# Cockpit Display of Traffic Information

## What is compatible with Australia's ADS-B program?

## 1. Introduction

Australia's plans for the introduction of ADS-B are generating considerable interest. One of the applications supported by ADS-B is the display of nearby aircraft to pilots on cockpit screens, a system commonly known as Cockpit Display of Traffic Information (CDTI). CDTI has the potential to provide significant benefits in safety and efficiency to the aviation industry.

Other systems such as Traffic Information Service (TIS) and Traffic information Service Broadcast (TIS-B) have been developed to allow traffic to be displayed to pilots, however these services will not be implemented under the Australian ADS-B Programs.

This article explains the difference between ADS-B, TIS-B, and TIS, and outlines the scope of ADS-B based Traffic Information Services that will be available in Australia.

## 2. ADS-B

Automatic Dependent Surveillance Broadcast or ADS-B is the broadcast, by an aircraft, of its identification, position, and velocity. The information is transmitted by the aircraft's transponder on the secondary radar downlink channel or 1090 MHz frequency. Since ADS-B employs a broadcast protocol, any capable 1090 MHz receiver can receive and decode the signals to determine the position of the aircraft. It is therefore possible to provide traffic displays in the cockpits of other aircraft using airborne ADS-B receivers and associated displays, without the need for any ground based equipment.

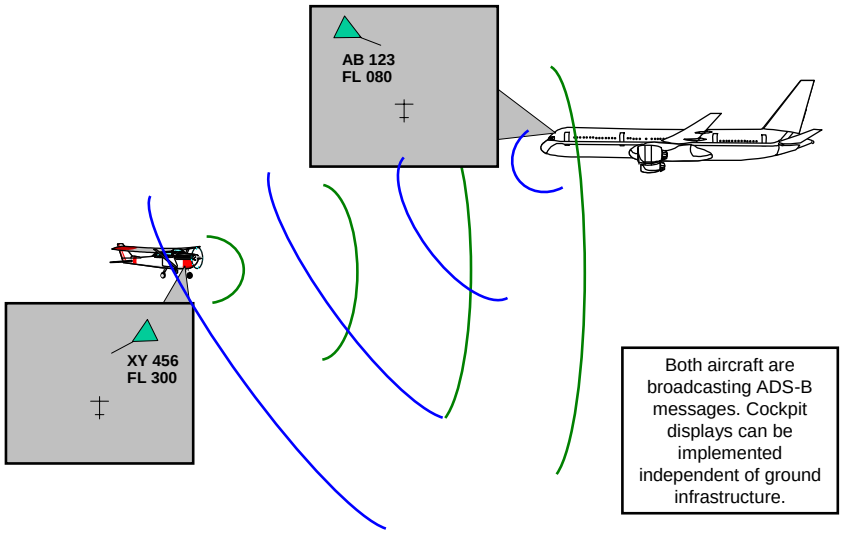


**Figure 1 - Cockpit traffic displays based on ADS-B**

Many new air transport aircraft are being delivered with ADS-B transponders and manufacturers are developing ADS-B transponders for general aviation aircraft. As the number of aircraft fitted with ADS-B increases, the use of cockpit traffic displays based on ADS-B becomes a practical option.

If the carriage of ADS-B becomes widespread then it is expected that cockpit traffic display products based on ADS-B will become widely available. Manufacturers can adapt multi-function displays to receive and display traffic from an ADS-B receiver.

## 3. TIS-B

Traffic Information Services Broadcast (TIS-B) makes use of ground-based surveillance equipment, typically secondary radar, to track the position of aircraft. "ADS-B like" messages for those aircraft are then generated and broadcast by a TIS-B ground station on the 1090 MHz frequency. Aircraft equipped with a 1090 MHz receiver can receive TIS-B messages for display on a CDTI. While 1090 MHz ADS-B receivers are now being developed, it is expected that these receivers will also be capable of receiving TIS-B messages.

TIS-B allows any aircraft equipped with a conventional transponder to be made visible on a cockpit display in another aircraft (see Figure 2). The important point, however, is that the tracked aircraft needs to be in radar coverage, while the receiving aircraft has to be within the broadcast region of the TIS-B ground station.

