F ____	Text Message to Fax Number	NOTAM ____	NOTAMS ¹
NATE	North Atlantic Tracks (eastbound)	TWIP ____	Terminal Weather Info for Pilots (Microburst, Thunderstorms) ²
NATW	North Atlantic Tracks (westbound)		

Communications and Support Short Codes *(Enter short code in free-text message address field)*

DIALED	Last Calls Dialed Via Inmarsat	S64	Swift 64 Congestion
FDF	FlightDeck Freedom® (Datalink) Support	SATINFO	Satellite System Status
FDFDATA	Last Datalink Messages Sent	SD	Satcom Direct® Technical Support
GON	Global One Number(s)	TEST	Test Message/Automated Response
PING	OneView & DIRECTV® PING request	YONDER	Yonder®/BBML Support



Unique to

FlightDeck
freedom®



Trip Planning and Flight Support Providers



FlightDeck Freedom Portal



Send message to / from aircraft

Manage aircraft distribution lists

Manage takeoff / landing reports

Copy settings for fleet of aircraft

Access to SD Global Flight Tracker

Setup short codes

Designate authorized users

Specify message preferences

Access network service notifications

A screenshot of the FlightDeck Freedom Portal web interface. The page has a dark header with the 'flightdeck freedom' logo and a 'powered by SD' badge. A top right box shows 'AIRCRAFT SELECTED' as 'N990MM' with a 'Make this my Default Selection' link. The main content area is divided into a left sidebar with a menu (HOME, ADMINISTRATORS, APG, AUTHORIZED USERS, COPY SETTINGS, DISTRIBUTION LISTS, FLIGHT TRACKER, MESSAGE CENTER, PLANE SIMPLE, PREFERENCES, REPORTS, SEND TEXT MESSAGE, TECHNICAL SUPPORT, FAQs, CONTACT) and a main panel. The main panel shows the 'Service Overview' for aircraft 'N990MM', including a 'Send Text Message' form and a 'Configuration' link. Below this is the 'Aircraft Status' section with a map showing the latest flight activity and a 'Go to Flight Tracker' button. The 'Current Status' section shows the aircraft is 'Parked' at 'KMLB - MELBOURNE INTL'. At the bottom, there is a 'MESSAGE CENTER' section showing 'You have no messages in your Inbox' and a 'View All (0)' button. A footer section contains 'NEWS', 'EVENTS', and 'TRAINING' updates.

Communicating with the Aircraft



powered by

AIRCRAFT SELECTED

N990MM

Make this my Default Selection

HOME

ADMINISTRATORS

APG

AUTHORIZED USERS

COPY SETTINGS

DISTRIBUTION LISTS

FLIGHT TRACKER

MESSAGE CENTER

PLANE SIMPLE

PREFERENCES

REPORTS

SEND TEXT MESSAGE

TECHNICAL SUPPORT

FAQS

19:15:28 UTC

ACCOUNT HOLDER:

MY PROFILE

ACCOUNT SERVICES

LOGOUT

✓ Authorized Users

Tail: N990MM

Authorized Senders

FlightDeck Freedom® allows users to send email messages to N990MM by using email address N990MM@fdmail.com. Only email addresses on the whitelist below can send messages to N990MM@fdmail.com, which you may edit at any time. You may allow full domains by using the wildcard * (e.g. *@satcomdirect.com), which allows any email sender with that domain name to send a message to your aircraft.

If Receive Confirmation is selected, the sender will receive an email confirmation that their email has been received at Satcom Direct and queued for uplink.

☒ Activate emails to aircraft?

Add an email address

☒ Receive Confirmation ☐ No Confirmation

Add Email address

Email	Confirmation	
	Yes	Delete
	Yes	Delete
	Yes	Delete
	Yes	Delete
	Yes	Delete

Outage Notifications



Service Notifications (Planned/Unplanned Outages, Service Impacts)

Automatically send service notifications to the aircraft for the following services:

- ☒ FlightDeck Freedom
- ☒ Inmarsat Voice
- ☐ Iridium
- ☒ MPDS
- ☐ OneView
- ☒ SwiftBroadband
- ☐ Swift 64
- ☐ Yonder



Monitor SD Cabin Services



- Monitor cabin services selections
 - Notify flight deck when a certain number of SBB MB are used
 - Notify flight deck when a certain percentage of plan is used
- Satcom Logon/Logoff status
- Helps control cost
- GeoFence Messages

A screenshot of the SwiftBroadband Alerts web interface. The interface is divided into a left sidebar and a main content area. The sidebar contains a list of navigation links: HOME, ADMINISTRATORS, APG, AUTHORIZED USERS, COPY SETTINGS, DISTRIBUTION LISTS, FLIGHT TRACKER, NEW SBB C2B336, PLANE SIMPLE, PREFERENCES, REPORTS, SEND TEXT MESSAGE, TECHNICAL SUPPORT, FAQs, and CONTACT. Below these links is contact information for 24-hour Tech Support and Customer Support, followed by a 'LOG IN AS' section with a 'User Token' field and a 'LOG IN' button. The main content area shows the 'ACCOUNT HOLDER: David Buchart' and tabs for 'MY PROFILE', 'ACCOUNT SERVICES', and 'LOGOUT'. Below this is the 'SwiftBroadband Alerts' section with instructions on how to set a usage alert. It includes a dropdown for 'Aircraft Tail Number' (currently showing N651SD) and 'Save' and 'Reset' buttons. There are three alert configuration boxes: 'Traffic Volume Alert' (with an 'Enable traffic volume alert' checkbox and a 'Send alert after every' field set to 1000 MBs), 'Streaming Traffic Alert' (with an 'Enable streaming traffic alert' checkbox and a 'Send alert after every' field set to 100.00 dollars of use), and 'Plan Usage Alert' (with an 'Enable plan usage alert' checkbox, a 'Percentage' field set to 90 %, and a note that N651SD is on the Free Use plan). At the bottom, there is a 'Send To' section with checkboxes for 'Send to my email (dbuchart@satcomdirect.com)' and 'Send notifications to the flight deck', and an 'Add New Email' field with an 'Add' button. A disclaimer at the bottom states: 'Plan usage alert thresholds are measured during the current billing period and will remain in place for each billing period until you change it. NOTE: The billing period for Annual Plans is 12 months or the plan renewal date, whichever comes first.'

SD GeoServices - GeoFence

- Uplink messages to aircraft when A/C enters a defined geographic region
 - Exit message
- Areas of VHF restriction
- Comm security issues
- Customer defined regions

Example: I4 Coverage “Greenland Gap” alert

SUBJECT: SATCOM DIRECT ALERT FOR N1234

I4 GREENLAND GAP

APPROACHING BOUNDARY OF I4 COVERAGE AREA.

SBB WILL BECOME UNAVAILABLE. ENSURE SATCOM

IS LOGGED ON TO I3 SATELLITES FOR CONTINUED

DATALINK/CPDLC USE.



Active GeoFence Alerts



GeoFence	Service Type	Region	Summary
China SAS	SwiftBroadband	China	Alerts SwiftBroadband customers when entering/exiting region where traffic is routed to China access station (SAS)
China VHF	FlightDeck Freedom	China	Alerts select EPIC equipped aircraft of limitations within coverage region
DirectTV OneView US Coverage	DirectTV OneView	Continental US	Alerts DirectTV OneView customers when re-entering US coverage area
I4 Coverage Gap	SwiftBroadband	North Atlantic	Alerts SwiftBroadband customers of service limitations due to gap in I4 satellite coverage
Japan AFIS	FlightDeck Freedom	Japan	Alerts AFIS equipped aircraft of limitations within coverage region
SITA Pacific	Collins Proline FlightDeck Freedom	SE Asia & Pacific Ocean	Alerts customers of limitations when entering/exiting coverage region
3G service	SDR 3G Wi-Fi	Various Regions	Alerts customers with SDR and 3G Wi-Fi of excessive data rates
Yonder Coverage	ViaSat Yonder	Worldwide	Alerts ViaSat Ku customers when leaving or entering coverage region

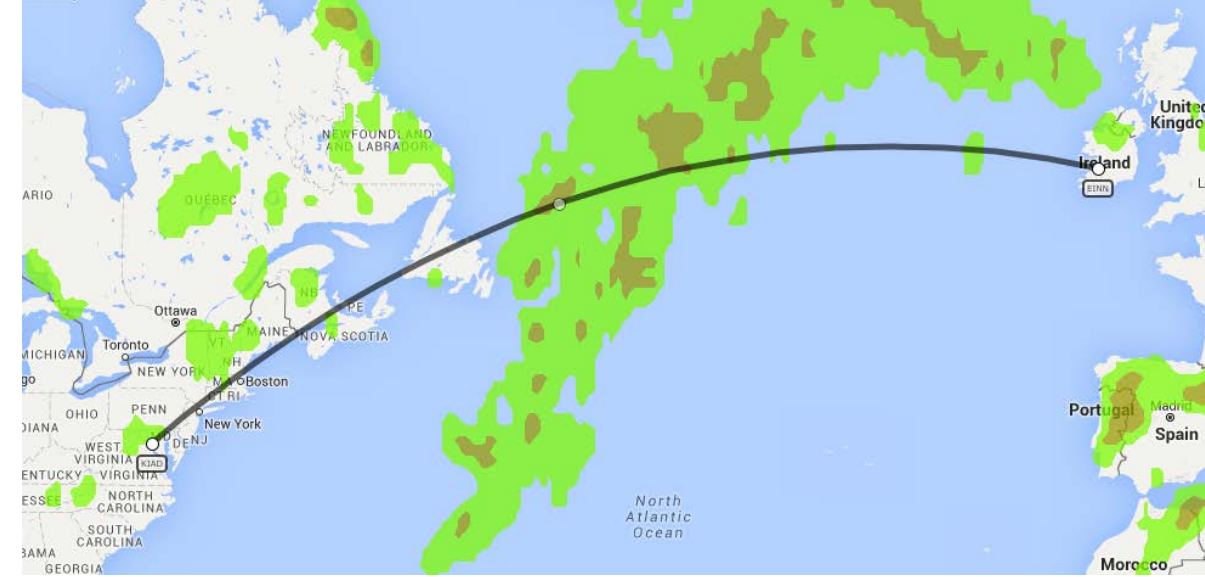
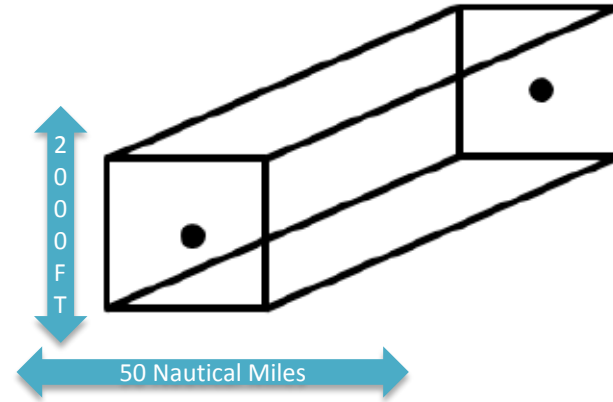


SD Route Alerts



Route evaluated

- When flight plan received
- At takeoff
- Every 5 minutes
- Landing ends monitoring



Route

- Turbulence
- Thunderstorms
- Volcanic ash / eruptions
- Convective SIGMET
- Icing
- USA TFR

Airport

- Tornado
- Severe hail
- Lightning
- Ceiling, visibility, fog
- Wind gusts



Route Alerts



EXAMPLE OF A PREFLIGHT EVALUATION

Route Alert Notification:

Your flight plan U2972 KDCA-KHPN has been evaluated and the following alerts are present along your route.

SEGMENT: STIKY-OOD

ROUTE ALERT: Moderate Turbulence, FL240, Valid Time 03/10/16 2300Z

SEGMENT: SOUND-GWENY

ROUTE ALERT: Moderate Turbulence, FL125, Valid Time 03/10/16 2300Z END OF NOTIFICATION



Route Alerts

EXAMPLE OF AN INFLIGHT EVALUATION

Route Alert Notification:

New alerts have been triggered along the following segments in your route.

SEGMENT: SOUND-GWENY

ROUTE ALERT: Moderate Turbulence, FL125, Valid Time 03/10/16 2200Z

END OF NOTIFICATION



Route Alerts – FDF Portal



Hazards to monitor

Preflight Alerts

Airport:

- ☒ Tornado
- ☐ Lightning
- ☒ Sev Hail
- ☐ Any Hail
- ☒ Winds > KTS

Route:

- ☒ Turbulence
- ☒ Thunderstorm
- ☐ Convective SIGMET
- ☒ Volcanic Ash
- ☐ Lightning
- ☒ Icing

In-Flight Alerts

Airport:

- ☒ Tornado
- ☒ Lightning
- ☒ Sev Hail
- ☒ Any Hail
- ☒ Winds > KTS

Route:

- ☒ Turbulence
- ☒ Thunderstorm
- ☐ Convective SIGMET
- ☒ Volcanic Ash
- ☐ Lightning
- ☒ Icing

Do not send alerts:

Minutes prior to ETA

Unless a selected event occurs at destination or alternate airport

- | | |
|---|---|
| ☒ Tornado | ☐ Any Hail |
| ☒ Lightning | ☒ Winds > <input type="text" value="40"/> KTS |
| ☒ Sev Hail | |



Why SD Route Alerts?

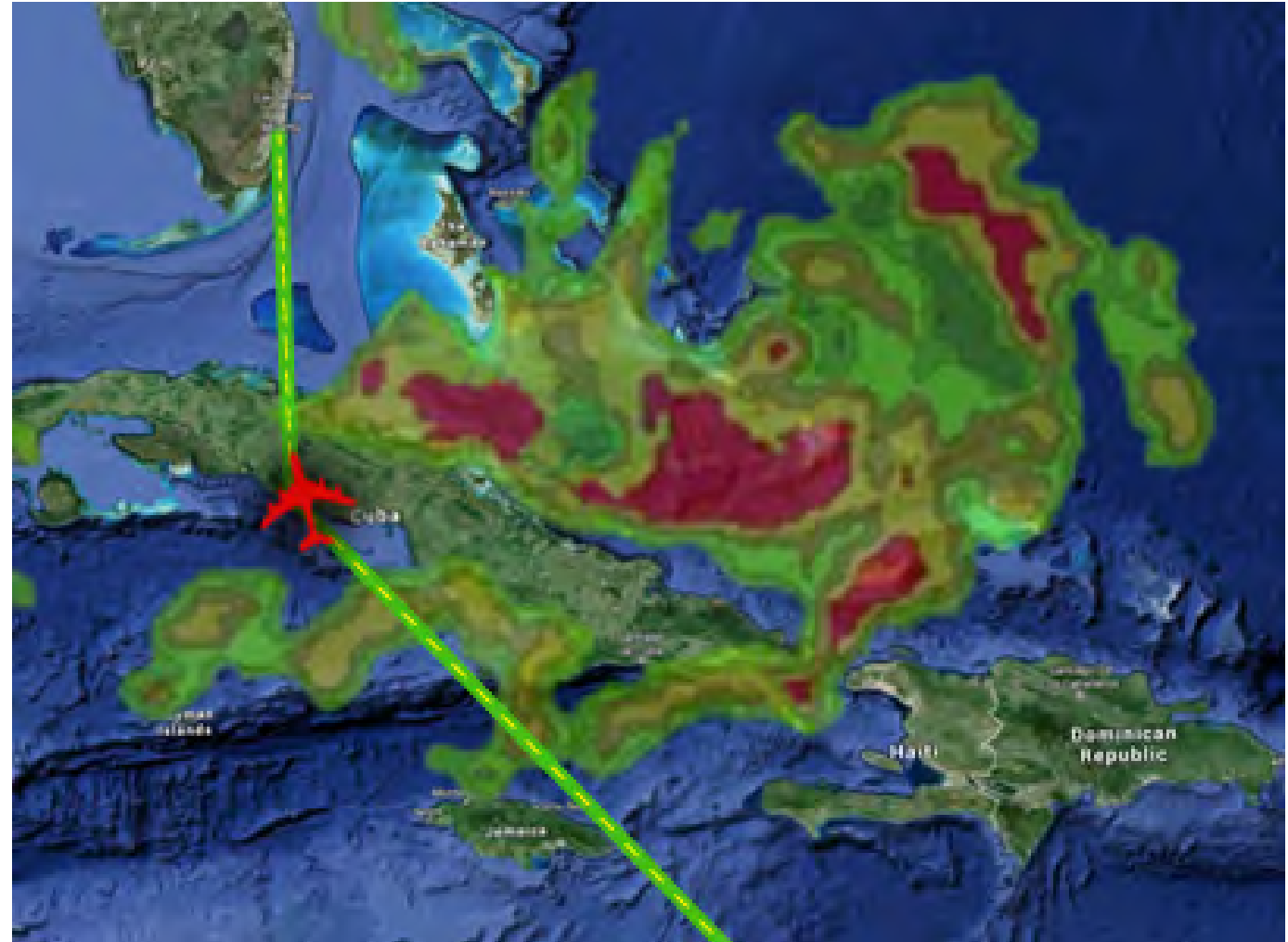


Efficiency

- Passenger Comfort
- Diversion Planning
- Reduce WX deviation.

Safety

- Situational Awareness
- Reduces risk
- Reduced crew workload
- Avoid hazardous weather events





APG & FDF

FlightDeck
freedom[®]



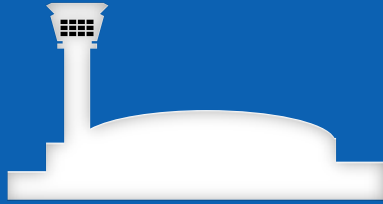
APG



Flight manual
performance data



Airport Facility
Directory
information



Weather
conditions



Airport
obstacles



Compliance
calculation data

FAR: 91.605/1037,
135.379/385, 212,
AC 120-91²⁵
Minimum obstacle
clearance 35'

APG

Takeoff distance

Accelerate stop
distance
Accelerate go
distance



Critical speeds

Engine
failure

Obstacle
clearance

Obstacle
clearance with
engine failure

Landing
distance

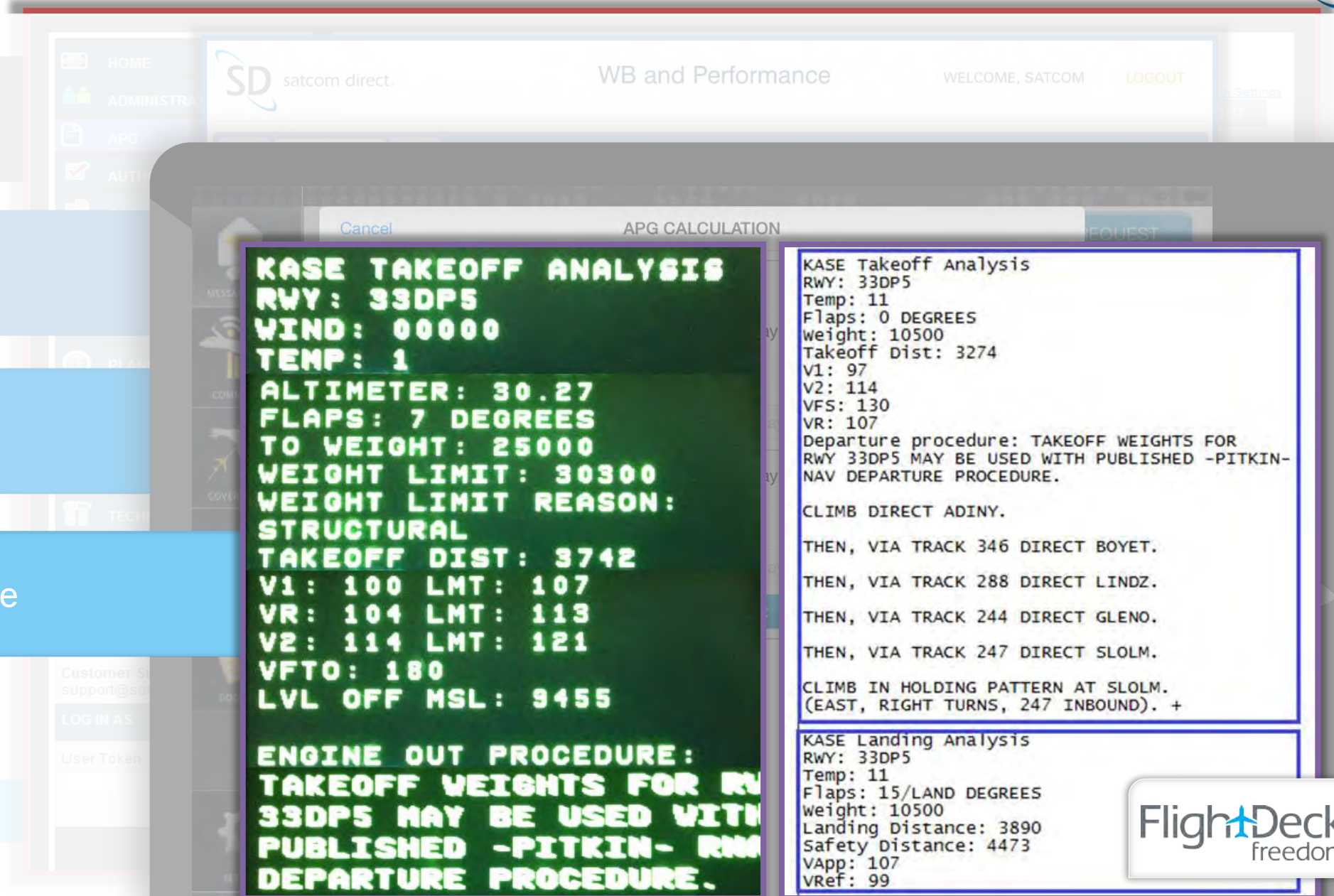


FDF portal

APG interface

iPad interface

APG request & response



The screenshot displays the 'satcom direct' interface for 'WB and Performance'. The sidebar on the left includes links for HOME, ADMINISTRATION, APG, AUTHENTICATION, and TECHNICAL. The main content area shows an 'APG CALCULATION' window with a 'Cancel' button and a 'REQUEST' button. The terminal window displays the following data:

```

KASE TAKEOFF ANALYSIS
RWY: 33DP5
WIND: 00000
TEMP: 1
ALTIMETER: 30.27
FLAPS: 7 DEGREES
TO WEIGHT: 25000
WEIGHT LIMIT: 30300
WEIGHT LIMIT REASON:
STRUCTURAL
TAKEOFF DIST: 3742
V1: 100 LMT: 107
VR: 104 LMT: 113
V2: 114 LMT: 121
VFTO: 180
LVL OFF MSL: 9455

ENGINE OUT PROCEDURE:
TAKEOFF WEIGHTS FOR RWY
33DP5 MAY BE USED WITH
PUBLISHED -PITKIN- RNAV
DEPARTURE PROCEDURE.
    
```

Below the terminal window, there are two sections for 'KASE Takeoff Analysis' and 'KASE Landing Analysis'.

KASE Takeoff Analysis

```

RWY: 33DP5
Temp: 11
Flaps: 0 DEGREES
Weight: 10500
Takeoff Dist: 3274
V1: 97
V2: 114
VFS: 130
VR: 107
Departure procedure: TAKEOFF WEIGHTS FOR
RWY 33DP5 MAY BE USED WITH PUBLISHED -PITKIN-
NAV DEPARTURE PROCEDURE.

CLIMB DIRECT ADINY.

THEN, VIA TRACK 346 DIRECT BOYET.

THEN, VIA TRACK 288 DIRECT LINDZ.

THEN, VIA TRACK 244 DIRECT GLENO.

THEN, VIA TRACK 247 DIRECT SLOLM.

CLIMB IN HOLDING PATTERN AT SLOLM.
(EAST, RIGHT TURNS, 247 INBOUND). +
    
```

KASE Landing Analysis

```

RWY: 33DP5
Temp: 11
Flaps: 15/LAND DEGREES
Weight: 10500
Landing Distance: 3890
Safety Distance: 4473
VApp: 107
VRef: 99
    
```

The bottom right corner features the 'FlightDeck freedom' logo.

