



| ICAO

INTERNATIONAL CIVIL AVIATION ORGANIZATION

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GNSS-BASED · 1090ES · ADS-B OUT

ADS-B

Automatic Dependent Surveillance — Broadcast

A cooperative surveillance technology — aircraft broadcast their own GNSS-derived position once per second for air traffic control and surrounding traffic.



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What Is ADS-B?

A cooperative surveillance technology in which an aircraft autonomously broadcasts its own GNSS-derived state vector — position, altitude, velocity and identity — once per second, for use by air traffic control and other aircraft. No interrogation is required.



Automatic

Transmits continuously with no pilot or controller action required.



Dependent

Position is derived from the aircraft's own GNSS / navigation system.



Surveillance

Provides 3-D position and identification of the aircraft.



Broadcast

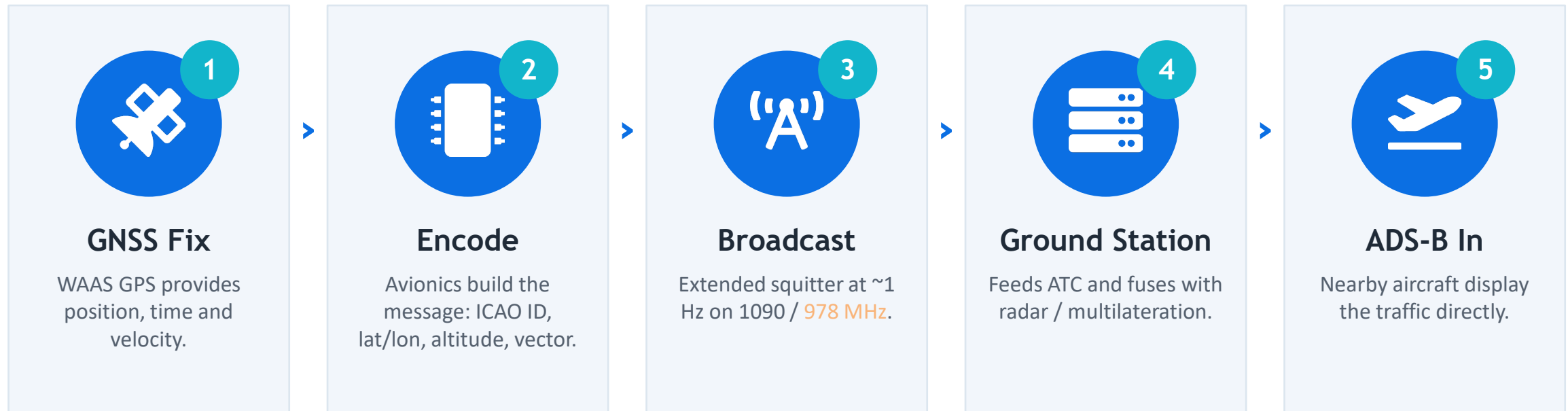
One-way, open transmission received by anyone suitably equipped.

ADS-B vs. Secondary Surveillance Radar

	Secondary Radar (SSR)	ADS-B
POSITION SOURCE	Ground antenna interrogates transponder	Aircraft's own GNSS receiver
UPDATE RATE	One sweep every 5–12 seconds	~Once per second (1 Hz)
ACCURACY	Degrades with range and azimuth	GPS-precise, range-independent
COVERAGE	Line-of-sight; blocked by terrain	Low-altitude & remote areas via small stations
INFRASTRUCTURE	Large rotating radar towers	Compact, flexibly sited ground stations

How ADS-B Works, End to End

The aircraft computes its own state vector from GNSS, an avionics unit encodes it, and the signal is broadcast once per second to ground stations and to other aircraft.



Position is broadcast at approximately 1 Hz — roughly 5–12× more often than a radar sweep.

Position Source & Performance

ADS-B is only as good as its navigation source. 14 CFR §91.227 sets quantitative thresholds the GNSS receiver must meet — typically satisfied by a WAAS-capable GPS.

NACp ≥ 8

Navigation Accuracy Category–Position. 95% containment radius $\leq$ 0.05 NM.

