

# Traffic Collision and Avoidance System

## I. Read the text. What is the role of TCAS?

Traffic Collision and Avoidance System The TCAS was developed in prototype form during the 1960s and 1970s to provide a surveillance and collision avoidance system to help aircraft avoid collisions. It was certified by the FAA in the 1980s and has been in widespread use in the United States in its initial form. TCAS is based on the beacon interrogator and operates in a similar fashion to the ground-based SSR already described. The system **comprises** two elements: a surveillance system and a collision avoidance system. TCAS detects the range, **bearing** and altitude of aircraft in the near proximity for display to the pilots. TCAS transmits a mode C interrogation search pattern for mode A and C **transponder** equipped aircraft and receives replies from all such equipped aircraft. In addition, TCAS transmits one mode S interrogation for each mode S transponder equipped aircraft, receiving individual responses from each one. It will be recalled that mode A relates to range and bearing, while mode C relates to range, bearing, and altitude and mode S relates to range, bearing, and altitude with a unique mode S reply. The aircraft TCAS equipment comprises a radio transmitter and receiver, directional antennae, a computer, and flight deck display. Whenever another aircraft receives an interrogation, it transmits a reply and the TCAS computer is able to determine the range from the time taken to receive the reply. The directional antennae enable the bearing of the responding aircraft to be measured. TCAS can track up to 30 aircraft but only display 25, the highest-priority targets being the ones that are displayed. TCAS is unable to detect aircraft that are not carrying an appropriately operating transponder or that have **unserviceable** equipment. A transponder is **mandated** if an aircraft flies above 10 000 ft or within 30 miles of major airports; consequently, all commercial aircraft and the great majority of corporate and general aviation aircraft are **fitted with** the equipment. TCAS exists in two forms: TCAS I and TCAS II. TCAS I indicates the range and bearing of aircraft within a selected range, usually 15-40 nautical miles forward, 5-15 nautical miles aft, and 10-20 nautical miles on each side. The system also warns of aircraft within  $\pm 8700$  ft of the aircraft's own altitude. The collision avoidance system element predicts the time to, and separation at, the intruder's closest point of approach. These calculations are undertaken using range, closure rate, altitude, and vertical speed. Should the TCAS **ascertain** that certain safety boundaries will be violated, it will issue a traffic **advisory** (TA) to alert the crew that closing traffic is in the vicinity via the display of certain coloured symbols. Upon receiving a TA, the flight crew must visually identify the intruding aircraft and may alter their altitude by up to 300 ft. A TA will normally be advised between 20 and 48 s before the point of closest approach with a simple audio warning in the flight crew's headsets: "TRAFFIC, TRAFFIC". TCAS I does not offer any **deconfliction** solutions but does provide the crew with vital data in order that they may determine the best course of action. TCAS II offers a more **comprehensive** capability, with the **provision** of Resolution Advisories (RAs). TCAS II determines the relative motion of the two aircraft and determines an appropriate course of action. The system issues an RA via mode S, advising the pilots to execute the necessary manoeuvre to avoid the other aircraft. An RA will usually be issued when the point of closest approach is within 15 and 35 s and the deconfliction symbology is displayed coincident with the appropriate warning. A total of ten audio warnings may be issued. Examples are: "CLIMB, CLIMB, CLIMB". "DESCEND, DESCEND, DESCEND". "REDUCE CLIMB, REDUCE CLIMB". Finally, when the situation is resolved, "CLEAR OF CONFLICT".

## II. Read the text again. Answer the questions.

1. What two parts does the system consist of?
2. What data does TCAS use to locate the aircraft?
3. What equipment does the system consist of?
4. When is transponder obligatory in the US?

5. What is the difference between TCAS I and TCAS II?
6. What kind of warnings does TCAS II issue?

### III. Explain the meaning of the words in bold in the text.

### IV. Complete the sentences with words in bold from the text. You may need to modify the words.

1. It should be \_\_\_\_\_ that the system complies with the regulations.
2. The team has carried out a \_\_\_\_\_ test of the system.
3. Manned aircraft and UAVs must be \_\_\_\_\_ by time, altitude, and/or location to avoid a potential midair collision.
4. The crew received a mid-air collision \_\_\_\_\_.
5. There are many safety regulations \_\_\_\_\_ by law.

### V. Find examples of passive voice in the text.

### VI. Read the rules and complete the sentences with appropriate forms of the verbs in brackets.

We make the passive using 'be' – in a suitable tense – and the **past participle** ('done', 'played' etc.). We use the passive:

1) ... when we don't know, or we are not interested in, who does an action.

•My car was stolen yesterday.

We don't know who stole the car.

•A lot of wine is produced in France.

It's not important who produces the wine.

2) ... when the main topic of the sentence isn't who did the action.

•Television was invented in the 1920s by John Logie Baird.

The main topic here is television – we aren't particularly interested in 'who'.

•Kennedy was assassinated in 1963.

In English we tend to put the most important thing at the start of the sentence.

3) ... more in written English than in spoken English.

•War and Peace was written by Tolstoy.

You often see the passive in textbooks.

•The mixture is heated to 500°C.

Scientific texts especially use the passive.

#### Tenses

The passive can be used with all tenses - the form of 'be' changes.

•What is tiramisu made from?. Present Simple.

•The hall is being painted this week so our class will be in a different room. Present Continuous.

•Oranges have been grown here for centuries. Present Perfect.

•When he got home he found that his flat had been burgled. Past Perfect.

•The work won't be finished until next week. Future Simple.

Modal verbs also use 'be' and the **past participle**.

•Answers must be written in pencil.

•Competition entrants might be chosen to appear on TV.

1. TCAS \_\_\_\_\_ (introduce) in the United States in 1980s.
2. In the future all aircraft around the world \_\_\_\_\_ (equip) with TCAS equipment.
3. The calculations \_\_\_\_\_ (make) using the latest software.
4. The crew \_\_\_\_\_ (advise) to return to the airport.
5. The TBO \_\_\_\_\_ (estimate) by our engineers.

**VII. Describe a scientific or technological process you are familiar with.**