Runway Analysis using datalink



- Point calculation
 - Takeoff calculation for current conditions
 - Emergency procedure included
 - Landing calculation for current conditions
 - Takeoff / landing calculation dependent on phase of flight

APG

TO/FROM	(To be ignored)
ADDRESS	APG
MESSAGE LINE 1	ICAO address of airport
MESSAGE LINE 2	Runway
MESSAGE LINE 3	Weight of aircraft

```
KASE TAKEOFF ANALYSIS
RWY: 33DP5
WIND: 00000
TEMP: 1
ALTIMETER: 30.27
FLAPS: 7 DEGREES
TO WEIGHT: 25000
WEIGHT LIMIT: 30300
WEIGHT LIMIT REASON:
STRUCTURAL
TAKEOFF DIST: 3742
V1: 100 LMT: 107
VR: 104 LMT: 113
V2: 114 LMT: 121
VFTO: 180
LVL OFF MSL: 9455

ENGINE OUT PROCEDURE:
TAKEOFF WEIGHTS FOR RW
33DP5 MAY BE USED WITH
PUBLISHED -PITKIN- RNA
DEPARTURE PROCEDURE.
```

```
KASE Takeoff Analysis
RWY: 33DP5
Temp: 11
Flaps: 0 DEGREES
Weight: 10500
Takeoff Dist: 3274
V1: 97
V2: 114
VFS: 130
VR: 107
Departure procedure: TAKEOFF WEIGHTS FOR
RWY 33DP5 MAY BE USED WITH PUBLISHED -PITKIN-
NAV DEPARTURE PROCEDURE.

CLIMB DIRECT ADINY.

THEN, VIA TRACK 346 DIRECT BOYET.
THEN, VIA TRACK 288 DIRECT LINDZ.
THEN, VIA TRACK 244 DIRECT GLENO.
THEN, VIA TRACK 247 DIRECT SLOLM.

CLIMB IN HOLDING PATTERN AT SLOLM.
(EAST, RIGHT TURNS, 247 INBOUND). +

KASE Landing Analysis
RWY: 33DP5
Temp: 11
Flaps: 15/LAND DEGREES
Weight: 10500
Landing Distance: 3890
Safety Distance: 4473
VApp: 107
VRef: 99
```





FD360 iPad Application

FlightDeck
freedom[®]



FlightDeck 360



Message Center



Extension of datalink capabilities

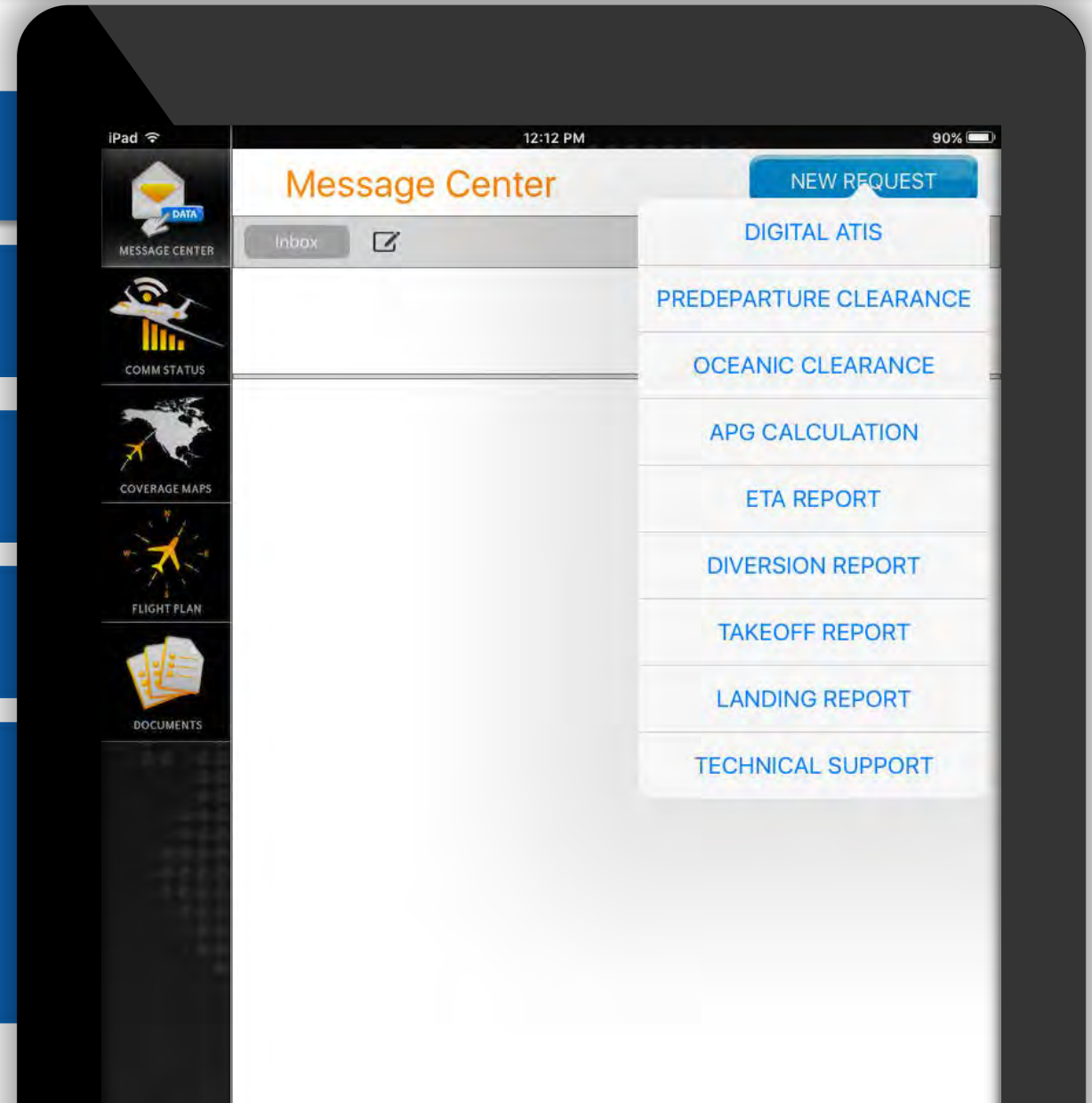
Additional tool for VLJ

Email messages to FlightDeck 360

Real time requests

Pre-departure clearances

Aircraft movement messages updated
flight tracking



Oceanic Clearances



Clearances can be delivered via
FD360 in North Atlantic airspace





SD Flight Tracking

FlightDeck
freedom[®]



Tracking Data Sources



Coverage

- FAA radar-controlled airspace
- Canadian radar-controlled airspace

Types of data

- Takeoff / landing reports
- Filed flight plans
- Position reports every minute
- Diversions & ETA updates



Coverage

- VHF
- Inmarsat I3 / I4 / SwiftBroadband
- Iridium

Types of data

- Takeoff / landing reports
- Filed flight plans
- Position reports every minute
- Diversions & ETA updates



Ku-band

Coverage

- Within Ku coverage areas

No delay in data transmission
All transmissions secure

Types of data

- Position reports every minute
- Planned route and ETE
- ETA may not be provided
- Unique SD algorithms used for takeoff / landing reports



SwiftBroadband

Coverage

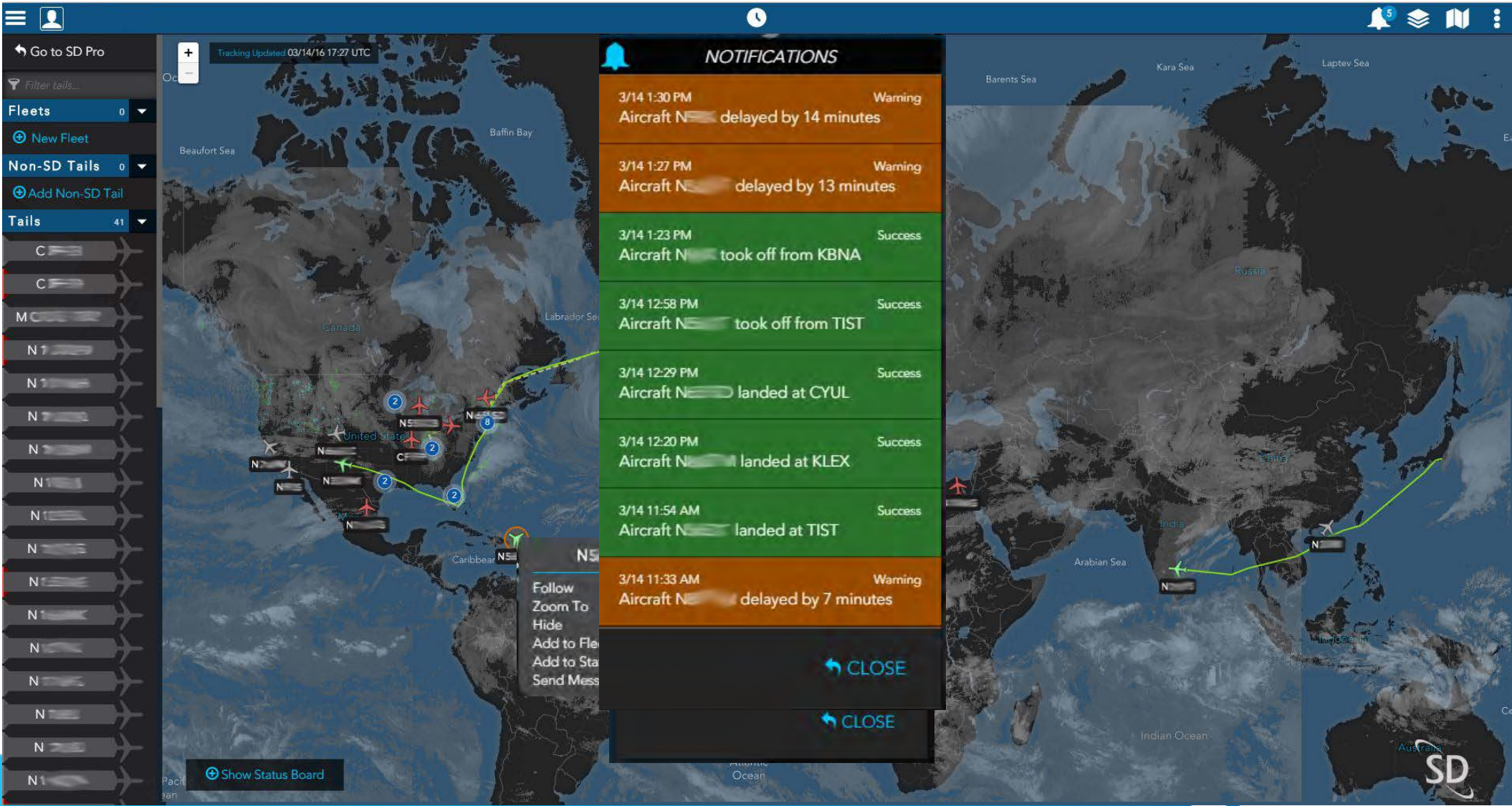
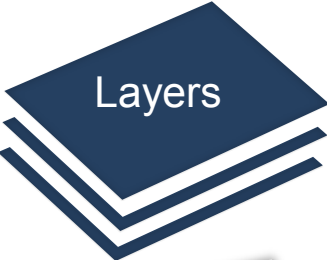
- Worldwide

No delay in data transmission
All transmissions secure

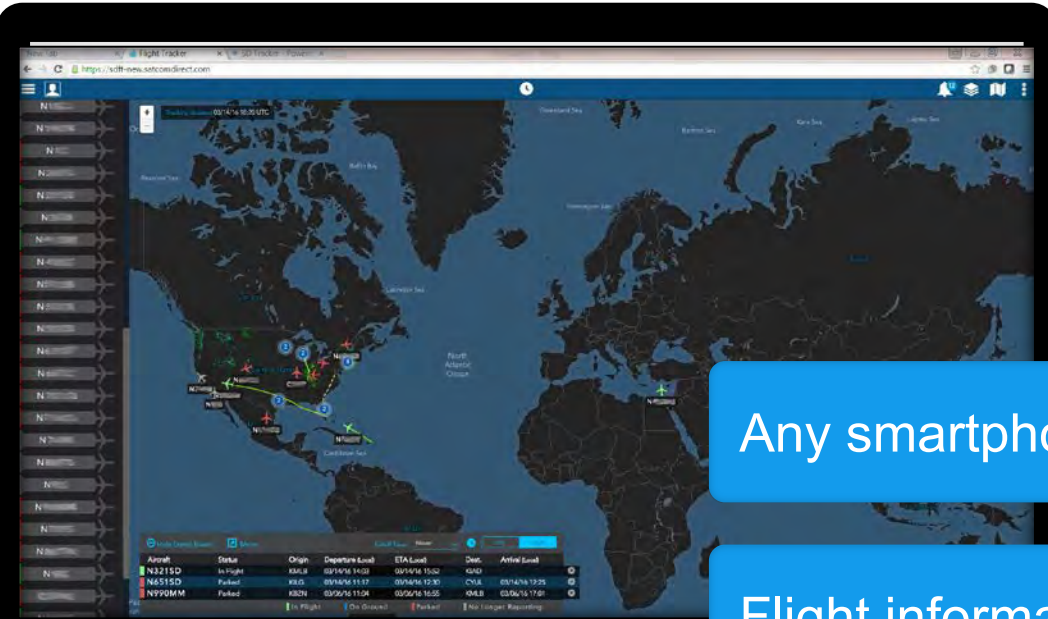
Types of data

- Position reports
- Unique SD algorithms used for takeoff / landing reports

SD Flight Tracker



Flight Tracker Options



SD Flight Tracker on the web

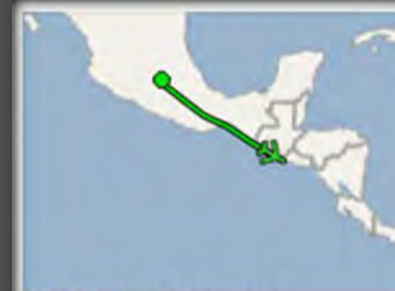
Any smartphone

Flight information

Automatic receipts

Authorized trackers

SD Tracker Mail



Tail Number: N990MM

Status: InFlight

Departed: MMTO - LIC ADOLFO LOPEZ MATEOS INTL

Departed at: 11-Jan-2013 02:46 UTC / 10-Jan-2013 20:46 LCL

Destination: MPTO - TOCUMEN INTL

ETA: 11-Jan-2013 05:47 UTC / 11-Jan-2013 00:47 LCL

Altitude: 41,000 ft

Last Report: 11-Jan-2013 04:06 UTC

[Update](#)

[Send Message](#)



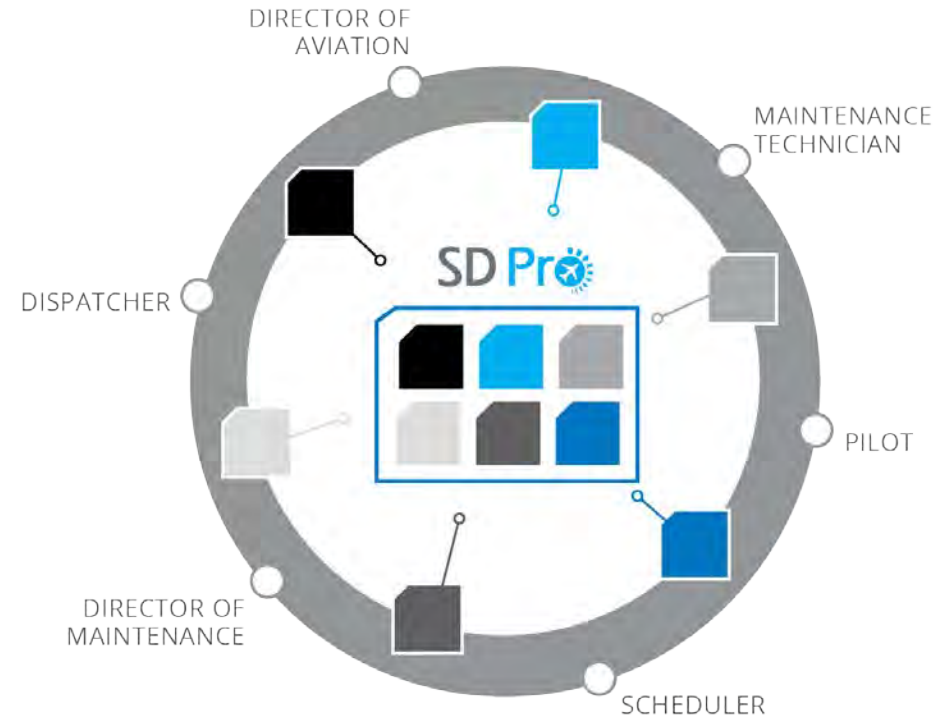
SD Pro is an integrated flight operations management platform





THE INTEGRATED FLIGHT OPERATIONS MANAGEMENT PLATFORM

- Single user interface for Business Aviation
- Keeps flight department in sync with aircraft
- One Platform – Multiple Modules
- One Data Center
- Provides Accuracy
- Provides Efficiency
- Reduces Complexity
- Standardizes the flight department





ONE PLATFORM – ACCURATE, INTEGRATED, REAL-TIME



CONNECTIVITY

SDR VIEWER

SD FLIGHTLOGS

SD FLIGHT TRACKER

MAINTENANCE VIEWER

SCHEDULER VIEWER

TRIP SUPPORT SERVICE

More modules are in development



SD Pro Modules



Module	Description	Integration Partners
SD FlightLogs SM	Auto-captures flight data and cycle events, in real-time, reducing manual user input. Provides visibility of flight log information to the entire flight operation. Data capture powered by FlightDeck Freedom [®] (FDF) and the SDR [™] .	Powered by
Scheduler Viewer	Provides trip information including trip legs and maintenance scheduled events, calendar and crew info. Integrates with scheduling partners PFM and AircraftLogs.	
SD Flight Tracker	Real-time flight tracking including departures, destinations, ETA, altitude, and speed information. At-a-glance status view shows weather overlays including NEXRAD and worldwide satellite imagery.	Powered by
Maintenance Viewer	Performance feed from maintenance providers. Includes engine hours, cycles, and times. Integrates with maintenance partners Gulfstream CMP [®] and Flightdocs [™] .	
Connectivity	Displays devices connected, along with connectivity status of datalink, internet, SDR [™] , voice, Global One IPTM, AeroX [®] , AeroXR [®] , and Global One Number [®] , plus alerts of outages. Tracks voice and data usage by month, flight and duration.	Powered by
Trip Planning	Connects to Universal Weather and Aviation trip planning and trip support services via a web-based version of uvGO.	
SDR [™]	Shows status of the onboard Satcom Direct Router (SDR [™]) including available networks and connection status as it automatically switches between providers. Tracks device connectivity and usage, also available via the SDR mobile application. The SDR is a powerful source of aircraft data, enabling the full functionality of SD Pro.	Powered by



- Replaces paper flight logs
- Real-time auto capture of data
- Third party vendor integration with maintenance and scheduling software
- Reduces human error
- Creates electronic history of aircraft
- Smart alerts when inconsistencies are present





TRUENORTH

THE CONNECTED AIRCRAFT



TrueNorth Avionics



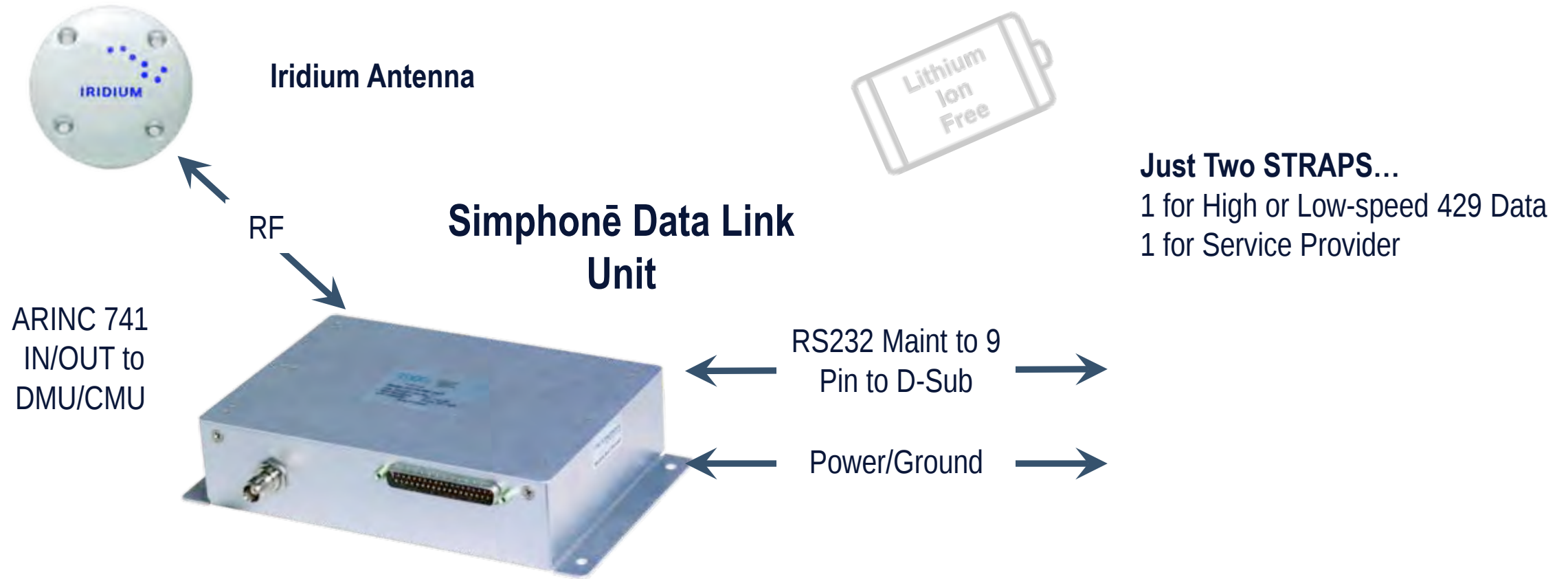
- SD to acquire the Ottawa based company by end of 4th quarter
- TrueNorth offers the latest technology in cabin communication solutions
- Broadens SD's avionics product portfolio enabling SD to accelerate our ability to bring fully integrated solutions to our customers



- Optelity, TrueNorth's latest innovation, delivers high fidelity voice, fax and WiFi solutions that enable intuitive connectivity for mobile devices
- The Satcom Direct Router (SDR) and SD Pro flight operations platform combined with TrueNorth avionics will give aircraft operators an unrivaled ability to manage communication systems and give passengers an extraordinary user experience



ZERO CONFIGURATION REQUIRED



STCs ON MANY POPULAR AIRCRAFT TYPES



CL601



CL650



CL650



Learjet 60



Global 5000



Global 7000



Falcon 50



Falcon 900



Falcon 7X



Falcon 50EX



Falcon 900EX



Falcon 2000



Falcon 2000EX

Bombardier

Dassault

STCs ON MANY POPULAR AIRCRAFT TYPES



Citation C550



G650



GIV



Citation C560

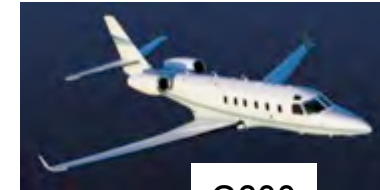
Cessna



GV



G550



G200



Hawker 800

Hawker

Gulfstream



G450

STCs ON MANY POPULAR AIRCRAFT TYPES



ACJ



A310



A320



Airbus



A330

BBJ



Boeing



B737

B747



B777



B787





MANY ACARS SYSTEMS

Proline IV/21

- Rockwell Collins, CMU

UNIVERSAL

- Unilink

GULFSTREAM

- PlaneView (Honeywell CMU)

EASY

- Honeywell CMU

TELEDYNE

- TeleLink

MANY INTERFACES & NETWORKS

- ARINC 429 high- or low-speed to ACARS or AFIS data link systems
- ARINC 618 Satcom transport interface ARINC 741
- ACARS MU/CMU





Thank you

NextGen Transponders:

ADS-B Transponder Solutions from

L-3 Aviation Products

Overview

Tom Lippincott

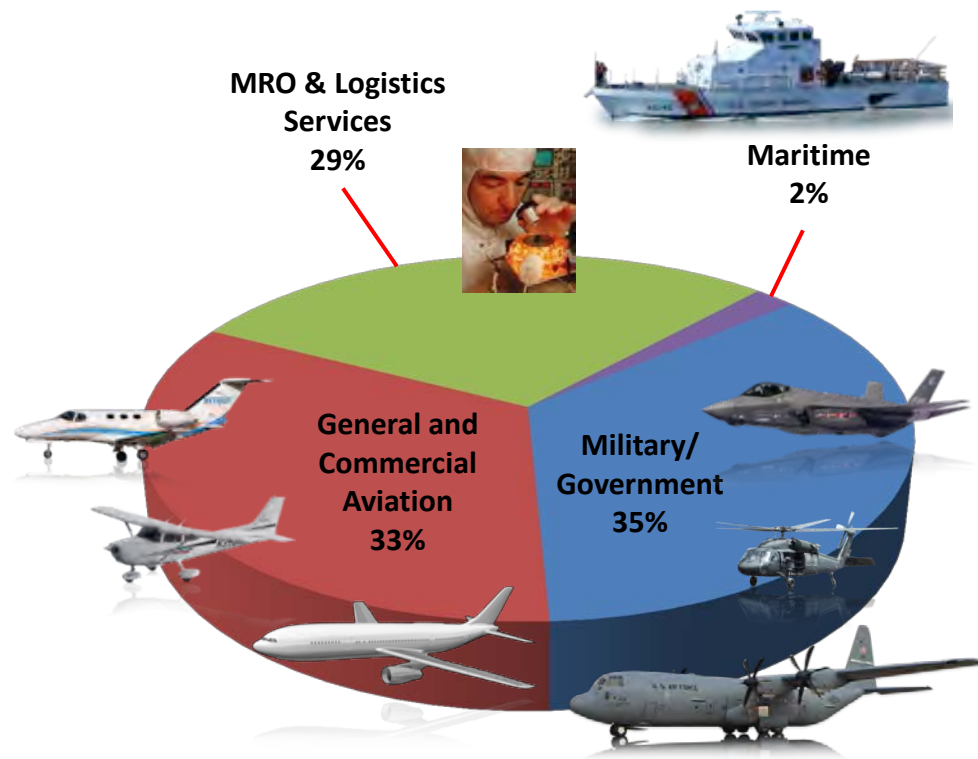
L-3 Aviation Products

Aftermarket Sales Representative

480-202-8321 Mobile

Thomas.Lippincott@L-3Com.com

- Comprised of five aerospace focused business units:
 - Aviation Communication & Surveillance Systems (ACSS)
 - Avionics Systems
 - Aviation Recorders
 - Display Systems
 - Electronic System Services
- ~1,500 employees
- 13 locations worldwide
- Market Diverse
- Actively investing for the future