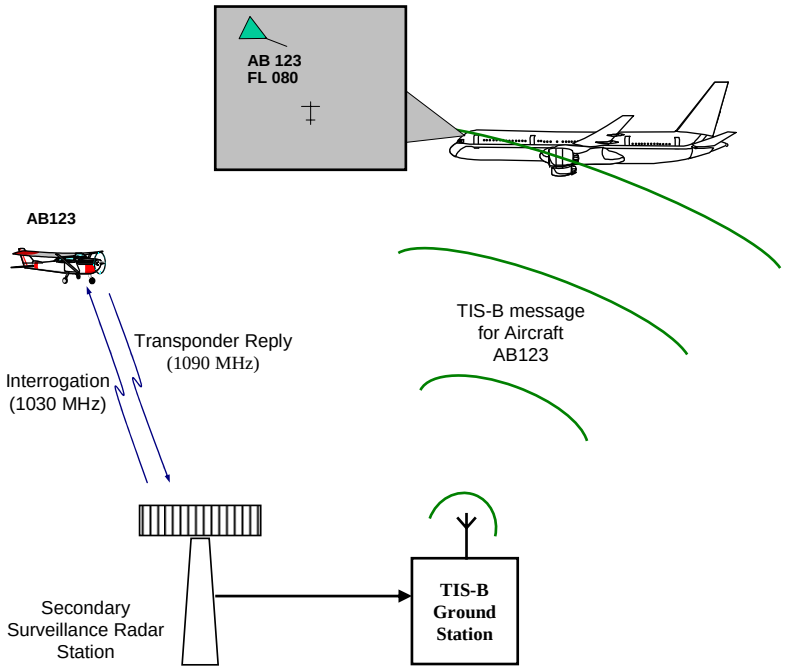


**Figure 2 - TIS-B concept diagram**

There are no plans to implement TIS-B in Australia for the simple fact that there are vast areas of the continent where there is no radar coverage to support it. If the Lower Airspace Project goes ahead then the existing en-route radars will be decommissioned. If aircraft are equipped with ADS-B then there is no need for TIS-B.

TIS-B is intended to provide CDTI capability in an environment where not all aircraft are equipped with ADS-B. It is promoted as a technology to be used in the transition from the current situation to one where high levels of ADS-B equipage exist. TIS-B can also be used to make aircraft operating on different ADS-B data links[1] visible to each other.

[1] See the discussion on ADS-B data links in Section 5.

## 4. TIS

Traffic Information Services (TIS) is a system currently offered in the US for aircraft equipped with an appropriate Mode S transponder. The Mode S system allows for the exchange of data between the aircraft and ground radar. When a pilot subscribes to TIS, the transponder sends a request to the radar station for traffic information. The radar then sends information to the transponder indicating the position of other aircraft in the vicinity of the subscribing aircraft. This information can be passed from the transponder to a traffic display in the cockpit.

TIS information is sent on the radar uplink channel or 1030 MHz frequency. The information is directed at each subscribing aircraft and updated with every revolution of the radar. Both the transponder and ground radar must support the TIS service to make it viable (see Figure 3).

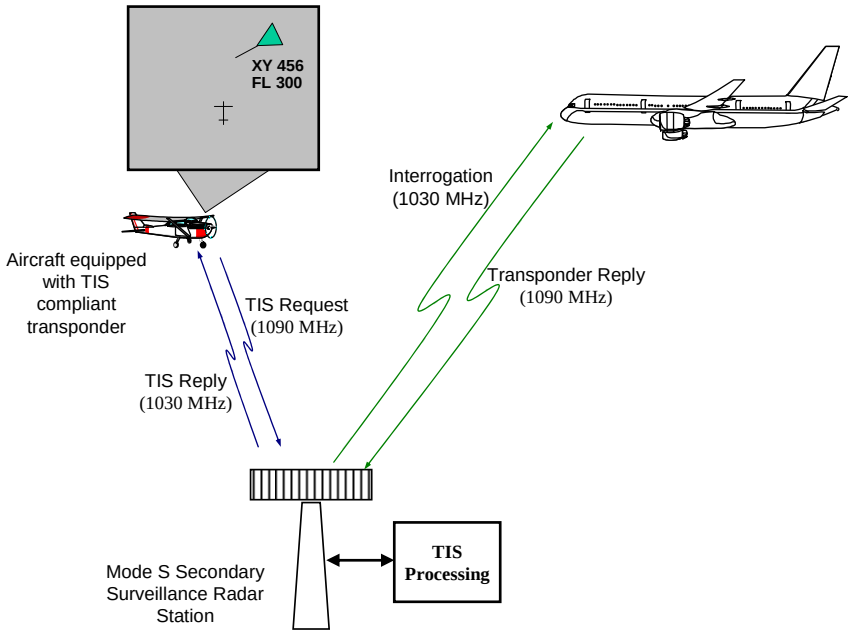


**Figure 3 - TIS concept diagram**

There are no plans for the introduction of TIS in Australia. The current radars do not support TIS and coverage is not widespread. Also, if the ADS-B Lower Airspace Project (LAP) is approved then the en-route radars may be de-commissioned within the next few years.

## 5. ADS-B Data links

The ADS-B system described above uses a data link called Mode S Extended Squitter. It should be noted that there are two other data links used for ADS-B in some localised areas of the world, Universal Access Transmitter (UAT) operating at a frequency of 978 MHz, and VHF Data link Mode 4 (VDLM4) which operates within the VHF air band. The data link describes the data protocol used to broadcast the ADS-B messages. Both the transmitting and receiving aircraft have to operate on the same data link to allow the exchange of information.

There is international agreement that Mode S Extended Squitter will be used for air transport aircraft worldwide. In the interests of interoperability between air transport and general aviation aircraft, Australia plans to adopt Mode S Extended Squitter for general aviation as well. There are no plans in Australia to use either UAT of VDLM4.

## 6. Conclusion

This paper describes three systems that support the display of traffic to pilots. There are no plans in Australia to introduce TIS or TIS-B, both of which are dependent on expensive ground infrastructure that does not exist in most parts of the country. ADS-B offers the advantage that cockpit traffic displays can be implemented independent of any ground systems. If the carriage of ADS-B becomes widespread in Australia then cockpit displays will become a practical option.

Aircraft operators considering CDTI in Australia should consider the information provided in this paper prior to purchasing new avionics.

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