



**Australian Government**  

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**Civil Aviation Safety Authority**

**TRAFFIC ALERT AND  
COLLISION AVOIDANCE SYSTEM  
(TCAS II)**

**COMPETENCY STANDARD**

**Version 2.0 – Effective July 2005**

## Traffic Alert and Collision Avoidance System (TCAS II)

You should always refer to the applicable provisions of the Civil Aviation Act, Civil Aviation Regulations and the Civil Aviation Orders, rather than this manual, to ascertain the requirements of, and the obligations imposed by or under, the civil aviation legislation.

Version 2.0: July 2005

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## Revision History

Version	Date	Section(s)	Details of Change
2.0	July 2005	All	Re-written in new competency standard format. Traffic Advisories actions clarified.
1.0	June 2004	All	Initial issue.

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## OVERVIEW

### Introduction

The operational flight standards in this document apply to the Airborne Collision Avoidance System (ACAS), known as TCAS II.

Version 2.0 of the standard is a rewrite of the original standard, and although the format is different, the content is the same as the previous standard. However, there is clarification of action to be taken when a Traffic Advisory occurs.

The purpose of the standard is to provide guidance to pilots, instructors and assessors about the system operating skills and underpinning knowledge requirements for an applicant to obtain a TCAS II endorsement. In addition, the document explains the standard of operational competency that must be demonstrated to qualify for the endorsement, which is entered into the pilot's logbook.

The knowledge required to obtain this endorsement is contained in the standard. This knowledge is detailed in the [Evidence](#) section of the flight standard.

Pilots must complete oral, written or multiple-choice tests; or provide correct responses to questions generated by an interactive multi-media programme such as a computer-based training programme (CBT) or any combination of these to assess the knowledge of the applicant. A pass mark of not less than 80% is required.

The competency based standards for TCAS II Operations consist of Units and Elements of competency, Range of Variables and Evidence.

All the pre-flight and in-flight requirements of TCAS II operations are divided into realistic individual tasks called Units of Competency, such as 'Traffic Collision and Avoidance System'.

The Unit is further divided into Elements of Competency, which describes what the candidate must do.

Each Element of Competency has Performance Criteria that clearly define the performance an applicant must demonstrate to achieve the required standard.

Included with each Unit are the Range of Variables, which specifies the conditions under which the assessment is made; and Evidence which details the evidence that the assessor should observe to ensure competence.

When determining pilot competency, assessors should use the specified tolerances as a guide to confirm that approved TCAS II techniques are always used.

To this end, the assessor should be driven by approved techniques, rather than solely by specified numerical tolerances.

For initial endorsement and renewals, the pre-flight and in-flight competencies must be demonstrated in an approved flight simulator, or by means of interactive multi-media or CBT programmes acceptable to CASA, except that the pre-flight competencies and the control of the TCAS II display may be demonstrated in an aircraft.

Where a flight simulator is used, control inputs should be positive, smooth and coordinated and changes in vertical speed accomplished within the specified acceleration tolerances.

For initial endorsement, all elements of the pre-flight and in-flight competencies must be demonstrated.

On initial endorsement an entry must be made in the pilot's logbook certifying that the pilot has successfully completed the required TCAS II training. The form of the entry should be:

I consider (Pilots name and ARN) competent in the operation of TCAS II equipment; he/she has been instructed and found competent in all required elements of training in the use of TCAS II prepared by CASA and published under [CAR 5.59](#) (h).

Name \_\_\_\_\_ ARN \_\_\_\_\_ Date \_\_\_/\_\_\_/\_\_\_\_"

For renewals of TCAS II the form of the logbook entry should be:

(Pilots Name and ARN) has completed TCAS II renewal training as required under [CAR 5.59](#) (h).

Name \_\_\_\_\_ ARN \_\_\_\_\_ Date \_\_\_/\_\_\_/\_\_\_\_"

## Definitions

When these terms appear in the text of the standard they are underlined.

The checks and actions detailed in these definitions are advisory. Checks and actions in approved checklists, placards, Flight Manual/POHs, or Operations Manuals have precedence and must be complied with.