Standby Systems



ADS-B & Transponders



NXT-700
MCU Form-Factor



Stormscope®



TCAS I & II



TACAN+



Integrated Avionics

Flight Displays / Processors



Flight Data & Cockpit Voice Recorders



Avionics/Electronics Repair & Overhaul



LRUs & Controllers

Lynx NGT-9000



Lynx NGT-9000R





NXT-600

“RCZ” Form-factor



NXT-700

2MCU Form-factor



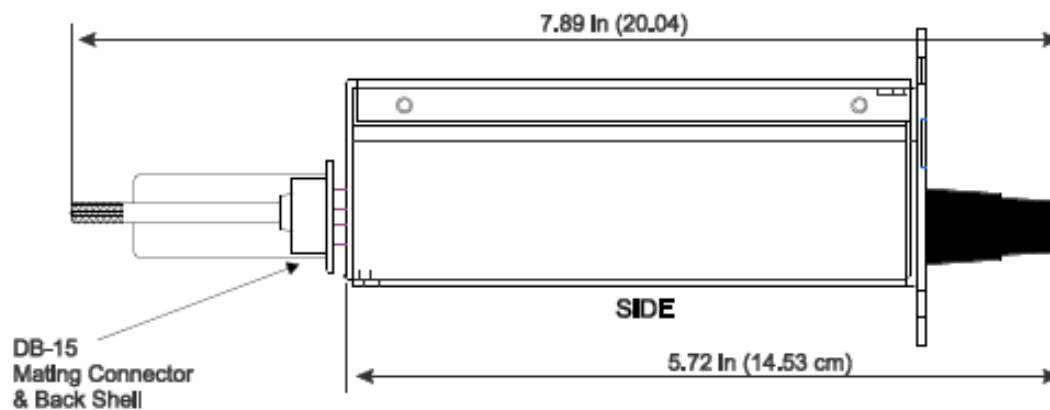
NXT-800

4MCU Form-factor

Lynx Transponders

- **NGT-9000 / NGT-9000+ / NGT-9000D / NGT-9000D+**
 - TSO-C112d, TSO-C166b, TSO-C195b, DO-260B, DO-181E Compliant
 - Broadcasts 1090 MHz Mode S Extended Squitter
 - Receives BOTH 1090 MHz and 978 MHz ADS-B and FIS-B
 - Internal rule-compliant (TSO C145c) WAAS GPS receiver
 - Multifunction touch screen displays
 - NGT-9000
 - Provides transponder & ADS-B functions, displays weather & traffic on own displays, on tablet apps through Wi-Fi Module, and outputs to MFDs (ARINC 429, RS-232/422)
- NGT-9000+
 - NGT-9000 with active traffic (Skywatch/TAS) enabled
- NGT-9000D
 - NGT-9000 with diversity antenna option enabled
- NGT-9000D+
 - NGT-9000 with active traffic and diversity antenna option enabled

- *Same features as NGT-9000 but without the touch-screen display*
- *Uses CP-2500 Controller or interfaces to integrated avionics suite*
- *NGT-9000R*
 - *Base unit with standard features*
- *NGT-9000R+*
 - *NGT-9000R with active traffic (Skywatch/TAS) enabled*
- *NGT-9000RD*
 - *NGT-9000R with diversity antenna option enabled*
- *NGT-9000RD+*
 - *NGT-9000R with active traffic and diversity antenna option enabled*



➤ All dual band panel mount models contain:

- Multifunction touch screen display
- Mode S 1090ES transponder (ADS-B OUT)
- 1090MHz IN
- 978MHz UAT IN (traffic and FIS-B weather)
- *Fits standard 6.25" radio racks*
- Internal rule-compliant (TSO C145c) WAAS GPS receiver
- USB maintenance port
- Data Configuration Module in harness
- Field loadable software
- +14VDC or +28VDC power input
- Wi-Fi serial output



- Two new features for the NGT-9000
 - ATAS (also referred to as TSAA)
 - Class B Terrain Awareness and Warning System (TAWS)
- Both features activated via software enablement codes
- ATAS provides traffic alerts using ADS-B IN traffic information
 - First certified (TSO-C195b) application for ADS-B IN
- Embedded Class B TAWS provides terrain and obstacle alerting



NGT-9000 Block Diagram



WAAS GPS Antenna



Pressure Altitude
(Grey code, serial, digital)



Transponder
Antenna



Audio Alerting (ATAS, TAS, TAWS)



Serial interface to
PIM-9000 Wi-Fi for
iPad/tablet integration



Digital Magnetic Heading



Power (+14V or +28V)
and GND



External Cockpit Displays

= Required Inputs/Outputs

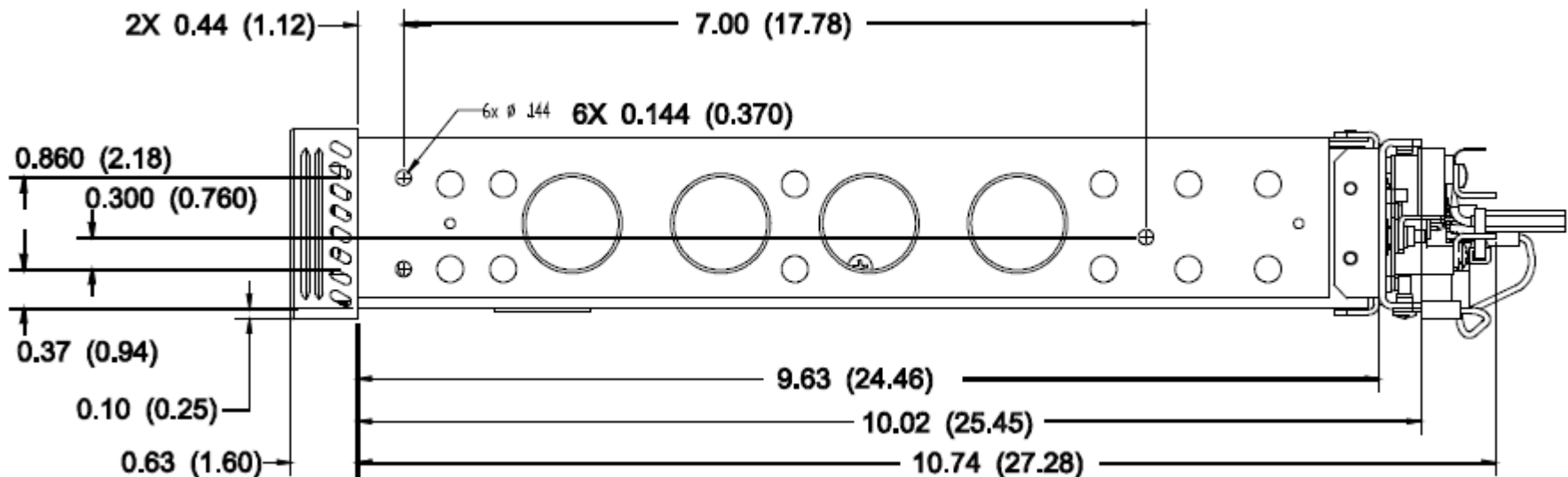
= Optional Inputs/Outputs

- Active Traffic Displays (TAS/TCAS ARINC 735 format)
 - Garmin G500/G600
 - Garmin GNS430(W)/530(W)
 - Garmin MX-20/GMX-200
 - Garmin GTN650/750
 - Avidyne EX500/5000
- FIS-B WX and Traffic Display (RS-422)
 - Aspen EFD1000 PFD and MFD, EFD500 MFD
 - Garmin MX-20/GMX-200
 - Avidyne IFD 440/540 – will be tested soon

- *Spacing Requirements in Panel:*
 - *Bezel Dimensions*
 - Width 6.25"
 - Height 1.8"
- *Extra spacing may be required between panel mounted avionics due to NGT bezel height of 1.8"*
- *Depth of unit is 11" including connectors*



- *Extra spacing is required between racks due to NGT bezel being slightly taller than the rack itself*
- *Depth of rack including connectors is 11"*



- AML STC for the NGT-9000/9000R on....
- US FAA Part 23/25 fixed-wing aircraft
- US FAA Part 27/29 rotorcraft

United States of America
Department of Transportation - Federal Aviation Administration
Supplemental Type Certificate
Number SA02444AK

This Certificate issued to: ADS-B Technologies, LLC
900 Merrill Field Drive
Anchorage, Alaska 99501

certifies that the change in the type design for the following product with the limitations and conditions therein as specified herein meets the airworthiness requirements of Part 23 of the Federal Aviation Regulations:

Original Product: Type Certificate Number: *Refer to FAA Approved Model List (AML), Number SA02444AK, Revision 1, dated June 19, 2015, or later FAA approved revision, for airplane makes and models, corresponding Type Certificate numbers, and applicable airworthiness regulations.

Limitations and Conditions:

- 1) The installer must determine whether this design change is compatible with previously approved modifications.
- 2) If the holder agrees to permit another person to use this Certificate to alter the product, the holder shall give the other person written evidence of that permission.
- 3) Installation requires prior FAA approved antenna installation for Global Positioning antenna, Universal Access Transceiver antenna and 1090 megahertz antenna.
- 4) Instructions for Continued Airworthiness, L3-76-ICA1, Revision 1, dated May 22, 2015, or later FAA accepted revision is required as part of this installation.

Limitations and Conditions continued on Page 3

This certificate and the supporting data which is the basis for approval shall remain in effect until superseded, suspended, voided or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: July 18, 2013
Date of issuance: March 31, 2015

By direction of the Administrator:
Stacie Bushardt
For: J
August A. Asay
Manager, Anchorage Aircraft Certification Office

(7566)

Any alteration of this certificate is prohibited by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.
This certificate may be transcribed in accordance with FAR 21.47.

United States of America
Department of Transportation - Federal Aviation Administration
Supplemental Type Certificate
Number SR02471AK

This Certificate issued to: ADS-B Technologies, LLC
900 Merrill Field Drive
Anchorage, Alaska 99501

certifies that the change in the type design for the following product with the limitations and conditions therein as specified herein meets the airworthiness requirements of Part 27 of the Federal Aviation Regulations:

Original Product: Type Certificate Number: *Refer to FAA Approved Model List (AML), Number SR02471AK, dated February 16, 2016, or later FAA approved revision, for airplane makes and models, corresponding Type Certificate numbers, and applicable airworthiness regulations.

Limitations and Conditions:

- 1) The installer must determine whether this design change is compatible with previously approved modifications.
- 2) If the holder agrees to permit another person to use this Certificate to alter the product, the holder shall give the other person written evidence of that permission.
- 3) Installation requires prior FAA approved antenna installation for Global Positioning antenna, Universal Access Transceiver antenna and 1090 megahertz antenna.
- 4) Rotorcraft Flight Manual Supplement or Supplemental Flight Manuals, L3-89-RFMS1, Revision 0, dated February 16, 2016, is required to be carried on the rotorcraft as part of the installation of the NGT-9000 or L3-89-RFMS2, Revision 0, dated February 16, 2016, is required to be carried on the rotorcraft as part of the installation of the NGT-9000R, or later FAA approved revisions.

This certificate and the supporting data which is the basis for approval shall remain in effect until superseded, suspended, voided or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: August 8, 2015
Date of issuance: February 16, 2016

By direction of the Administrator:
August A. Asay
Manager, Anchorage Aircraft Certification Office

(7566)

Any alteration of this certificate is prohibited by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.
This certificate may be transcribed in accordance with FAR 21.47.

NXT Transponders

NextGen Transponder



NXT-600

“RCZ” Form-factor



NXT-700

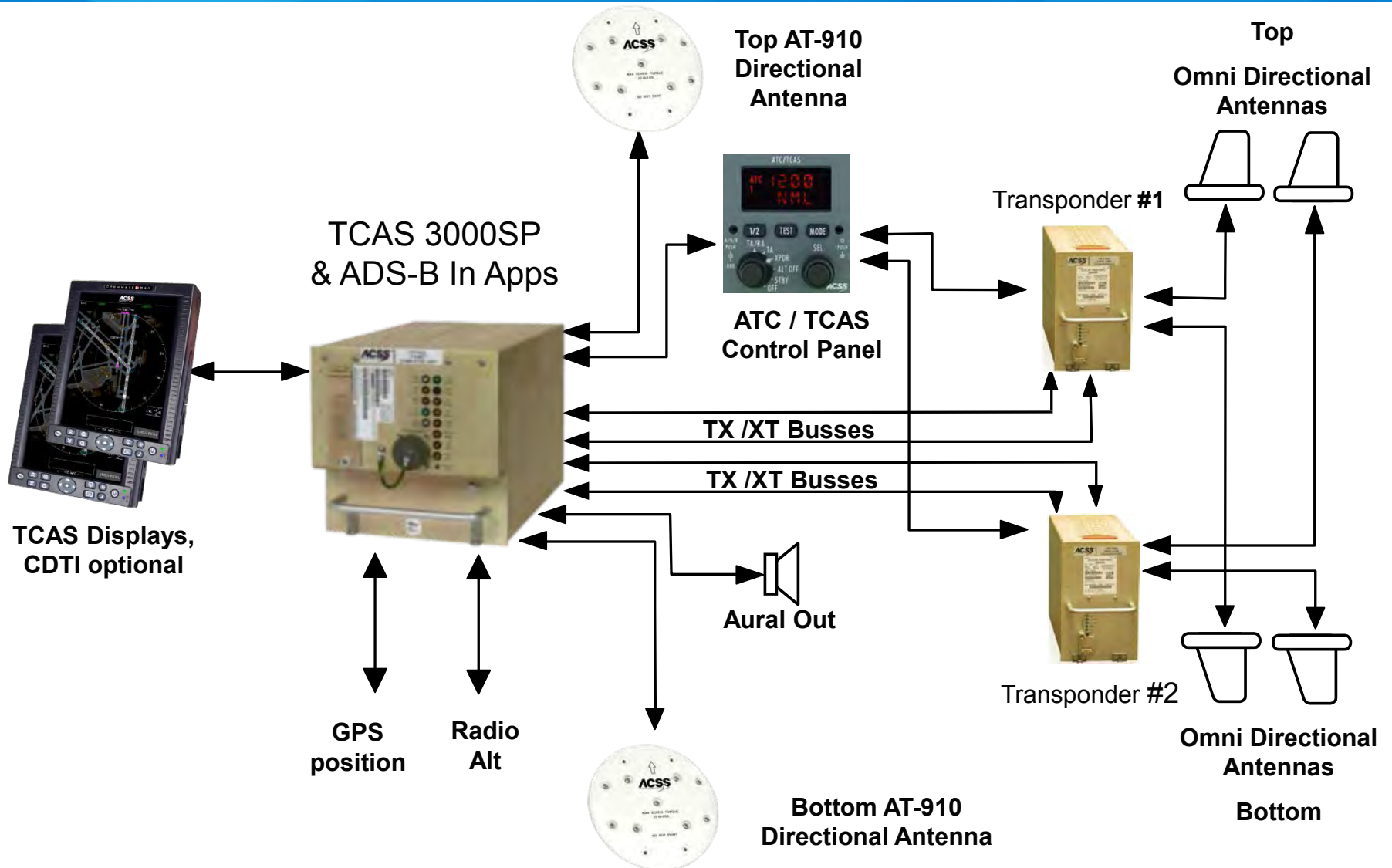
2MCU Form-factor



NXT-800

4MCU Form-factor

- *NXT-600/700/800 NextGen Transponders*
 - *DO-260B and DO-181E (EASA) Compliant – meets global ADS-B mandate*
 - *TSO-C112d (Mode S ES transponder)*
 - *TSO-C166b (ADS-B Out)*
 - *Elementary Surveillance (ELS) and Enhanced Surveillance (EHS) compliant*
 - *Datalink functionality for Downlink of Aircraft Parameters (DAPs)*
 - *DC or AC (NXT-800 only)*
 - *Compatible with all ARINC 735B/735A/735 TCAS II systems*
 - *including ACSS TCAS 3000SP, TCAS 2000, T²CAS, T³CAS*



- Form factor replacement for legacy RCZ-852
- Compliant to EASA/FAA 2020 DO-260B Mandate
 - Next generation based on RCZ-852 predecessor form fit,
 - Over 1500 RCZ Units sold
 - Highest level of DO-260B Out (A3)
 - DO-181E, DO-260B, A718A-4 compliant
- Elementary & Enhanced Surveillance (ELS and EHS)
- Interfaces with all ARINC standard TCAS II
- Commercial Mode S Transponder
- Onboard maintenance system interface
- Software upgradeable via front panel RJ-45
- Available as stand-alone product
- Forward Fit on ATR and Q-400 Aircraft



RCZ-852



NXT 600

- *Designed to be a form-fit replacement for the MST-67A*
 - *¼ ATR short form*
 - *Operator can utilize existing tray*
 - *Can use existing mounting rack and connectors*
 - *Compatible with current retrofit TCAS II, 7.1 systems*
 - *No additional control head required*



■ Features

- *Interfaces with TPU-67A TCAS II Processors (KFS-578A/PS-578A/PS-550 Control)*
 - *or CD-674C control*
 - *or CTA-81A/81D Control*
 - *or RMS-555 Radio Management System*
- *Interfaces with Rockwell Collins TTR-921, TTR-2100 TCAS II Processors*



- *An approved Model List Supplemental Type Certificate (AML STC) with the FAA, TCCA and EASA will be offered as a certification path*
- *NXT-700 Compatible Platforms*
 - *Beechcraft Hawker 125-400/600/700, Early Series*
 - *Beechcraft Hawker 400 SP/ (Beechjet), Early 400 Series only*
 - *Bombardier CL601-3A/R*
 - *Dassault Aviation Falcon 50, 20, 900, 900B and Falcon 10*
 - *Gulfstream III and IIB*
 - *Hawker Beechcraft 750/950*
 - *IAI Westwind 1124*
 - *Learjet 35, 36, 35A and 36A*
 - *Textron Aviation Inc. Citation Jet, Ultra, VII and 550*
 - *Others....*



- *Form factor replacement for legacy XS-950 ATDL*
- *Compliant to EASA/FAA 2020 DO-260B Mandate*
 - *Next generation based on XS-950 predecessor*
 - *Over 11,000 Units sold*
 - *First Certified in June 2010 (on XS-950)*
 - *Highest level of DO-260B Out (A3)*
 - *DO-181E, DO-260B, A718A-4 compliant*
 - *NXT-800 TC'd on B737, B767, & B777*
- *Elementary & Enhanced Surveillance*
- *Interfaces with all ARINC standard TCAS II*
- *Commercial Mode S Transponder*
- *Onboard maintenance system interface*
- *Software upgradeable via front panel RJ-45 port*
- *Available as stand-alone product*



ATDL Mode S Level
4/5



NXT 800

	NXT-600	NXT-700	NXT-800
PHYSICAL DESCRIPTION			
Size (inches)	3.4 (H) x 4.1 (W) x 14.01 (L)	4.76 (H) x 2.25 (W) x 12.4 (L)	4 MCU
Weight	5.0 lbs.	5.5 lbs.	8.6 lbs. (AC), 7.8 lbs. (DC)
Mounting	MT-600 Mount	ARINC 404A, 1/4 ATR Short	ARINC 600 4 MCU Mount
Cooling	Internal	Internal	ARINC 600 External
CERTIFICATION			
Environmental	DO-160G		
TSO/JTSO	C112d, C166b / C112d		
Software	DO-178B Level B		
Transp. Data Link Capability	ICAO Level 3 (COMM-A/B/C)		
ADS-B Capability	1090ES Extended Squitter per RTCA DO-260B MOPS for 1090 ADS-B Equipment		
Operating Altitude	Sea level to 55,000 feet		
Operating Temperature	-55 to +70 degrees C		
Storage Temperature	-55 to +85 degrees C		
Power	28V DC	28V DC	115VAC, 400Hz or 28V DC
Power Consumption	28 Watts (standby), 55 Watts (maximum)	28 Watts (standby), 55 Watts (maximum)	40 Watts (standby), 85 Watts (maximum)
No. of Antenna Ports	2 (diversity)		
INTERFACES			
Controller	Low speed ARINC 429		
TCAS II	High speed ARINC 429		
GPS	High or low speed ARINC 429		
Altimeter	ARINC 429/575 (digital air data)		
Flight Identifier	Various		
Maintenance Computer	Low speed ARINC 429		
WebEDDIT	RS-232		

Gables G7130-XX



Item	Specification
Dimensions (maximum):	
• Height	2.25 in. (57.2 mm)
• Weight	5.75 in. (146.1 mm)
• Length	5.80 in. (147.3 mm)
Weight (maximum)	2.0 lb (0.907 kg) (Gables units)
Power Requirements:	
• Primary	+28 ± 4 V dc, 0.25 A maximum current
• Lighting	5 V, 400 Hz, 2.3 A maximum
Mating Connectors:	
• J1	M83723/75R16247 or equivalent
• J2 (Dual Mode S transponder Version)	M83723/75R16248 or equivalent
Mounting	Unit Dzus Fasteners

SPECIFICATIONS		
PHYSICAL		
Unit Dimensions	Refer to Outline Dimensions, Figure 201	
Weight	1.1 lbs (0.50 Kg) maximum	
Mounting	Two modified round allen keyed mounting screws, washers, and hex nuts	
Color	*Front Panel	Black, Fed. Std. 595b color 37038 Gray, Fed. Std. 595b color 36118
	*Pushbutton Keys	Black, Fed. Std. 595b color 37038 Gray, Fed. Std. 595b color 36118
	*Mode Select Rotary Knob	Black, Fed. Std. 595b color 37038 Gray, Fed. Std. 595b color 36118
	*Knobstack	Black, Fed. Std. 595b color 37038 Gray, Fed. Std. 595b color 36118
Front Panel Display (LCD)	*2 row Twisted Nematic	Backlighting - White Amber NVIS
Panel Lighting	GEI Lighting Spec. Document A40810	
Temperature	Operating	-20° C to + 70° C
	Storage	-55° C to +85° C
Cooling	No special requirements	
ELECTRICAL		
Power Requirements	Control Panel, Annunciators, LCD 28 Vdc @ 7 Watts (maximum) Backlighting, Light Plate	
SYSTEM		
ARINC 429	Mark 33 Digital Information Transfer System (DITS)	
ARINC 532D	Air Traffic Control Transponder	
ARINC 572-1	Mark 2 Air Traffic Control Transponder	
ARINC 718	Mark 4 Air Traffic Controller Transponder (Mode-S/ATCRBS)	
ARINC 720	Digital Frequency/Function Selection	
ARINC 735	TCAS	



What about a rule-compliant GPS position source for my NXT ADS-B transponder??

...we've got that covered also!!



