



WORKING PAPER

ASSEMBLY — 41ST SESSION

TECHNICAL COMMISSION

Agenda Item 31: Aviation Safety and Air Navigation Standardization

AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST SECURITY AND PRIVACY CONCERNS AND POSSIBLE SOLUTIONS

(Presented by Saudi Arabia)

EXECUTIVE SUMMARY

Automatic dependent surveillance — broadcast (ADS-B) data is commonly used by internet-based flight tracking platforms to provide commercial real-time tracking including private and security sensitive flights. This paper provides information on the current practices for sharing ADS-B data through the Internet using specialized flight tracker platforms and websites. The uncontrolled access to detailed/accurate ADS-B data on the internet raised concerns by aircraft operators and owners on safety, security, and privacy of flights. The paper proposes potential solutions that may be considered to mitigate safety and security risks suggesting a controlled level of privacy measures. It also highlights the potential financial implications that ICAO may consider in the development of new standards and technical specifications to protect the ADS-B data from public use and restrict the access to air traffic management (ATM) community.

Action: The Assembly is invited to:

- a) note the information provided in this paper; and
- b) discuss and adopt the proposal to consider inviting ICAO to lead the development of new provisions through the appropriate panels to introduce required measures reducing safety and security hazards, risks and threats related to public availability and sharing, on the internet, of ADS-B information related to flights.

<i>Strategic Objectives:</i>	This working paper relates to the Safety and Air Navigation Capacity and Efficiency Strategic Objectives.
<i>Financial implications:</i>	No additional resources are required.
<i>References:</i>	Annex 10 — <i>Aeronautical Telecommunications</i> , Volume III — <i>Communication Systems</i> and Volume IV — <i>Surveillance and Collision Avoidance Systems</i> Doc 9924, <i>Aeronautical Surveillance Manual</i> Doc 9750, <i>Global Air Navigation Plan</i> Circular 326, <i>Assessment of ADS-B and Multilateration Surveillance to Support Air Traffic Services and Guidelines for Implementation</i> MIDANPIRG/19 & RASG-MID/9 REPORT Paras. 5.8.32, 5.8.33, 5.8.34 and 5.8.35 ¹ .

¹ [MIDANPIRG/19 & RASG-MID/9 \(icao.int\)](https://www.icao.int/MIDANPIRG/19%20%26%20RASG-MID/9)

1. INTRODUCTION

1.1 The automatic dependent surveillance–broadcast (ADS-B) sends frequent and automatic broadcast transmissions of an aircraft’s identification, position, altitude, velocity, and other information to any receiver (airborne or ground) within range of the broadcasted information. The information related to aircraft position/velocity is normally based on the global navigation satellite system (GNSS) and transmitted at least once per second.

1.2 Under legacy usage, the ADS-B data is broadcasted in an unencrypted structured format allowing the ground-based Air Navigation Service Providers (ANSPs) systems used for air traffic services (ATS) surveillance purpose supporting the required air traffic control (ATC) separation minimal between aircraft.

1.3 However, the ADS-B data can be easily received and processed using widely available primitive receivers that are commonly used by the public or private sophisticated systems tracking platforms used for commercial. Consequently, the flights providing ADS-B data in support of surveillance services, are visible to the public and commercial entities equipped with appropriate receivers and shared through the Internet using specialized flight tracker platforms and websites. This constitute a serious security threat to all member states that is not currently addressed at ICAO level.

1.4 The number of internet-based flight tracker platforms and websites is increasing offering free access and extended commercial services with more precise details on flights. The commercial entities managing the platforms and websites obtain the flights’ data from commercially offered ground network of ADS-B receivers and ground stations deployed and used ANSPs. The latter is usually subject of specific arrangements between the entities and the involved ANSP.

1.5 Recently, the available sources of ADS-B data are being complemented with the data obtained from satellite-based ADS-B receivers allowing the internet-based flight tracker platforms and websites to access the data independently from the ground infrastructure.

1.6 In general, the ADS-B data is also supplemented by:

- a) information on the airport of departure & arrival, and flight routing by matching the aircraft/flight identification (ACID) or call sign/flight ID of the flight to databases of flight plans (FPLs) and airline and airport arrival and departure schedules.
- b) additional information, such as pictures of the aircraft type, and/or registration assigned to the aircraft using the 24-bit address.

2. DISCUSSION

2.1 Safety, security, and privacy concerns have been raised due to the availability of detailed and accurate flight information shared on the internet in the public domain. The uncontrolled access to detailed/accurate ADS-B data on the internet raises the same concerns. Aircraft owners and operators including State aircraft, and private flights expressed that the tracking of such flights publicly is unacceptable where it increases security threats and safety risks against, requiring certain measures to be taken to protect the right of privacy and enforce control measures to ADS-B and flight data information available publicly on the internet.