<b>ACAS</b>	Airborne Collision Avoidance System. For the purposes of these competency standards, ACAS is an approved TCAS II within the meaning given by <a href="#">CAR 262AB</a> .
<b>Approved checklist</b>	A checklist derived from information set out in the Flight Manual/POH, placards or other documents provided with the aircraft, necessary to ensure the situation awareness operation of the aircraft.
<b>Effect of turbulence</b>	The effect of turbulence must be considered when measuring standards of flying competency. Assessors must evaluate each situation and then apply considered judgement to compensate for variations to the published standards.
<b>Safe</b>	Means that a manoeuvre of flight is completed without injury to persons, damage to aircraft or breach of aviation safety regulations, while meeting the requirements of the Australian National Competency Standards for Private and Commercial Pilots.
<b>Situation awareness</b>	An appreciation of all factors relevant to the <u>safe</u> progress of a flight.
<b>TCAS II</b>	Traffic Alert and Collision Avoidance System. TCAS II is an ACAS that provides both Traffic Advisories (TA) and Resolution Advisories (RA).

## **COMPETENCY STANDARDS FOR TCAS II OPERATIONS**

### **Traffic and Collision Avoidance Systems**

- 1.1 Airborne Collision Avoidance System (ACAS II) is the ICAO term for equipment that meets the requirements of Annex 10 to Standards and Recommended Practices (SARPS) for collision avoidance systems. Traffic Alert and Collision Avoidance System (TCAS II) is the US-manufactured equipment that is fitted to aircraft in Australia and worldwide, and has become synonymous with the term ACAS II.
- 1.2 Pilots are to complete an oral, written or multiple-choice test; or provide correct responses to questions generated by an interactive multi media programme such as a computer-based training programme (CBT) or any combination of these.
- 1.3 For initial endorsement and renewals, the pilot must demonstrate the pre-flight and in-flight competencies in an approved flight simulator, or by means of interactive multi-media or computer-based training programmes acceptable to CASA. The pre-flight competencies and the control of the TCAS II display may be demonstrated in an aircraft.
- 1.4 For initial endorsement, all elements of the pre-flight and in-flight competencies must be demonstrated. For renewal of the endorsement, those items identified with an asterisk (\*) in the tables below, are required to be demonstrated.

## Traffic and Collision Avoidance System – Flight Standard

1.5 **Unit Description.** This covers knowledge and skills required to:

- (a) Perform TCAS II pre-flight procedures.
- (b) Determine the serviceability status of TCAS II equipment and select the appropriate modes of operation.
- (c) Control the display configuration.
- (d) Recognise and interpret all information displayed on TCAS II.
- (e) Assess and respond appropriately to Traffic Advisories (TA) and Resolution Advisories (RA) issued by TCAS II.
- (f) Recognise and respond appropriately to in-flight failures of the TCAS II system.

Elements	Performance Criteria
<p><b>1. *Operate <u>TCAS II</u> equipment on the ground</b></p>	<ol style="list-style-type: none"> <li>1. Perform pre-flight procedures in accordance with the <u>approved checklist</u>, company operations manual or Pilot's Handbook to ensure serviceability of <u>TCAS II</u> equipment in accordance with approved testing procedure and rectify faults when possible.</li> <li>2. Interprets <u>TCAS II</u> self test function and determines system serviceability.</li> <li>3. Selects appropriate <u>TCAS II</u> modes for taxiing and take off in accordance with <u>approved checklist</u> or company operations manual or Pilot's Handbook.</li> </ol> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p><b>Note:</b> Selection of required modes may vary with specific operator procedure</p> </div> <p><b>Brief Crew</b></p> <ol style="list-style-type: none"> <li>4. Performs pre-flight briefing addressing the procedures that will be used in responding to TAs and RAs in accordance with the company operations manual.</li> <li>5. Specifies communication procedures relating to <u>TCAS II</u> alerts.</li> </ol>
<p><b>2. *Operate <u>TCAS II</u> equipment airborne</b></p>	<p><b>Select modes and display configurations</b></p> <ol style="list-style-type: none"> <li>1. Selects appropriate <u>TCAS II</u> display configuration at various stages of flight in accordance with the <u>approved checklist</u>, company operations manual or Pilot's Handbook.</li> <li>2. Controls display configuration to show appropriate <u>TCAS II</u> information without elimination of other necessary flight information.</li> <li>3. Selects appropriate <u>TCAS II</u> display configuration at various stages of flight in accordance with the <u>approved checklist</u>, company operations manual or Pilot's Handbook.</li> </ol>