WAAS/SBAS Compliant GPS Source with 978 MHz UAT ADS-B IN

- *Inexpensive rule-compliant GPS position source solution for the NXT NextGen Mode S transponders*
- *No need to upgrade FMS for ADS-B compliance*



- *TSO-C145c, C154c, C157a*
- *Meets requirements of AC20-138D and AC20-165B*
- *Designed to be paired with the NXT line of transponders*
- *Sends GPS position, velocity, time and integrity information to NXT transponder via ARINC 429*
- *Contains 978Mhz UAT ADS-B IN receiver for FIS-B subscription free weather*
- *Wi-Fi interface to tablet computer for displaying FIS-B weather products*

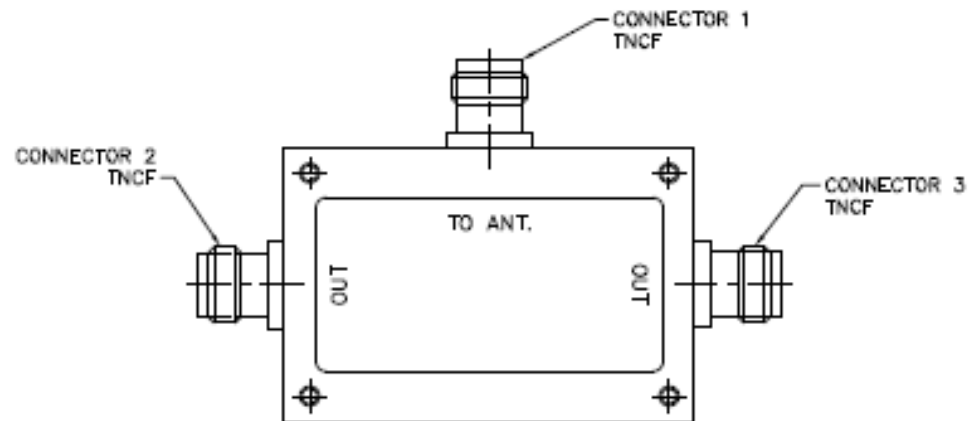
- *CMC*
 - *CMA-5024 GPS/SBAS Receivers*
- *Rockwell Collins*
 - *GPS-4000*
- *FreeFlight*
 - *1201*
 - *1203C*
 - *1204*

- US FAA AML STCs are in work for both the NXT-600 and 700 with the NXG-900 as the position source, as well as the previously mentioned GPS sources

- *Eliminates adding multiple GPS antennas for dual transponder systems*
- *US FAA STC Approved*



GPS Networking GPS Splitter p/n LDCBS1X2-N



**AeroAntenna Technology Inc.
PD20RG GPS Coupler**



NOW IS A GOOD TIME FOR TCAS CHANGE 7.1

Our TCAS Platforms:

Citation Mustang	Gulfstream 350
Citation Sovereign	Gulfstream 450
Citation X	Gulfstream 500
Citation XLS	Gulfstream 550
Embraer Legacy	Hawker Horizon
Embraer Phenom	Learjet 40
Falcon 2000	Learjet 40XR
Falcon 7X	Learjet 45
Falcon 900	Learjet 45XR
Global 5000	



Aviation Products

- Change 7.1 provides specific, clear and concise RA commands resulting in faster reaction time improving avoidance performance
 - Changes the current TCAS II aural warning from "Adjust Vertical Speed, Adjust" to "Level Off, Level Off"
 - Introduces improvements to the current reversal logic to address late issuance of reversal RAs and potential failures to initiate reversal RA's.
- Change 7.1 reduces the probability of a mid-air collision in European Airspace from 1 in every 3 years to 1 in every 12 years
- Easy Installation - Change 7.1 is most likely a wing loadable software upgrade for most
- Change 7.1 Mandates - If you intend to fly your aircraft in European or Hong Kong Airspace, you must comply with the Change 7.1 Mandate
 - All civil turbine powered transport aircraft with more than 19 passenger seats (or MTOW above 5,700 kg/12,566 lbs)

Description	Change 7.1 Part Number
TCAS II	4066010-914
TCAS 2000	7517900-10020, -55020, -71020
TCAS 2000 (Military Version)	7517900-56120
TCAS 2000 +MASS	7517900-20003, -65003
T2CAS (Non-Airbus)	9000000-10309, -55309, -20309
T2CAS (Airbus)	9000000-11414
T2CAS + MASS	9000000-TBD
TCAS 3000	9003000-10005, -55005, -65005
TCAS 3000 SP	9003500-10905, -55905, -65905
TCAS 3000 SP with A3 Sensitivity	9003500-12907, -58907, -68907

- CPDLC “Controller Pilot Data Link Communication”
 - A component of Future Air Navigation System (FANS)
 - Digital text-based communication between Air Traffic Control and Pilots
 - Currently used in areas where VHF and HF communications are unavailable or unreliable
 - Specific Oceanic Routes
 - Isolated Land Routes
 - Works with different datalink networks, equipment types, and service providers:
 - Iridium, Inmarsat, VHF Data Link (VDL Mode 2)
 - When a FDR & CVR is required and when CPDLC capable data link systems are installed, message-set data must recorded

■ When is data link recording required?

- FAA
 - “All airplanes or rotorcraft required by this section to have a cockpit voice recorder and a flight data recorder, that install datalink communication equipment on or after December 6, 2010 (FAR 135.151h) or April 6, 2012 (FAR 91.609j), must record all datalink messages as required by the certification rule applicable to the aircraft.”
 - If datalink system is installed on or after the above dates, the CVR is required to perform recording of datalink messages
 - Reference Advisory Circular AC20-160 for means of compliance and message-set requirements
 - Rule clarification - FAA Info Document # 10016

■ When is data link recording required?

- EASA

- Airplanes first issued with an individual certificate of airworthiness (C of A) on or after April 8th, 2014 that have the capability to operate data link communications and are required to be equipped with a CVR, shall record data link communications on a recorder, as defined by EASA CAT.IDE.A.195
- Helicopters first issued with an individual certificate of airworthiness (C of A) on or after April 8th, 2014 that have the capability to operate data link communications and are required to be equipped with a CVR, shall record data link communications on a recorder, as defined by EASA CAT.IDE.H.195
- Rules apply to forward-fit only, no current requirement for retrofit

The FA2100 and FA5000 series solid state recorders are capable of OMS and CPDLC data link recording:



Model	FA2100 Series SSCVR	FA5000 Series SSCVDR
Type	Solid State Cockpit Voice Recorder	Solid State Cockpit Voice and Data Recorder
Recording Time	120 minutes audio 120 minutes data link	120 minutes audio 120 minutes data link
Channels	4 channels audio	4 channels audio
Data Link Capability	ARINC 429 OMS/CPDLC	ARINC 429 OMS/CPDLC
Regulatory	EUROCAE MOPS ED-56A	EUROCAE MOPS ED-112
Certification	TSO-C123a	TSO-C123b
Power	115 VAC / 28 VDC	115 VAC / 28 VDC

L-3 Recorders on Commercial and BGA Platforms

CUSTOMER	AIRFRAME
AIRBUS	A300 / A330 / A340 A320 Family, A350 A380
ATR	42 / 72
AVIC	ARJ 21
BEECHCRAFT	C 90 / 200 / 350 / B1900 400 / PREMIER HAWKER
BOEING	737 / 757 / 767 / 747 / 777 / BBJ
BOMBARDIER CRJ	100 / 200 / 700 / 900 CONTINENTAL / 604 LEAR 31 / 45 / 60 / 85

CUSTOMER	AIRFRAME
CESSNA	ALL TYPES CITATION X
DORNIER	DO 228/328
EMBRAER	135 / 145 / 170 /190 PHENOM / MLJ
GULFSTREAM	G IV / G V
HARBIN	Y-12
PIAGGIO	P-180
PILATUS	PC 7 / 9 / 12 / 21
SUKHOI	SUPERJET 100

- L-3 has already implemented the 90 day beacon for Forward Fit Recorder Solutions – conversion kit
 - SB L3AR-001 R1
 - SB FA2100FDR SB024 RB03
 - SB FA2100CVR SB022 R03



AS DIVERSE AS AVIATION ITSELF



Aviation Products

ACSS • Aviation Recorders • Avionics Systems • Display Systems • Electronic System Services

NextGen Transponders:

Soluciones de ADS-B Transponder de

L-3 Aviation Products

Resumen

Tom Lippincott

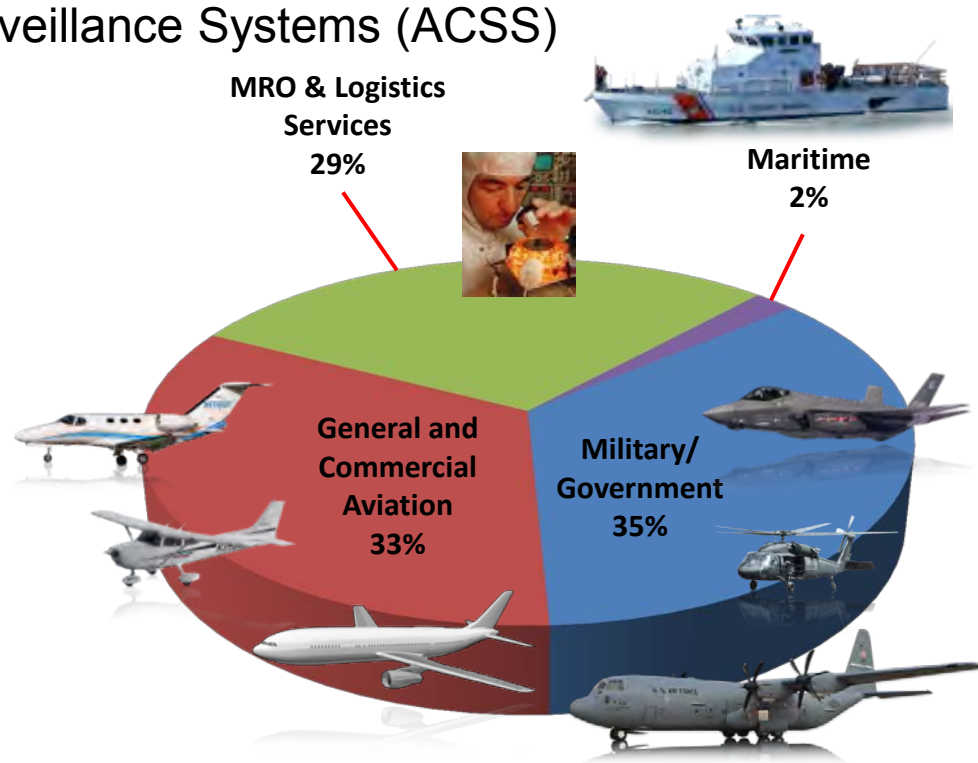
L-3 Aviation Products

Representante de Ventas

480-202-8321 Mobile

Thomas.Lippincott@L-3Com.com

- Conformada por cinco unidades de negocio enfocadas aeroespacial:
 - Aviation Communication & Surveillance Systems (ACSS)
 - Avionics Systems
 - Aviation Recorders
 - Display Systems
 - Electronic System Services
- ~1,500 empleados
- 13 lugares del mundo
- Mercado Diversos
- Inversión activo para el futuro



Standby Systems



ADS-B & Transponders



Stormscope®



TCAS I & II



TACAN+



Integrated Avionics

Flight Displays / Processors



Flight Data & Cockpit Voice Recorders



Avionics/Electronics Repair & Overhaul



LRUs & Controllers

Lynx NGT-9000



Lynx NGT-9000R





NXT-600

“RCZ” Form-factor



NXT-700

2MCU Form-factor



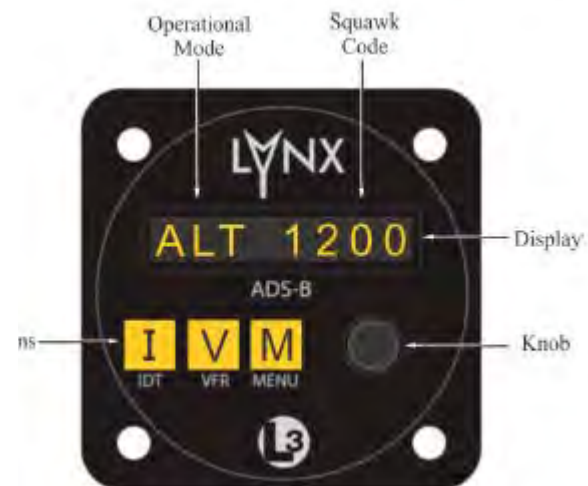
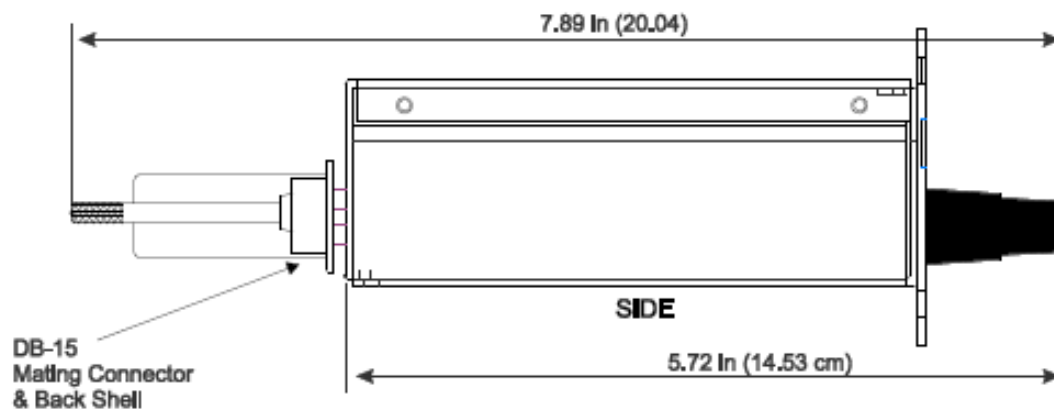
NXT-800

4MCU Form-factor

Lynx Transponders

- **NGT-9000 / NGT-9000+ / NGT-9000D / NGT-9000D+**
 - *Compatible con TSO-C112d, TSO-C166b, TSO-C195b, DO-260B, DO-181E*
 - *1090 MHz Mode S Extended Squitter Emisiones*
 - *Recibe AMBOS 1090 MHz and 978 MHz ADS-B and FIS-B*
 - *Receptor interna WAAS GPS, compatible con TSO C145c*
 - *Pantalla táctil multifunción*
 - **NGT-9000**
 - *Funciona como transponder y ADS-B, meteorología y tráfico mostrado en pantalla, en tablet apps por Wi-Fi Module, y por MFDs (ARINC 429, RS-232/422)*
 - **NGT-9000+**
 - *NGT-9000 con tráfico activo (Skywatch/TAS) habilitado*
 - **NGT-9000D**
 - *NGT-9000 con la opción diversity antenna habilitado*
 - **NGT-9000D+**
 - *NGT-9000 con las opciones tráfico activo y diversity antenna habilitados*

- *Las mismas características que NGT-9000, pero sin la pantalla táctil multifunción*
- *Utiliza un CP-2500 Controller o se puede utilizar un suite de aviónica integrada*
- *NGT-9000R*
 - *Unidad básica con características estándar*
- *NGT-9000R+*
 - *NGT-9000R con tráfico activo (Skywatch/TAS) habilitado*
- *NGT-9000RD*
 - *NGT-9000R con la opción diversity antenna habilitado*
- *NGT-9000RD+*
 - *NGT-9000R con las opciones tráfico activo y diversity antenna habilitados*



➤ Todos los modelos de montaje en panel de doble banda contienen:

- Pantalla táctil multifunción
- Mode S 1090ES transponder (ADS-B OUT)
- 1090MHz IN
- 978MHz UAT IN (trafico y meteorología de FIS-B)
- Se adapta a bastidores de radio estándar de 6,25 pulgadas
- Receptor interna WAAS GPS, compatible con TSO C145c
- Puerto de mantenimiento USB
- Módulo de configuración de datos en arnés
- Software cargable en el sitio
- +14VDC or +28VDC
- Salida serial de Wi-Fi



- Dos nuevas características para el NGT-9000
 - ATAS (también llamado TSAA)
 - Class B Terrain Awareness and Warning System (TAWS)
- Ambas funciones se activan con códigos de habilitación de software
- ATAS da alertas de tráfico utilizando información de tráfico ADS-B IN
 - Primera ATAS certificada (TSO-C195b) para ADS-B IN
- La clase B TAWS integrada da alertas de terreno y obstáculos



NGT-9000 Block Diagram



WAAS GPS Antenna



Pressure Altitude
(Grey code, serial, digital)



Transponder
Antenna



Audio Alerting (ATAS, TAS, TAWS)



Serial interface to
PIM-9000 Wi-Fi for
iPad/tablet integration



Digital Magnetic Heading



Power (+14V or +28V)
and GND



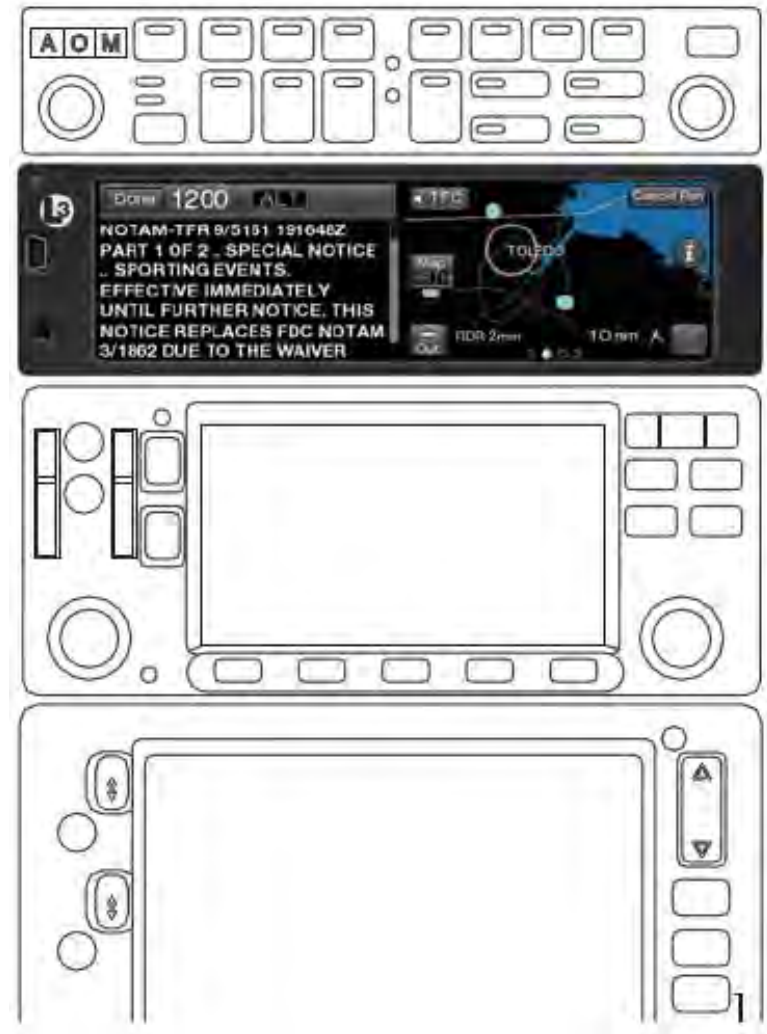
External Cockpit Displays

= Required Inputs/Outputs

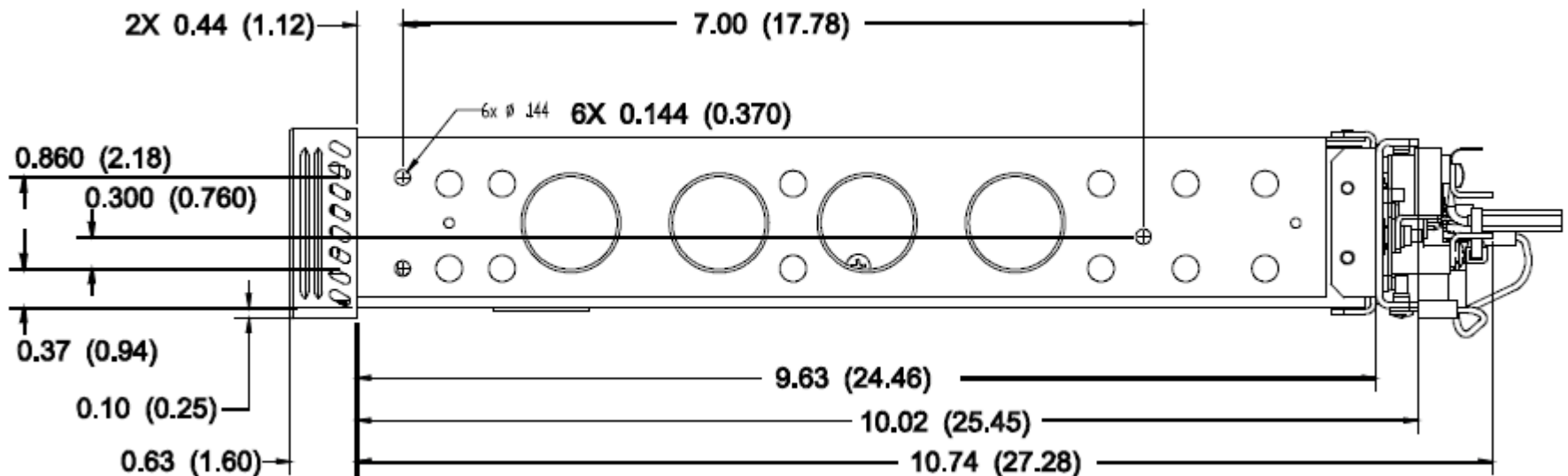
= Optional Inputs/Outputs

- Pantallas con Tráfico Activo (Formato TAS/TCAS ARINC 735)
 - Garmin G500/G600
 - Garmin GNS430(W)/530(W)
 - Garmin MX-20/GMX-200
 - Garmin GTN650/750
 - Avidyne EX500/5000
- Pantallas con Meteorología de *FIS-B* y Tráfico Activo (RS-422)
 - Aspen EFD1000 PFD and MFD, EFD500 MFD
 - Garmin MX-20/GMX-200
 - Avidyne IFD 440/540 – será probado pronto

- *Requisitos de Espaciado en el Panel:*
 - *Dimensiones del Bisel*
 - Anchura 6,25"
 - Altura 1,8"
- *Puede requerirse un espacio extra entre la aviónica montada en el panel debido a la altura del bisel NGT de 1,8"*
- *La profundidad de la unidad es de 11" incluyendo conectores*



- *Se requiere un espacio extra entre los bastidores debido a que el bisel NGT es ligeramente más alto que el propio bastidor*
- *La profundidad de la unidad es de 11" incluyendo conectores*



- AML STC para el NGT-9000/9000R en....
- US FAA Part 23/25 aeronaves con ala fija
- US FAA Part 27/29 helicópteros

United States of America
Department of Transportation - Federal Aviation Administration

Supplemental Type Certificate

Number SA02444AK

This Certificate issued to: ADS-B Technologies, LLC
900 Merrill Field Drive
Anchorage, Alaska 99501

certifies that the change in the type design for the following product with the limitations and conditions therein as specified herein meets the airworthiness requirements of Part 23 of the Federal Aviation Regulations:

Original Product: Type Certificate Number: *Refer to FAA Approved Model List (AML), Number SA02444AK, Revision 1, dated June 19, 2015, or later FAA approved revision, for airplane makes and models, corresponding Type Certificate numbers, and applicable airworthiness regulations.

Model: _____
Model: _____

Description of Type Design Change:
Approval of the L-3 Communications NGT 9000/9000R ADS-B system installed in accordance with the Master Data List, L3-76AK-MDL1, Revision 1, dated June 2, 2015, or later FAA approved revision.

Limitations and Conditions:

- 1) The installer must determine whether this design change is compatible with previously approved modifications.
- 2) If the holder agrees to permit another person to use this Certificate to alter the product, the holder shall give the other person written evidence of that permission.
- 3) Installation requires prior FAA approved antenna installation for Global Positioning antenna, Universal Access Transceiver antenna and 1090 megahertz antenna.
- 4) Instructions for Continued Airworthiness, L3-76-ICA1, Revision 1, dated May 22, 2015, or later FAA accepted revision is required as part of this installation.

Limitations and Conditions continued on Page 3

This certificate and the supporting data which is the basis for approval shall remain in effect until superseded, suspended, voided or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: July 18, 2015
Date of issuance: March 31, 2015

By direction of the Administrator:
Stacie Bushardt
For: J
August A. Asay
Manager, Anchorage Aircraft Certification Office

(7566)

Any alteration of this certificate is prohibited by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.
This certificate may be transferred in accordance with FAR 21.67.

United States of America
Department of Transportation - Federal Aviation Administration

Supplemental Type Certificate

Number SR02471AK

This Certificate issued to: ADS-B Technologies, LLC
900 Merrill Field Drive
Anchorage, Alaska 99501

certifies that the change in the type design for the following product with the limitations and conditions therein as specified herein meets the airworthiness requirements of Part 27 of the Federal Aviation Regulations:

Original Product: Type Certificate Number: *Refer to FAA Approved Model List (AML), Number SR02471AK, dated February 16, 2016, or later FAA approved revision, for airplane makes and models, corresponding Type Certificate numbers, and applicable airworthiness regulations.

Model: _____
Model: _____

Description of Type Design Change:
Installation of the L-3 Communications NGT-9000/9000R ADS-B System in accordance with L3nx NGT-9000 and CP2500 Rotorcraft Installation Manual, L3-89-IM, Revision 0, dated December 2, 2015, or later FAA approved revision.

Limitations and Conditions:

- 1) The installer must determine whether this design change is compatible with previously approved modifications.
- 2) If the holder agrees to permit another person to use this Certificate to alter the product, the holder shall give the other person written evidence of that permission.
- 3) Installation requires prior FAA approved antenna installation for Global Positioning antenna, Universal Access Transceiver antenna and 1090 megahertz antenna.
- 4) Rotorcraft Flight Manual Supplement or Supplemental Flight Manuals, L3-89-RFMS1, Revision 0, dated February 16, 2016, is required to be carried on the rotorcraft as part of the installation of the NGT-9000 or L3-89-RFMS2, Revision 0, dated February 16, 2016, is required to be carried on the rotorcraft as part of the installation of the NGT-9000R, or later FAA approved revisions.

This certificate and the supporting data which is the basis for approval shall remain in effect until superseded, suspended, voided or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: August 8, 2015
Date of issuance: February 16, 2016

By direction of the Administrator:
August A. Asay
August A. Asay
Manager, Anchorage Aircraft Certification Office

(7566)

Any alteration of this certificate is prohibited by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.
This certificate may be transferred in accordance with FAR 21.67.