2.2 To limit the extent to which the aircraft/flight can be quickly and easily identified and displayed with real-time position with identification information that can be shared through internet-based flight tracker platforms and websites, aircraft operators including State flights, may, when possible, switch off or disable Mode S/ADS-B and revert to Mode 3/A/C for specific, sensitive, and training flights to restrict tracking and recording of flight maneuvers, performance, and capabilities. However, this operation is not always possible as ADS-B transmitting equipment is not independent and there is no standalone cockpit unit control that enables the pilot to turn the ADS-B transmissions on and off. In addition, in some cases the ADS-B equipment may be coupled with aircraft transponder and Airborne Collision Avoidance System (ACAS) systems where disabling the ADS-B functionality may have an adverse effect on the transponder and ACAS main safety functions. This might lead to the loss of ATS surveillance data and inability of ATS units to provide safe ATC services jeopardizing the safety of aircraft operations.

2.3 When exploring possible security and privacy schemes, measures and practices related to ATM data distribution and/or dissemination related to aircraft and flights broadcasting ADS-B data, the following potential solutions may be considered:

2.3.1 Filtering of flight data by ANSPs and the platform/web-based entities.

2.3.1.1 The filtering of ADS-B data items is considered one of the potential solutions that may mask the identity of a flight or aircraft. Two types of agreement can be considered: 1/ Agreement between adjacent ANSPs to avoid sharing of the ADS-B data for all flights that are outside their Area of responsibility (AoR); and 2/ Agreement with the commercial platform/web-based entities to mask the flight and aircraft data from the real-time tracking. The filtering can be based on 24-bit address or ACID. However, the filtering may be a partial solution as it is subject of platform/web-based entities, and it is limited to specific flights and data items only. Further, the filtering solution does not prevent the ground equipment from receiving the ADS-B data.

2.3.2 Restrict access to the flight data and flight plans.

2.3.2.1 The internet-based flight tracker platforms receive ADS-B data and/or flight plan data from multiple sources. In general, the flight plan data is often provided through agents serving the airlines industry. They have access to flight plan data, including all data items (Departure and Destination aerodromes, timing, aircraft type, flight route etc..). These agents may share the flight data commercially with the platform/web-based providers. To restrict access to detailed flight plan data, the management of flight plans should be reviewed to limit the access to parties directly concerned by the flight. In addition, the Stakeholders providing flight data and flight plans should establish agreements with the parties to limit the use of the data for intended purpose only and with appropriate sharing restrictions towards general public and platform/web-based entities.

2.3.3 De-identification of aircraft and flight.

2.3.3.1 The ICAO 24-bit aircraft address is allocated to States to identify aircraft. ICAO Annex 10, Aeronautical Telecommunications Vol III, Appendix to Chapter 9 describes the worldwide scheme for allocation, assignment, and application of aircraft addresses. As the 24-bit address is static and it is included in every ADS-B message sent by the aircraft, it can easily be used to identify the aircraft. In order to protect the identify of an aircraft ensure the privacy of any flight, the static assignment of the 24-bit address needs to be reviewed through the implementation of dynamic 24-bit address scheme. With this scheme, there is a need to allocate generic or anonymous ACID to ensure complete de-identification of

the flight and prevent correlation to other data. The identification of aircraft and flight must be subject of safety risk assessment to assess the impact on ATS and ATM systems and on other systems such emergency locator transmitter (ELT) including the new requirements for the Global Aeronautical Distress and Safety System (GADSS) Distress Tracking Data Repository (DTR).

2.3.4 Encryption of ADS-B data.

2.3.4.1 The encryption of data is used for military surveillance. It can be used to restrict the processing of the data to authorized parties or providers. The encryption of ADS-B data may include the management and distribution of the encryption keys to all concerned parties or providers and use of a new encrypted protocol combined with a specific number of bits in the ADS-B downlink format defined under Annex 10 — *Aeronautical Telecommunications, Volume IV — Surveillance and Collision Avoidance Systems*, Chapter 3.

2.4 The introduction of new standards to protect the identity of aircraft broadcasting ADS-B data may incur financial implication for owners and airlines depending on the solutions and options that will be deployed. Therefore, the financial impact of all possible solutions must be considered as one of the main factors in the definition of new standards and technical specifications to protect the ADS-B from unauthorized use. The new standards and technical specifications should be developed using phased approach with consideration for potential “exemptions” where the retrofit for specific type of aircraft is not cost-effective.

2.5 ICAO has already adopted provisions related to ADS-B aircraft equipage and the usage of the data for air traffic services. These provisions should be extended to protect the safety of flights broadcasting ADS-B data from open access through internet-based flight tracker platforms and websites as it raises serious security and risk threats. The main ADS-B data usage should be directed towards ATM applications to enhance and support the provision of ATS surveillance at State, regional and global levels. However, filtered, and controlled ADS-B data may be shared with other platforms and applications.

2.6 Considering the available capabilities, expertise, and structured panels, ICAO should lead the development of new Standards and technical specifications to protect the identity of aircraft broadcasting ADS-B data.

3. CONCLUSION

3.1 The public availability of ADS-B positioning data raises safety, security, and privacy concerns with regards to real-time tracking of security sensitive flights, State aircraft, and private flights. Detailed flight data are widely available on free and commercial internet-based platforms.

3.2 Currently, there are neither regional nor global solutions to control and limit access to the ADS-B data of private and sensitive flights. Therefore, the Assembly may consider inviting ICAO to lead the development of new provisions through the appropriate panels to introduce required measures reducing safety and security hazards, risks and threats related to public availability and sharing, on the internet, of ADS-B information related to flights.