

**DEPARTMENT OF CIVIL AVIATION
MALAYSIA
AIRWORTHINESS NOTICE**

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ATC TRANSPONDER AND TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEMS (TCAS) GROUND TESTING

1. Introduction

This notice is to provide general guidance material to aircraft maintenance organisations and maintenance personnel relating to ATC Transponder and Traffic Alert and Collision Avoidance Systems (TCAS). It includes information on the TCAS system together with precautions to be considered when ground testing ATC Transponders in order to minimise the possibility of causing nuisance advisory warnings on TCAS equipped aircraft.

2. General

A number of aircraft operating within airspace regulated by Malaysia are now equipped with TCAS. This equipment provides flight deck crew with an independent back-up to visual search and the ATC system by alerting them to potential collision hazards. In the case of more sophisticated systems which predominate in number, the equipment provides advice to the flight deck crew on how best to manoeuvre so that adequate separation may be maintained or achieved between potentially conflicting aircraft.

3. System Description And Operation - TCAS II

3.1 TCAS comprises a dedicated computer unit with associated aerals. Visual and voice advisories are provided for the flight deck crew.

3.2 The TCAS computer requires the presence of a Mode S transponder which provides a data link between TCAS equipped aircraft. Sensor inputs to TCAS include radio height and pressure altitude.

3.3 TCAS can provide two distinct forms of advisory information provided in the flight deck crew, Traffic Advisory (TA), and Resolution Advisory (RA).

(a) Traffic Advisory (TA), is aural and visual information provided in the cockpit to advise the flight deck crew as to the position of a potential threat aircraft.

(b) Resolution Advisory (RA), is aural and visual information provided in the cockpit to advise the flight crew that a particular manoeuvre should, or should not, be performed to maintain safe separation from a threat aircraft.

NOTE: Resolution Advisories cannot be produced if a potential threat aircraft does not provide altitude information.

3.4 TCAS equipped aircraft operate by interrogating the Mode S or Mode A/C transponders in proximate aircraft. The replies from Mode S and Mode C transponders are tracked in range, bearing and altitude. This data is passed on to the system logic for TA and RA processing and display.

3.5 Mode A/C transponders which are not equipped with an altitude encoder or when the altitude reporting is switched off, reply with no data in the altitude field, therefore, the TCAS will track in range and bearing only. This information is passed to the collision avoidance logic for TA detection and display.

4. Testing And Consideration

4.1 Recognising that airborne TCAS aircraft operate by interrogating operational transponders, it is apparent that they will elicit replies from the transponder equipped aircraft on the ground if they are in range and the equipment switched on.

4.2 This, Therefore, presents the possibility that a ground operated transponder may trigger a nuisance advisory on a TCAS equipped aircraft operating in the close vicinity. If the ground target is providing altitude data the TCAS logic should declare the aircraft to be on ground and ought not to generate an advisory. If no altitude data is provided the TCAS will generate a TA if the threat criteria are met. If the ground is providing altitude data other than surface altitude, as may happen with a defective altitude encoder, the TCAS may generate both TA and RA if the threat criteria are met.

- 4.3 Maintenance organisations and personnel who are involved in the ground testing of transponders and TCAS equipment are requested to establish procedures and take precautions to ensure that the risks of causing nuisance advisories are recognised and kept to a minimum.
- 4.4 It is considered that nuisance advisories may be caused to any TCAS equipped aircraft flying in the vicinity of transponders which are being tested, this may also include aircraft passing overhead at medium altitudes. The problem may be more noticeable where ground testing of transponders takes place at airfields located beneath Terminal Control Areas or in the vicinity of Control Areas or Zones where air traffic movements are likely to be numerous.
- 4.5 The following advice is provided to minimise the possibility of causing nuisance advisories to TCAS equipped aircraft when ground testing transponders and/or TCAS:
- (a) When not required ensure that transponders are selected to 'OFF' or 'Standby'.
 - (b) For transponders under test, when equipped for altitude reporting, set the control unit to 'Mode A/C' and select Altitude Reporting 'ON'.
 - (c) Where possible, carry out testing inside a hangar to take advantage of any shielding properties it may provide.
 - (d) Always use the antenna transmission absorption covers when these are provided with the test set.
 - (e) When testing C mode operation which require the altitude to be increased, radiate directly into the ramp test set via the prescribed attenuator.
 - (f) In between test parameters, select the transponder to the standby mode.
 - (g) The simulation of TCAS operation by the radiation from an antenna located on, or remotely based from a workshop, is not permitted.

NOTES: (1) The FAA have advised their staff of operational problems resulting in nuisance caused by ground based transponders installed on hangars for the purpose of testing TCAS installations. Maintenance organisations are reminded that all Malaysian aeronautical radio stations are required to be licensed by the Department of Telecommunications (Jabatan Telekom Malaysia) and the equipment approved by the DCA.

(2) Air Traffic Service Units may be advised when testing is to be carried out if it is considered that there is a possibility of nuisance advisories being caused by the activity due to its proximity to operational runways.

DIRECTOR GENERAL
DEPARTMENT OF CIVIL AVIATION
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