NXT Transponders

NextGen Transponder



NXT-600

“RCZ” Form-factor



NXT-700

2MCU Form-factor

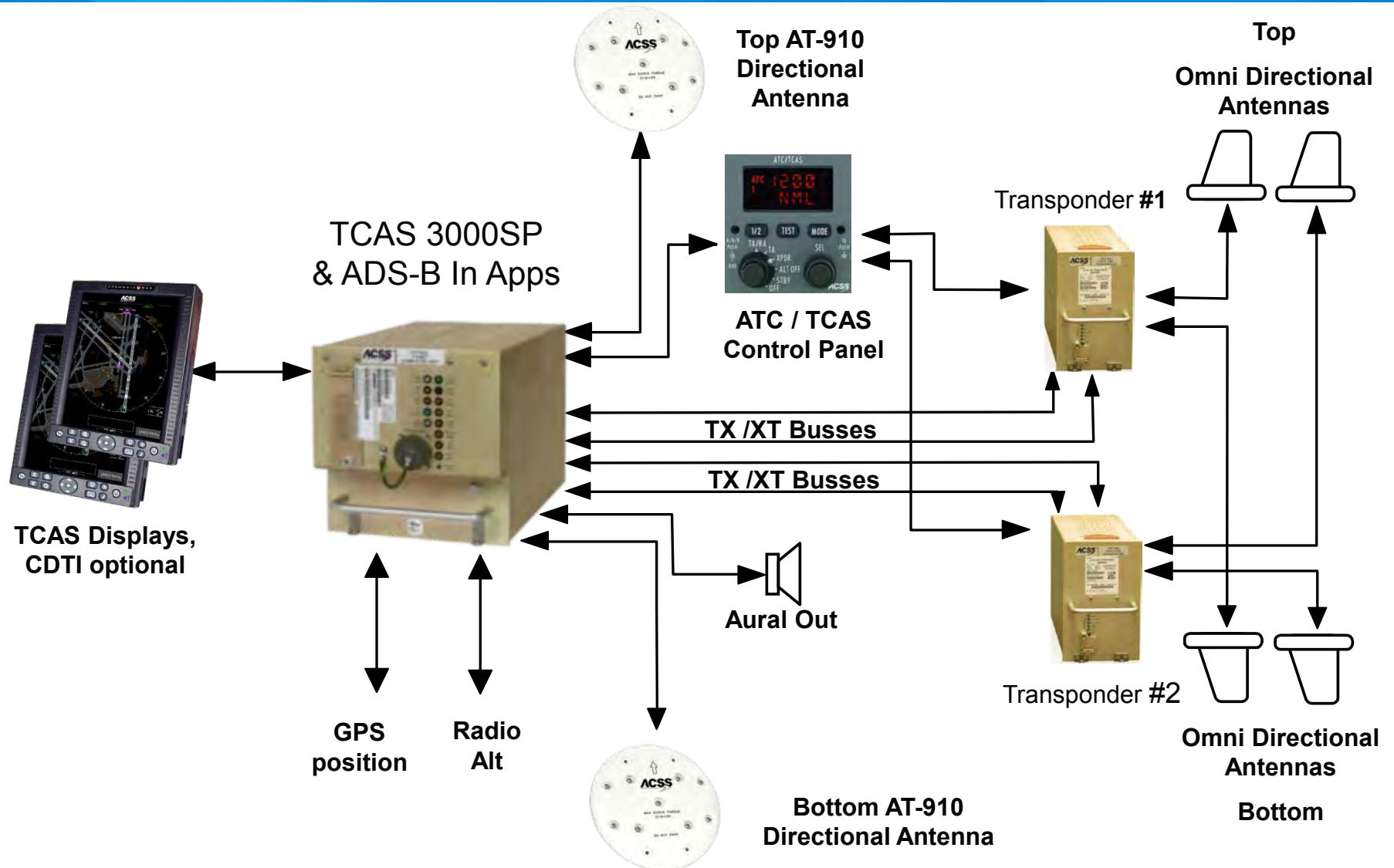


NXT-800

4MCU Form-factor

➤ *NXT-600/700/800 NextGen Transponders*

- *Compatible con DO-260B y DO-181E (EASA) – Cumple con el mandato global ADS-B*
- *TSO-C112d (Mode S ES transponder)*
- *TSO-C166b (ADS-B Out)*
- *Compatible con Elementary Surveillance (ELS) y Enhanced Surveillance (EHS)*
- *Funcionalidad de enlace de datos para Downlink of Aircraft Parameters (DAPs)*
- *DC o AC (Solo el NXT-800)*
- *Compatible con todos las sistemas ARINC 735B/735A/735 TCAS II*
 - *incluso ACSS TCAS 3000SP, TCAS 2000, T²CAS, T³CAS*



- Reemplazo de factor de forma para legado RCZ-852
- Compatible con Mandato EASA/FAA 2020 DO-260B
- La siguiente generación basada en la forma del predecesor RCZ-852,
 - Más de 1500 unidades RCZ vendidas
 - El mayor nivel de DO-260B Out (A3)
 - Compatible con DO-181E, DO-260B, A718A-4
- Elementary y Enhanced Surveillance (ELS y EHS)
- Trabaja con todos los TCAS II de estándar ARINC
- Mode S Transponder Comercial
- Interfaz del sistema de mantenimiento a bordo
- Software actualizable a través del panel frontal RJ-45
- Disponible como producto autónomo
- En producción con Aeronaves ATR y Q-400



RCZ-852



NXT 600

- *Reemplazo de factor de forma para MST-67A*
 - *¼ ATR short form*
 - *El operador puede utilizar la bandeja existente*
 - *Puede utilizar el bastidor de montaje existente y los conectores*
 - *Compatible con sistemas retrofit TCAS II, 7.1*
 - *No se requiere un controlador adicional*



■ Features

- *Trabaja con Procesadores TPU-67A TCAS II (KFS-578A/PS-578A/PS-550 Control)*
 - o *CD-674C control*
 - o *CTA-81A/81D Control*
 - o *RMS-555 Radio Management System*
- *Trabaja con Procesadores Rockwell Collins TTR-921, TTR-2100 TCAS II*



- *Un Model List Supplemental Type Certificate (AML STC) con FAA, TCCA y EASA se ofrecerá como una ruta de certificación*
- *Plataformas Compatibles con NXT-700*
 - *Beechcraft Hawker 125-400/600/700, Early Series*
 - *Beechcraft Hawker 400 SP/ (Beechjet), Early 400 Series only*
 - *Bombardier CL601-3A/R*
 - *Dassault Aviation Falcon 50, 20, 900, 900B and Falcon 10*
 - *Gulfstream III and IIB*
 - *Hawker Beechcraft 750/950*
 - *IAI Westwind 1124*
 - *Learjet 35, 36, 35A and 36A*
 - *Textron Aviation Inc. Citation Jet, Ultra, VII and 550*
 - *Más....*



- Reemplazo de factor de forma para legado XS-950 ATDL
- Compatible con el Mandato EASA/FAA 2020 DO-260B
 - Basado en XS-950 predecessor
 - Más de 11.000 Unidades Vendidas
 - Primera certificación en junio de 2010 (en XS-950)
 - El nivel más alto de DO-260B Out (A3)
 - Compatible con DO-181E, DO-260B, A718A-4
 - NXT-800 TC'd en B737, B767, & B777
- Elementary & Enhanced Surveillance
- Trabaja con todos los TCAS II de estándar ARINC
- Mode S Transponder Comercial
- Interfaz del sistema de mantenimiento a bordo
- Software actualizable a través del panel frontal RJ-45
- Disponible como producto autónomo



ATDL Mode S Level 4/5



NXT 800

	NXT-600	NXT-700	NXT-800
PHYSICAL DESCRIPTION			
Size (inches)	3.4 (H) x 4.1 (W) x 14.01 (L)	4.76 (H) x 2.25 (W) x 12.4 (L)	4 MCU
Weight	5.0 lbs.	5.5 lbs.	8.6 lbs. (AC), 7.8 lbs. (DC)
Mounting	MT-600 Mount	ARINC 404A, 1/4 ATR Short	ARINC 600 4 MCU Mount
Cooling	Internal	Internal	ARINC 600 External
CERTIFICATION			
Environmental	DO-160G		
TSO/JTSO	C112d, C166b / C112d		
Software	DO-178B Level B		
Transp. Data Link Capability	ICAO Level 3 (COMM-A/B/C)		
ADS-B Capability	1090ES Extended Squitter per RTCA DO-260B MOPS for 1090 ADS-B Equipment		
Operating Altitude	Sea level to 55,000 feet		
Operating Temperature	-55 to +70 degrees C		
Storage Temperature	-55 to +85 degrees C		
Power	28V DC	28V DC	115VAC, 400Hz or 28V DC
Power Consumption	28 Watts (standby), 55 Watts (maximum)	28 Watts (standby), 55 Watts (maximum)	40 Watts (standby), 85 Watts (maximum)
No. of Antenna Ports	2 (diversity)		
INTERFACES			
Controller	Low speed ARINC 429		
TCAS II	High speed ARINC 429		
GPS	High or low speed ARINC 429		
Altimeter	ARINC 429/575 (digital air data)		
Flight Identifier	Various		
Maintenance Computer	Low speed ARINC 429		
WebEDDIT	RS-232		

Gables G7130-XX



Item	Specification
Dimensions (maximum):	
• Height	2.25 in. (57.2 mm)
• Weight	5.75 in. (146.1 mm)
• Length	5.80 in. (147.3 mm)
Weight (maximum)	2.0 lb (0.907 kg) (Gables units)
Power Requirements:	
• Primary	+28 ± 4 V dc, 0.25 A maximum current
• Lighting	5 V, 400 Hz, 2.3 A maximum
Mating Connectors:	
• J1	M83723/75R16247 or equivalent
• J2 (Dual Mode S transponder Version)	M83723/75R16248 or equivalent
Mounting	Unit Dzus Fasteners

SPECIFICATIONS		
PHYSICAL		
Unit Dimensions	Refer to Outline Dimensions, Figure 201	
Weight	1.1 lbs (0.50 Kg) maximum	
Mounting	Two modified round allen keyed mounting screws, washers, and hex nuts	
Color	*Front Panel	Black, Fed. Std. 595b color 37038 Gray, Fed. Std. 595b color 36118
	*Pushbutton Keys	Black, Fed. Std. 595b color 37038 Gray, Fed. Std. 595b color 36118
	*Mode Select Rotary Knob	Black, Fed. Std. 595b color 37038 Gray, Fed. Std. 595b color 36118
	*Knobstack	Black, Fed. Std. 595b color 37038 Gray, Fed. Std. 595b color 36118
Front Panel Display (LCD)	*2 row Twisted Nematic	Backlighting - White Amber NVIS
Panel Lighting	GEI Lighting Spec. Document A40810	
Temperature	Operating	-20° C to + 70° C
	Storage	-55° C to +85° C
Cooling	No special requirements	
ELECTRICAL		
Power Requirements	Control Panel, Annunciators, LCD 28 Vdc @ 7 Watts (maximum) Backlighting, Light Plate	
SYSTEM		
ARINC 429	Mark 33 Digital Information Transfer System (DITS)	
ARINC 532D	Air Traffic Control Transponder	
ARINC 572-1	Mark 2 Air Traffic Control Transponder	
ARINC 718	Mark 4 Air Traffic Controller Transponder (Mode-S/ATCRBS)	
ARINC 720	Digital Frequency/Function Selection	
ARINC 735	TCAS	



¿Qué hay de una fuente de posición GPS compatible con las normas para mi transpondedor ADS-B NXT?

...tenemos eso cubierto también!!



Fuente de GPS compatible con WAAS / SBAS con 978 MHz UAT
ADS-B IN

- *Solución de fuente de posición GPS compatible con el mandato y barata para los transpondedores Mode S NXT NextGen*
- *No es necesario actualizar el FMS para cumplir con ADS-B*



- TSO-C145c, C154c, C157a
- Compatible con AC20-138D y AC20-165B
- Diseñado para ser emparejado con la línea NXT de transpondedores
- Envía la posición GPS, velocidad, tiempo e información de integridad al transpondedor NXT por ARINC 429
- Contiene receptor de 978Mhz UAT ADS-B IN para meteorología gratis (sin suscripción) de FIS-B
- Interfaz Wi-Fi a la computadora de la tableta para exhibir productos de meteorología de FIS-B

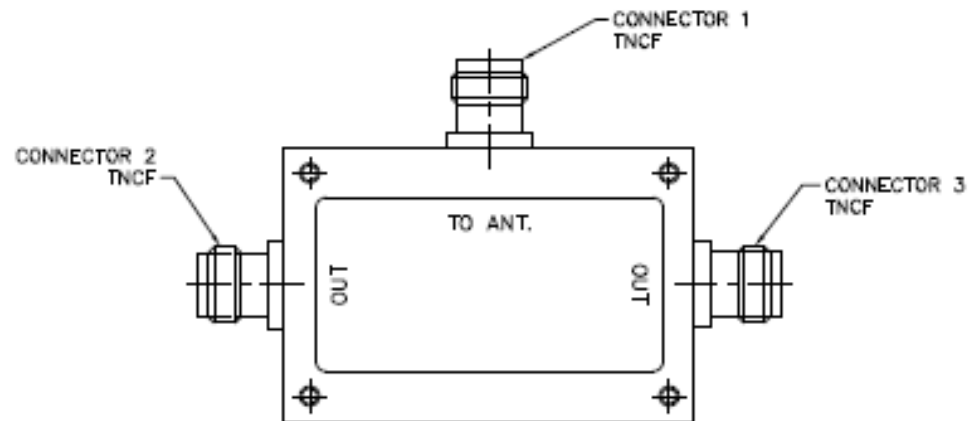
- *CMC*
 - *CMA-5024 GPS/SBAS Receivers*
- *Rockwell Collins*
 - *GPS-4000*
- *FreeFlight*
 - *1201*
 - *1203C*
 - *1204*

- US FAA AML STCs se están desarrollando para el NXT-600 y el 700 con el NXG-900 como fuente de posición, así como las fuentes GPS mencionadas anteriormente

- *Elimina la adición de múltiples antenas GPS para sistemas de transpondedor dual*
- *Está aprobado por US FAA STC*



GPS Networking GPS Splitter p/n LDCBS1X2-N



**AeroAntenna Technology Inc.
PD20RG GPS Coupler**



NOW IS A GOOD TIME FOR TCAS CHANGE 7.1

Our TCAS Platforms:

Citation Mustang	Gulfstream 350
Citation Sovereign	Gulfstream 450
Citation X	Gulfstream 500
Citation XLS	Gulfstream 550
Embraer Legacy	Hawker Horizon
Embraer Phenom	Learjet 40
Falcon 2000	Learjet 40XR
Falcon 7X	Learjet 45
Falcon 900	Learjet 45XR
Global 5000	



Aviation Products

- Change 7.1 proporciona comandos RA específicos, claros y concisos que resultan en un tiempo de reacción más rápido mejorando el rendimiento de la evitación
 - Cambia la actual advertencia auditiva de TCAS II de "Adjust Vertical Speed, Adjust" a "Level Off, Level Off"
 - Introduce mejoras a la actual lógica de reversión para abordar la emisión tardía de RA de reversión y las fallas potenciales para iniciar la inversión de RA
- Change 7.1 reduce la probabilidad de una colisión en el aire en el Espacio Aéreo Europeo de 1 en cada 3 años a 1 en cada 12 años
- Instalación Fácil - Change 7.1 es muy probable solamente una actualización de software cargable de ala
- Mandatos Change 7.1 - Si tiene la intención de volar su avión en el Espacio Aéreo Europeo o de Hong Kong, debe cumplir con el mandato Change 7.1
 - Todas las aeronaves de transporte con turbina civil con más de 19 asientos de pasajeros (o MTOW por encima de 5.700 kg / 12.566 libras)

Description	Change 7.1 Part Number
TCAS II	4066010-914
TCAS 2000	7517900-10020, -55020, -71020
TCAS 2000 (Military Version)	7517900-56120
TCAS 2000 +MASS	7517900-20003, -65003
T2CAS (Non-Airbus)	9000000-10309, -55309, -20309
T2CAS (Airbus)	9000000-11414
T2CAS + MASS	9000000-TBD
TCAS 3000	9003000-10005, -55005, -65005
TCAS 3000 SP	9003500-10905, -55905, -65905
TCAS 3000 SP with A3 Sensitivity	9003500-12907, -58907, -68907

■ CPDLC “Controller Pilot Data Link Communication”

- Un componente de Future Air Navigation System (FANS)
- Comunicación digital basada en texto entre el Control de Tráfico Aéreo y los Pilotos
- Se utiliza actualmente en áreas donde las comunicaciones VHF y HF no están disponibles o son poco fiables
 - Rutas Oceánicas Específicas
 - Rutas Terrestres Aisladas
- Funciona con diferentes redes de enlace de datos, tipos de equipos y proveedores de servicios:
 - Iridium, Inmarsat, VHF Data Link (VDL Mode 2)
- Cuando se requiere un FDR & CVR y cuando se instalan sistemas de enlace de datos con CPDLC, los datos de conjunto de mensajes deben registrarse

■ ¿Cuándo se requiere la grabación de enlace de datos?

- FAA
 - “All airplanes or rotorcraft required by this section to have a cockpit voice recorder and a flight data recorder, that install datalink communication equipment on or after December 6, 2010 (FAR 135.151h) or April 6, 2012 (FAR 91.609j), must record all datalink messages as required by the certification rule applicable to the aircraft.”
 - Si el sistema de enlace de datos se instala en o después de las fechas anteriores, se requiere que el CVR lleve a cabo la grabación de mensajes de enlace de datos
 - Referencia Circular de asesoramiento AC20-160 para los medios de cumplimiento y los requisitos de conjunto de mensajes
 - Clarificación de reglas - FAA Info Document # 10016

■ ¿Cuándo se requiere la grabación de enlace de datos?

- EASA

- Los aviones expedidos por primera vez con un certificado individual de aeronavegabilidad (C de A) a partir del 8 de abril de 2014 que tengan la capacidad de operar comunicaciones de enlace de datos y deban estar equipados con un CVR, registrarán las comunicaciones de enlace de datos en un registrador, definido por EASA CAT.IDE.A.195
- Los helicópteros primero expedidos con un certificado individual de aeronavegabilidad (C de A) a partir del 8 de abril de 2014 que tienen la capacidad de operar comunicaciones de enlace de datos y deben estar equipados con un CVR, deben registrar las comunicaciones de enlace de datos en un registrador, definido por EASA CAT.IDE.H.195
- Las reglas se aplican sólo al encaje directo, sin requerimiento actual de retrofit

Las grabadoras de “solid state” de las series FA2100 y FA5000 son capaces de registrar el enlace de datos OMS y CPDLC:



Model	FA2100 Series SSCVR	FA5000 Series SSCVDR
Type	Solid State Cockpit Voice Recorder	Solid State Cockpit Voice and Data Recorder
Recording Time	120 minutes audio 120 minutes data link	120 minutes audio 120 minutes data link
Channels	4 channels audio	4 channels audio
Data Link Capability	ARINC 429 OMS/CPDLC	ARINC 429 OMS/CPDLC
Regulatory	EUROCAE MOPS ED-56A	EUROCAE MOPS ED-112
Certification	TSO-C123a	TSO-C123b
Power	115 VAC / 28 VDC	115 VAC / 28 VDC

L-3 Recorders on Commercial and BGA Platforms

CUSTOMER	AIRFRAME
AIRBUS	A300 / A330 / A340 A320 Family, A350 A380
ATR	42 / 72
AVIC	ARJ 21
BEECHCRAFT	C 90 / 200 / 350 / B1900 400 / PREMIER HAWKER
BOEING	737 / 757 / 767 / 747 / 777 / BBJ
BOMBARDIER CRJ	100 / 200 / 700 / 900 CONTINENTAL / 604 LEAR 31 / 45 / 60 / 85

CUSTOMER	AIRFRAME
CESSNA	ALL TYPES CITATION X
DORNIER	DO 228/328
EMBRAER	135 / 145 / 170 /190 PHENOM / MLJ
GULFSTREAM	G IV / G V
HARBIN	Y-12
PIAGGIO	P-180
PILATUS	PC 7 / 9 / 12 / 21
SUKHOI	SUPERJET 100

- L-3 ya ha implementado el faro de 90 días - kit de conversión
 - SB L3AR-001 R1
 - SB FA2100FDR SB024 RB03
 - SB FA2100CVR SB022 R03



AS DIVERSE AS AVIATION ITSELF



Aviation Products

ACSS • Aviation Recorders • Avionics Systems • Display Systems • Electronic System Services

Futuro en la
modernización
del espacio
aéreo?

...Como podemos estar
preparados?



**Rockwell
Collins**

A que se refiere la “Modernización del Espacio aéreo”?

• C



& no-

• N

- Oceánicas RNAV-10 y RNP-4
- Área Terminal
 - RNAV & RNP-1 SIDS y STARS
 - RNAV-1 & -5 llegadas/salidas
- Aproximaciones & aterrizaje
 - NPA
 - RNP AR 0.3 & <0.3
 - PA
 - ILS
 - LPV & LP
- GNSS (constelaciones múltiples)
- SBAS (múltiples agencias aéreas)

• Vigilancia(Surveillance)

- ACAS/TCAS 7.1
- Transponder (requerimientos)
- ADS-B Out
 - DO-260A
 - DO-260B
 - GNSS (diferente requerimiento)
- TAWS

• Operaciones oceánicas

- FANS 1/A

donde?

US

Cuand

01 Dic
2015

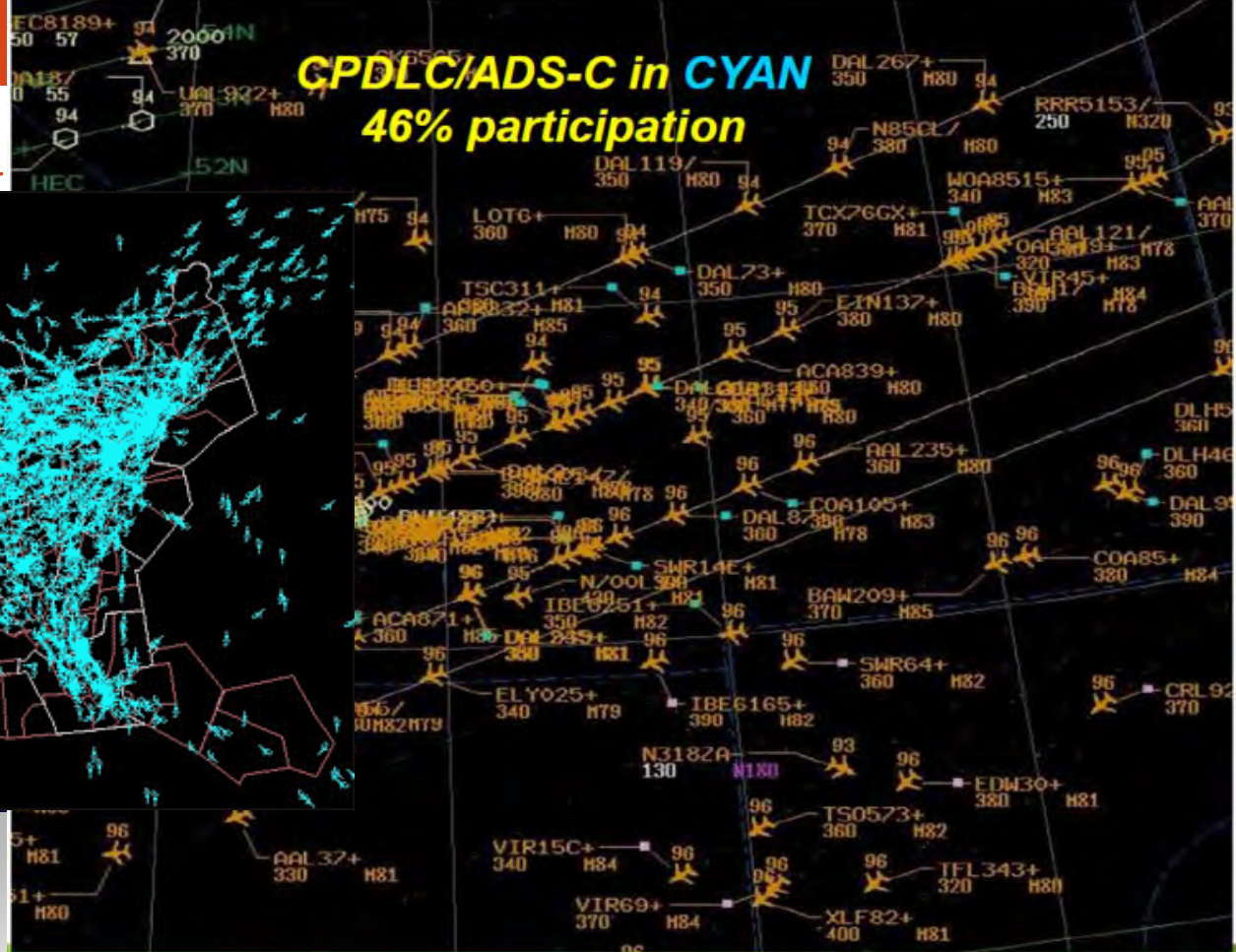
2016

2017

2020



Por que la Moderniza



<https://vimeo.com/98941796>

Los controladores se basan en las comunicaciones de voz transmitidas, y numerosos pasos de entrada manual de datos

Limitando las opciones de ruta / altitud; esto lleva a tener un programa de modernización con una fecha

ATC necesita adaptarse a un mayor número de aviones en el mismo espacio aéreo (es decir, reducir los mínimos de separación), mientras se mantiene el mismo nivel de seguridad

Por que la modernización?