NIC ≥ 7

Navigation Integrity Category — bounds the position-error containment region.

SIL & SDA

Source Integrity Level and System Design Assurance qualify the data's trustworthiness.

DO-260B

Version-2 ADS-B Out; Mode S must be Level 2 with Extended Squitter enabled.



GNSS provides the precise position that ADS-B depends on.

OPERATIONAL BENEFITS

Why the Industry Moved to ADS-B

~1 s

Update interval vs. 5–12 s for radar

15 NM

TIS-B traffic radius, $\pm 3,500$ ft

Free

Traffic & weather to equipped cockpits



Improved Safety

Shared traffic picture enables faster conflict detection and see-and-avoid.



Efficiency

Tighter spacing and optimal routing in oceanic, mountainous and low-altitude airspace.



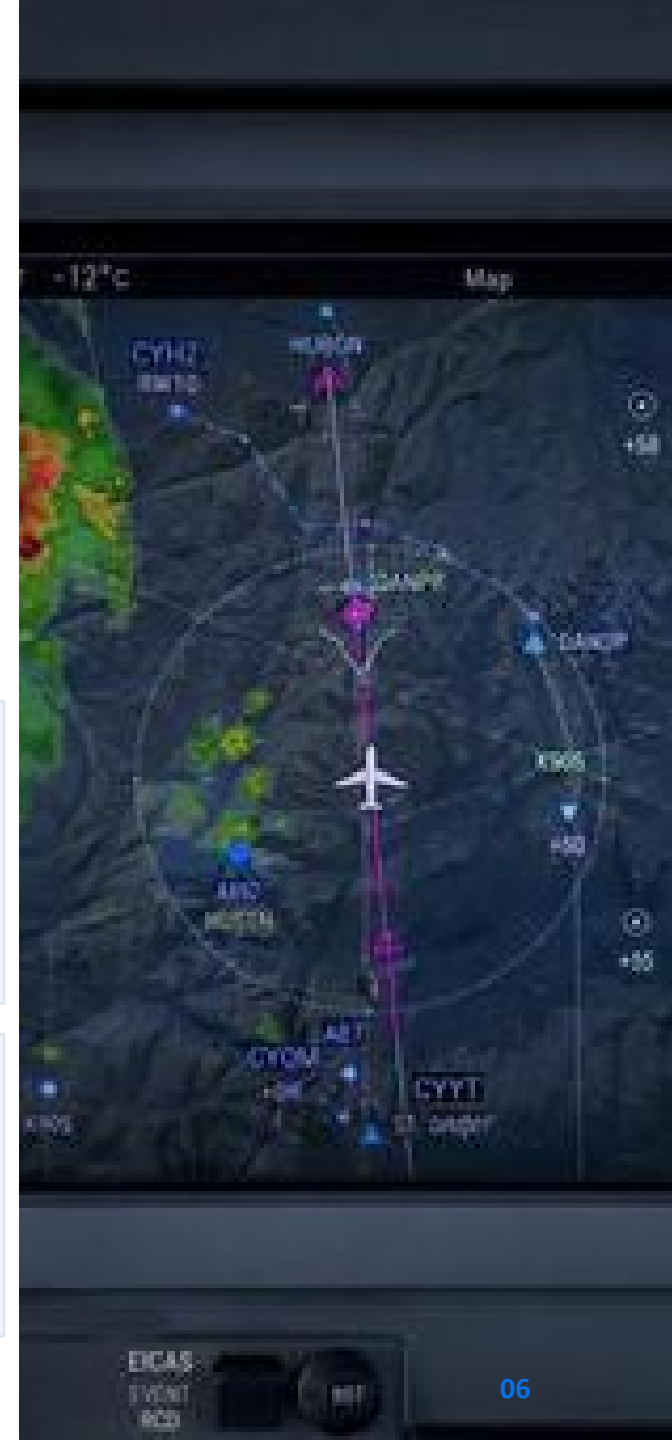
Situational Awareness

Cockpit traffic and weather displays mirror what ATC sees, at no cost to the operator.



Coverage & SAR

Surveillance reaches terrain and remote regions radar can't, aiding search and rescue.