Elements	Performance Criteria
<p><b>*Operate <u>TCAS II</u> equipment airborne (Contd.)</b></p>	<p><b><i>Interpret <u>TCAS II</u> display elements</i></b></p> <p>4. Recognises and interprets all information displayed by <u>TCAS II</u>. <i>Respond to Traffic Advisories (TA) and Resolution Advisories (RA) issued for a range of encounter geometries.</i></p> <p><b><i>Traffic Advisory</i></b></p> <p>5. Applies all available information to assist in visual acquisition and states expected position for visual acquisition of TA traffic.</p> <p>6. Complies with ATC instructions unless a conflicting RA command is displayed.</p> <p>7. Ensures no manoeuvres are initiated based solely on <u>TCAS II</u> TA information.</p> <p><b><i>Resolution Advisory</i></b></p> <p>8. Responds appropriately, within the specified time and acceleration tolerances, to RA issued for the following encounter geometries:</p> <ul style="list-style-type: none"> <li>a. Both TCAS and intruder aircraft in level flight.</li> <li>b. TCAS aircraft in level flight, intruder with vertical rate.</li> <li>c. TCAS aircraft with vertical rate, intruder in level flight.</li> <li>d. Both TCAS and intruder aircraft with vertical rate.</li> <li>e. Responds appropriately with positive control inputs to: <ul style="list-style-type: none"> <li>(i) Corrective RAs within 5 seconds of RA display;</li> <li>(ii) Increase/reversal or increase rate/reversal RAs within 2.5 seconds of RA display;</li> <li>(iii) Modify vertical speed for weakening RAs to initiate a return towards the original altitude specified by ATC within 2.5 seconds of RA display; and</li> <li>(iv) Modify vertical speed for strengthening RAs to comply with revised RA within 2.5 seconds of RA display.</li> </ul> </li> </ul> <p>9. Ensures RA commands are followed in priority to conflicting ATC instructions.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p><b>*Note:</b> For renewal of the TCAS endorsement, it is only necessary to demonstrate an appropriate response for one corrective RA and one preventative RA, in any convenient encounter geometry.</p> </div> <p><b><i>Perform radio communications procedures applicable to <u>TCAS II</u> operations</i></b></p> <p>10. Communicates with ATC using standard radiotelephone procedures applicable to the TCAS event.</p>

Elements	Performance Criteria
<p><b>3. *Recognise <u>TCAS II</u> failures and rectify fault or limit the use of <u>TCAS II</u></b></p>	<ol style="list-style-type: none"> <li>1. Recognises and identifies total <u>TCAS II</u> failure or failure of RA Mode.</li> <li>2. Tests and rectifies <u>TCAS II</u> faults in accordance with the <u>approved checklist</u>, company operations manual or Pilot Operating Handbook, where possible.</li> <li>3. Limits use of TCAS II in accordance with the reduced capabilities of the equipment where faults cannot be rectified.</li> </ol> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>Note:</b> Differences in TCAS II equipment supplied by different manufacturers and differences in company operating procedures by specific operators will result in a wide variation of appropriate procedures.</p> </div>

<b>Range of Variables</b>
<p><b>Checks and Actions</b></p> <p>During assessment the pilot should be observed to perform the following checks and actions as evidence of ability to meet the standards:</p> <ul style="list-style-type: none"> <li>• Checks and actions in approved checklists, placards, Flight Manual/POHs, or Operations Manuals have precedence and must be complied with.</li> </ul> <p><b>Workplace environment may include</b></p> <ul style="list-style-type: none"> <li>• Approved multi and single engine aircraft</li> <li>• Approved flight simulator</li> <li>• Variable weather</li> <li>• Day, night or IFR operations</li> <li>• Aircraft or simulator fitted with TCAS/ACAS systems</li> <li>• Synthetic training devices.</li> </ul>