Estaciones de VOR y DME antiguas

- Localización de los VOR en referencia a los aeropuertos y pistas causa limitaciones en ruta
- La Infraestructura limita las opciones del flujo de tráfico Cuando el clima interfiere en rutas ocupadas

Radar de Vigilancia (surveillance radar)

- Tecnología de la II Guerra
- Pone límites a la puntualidad y la cantidad de los datos de tráfico que el ATC utiliza para operar el espacio aéreo



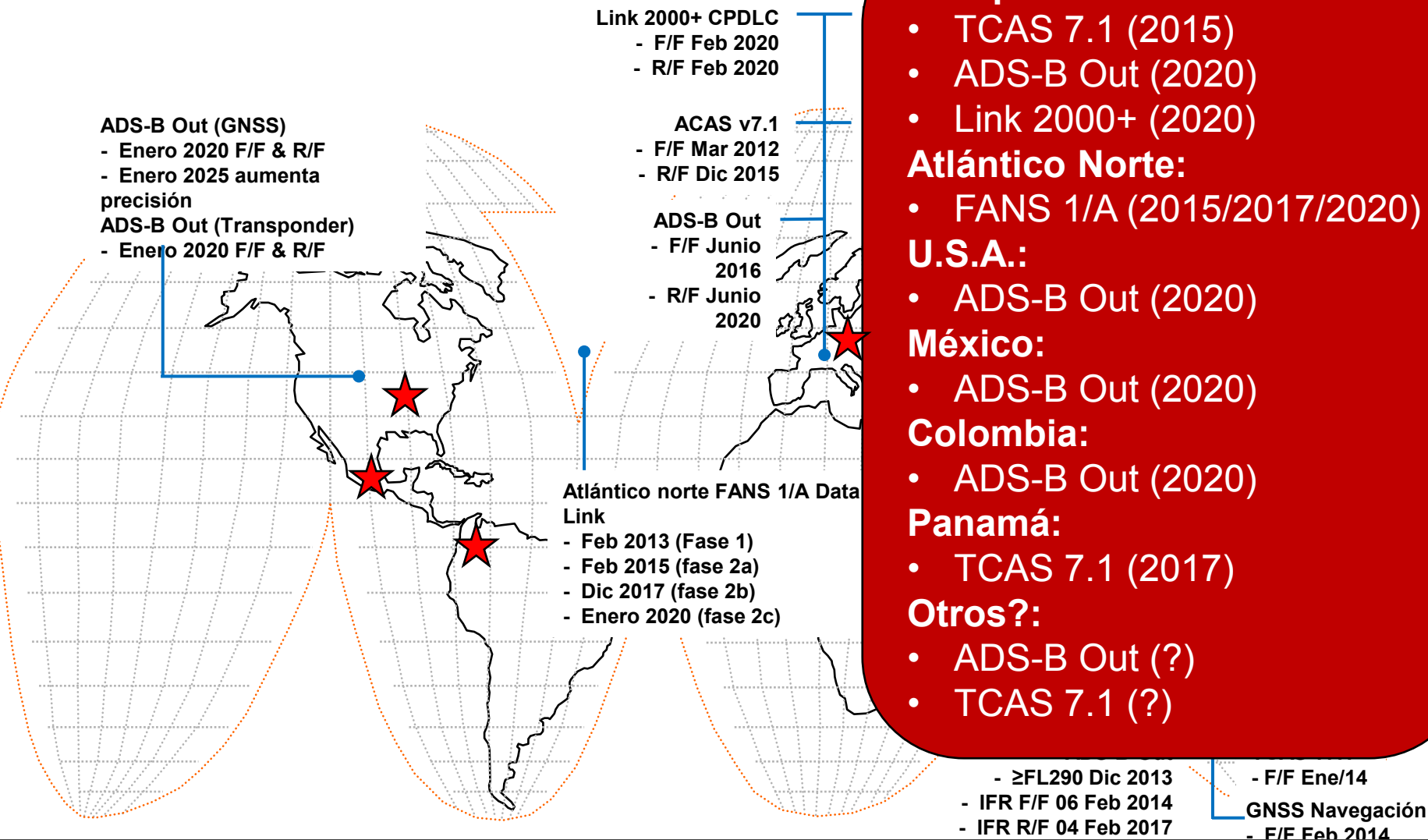
ATC necesita reemplazar la infraestructura antigua de navegación y vigilancia con Infraestructura menos costosa, fácil de implementar y mantener .

Por que la Modernización y la reglamentación requerida?

- Mejora las comunicaciones entre los pilotos y el ATC
- Permite al ATC el manejo efectivo y seguro del incremento de datos de tráfico en espacios aéreos congestionados (Atlántico Norte, Europa, etc.)
- Permite rutas mas eficientes y mejores
- Provee al ATC con una infraestructura moderna para el radar secundario de vigilancia (secondary surveillance)



Reglamentación Global (resumen)



Si vas a volar en México, Colombia, Europa, o Espacio aéreo en USA,
Necesitaras tener equipo abordo para ADS-B Out.

TCAS II CAMBIO 7.1

Aprendimos la lección?

Que paso al finalizar 2015?

- Requerimiento de Europa fecha limite fue 1º de Diciembre
Muchísimos operadores esperaron hasta Octubre, Noviembre, Diciembre para ordenar el TCAS.
- Para entonces , solo había unas cuantas unidades disponibles...
así que los operadores no pudieron volar , Muchos vuelos fueron cancelados .



Esperar puede ser costoso—Los equipos son escasos a ultimo minuto, no programar instalación a tiempo es problemas... cancelación de viajes/ puede tener un alto costo.



ADS-B OUT – 2020

Que es ? Que equipo se requiere y con cuanto tiempo contamos ?

Definición de ADS-B

- Automatic Dependent Surveillance-Broadcast (ADS-B)
 - Nueva tecnología de vigilancia para apoyar la modernización del control de tráfico aéreo ATC
 - NextGen – Destinado para la modernización de US FAA Air Traffic Control da apoyo a mayor volumen de tráfico aéreo con mejor eficiencia y seguridad
 - SESAR – iniciativa “cielos únicos europeos “también para mejorar la eficiencia y la seguridad del espacio aéreo Europeo
- ADS-B Out **Mandated by 2020**
 - EL Transponder utiliza varias fuentes de información y envía automáticamente los parámetros de ajuste que proporcionan la ubicación, la altitud, la velocidad horizontal y vertical y diversos valores específicos de la aeronave
 - Reglamentario en varias regiones del mundo
- ADS-B In
 - El TCAS utiliza información de transponders de otras aeronaves que se mostrará en las pantallas de vuelo, proporcionando una mayor comprensión de la posición y mejora la funcionalidad de operación del tráfico aéreo
 - No es obligatorio, pero se espera implementar después de ADS-B out tiene la reglamentación para después de 2020

- Mejora la seguridad
 - Entendimiento de la situación operacional
 - Mas precisión y vigilancia continua de las aeronaves
 - Mejora la resolución de un posible conflicto
 - Da una imagen completa del espacio aéreo
 - Proporciona una indicación inmediata del movimiento de otras aeronaves
- Mejora la Eficiencia
 - Menor tiempo de espera en tierra
 - Perfil de ascenso mas eficiente para llegar a la altura deseada
 - Perfil de aproximación mas eficiente
 - Mejor equipo, mejor servicio
 - Ahorro de combustible al tener rutas mas efectivas
- Operaciones de Vuelo
 - Obtención de Mejores datos , mejor estructurada la ruta

ESTAS LISTO PARA EL ADS-B OUT?

La FAA estima que entre **105,000 a 166,000** Aviones en USA entre Aeronaves de Aerolíneas/Aeronaves Ejecutivas y Aeronaves de aviación General necesitan instalar equipos con ADSB OUT

En MEXICO se calcula que aproximadamente 4000 equipos se necesitaran para cumplir con ADSB OUT

PARA **LATIN AMERICA 2020** ES **MAÑANA**

PARA **USA 2020** IS **TODAY**



GNSS Satellite

CDTI



Ops Superficie



- **ADS-B Out**

- ATC usa la transmisión ADS-B Out para mejorar la vigilancia del espacio aéreo

- **ADS-B In**

- La Aeronave Usa la transmisión ADS-B Out de otras aeronaves y tierra para mostrar la información de Tráfico



ADS-B



ADS-B



ADS-B



ADS-B Receptor



Modernización del Control de Tráfico aéreo ATC

TDR-94(D)
-501



GPS-4000S



FLT ID/EHS

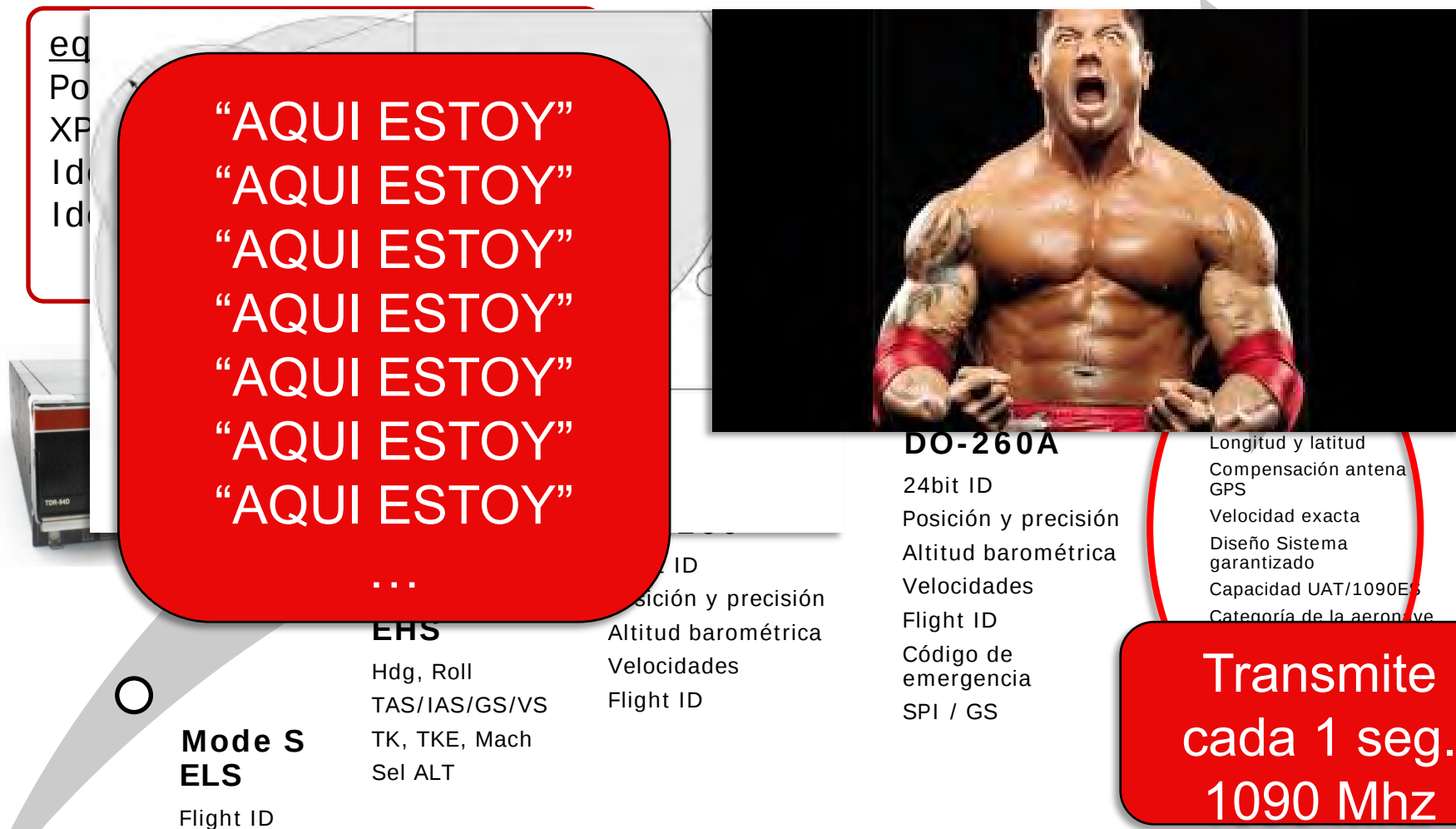


ADS-B Out significa tener :

- *Anuncio en Cabina de pilotos
- *GNSS Fuente de posición lat/lon (algunas regiones requieren habilitación de WAAS)
- *la Integración requiere modificación de instalación (adición de cableado para interconexión)
- *Transponder (ADS-B Out) tiene que cumplir con (DO-260/260A/260B)

Automatic
Dependent
Surveillance
-broadcast

ADS-B Out: Evolución del Transponder



Transponder DO-260A/B mas eficiente transmite más información, con máyor frecuencia (No tiene que esperar por interrogación SSR o TCAS).

ADS-B Out: GNSS Evolución del receptor

Común para ADS-B:

Pos:

XP

Id

Id

“precisión”

“precisión”

“precisión”

“precisión”

“precisión”

“precisión”

“precisión”

...

“Antiguo”

SA-On

(TSO-C129)

En ruta aNPA

Precisión: + / - 15m

“Actual”

Off/SA-Aware

(TSO-C196)

En ruta a NPA

Precisión: + / - 15m

Mejor respuesta en
precisión que “SA-On”
GNSS (se necesita para
parámetros NAC en -
260A/260B.)



Navegación primaria

En ruta a LPV

Precisión: + / - 1-3m

(Europa) GNSS tiene que tener:
-RAIM (Receiver Autonomous
Integrity Monitoring)
-FDE (Fault Detection and
Exclusion)

Se necesita de un GNSS preciso que de una posición exacta de la aeronave.

Revisión rápida – estándares actuales del GNSS

- TSO-C129 (GPS S/A On)
 - Estándares iniciales
 - Permite al equipo asumir la disponibilidad selectiva (selective availability (S/A)) continua activa (reducido por la disponibilidad)
- TSO-C196 (GPS S/A Aware)
 - Actualización del estándar TSO-C129, maneja la disponibilidad de selección (selective availability S/A)
- TSO-C145/TSO-C146 (SBAS) (Satellite-based Augmentation System)
 - Tiene SBAS , adiciona capacidad SBAS al TSO-c196

Revisión AC 20-165B Fuente de posición

3-3. Position Source.

a. Equipment eligibility. 14 CFR 91.227 is performance based and does not require any specific position source. The existing navigation equipment and airworthiness standards should be used, however they must be augmented to address the unique issues associated with ADS-B. A TSO authorization alone is not sufficient to ensure ADS-B compatibility. The position source must also comply with the appendix 2 minimum performance requirements. Compliance with the appendix 2 requirements may be documented in the position source manufacturer's installation instructions.

Note: Not all GNSS position sources will provide the same availability. See appendix 2 for more information on GNSS availability. The FAA recommends TSO-C145 or TSO-C146 position sources that meet the appendix 2 requirements to maximize availability and ensure access to the airspace identified in 14 CFR 91.227 after January 1, 2020.

Appendix 2

a. Position. GNSS position sources must provide a latitude and longitude output. Requirements and test procedures in TSO-C129/145/146/196 are sufficient and GNSS equipment with Technical Standard Order Authorization (TSOA) for the aforementioned TSOs require no additional qualification for the position output.

Note: The intent is to output position, velocity, and HFOM in a consistent manner for time of applicability (refer to DO-229D Section 2.1.2.6 and 2.1.2.6.2).

(1) **TSO C129.** The requirements outlined for 2D accuracy in paragraph (a)(3)(xvi) of TSO-C129 does not ensure full compliance for the GNSS unit. Additional means of compliance for this TSO requires GNSS manufacturers to substantiate that the latitude/longitude is output and referenced to WGS-84 coordinate system.

(2) **TSO C129a.** The requirements outlined for 2D accuracy in paragraph (a)(3)(xvi) of TSO-C129a does not ensure full compliance for the GNSS unit. Additional means of compliance for this TSO requires GNSS manufacturers to substantiate that the latitude/longitude is output and referenced to WGS-84 coordinate system.

(3) **TSO C145/146 Rev a Class 1.** Means of compliance for this TSO are defined in DO-229C, *Minimum Operational Performance Standards for Global Positioning System/Wide Area Augmentation System Airborne Equipment*, section 2.1.2.6.

(4) **TSO C145/146 Rev a Class 2/3.** Means of compliance for this TSO are defined in DO-229C sections 2.1.4.8 & 2.1.5.8.

(5) **TSO C145/146 Rev b/c Class 1.** Means of compliance for this TSO are defined in DO-229 D 2.1.2.6.

(6) **TSO C145/146 Rev b/c Class 2/3.** Means of compliance for this TSO are defined in DO-229D sections 2.1.4.8 & 2.1.5.8.

(7) **TSO C196/196a.** Means of compliance for this TSO are defined in DO-316, *Minimum Operational Performance Standards (MOPS) for Global Positioning System/Aircraft Based Augmentation System Airborne Equipment*, section 2.1.2.6.

b. Position source latency. GNSS position source manufacturer must provide position source latency information.

(1) **TSO C129.** Means of compliance for this TSO requires GNSS manufacturers to document the position source latency from Time Of Measurement (TOM) to time of position output. If this latency exceeds 0.9 seconds, it may not support the two second ADS-B transmission latency at the aircraft level.

(2) **TSO C129a.** Means of compliance for this TSO requires GNSS manufacturers to document the position source latency from TOM to time of position output. If this latency exceeds 0.9 seconds, it may not support the two second ADS-B transmission latency at the aircraft level.

(3) **TSO C145/146 Rev a Class 1.** Means of compliance for this TSO are defined in DO-229C section 2.1.2.6.2.

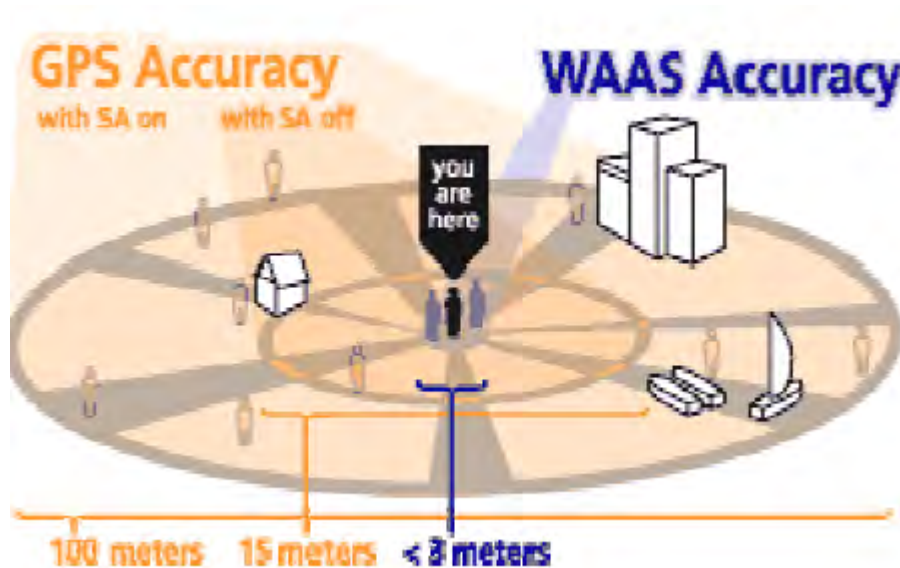
(4) **TSO C145/146 Rev a Class 2/3.** Means of compliance for this TSO are defined in DO-229C sections 2.1.2.6.2 and 2.1.5.8.2.

(5) **TSO C145/146 Rev b/c Class 1.** Means of compliance for this TSO are defined in DO-229 D 2.1.2.6.2.

(6) **TSO C145/146 Rev b/c Class 2/3.** Means of compliance for this TSO are defined in DO-229D sections 2.1.2.6.2 and 2.1.5.8.2.

(7) **TSO C196/196a.** Means of compliance for this TSO are defined in DO-316 section 2.1.2.6.2.

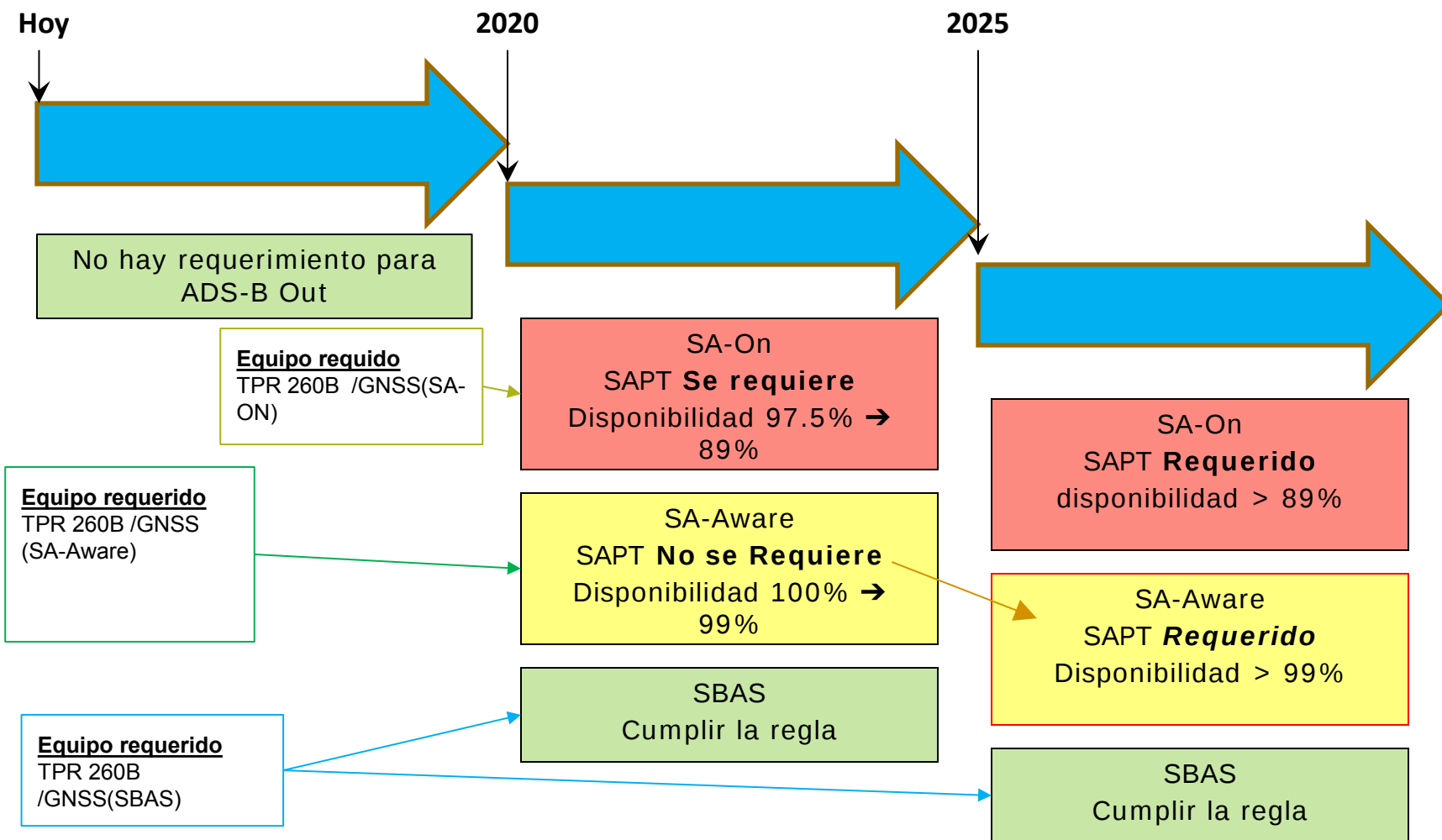
Beneficios de SA Aware (SA OFF)



- 100 metros: Precisión original del sistema GPS , el cual era sujeto a una degradación en la precisión impuesta por programa del Gobierno Americano conocido como Selective Availability (SA) .
- 15 metros: Típico GPS precisión de posición sin SA .
- 3-5 metros: Típico LAAS (SBAS) buena precisión de posición .
- < 3 metros: Típico WAAS (GBAS) precisión de posición casi exacta

GNSS actual y futuro

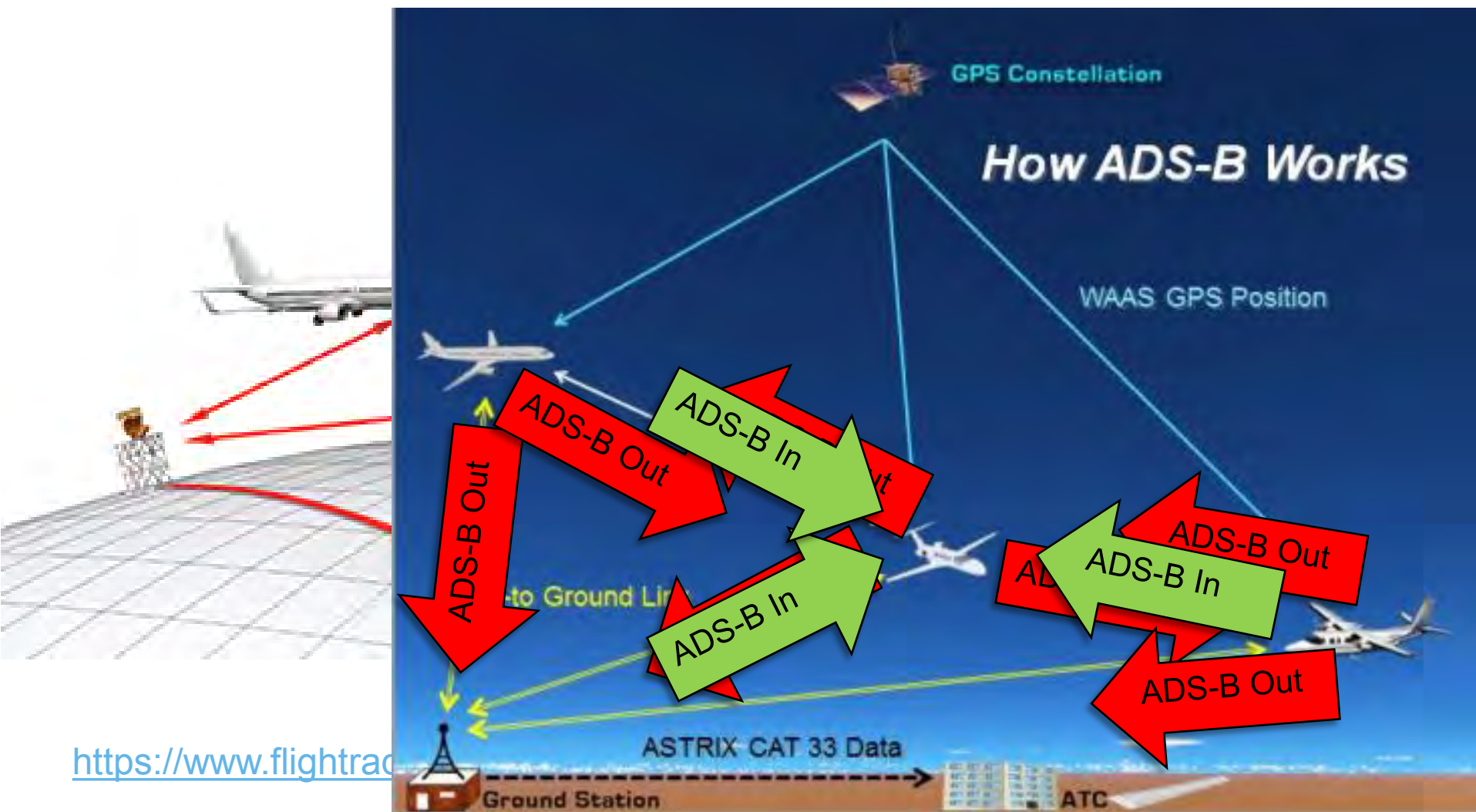
Recomendación (FAA) de contenido de quipos para 2020



NOTA: Uso de SAPT Implica retrasos potenciales en despacho de las aeronaves

FAA segmento fecha requerimiento ADS-B Out – TDR 260 B req (2020) y GPS Aware req (2025)

ADS-B Out: Red Terrestre



<https://www.flightradar24.com>

ADS-B Out funcionalmente reemplaza el sistema de radar secundario
ADS-B In funcionalmente da info. Como TCAS— no es parte del mandato ADSB out .