Equipage Mandates & Standards

UNITED STATES

Jan 1, 2020

14 CFR §91.225 / §91.227

- ADS-B Out required in Class A, B, C; Class E $\geq$ 10,000 ft MSL
- Within the 30 NM Mode C veil of Class B airports
- 1090ES at/above FL180; UAT or 1090ES below

EUROPE (EASA)

Dec 7, 2020

Reg. (EU) 2020/587 (SPI)

- Fixed-wing $>$ 5,700 kg or $>$ 250 kt true airspeed
- ADS-B Out plus Mode S Elementary & Enhanced
- Applies to IFR flights in the Single European Sky



A COMPLIANT INSTALLATION REQUIRES



Version-2 transmitter (DO-260B / DO-282B)



WAAS-capable GPS position source



Correct ICAO 24-bit address & install approval

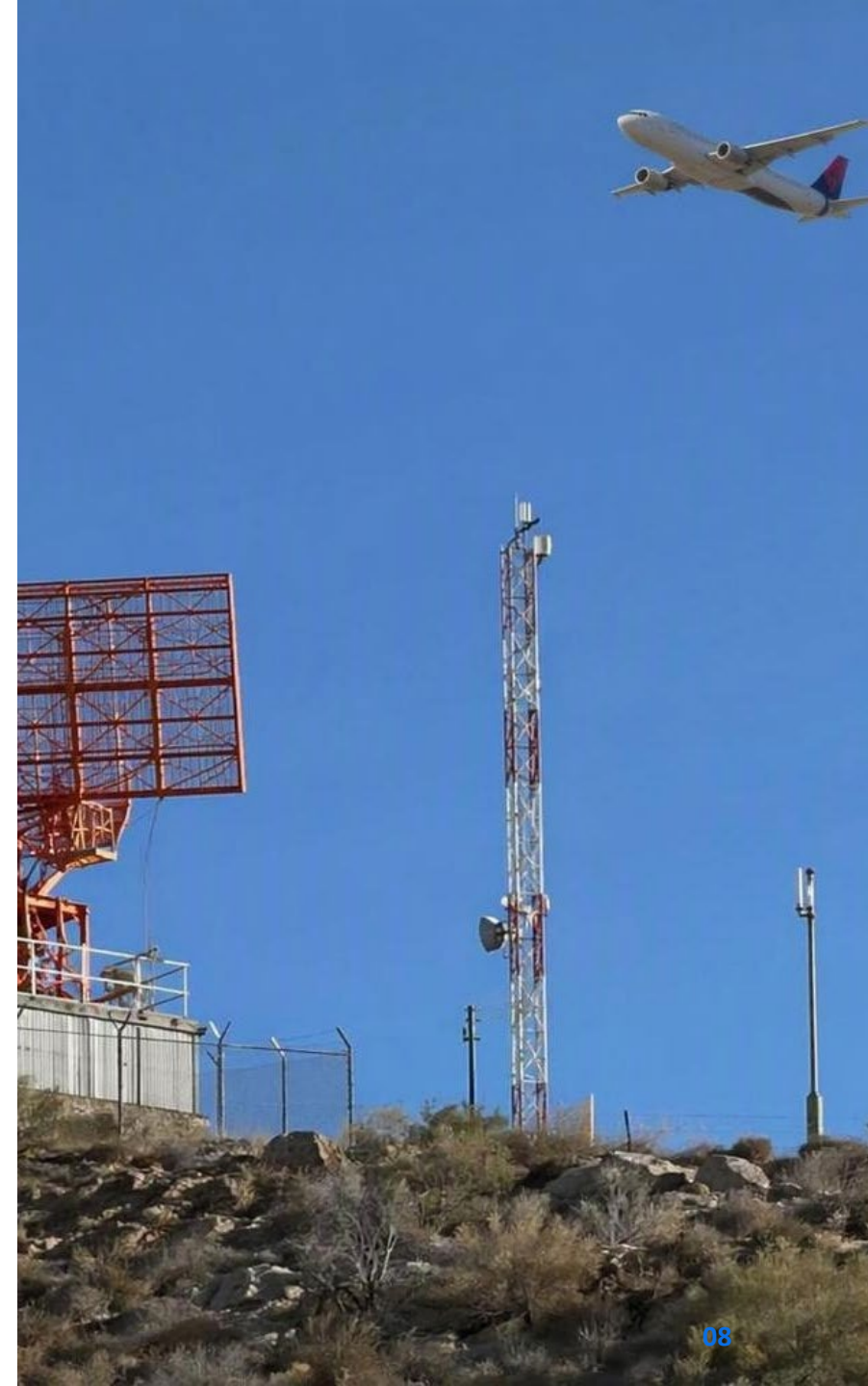
Main Purpose & New Capabilities

MAIN PURPOSE

To support the provision of Air Traffic Services and operational applications at reduced cost and with increased surveillance coverage.

NEW CAPABILITIES

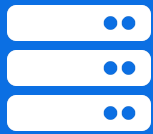
- Precise position and velocity in all airspace — accuracy is not range-dependent as with radar.
- Aircraft call sign plus position and velocity delivered to nearby aircraft with ADS-B In receivers.
- Supports State aircraft airspace access, leveraging dual-use capabilities to reduce cost and technical impact.



Four Enablers for ADS-B Deployment

Successful ADS-B implementation depends on the ground, the air, the people and the rules advancing together.

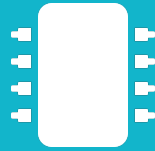
01



Ground System Infrastructure

ADS-B ground stations receive reports and feed ATC automation and the controller working position.

02



Airborne System Capability

Mode S transponder with extended squitter plus a qualified GNSS position source on board.

