

Automatic dependent surveillance- broadcast (ads-b) research paper

[Engineering](#), [Aviation](#)



ADS-B is one of the two types of Automatic Dependent Surveillance. ADS is an Air Traffic Control (ATC) technique that tracks aircraft without the use of radar. There exists two types of Automatic Dependent Surveillance, ADS-Contract (ADS-C) and ADS-Broadcast (ADS-B). ADS-C is controlled by agreements put forward by the ground station. This means that the broadcast of ADS reports is done by the ground station except in emergency situations when the flight crew can declare or cancel a reporting. Two pilots cannot communicate positional information using this system.

In ADS-B, the aircraft regularly broadcasts its position to no specific ground station using a transmitter called an ADS-B 'out' transmitter. A suitably equipped ground station can intercept broadcast information from the aircraft. Another aircraft can also intercept the broadcast signal using a receiver called an ADS-B 'in'. The information transmitted includes, identity, position, altitude, velocity, vector, and vertical rate. An aircraft typically broadcasts this information twice each second which is much more frequent than radar information is received. The ADS-B ground station consists of an antenna, a receiver unit, and a site monitor.

ADS-B starts when the aircraft's GPS records positional data and sends it to the ADS-B equipment. An ADS-B 'out' transmitter sends the data to a ground station or any other receiving aircraft equipped with ADS-B 'in' equipment. The ADS-B system broadcasts two means of identifying the transmitting aircraft. The first is aircraft address while the other is the flight identification. Flight identification is used to link individual aircraft to their flight plans. The ground station receives the data from the transmitter and decodes it. The ground crew then converts the data into a format suitable to

be displayed in a radar screen. This makes for easier understanding by the users of the positional data to manage the flights within the covered airspace.

ADS-B is set to replace conventional radar technology with the implementation of Next Generation Air Control Systems (NextGen) in the years between 2012 and 2025. This is because it offers certain advantages over radar systems. ADS-B increases accuracy of locating aircraft because of the use of GPS systems, which tracks an object's location via satellite. This improved accuracy is important in navigation by pilots. ADS-B also helps aircraft maintain their preferred routes by using their positional data to plot the suitable course. ADS-B covers a longer range of more than 100 miles. This is more than radar is capable of, which leads to increased control of flights by ground stations. In addition, ADS-B helps controllers to reduce collisions by enabling aircraft to communicate with each other and determine exact distances from each other and aerodromes. ADS-B is also environmentally friendly as it uses less power than radar and enables a direct approach to landings.

How ADS-B works

The inclusion of ADS-B in NextGen is also due to its safety record. It improves air safety by the following methods.

It allows for faster search and rescue as the precise location of aircraft can be known in case of an emergency. This is because ADS-B locates both aerial and ground traffic.

It allows improved air traffic control and pilot's situational awareness by providing his or her cockpit with more information than currently available.

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It allows for more coordinated landings and takeoffs since the data is transmitted about 12 times more than radar.

ADS-B 'in' enables the pilots to gather information about the weather from other surrounding pilots leading to safer flights.

ADS-B 'in' provides pilots with better terrain overlay information by comparing information gotten from surrounding airplanes and GPS input.

- All this is accomplished at a lower cost compared to radar. ADS-B also offers some advantages to Air Traffic Control Officers.

Increased information about aircraft for better management.

Reduces pressure on ground control by providing pilots with more management information.

Increased efficiency in the use of airspace.

A better flight planning and spacing.

- ADS-B in reducing risks for Air Traffic Control and Pilots.

- Weather reports

- A plane with ADS-B 'in' is able to receive reports from other airplanes around it. Such

- Reports will contain information about weather conditions. This will enable the pilot to avoid undesirable weather such as thunderstorms and excess clouds along its flight path. This leads to safer and more comfortable flights.

- Terrain Overlay

- ADS-B 'in' will allow airplanes to gather information about the obstacles in their paths. This helps the pilots to avoid crashing into high ground

especially in time of bad weather. ADS-B also helps to overcome the loss of

sight problems for ground control.

- Safe Landing and Altitude changes

- ADS-B will help pilots make continuous ascends and descends rather than the presently used steeped altitude changes. This will make landings and takeoffs safer especially when combined with the improved coordination with the ADS-B enabled ground stations. Automatic Dependent Surveillance - Broadcast will also reduce risks by using features such as automatic traffic call outs and warnings of possible runway intrusions.

- More penetration of Air Traffic Control

- ADS-B makes Air Traffic Control to areas where radar could not reach. This is because it uses GPS positioning rather than signals sent and reflected from the ground station. Increased air traffic control makes flying less risky as all the aircraft in the controlled space are carefully monitored and managed.

- Flight Control

- Search and rescue

- ADS-B allows for precise location of airplanes. This makes it easy for rescuers to reach downed aircrafts. Radar is not able to locate planes on the ground due to lack of clear paths for the signals. ADS-B sends a signal to other aircraft in the vicinity that greatly reduces reaction time. This is because ADS-B displays both aerial and ground traffic.

- Situational Awareness

- ADS-B 'in' and 'out' allows pilots to communicate their precise locations to other's in the same vicinity. This information gives pilots confidence in relation to other planes flying in the same airspace. It also allows pilots to share timely information whenever other near planes deviate from their

assigned flight plans. Pilots using ADS-B are able to locate the other planes with accuracies of less than 30 feet.

- Reaction to crisis

- Airspace and runway efficiency

- ADS-B is able to handle more aircraft than regular radar. This means that multiple planes can share the same airspace without increasing flight risks.

There is also improved management of runways allowing multiple planes to land at the same time with no increased collision risks.

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