ADS-B Revisión rápida de los requerimientos del Reglamento

Región	Regulación Requerimientos	Requerimientos Técnicos	Fecha Forward Fit	Fecha Retrofit	Requerimiento Transponder	Mínimos requerimiento del GPS	Comentarios
Europea	IR 1207/2011	CS-ACNS	8 Junio 2016	7 Junio 2020	DO-260B	SA-On	SA Aware es Altamente recomendado, sin embargo no se requiere
USA	FAR 91.225/91.227	AC 20-165A	1º Enero 2020	1º Enero 2020	DO-260B	SA Aware / SBAS	SA On requerirá el uso de herramienta pre despacho SAPT Requerida para SA-AWARE en 2025
Hudson Bay	AIC 21-09 & AIC 31/11	AMC 20-24	20 Octubre 2011	20 Octubre 2011	DO-260	SA-On	ADS-B Out Aeronaves equipadas podrán volar trayectos preferenciales
Australia	CASA CAO 20.18	CASA CAO 20.18	12 Diciembre 2013	-	DO-260	SA Aware para aviones nuevos después 8 Diciembre 2016	No requiere retrofit de GPS
Hong Kong	Airworthiness Notice 102F, Issue 2, 28 Feb 2011	AMC 20-24 or CASA CAO 20.18 Appendix XI	31 Diciembre 2013	-	DO-260	SA On	-
Singapore	CAAS AIC 14	AMC 20-24 or CASA CAO 20.18 Appendix XI	31 Diciembre 2013	-	DO-260	SA On	-
Taipei	AIC 02/2012	AMC 20-24 or CASA CAO 20.18 Appendix XI	31 Diciembre 2014		DO-260	SA On	Regulación aplica desde 31/12/13 para rutas B576 o B591 a/o arriba FL290 sin Taipéi FIR

ADS-B Out – Cuando?: Reglamento (Resumen)

▪ Regulación Forward Fit

:

- Europa: Enero 2015
- Australia: Diciembre 2013
- USA: 2020

▪ Regulación Retrofit :

- Hudson Bay: Diciembre 2012
- Australia & Singapur: Diciembre 2013
- Hong Kong: Enero 2015
- Europa: 2020
- **USA: 2020**
- **México: 2020**
- **Colombia: 2020**



The ADS-B Out esta constantemente creciendo.

ADS-B revisión de reglamento En la Región

Región	Regulación Requerimientos	Requerimiento s os Técnicos	Fecha Forward Fit	Fecha Retrofit	Requerimiento Transponder	Requerimiento mínimo de GPS	Comentarios
México	PROY - NOM - 91/2 - SCT3 - 2014	Texto en regulación	1º Enero 2020	1º Enero 2020	DO-260B (v2)	NACp/v, NIC, etc., definido en la regulación	Similar a regulación FAA
Colombia	RAC 4.2.2.6 (publicado en Mayo 2016)	Regulación en el texto	1º Enero 2020	1º Enero 2020	DO-260B (v2)	TSO-C129a, 145/145d, 146c/146d, 196a/196b	Cualquier uso de transponder es requerido

Los requisitos de transponder y GNSS pueden variar de una región a otra, dependiendo de cuál es el objetivo de cobertura - "procedimiento espacio aéreo en ruta" VS "el espacio aéreo de radar".

The diagram illustrates the vertical and horizontal structure of Class A, E, B, and C airspace. At the top, Class A airspace is shown as a blue layer starting at 18,000 ft, with a yellow double-headed arrow indicating that UAT or 1090ES is required. Below this is Class E airspace, also a blue layer, with a yellow double-headed arrow indicating that UAT or 1090ES is required. The boundary between Class E and the surface-based classes (B and C) is marked at 10,000 ft. Class B and Class C are depicted as blue cylindrical volumes originating from airports on the ground. Class B has a horizontal radius of 30 nm and a vertical extent from the surface to 10,000 ft. Class C has a horizontal radius of 30 nm and a vertical extent from the surface to 10,000 ft. Both Class B and Class C have a yellow double-headed arrow indicating that UAT or 1090ES is required. To the left of the Class B/C area, a small aircraft is shown in a blue box labeled 'UAT or 1090ES required' with a horizontal arrow pointing left labeled '12NM' and '3000 ft MSL'. The background shows a green landscape and a blue sky. A dashed line on the right side indicates 'Excluding 2500 ft AGL'.

Donde se requiera Modo C, se requerirá ADS-B out (Modo S 1090 MHZ Transponder extended squitter)

Beneficios de ADS-B

- Aviones equipados con ADS-B- tendrán **prioridad sobre aviones no-equipados ADSB**, incluyendo mayor flexibilidad y rutas continuas.
- Reduce el Requisito de Reportes de posición Aeronaves equipadas con ADS-B
- Mejor conocimiento de la posición, reduce incursiones erróneas de entrada pistas
- Información tráfico en tiempo real en la cabina con un alcance de mas de 100 millas (In)
- Utilizando tecnología de información lateral y vertical; transmite datos de posición y de velocidad automáticamente para una mayor precisión.
- **Permite la vigilancia** en zonas remotas que no son mostradas actualmente en el radar.
- **Reduce Separación entre aeronaves** , haciendo los tiempos de llegadas y salidas mas predecibles, ATC puede realizar planeación por adelantado.
- **Reduce el costo de infraestructura** que se necesita para operar el espacio aéreo
- **Mejora la seguridad para la aviación.**
- Puede ampliar y adaptarse para su uso en la aviación general y en vehículos de tierra. Proporciona la vigilancia asequible y eficaz de todo el tráfico aéreo y terrestre, incluyendo en calles de rodaje y pistas de aterrizaje.

Operadores mejor equipados tendrán mejores rutas, mejor servicio
Mejores rutas=Ahorro Combustible/ reducción de tiempo

ADS-B Out Implementación en la Región

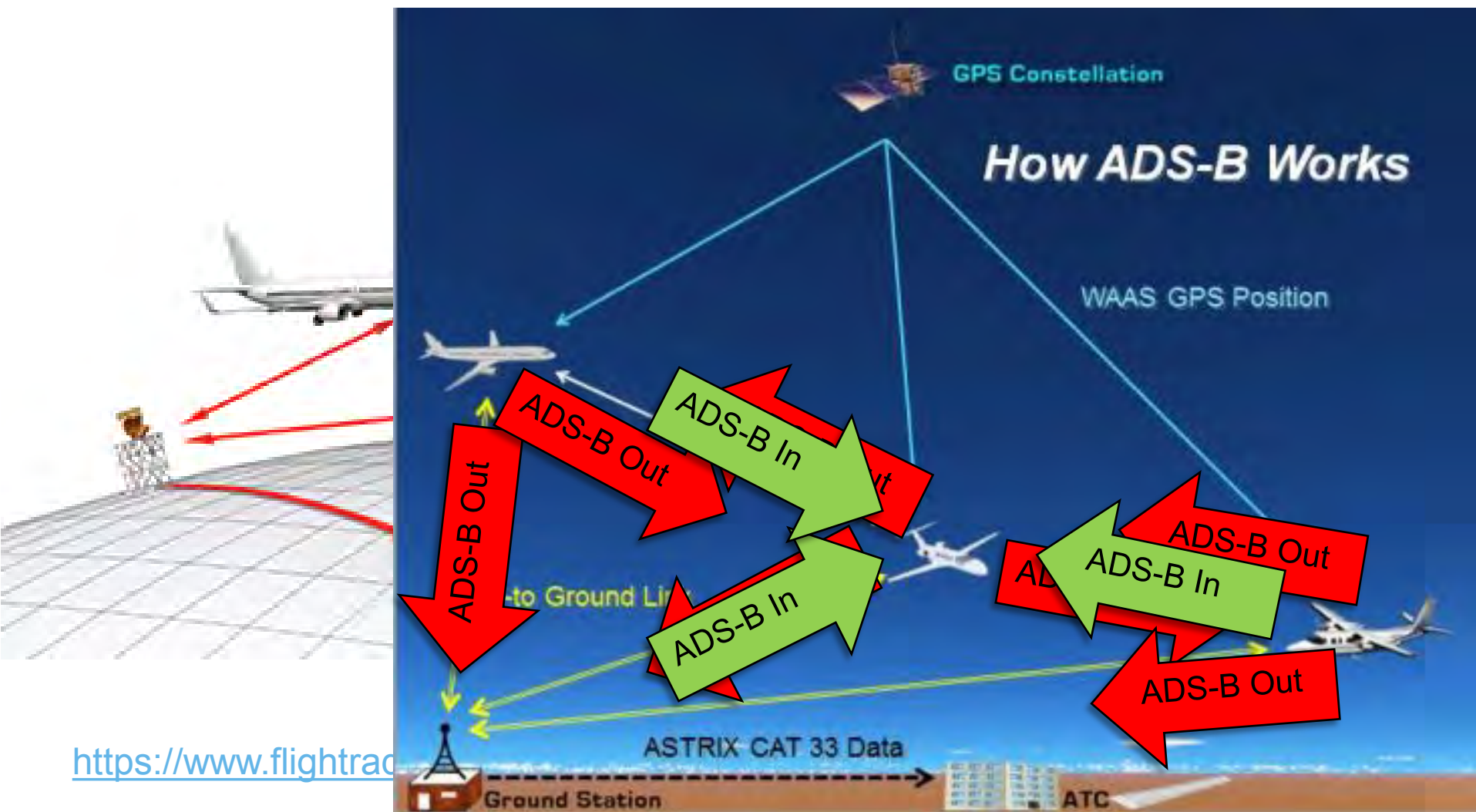
País	Plan para Instalar ADS-B	Definición de área	Comentarios
Argentina	Si	Para llenar los vacíos de cobertura radar	-
Bolivia	No	-	-
Brasil	Si	Bahia de Campos – plataformas petróleo tráfico helicópteros.	Planes futuros están siendo evaluados para comenzar con la regulación.
Chile	Si	Algunos aeropuertos	
Colombia	Si	Todo el país – 01 Enero 2020	Comunicación de Reglas fue publicada en Mayo 2016. (RAC 4.2.2.6)
Ecuador	No	-	-
México	Si	Todo el país – 01 Enero 2020	Similar o casi igual a requerimientos FAA.No oficialmente publicado
Paraguay	No	-	-
Perú	Si	Para llenar los vacíos de cobertura radar	-
Uruguay	No	-	-
Venezuela	Si	TBD	Ninguna actualización al momento

ADS-B Out global (Aireon – “basado en el espacio del ADS-B”)

- ADS-B Out hoy en día requiere red terrestre de antenas
 - Recibe señales de aeronaves que tienen ADSB OUT
 - Enlace de Telecomunicaciones al ATC
 - Transmite señales de ADS-B IN a aviones equipados ADSB IN
- Red de Satélites puede reemplazar la red terrestre
 - ADS-B transponders son incluidos en el paquete de satélites de 2ª generación de los satélites de Iridium que se están lanzando
 - 66 LEO satélites (+6 respaldo) en órbita para 2018 proveerán cobertura global oceánica y en áreas remotas



ADS-B Out: Terrestre red Satelital



<https://www.flightradar24.com>

ADS-B Out funcionalmente reemplaza el sistema de radar secundario
ADS-B In funcionalmente info. Como TCAS— no es parte regulación ADSB out.

ADS-B IN

- No es un reglamento Hoy en día
- Aeronaves equipados con ADSB In pueden recibir y procesar mensajes de otras aeronaves y de la red de tierra
 - Tráfico
 - TIS-B =Traffic Information Service Broadcast
<https://www.flightradar24.com>
 - 1090ES y UAT
 - Clima & Información de vuelo
 - FIS-B = Flight Information Services Broadcast
 - texto y gráficos de clima sin costo, NOTAMs, ATIS, etc.
 - UAT solo(978 Mhz – USA)
- Computadora abordo del tráfico consolidará ADS-B en los mensajes de tráfico con los datos del TCAS y mostrara información sobre el CDTI (Cockpit Display of Traffic Information)



PREGUNTAS?

WAAS-GPS / FMS-LPV

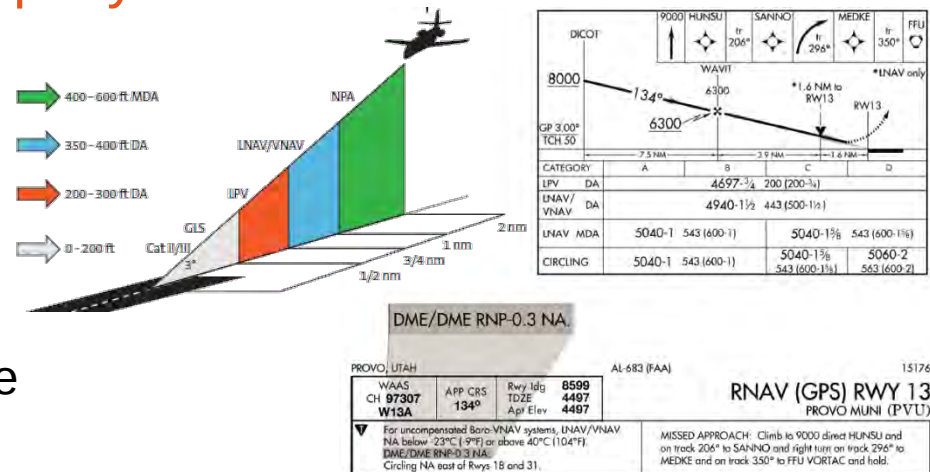
Cual es el beneficio?

Cuando el ATC implementa tecnologías modernas, Ahorras tiempo y dinero

GPS con SBAS

(Satellite Based Augmentation System)

- Elimina las restricciones basadas en rutas de ATC VOR-DME
- Elimina verificación de prevuelo de RAIM
- Aproximaciones LPV requiere señales corregidas de GPS



Que Ganas ? ...rutas mas cortas, Vuelos rápidos, menos consumo de combustible

- Aproximadamente 9-12 minutos de tiempo de vuelo ahorrado en cada aproximación RNP/LPV ...
- **Cuanto dinero ahorras durante un año?**

DOC / hr = \$3000

Horas de vuelo anual = 400 hours

Promedio de horas por pierna = 2.0 horas

Destinos aeropuertos con LPV/RNP = 40%

Ahorro de tiempo con aproximacion

LPV/RNP = 10 min

\$40,000.00 de Ahorro por año

Solución Rockwell Collins WAAS LPV / APV

GPS-4000S



Equipa el avion para SBAS

- GPS Primario significa
- GPS ya no es un suplemento para VOR/DME/ILS. FMS 4.0 RNP capacidad básica para NEXTGEN.
- Correcciones corregidas

Permite ajustar el patrón de VNAV para estar entre FAF y el final de la pista. Rutas eficientes cuando hay factores de obstáculos.

- No revisión de RAIM. Mejora la detección de fallas GPS
- Mejora la precisión y disponibilidad (GPS)
 - FMS posición lateral y vertical verdaderamente mejorada, reduce la probabilidad de una situación de "NO GPS".

Enhanced Mission Flexibility and Efficiency



Habilitación de aproximación LPV/APV

Mejora acceso aeropuertos

Valor adicional

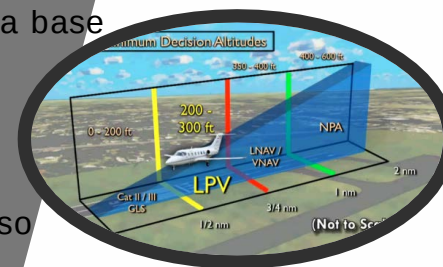
rápida carga de datos

Incrementa memoria base de datos

GPS Primario

Aproximaciones XYZ

Correcciones de descenso



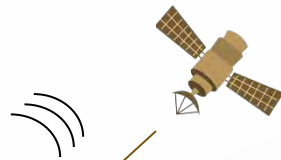
Paquete de actualización de NextGen / SESAR Space Based Navigation and Air Traffic Management

FANS 1 / A

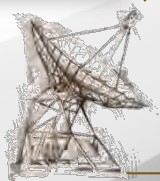
Hay una solución para mantener la eficiencia y capacidad en rutas transoceánicas-equipamiento de FANS-1/A

QUE ?

Avion volando rutas transoceanica



Unidad de servicio de rutas transoceánicas



Donde?

Específicamente para operación sobre el océano y regiones remotas



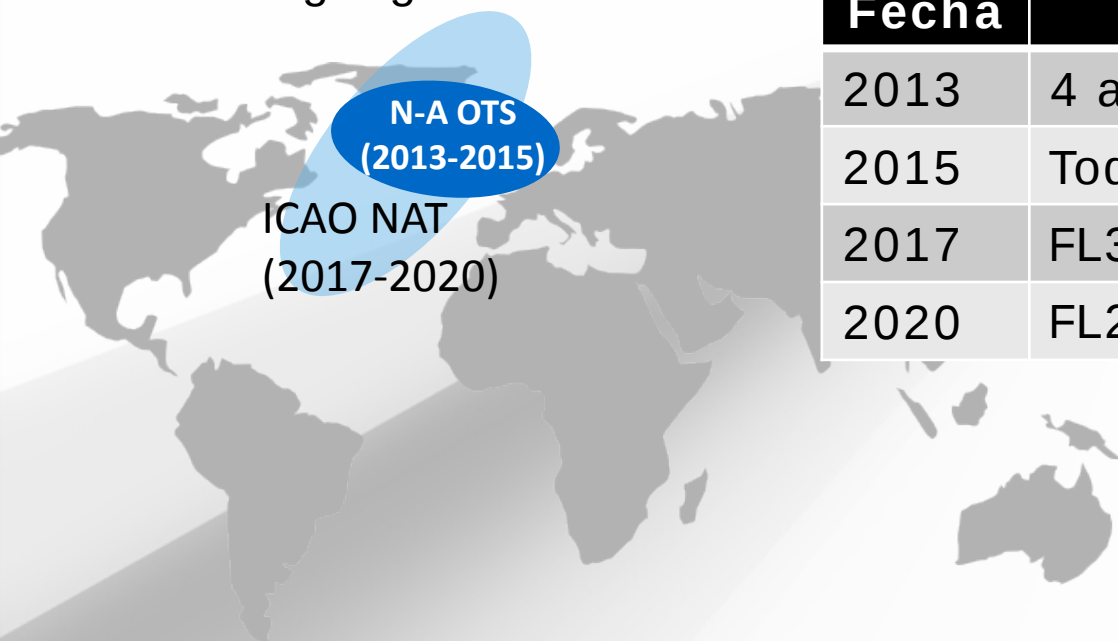
Two integrated applications

- Automatic Dependent Surveillance Contract (ADS-C)
- Controller Pilot Data Link Communications (CPDLC)

...and it's a **regulatory requirement** in the North Atlantic

acceso de curso trasatlántico impacta a ambas capacidades
flexibilidad rutas y la parte operacional, dandole valor de
mercado a su avión

Reglamentación área
geográfica



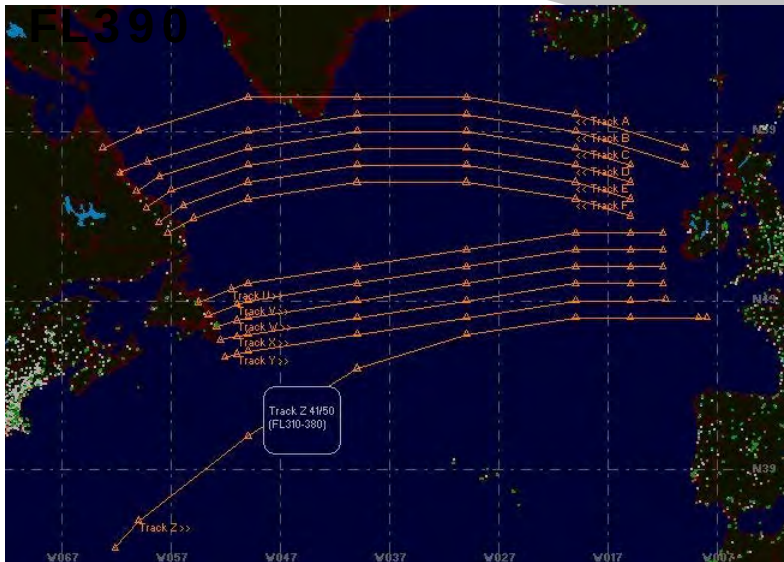
Fechas de reglamentación y aplicación

Fecha	Regla	Zona
2013	4 aerovias FL360-390	NA OTS
2015	Todas FL350-390	
2017	FL350-FL390	ICAO NAT
2020	FL290 & ↑	

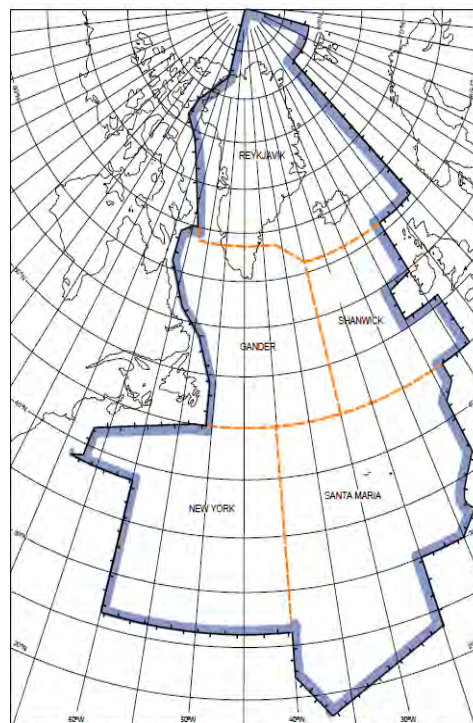
...between now and 2020, your mission capability and asset
value will become more and more challenged until you equip

No se quede en tierra , esta es una regla mandataria

Ahora - NAT OTS FL350 a



**Diciembre 2017
FL350 A FL390**



Published on behalf of the North Atlantic Systems Planning Group (NAT SPG)
by the European and North Atlantic Office of ICAO



Mantenga su avión actualizado , para cualquiera operación y futura venta

Que requieres para FANS-1/A

La actualizacion de la avionca

Opera con el actual FMS CDU (control display units)



Actualizar Flight Management Computer

- RNP 4
- Incremento de Memoria para base de datos global
- SBAS/LPV



Nuevo CMU -1000

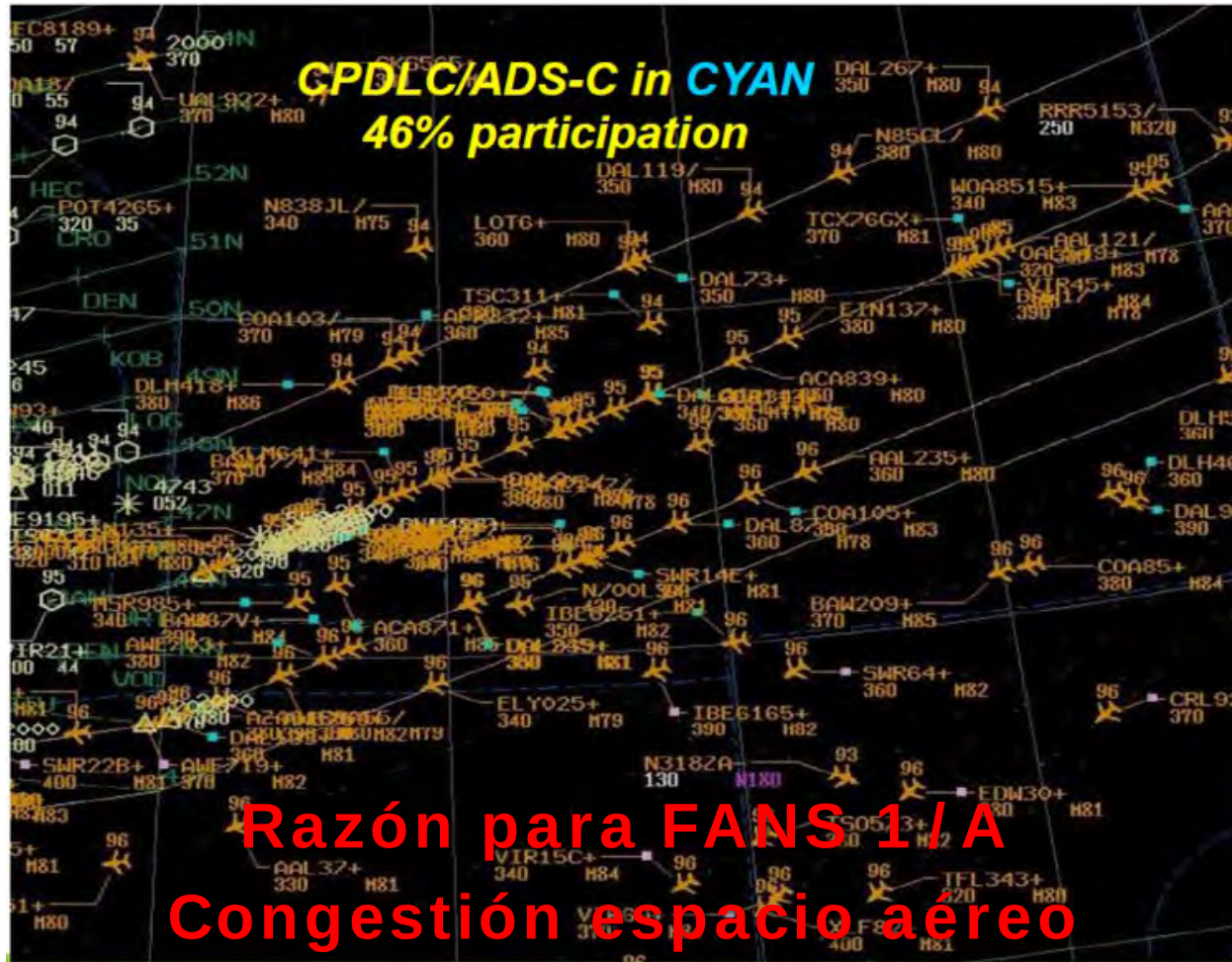
- Capacidad para funciones de data link comunes
- 1 caja de MCU de fácil instalación
- Diseñado para manejar Link 2000+

Ahorra costos de vuelo, y incrementa el valor en el mercado de tu avión

Por que es importante ?