03



Training

Controller, pilot and maintenance training on new symbology, phraseology and equipment.

04



Legislation / Regulation

National mandates, standards and approvals that require and govern ADS-B carriage and use.

Ground & Airborne Systems



ADS-B Ground Stations

SURVEILLANCE

Receive ADS-B reports and provide them to ATC automation for processing and display at the controller working position (HMI).



SSR Mode S Transponder

SURVEILLANCE

Extended squitter versions 0, 1 and 2.
Annex 10 Vol IV Ch. 2/3/5; Doc 9871;
RTCA/EUROCAE DO-260 / -260A / -260B
(ED-102/ED-102A).



GNSS Receiver with RAIM

NAVIGATION

Basic aviation GNSS position source compliant with [E]TSO-C129, -C196, or -C145/-C146 (see FAA AC 20-165 / EASA CS-ACNS).

Training & Regulation



Training Requirements

- Controller training on new surveillance symbology where introduced.
- Pilot and controller training when phraseology changes at an ANSP.
- Maintenance personnel training for newly installed equipment (ICAO Doc 8071).



Legislation & Regulation

- National regulation requiring ADS-B Out carriage and performance.
- Adoption of ICAO and regional standards into the State framework.
- Installation approvals and oversight of compliant equipage.

Stakeholders in ADS-B Implementation

Implementation requires coordination across the parties that build, fly, regulate and support the system.



ANSP

Air Navigation Service Provider
— operates surveillance and air
traffic services.



Aircraft Manufacturer

Designs and certifies compliant
avionics and transponder
installations.



Aircraft Operator

Equips and maintains the fleet
to meet ADS-B Out mandates.