<b>Evidence</b>
<p><b>Assessment must be confirmed by</b></p> <ul style="list-style-type: none"> <li>• Observation, simulation, role playing, questioning or any combination of these methods</li> <li>• Training records and achievement records</li> <li>• Examination results</li> <li>• This element may be assessed with other elements that form part of a job function.</li> <li>• When manipulating flight controls during the process of correcting errors, specified flight tolerances may be temporarily exceeded if <u>controlled corrective action</u> is in progress.</li> </ul>

## Evidence

### Critical aspects of evidence to be considered

- Perform pre-flight procedures and determine serviceability of TCAS II equipment
- Select required modes of TCAS II
- Brief crew about TCAS II procedures
- Select TCAS II display configuration
- Respond appropriately to traffic advisory and resolution advisory
- Perform radio communications appropriate to TCAS II advisories
- Recognise and respond to TCAS II failures
- Rectify TCAS II fault or limit the use of TCAS II.

### Underpinning knowledge and skills

- State the surveillance and collision avoidance functions of TCAS II.
- Explain system limitations, selectivity and inhibits.
- Identify the basic components of TCAS II.
- Identify and demonstrate or explain the function of cockpit controls.
- Explain the following terminology applicable to TCAS II:
  - Proximate
  - Intruder
  - Threat
  - Traffic Advisory (TA)
  - Resolution Advisory (RA)
  - Closest Point of Approach (CPA).
- Explain the effect of Tau and DMOD criteria on the protected area.
- Explain altitude separation thresholds.
- State the circumstances under which TCAS II inhibits RA at low altitude.
- Explain the level of protection provided by TCAS II applicable to:
  - Altitude-reporting intruders
  - Non altitude-reporting intruders
  - Multiple intruders
  - TCAS II to TCAS II coordination.
- Explain TCAS II visual displays and symbology.
- Explain the action requirements of display symbology that is coloured red.
- Describe and explain the functions of audio alerts and annunciations.
- State how TCAS II interfaces with other aircraft systems listed below:
  - Mode S transponder
  - Barometric and radio altimeter inputs to TCAS II
  - Weather radar
  - Electronic flight instruments.
- Interpret and apply displayed traffic information to enhance (improve) situation awareness.
- Interpret Traffic Advisory (TA) Mode and demonstrate knowledge of appropriate action to be taken.

## Evidence

- Interpret RA and demonstrate knowledge of appropriate action to be taken.
- Identify a strengthening or weakening RA and explain the appropriate action to be taken.
- State why TCAS II logic would issue a crossing RA action (RA) after detection of a crossing threat aircraft.
- State why TCAS II logic would issue an RA reversal.
- State maximum time available to initiate and appropriately respond to an RA to ensure collision avoidance.
- Describe the appropriate crew response to multiple TCAS II events and parallel runway approach conflicts.
- State the priorities given to:
  - Stall warnings
  - GPWS alert
  - Windshear
  - TCAS II RA.
- State what advisories TCAS II will use when aircraft performance limits response to RA.
- Describe crew responses to cancellation of RA.
- Recall the radiotelephone procedures following a TCAS II alert.
- Explain when a written report of a TCAS II alert is required and to whom it must be submitted.
- State under what circumstances flight with an unserviceable TCAS II is permitted.

### **Consistency of performance and context of assessment**

- Competency of performance is to be demonstrated on more than one flight.
- Competencies are to be assessed in flight in variable conditions.
- For RPL and PPL assessment, confirm that control of the aircraft or situation is maintained at all times and in such a manner that if the successful outcome is in doubt, corrective action is taken.
- For CPL and ATPL assessment, confirm that control of the aircraft or situation is maintained at all times and in such a manner the successful outcome or a procedure or manoeuvre is not in doubt.