RNP 4

Densidad de trafico sobre el Atlántico Norte fuerza a reducir el espaciamiento de aerovías(MNPS), mas corrección de precisión (ADS-C) y mejor efectividad de comunicación (CPDLC)

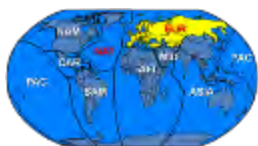


Manejo de Reglas que se necesitan para FANS

Iniciativa ICAO PBN



NAT SPG Oceanica FANS-1/A+

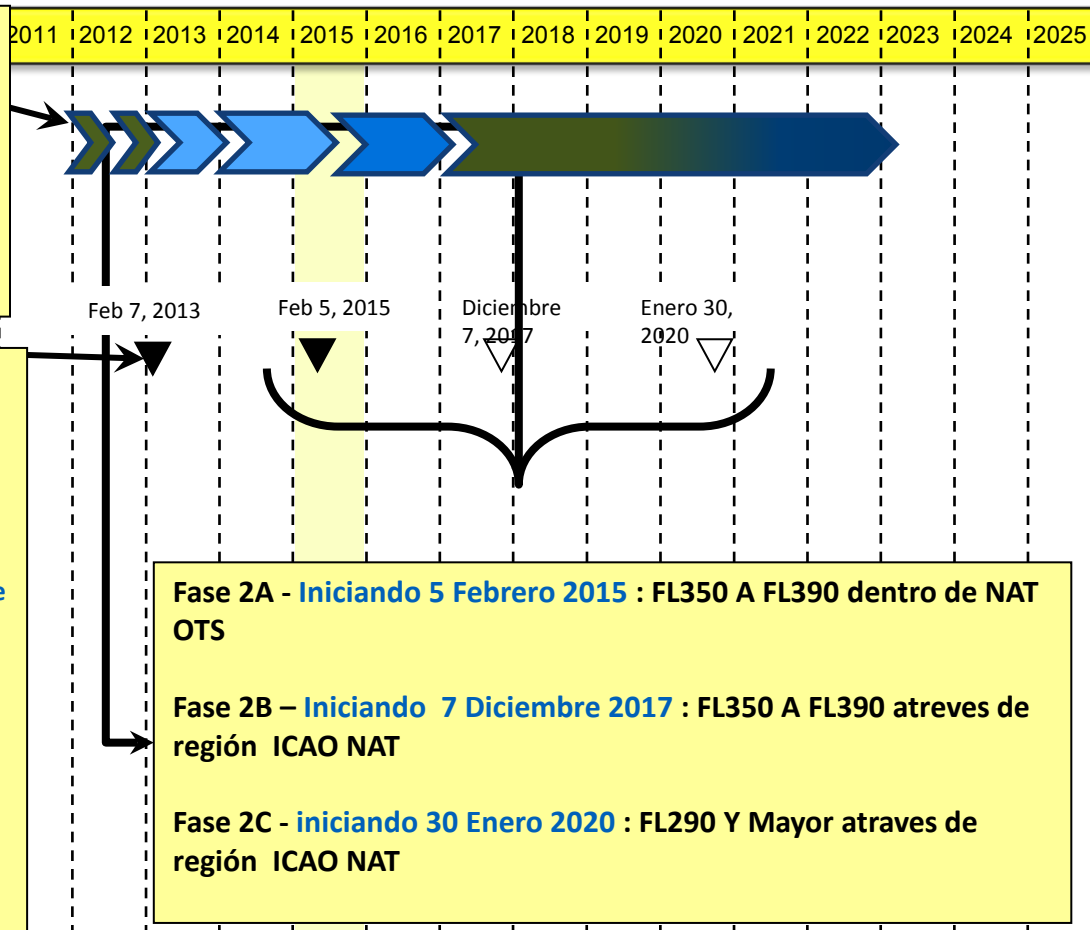


Iniciativa ICAO presiona RNP-4 para separación 30/30 . FANS (ADS-C, CPDLC) equipamiento puede ser un factor para aprobación en las áreas de implementación

ICAO AC 91-004 referirse
FAA 8400.33 referirse

Desde Febrero 7, 2013 sobre vías específicas y niveles de vuelo dentro de la organización de sistemas de aerovías (Organized Track System (OTS))

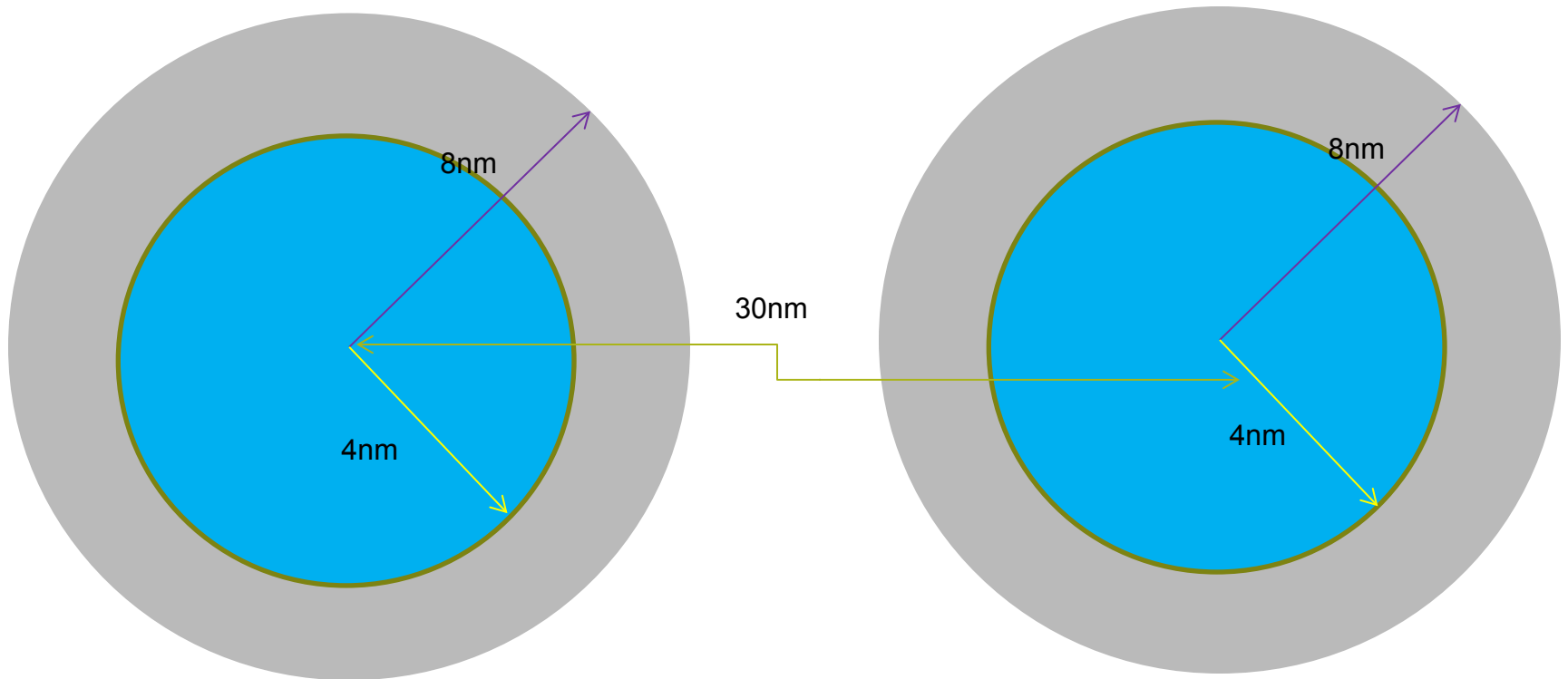
NAT boletin ops 2012-031 referirse
Requerimientos:
Aviones equipados y operación con FANS 1/A+ (o equivalente) CPDLC (Controller-Pilot Data Link Communication) y ADS-C (Automatic Dependent Surveillance-Contract) systems.



Para Fase 2: Actualización NAT OPS Boletín será publicado en el NAT ICAO website

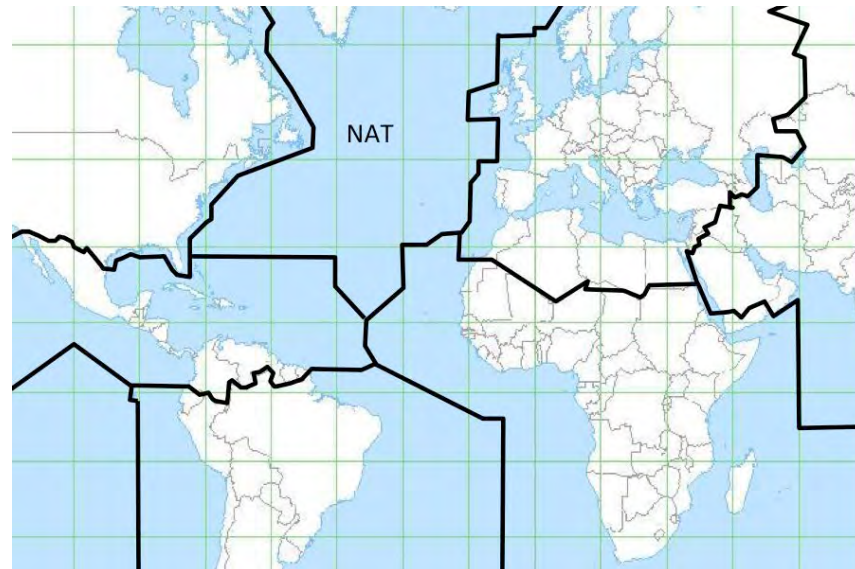
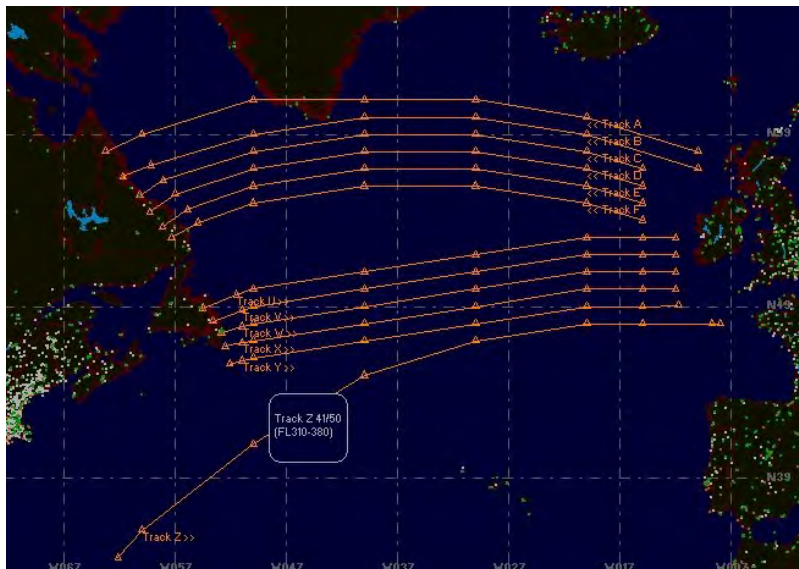
- ▼ = Mandate In Effect
- ▽ = Published Mandate
- = Forecast Mandate
- ▣ = Guidance Documents

Certificación y autorización FANS 1/A, RNP 4 Aviones tendrán capacidad de operar con un mínimo de separación de 30 millas náuticas horizontal y verticalmente
MNPS (Minimum Navigation Performance Standards)



Margen de error debe ser no mas grande que 4NM 95% del tiempo y no mas de 8nm 99.99% del tiempo

Reglas NAT SPG FANS 1/A



Fase 1

- Feb 7, 2013
- FL360-390 en dos sentidos de las aerovías

Fase 2A

- Feb 5, 2015
- FL350-390 en todas las aerovías

fase 2B

- Dec 7, 2017
- FL350-390
- Atarves de la region del NAT

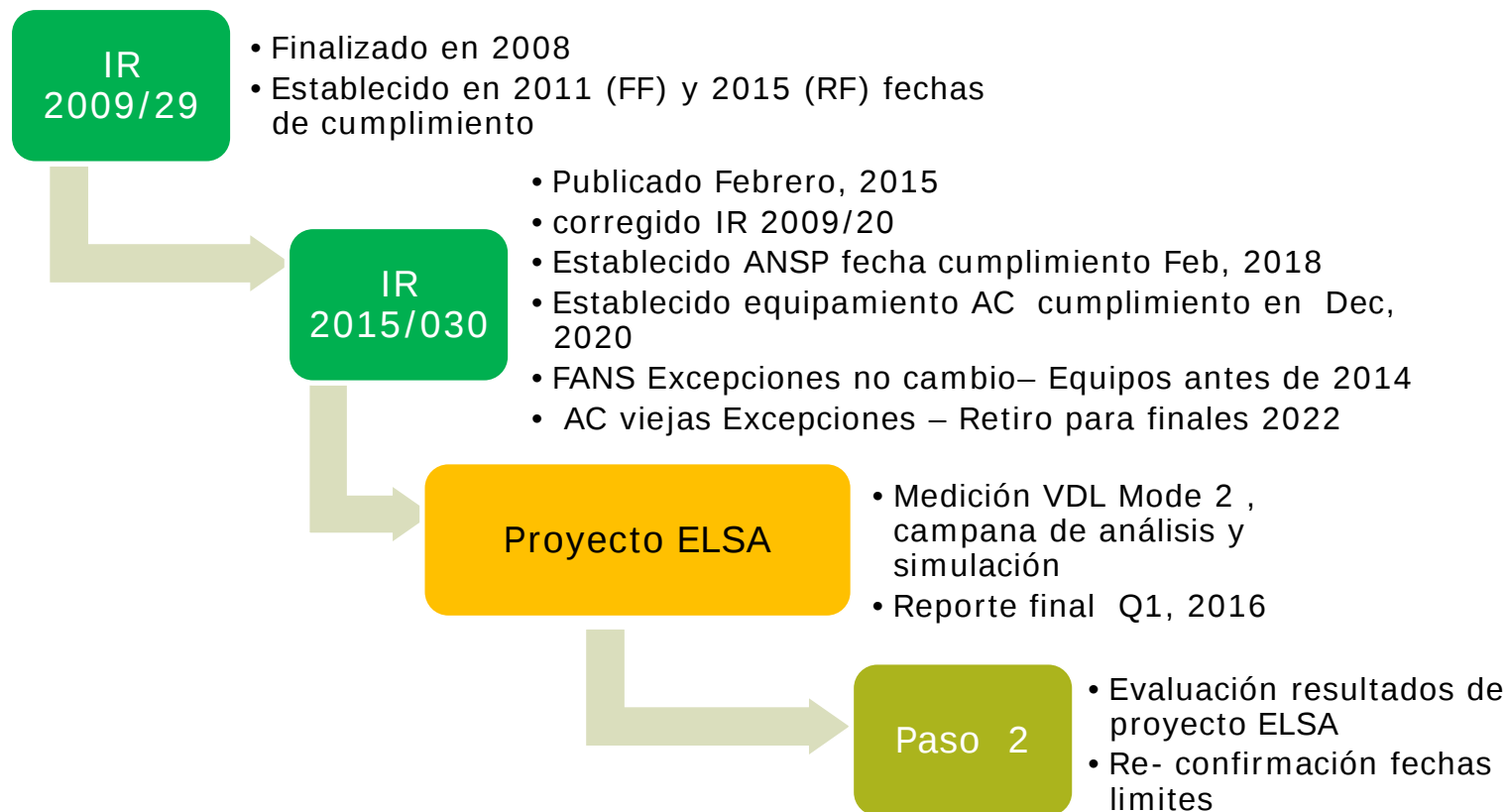
fase 2C

- Enero 30, 2020
- FL290 y arriba de la region del NAT

Capacidad de FANS Implementada basicamente en el FMS

LINK 2000+

Regla Link 2000+



Lista preliminar para el uso del CPDLC

Fuente Eurocontrol

- La lista preliminar define que aeronave esta autorizada para usar datalink con un particular ANSP
 - El objetivo es reducir el porcentaje de error en los PAs que ocurre por los operadores de control
 - Actualmente en vigor con MUAC y Skyguide – se espera que se mantenga en su lugar por una cantidad de tiempo considerable
- Solamente aviones con aviónica “aprovados” pueden ser adicionados a esta lista preliminar
 - Esto incluye VHF-2100 (-121) certificados en Airbus y VHF-2100 en Boeing con SB 7
 - VHF-2200 en A350XWB y algunas plataformas de A320
 - VHF-4000 Puede ser también modificado para ser compatible y estar en la lista preliminar

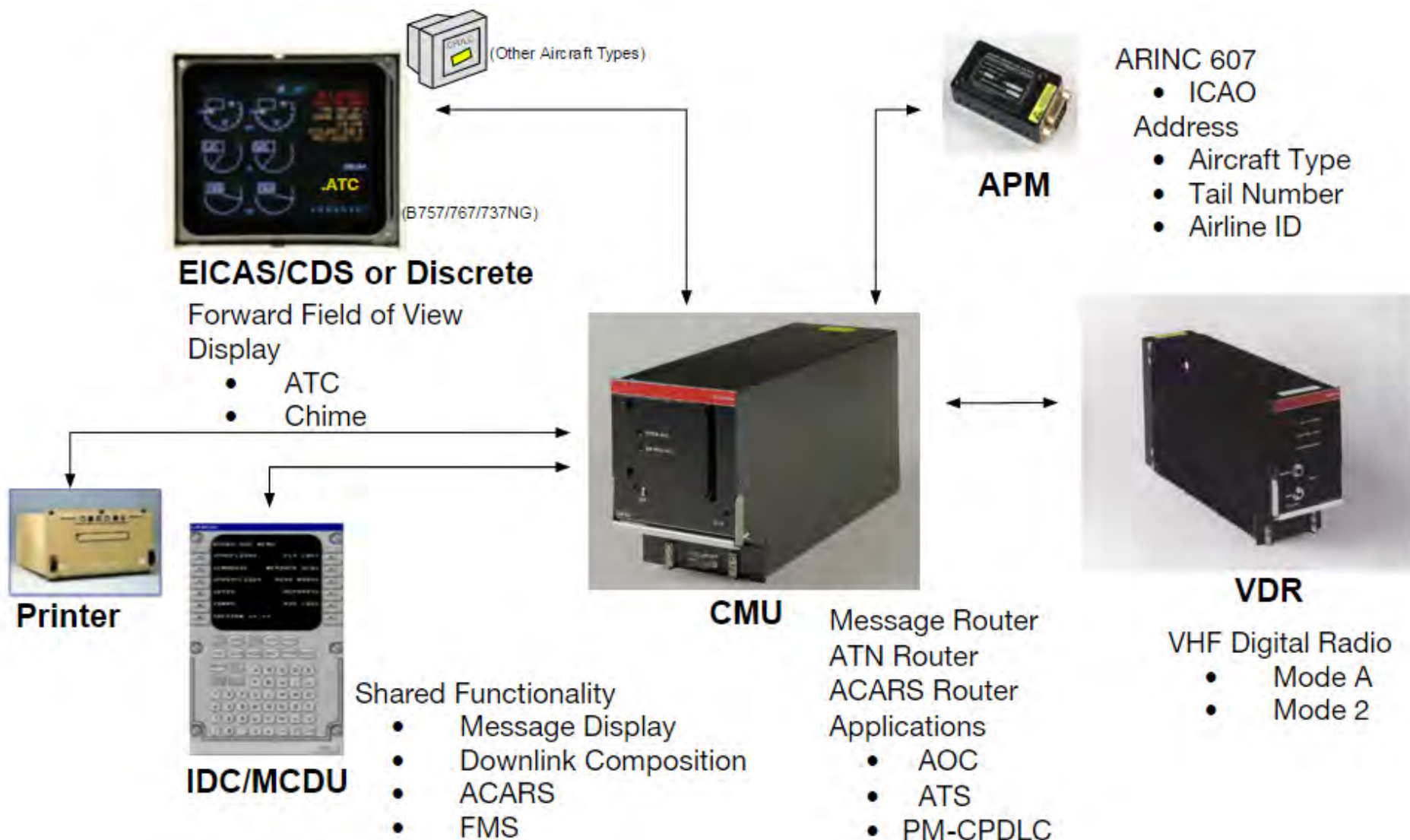
http://www.eurocontrol.int/link2000/wiki/index.php/White_Lists

Status de ANSP's – del segmento terrestre



- Verde – Link 2000+ implementado arriba FL285
- Rojo – Plan en lugar pero no implementado
- Crema – No hay plan

Revision de Avionics ATN-CPDLC



Resumen regla Global

A/C Continuous Tracking ~2025

ATC Voice SATCOM (China)

2015 50% flota
2018 100% flota

HUD (China)

2015 10% flota
2020 50% flota
2025 100% flota

ADS-B Out (GNSS)

Enero 2020 F/F & R/F

Enero 2025 Increm.presicion

ADS-B Out (Transponder)

Enero2020 F/F & R/F

ADS-B IN (SURF) ~2025

ACAS-X SURV ~2025

VHF ATC Datalink ~2025

Link 2000+ CPDLC

F/F Feb 2020

R/F Feb 2020

ACAS v7.1

F/F Mar 2012

R/F Dic 2015

ADS-B Out

F/F Junio 2016

R/F Junio 2020

Perf Based Nav

NPA 2015-01

- Terminal 2020

- En ruta 2023

8.33 Khz sintonia <FL195

2014 Sector seleccionado

2018 tolamente desarrollad

F/F Runway Surf Perf

~2025

Procedimeinto

Galileo ~2025

North Atlantic FANS 1/A Data Link

Feb 2013 (Fase 1)

Feb 2015 (fase 2a)

Dic 2017 (fase 2b)

Enero 2020 (Fase 2c)

Dubai ACAS v7.1

R/F Dic 2015

ADS-B Out

Singapore /

Hong Kong

2013-2014.

ADS-B Out

≥FL290 Dic 2013

IFR F/F 06 Feb 2014

IFR R/F 04 Feb 2017

TCAS v7.1

F/F Enero

2014

F/F Feb 2014

R/F Feb 2016

NOTA

Conocimiento regla

Estimada Futuro
reglamentart

PREGUNTAS?