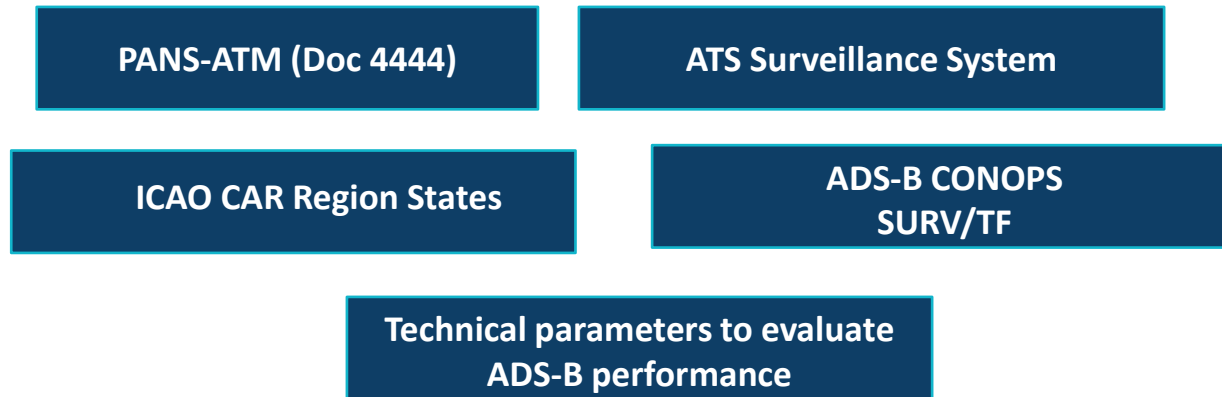


Others

Regulators, integrators and
service providers supporting
the rollout.

OPERATIONAL CONCEPT

Its purpose is to facilitate coordination among stakeholders involved in, or affected by, the implementation of ADS-B services — assisting ICAO CAR region States considering ADS-B as part of an ATS surveillance system.



Individual States may develop complementary implementation documents to reflect their unique operating environments.



Previous ADS-B Activities

2021

ADS-B/OUT Technical On-Line Workshop (ADS-B/OUT/W)

NAM/CAR Regions · 26–29 January 2021, 09:00–12:00 UTC-6.

[icao.int/NACC · meetings-2021-adsb](https://www.icao.int/NACC/meetings-2021-adsb)

2022

Surveillance Task Force – Technical Assistance Mission

Air Navigation Services (ANS), Mexico City · 13–15 July 2022.

[icao.int/NACC · meetings-2022-tfm](https://www.icao.int/NACC/meetings-2022-tfm)

2023

Workshop on ADS-B Implementation Regulation (ADS-B-Imp)

NAM/CAR/SAM · ICAO NACC Regional Office, Mexico City · 17–21 July 2023.

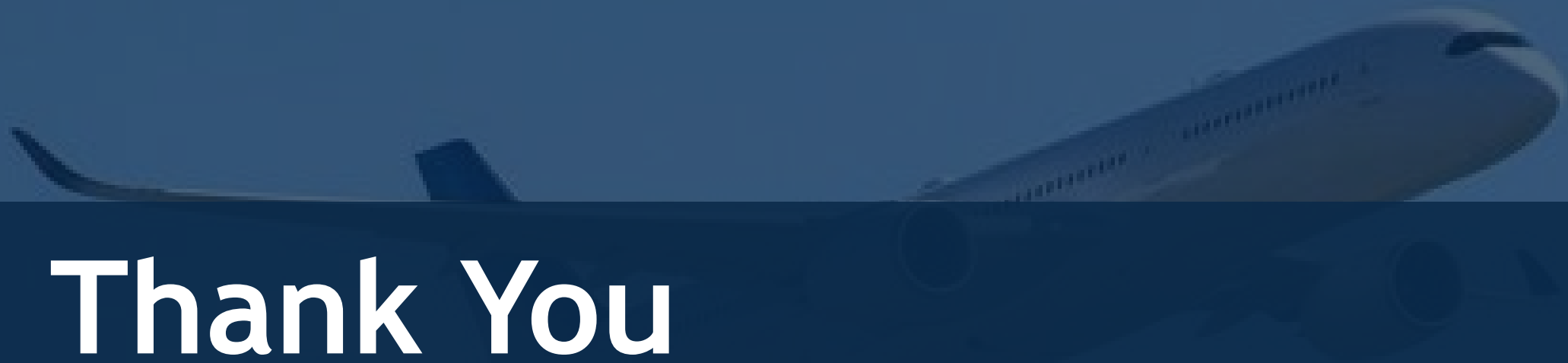
[icao.int/NACC · meetings-2023-adsb](https://www.icao.int/NACC/meetings-2023-adsb)

2024

Surveillance Task Force – Technical Meeting with IATA

Air Navigation Services (ANS), Mexico City · 30-31 July 2024.

[icao.int/NACC · meetings-2022-tfm](https://www.icao.int/NACC/meetings-2022-tfm)



Thank You

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