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24 / 2005
18 AUG

OPERATION OF TRAFFIC/AIRBORNE COLLISION AVOIDANCE SYSTEM (TCAS/ACAS) EQUIPMENT

1. INTRODUCTION

- 1.1 This AIC is issued in the exercise of the powers conferred under Section 24o of the Civil Aviation Act 1969
- 1.2 This AIC outlines the operation of TCAS/ACAS II equipment and the procedures to be adhered to when there is a conflict between the RA and air traffic control (ATC) instruction.

2. APPLICABILITY

- 2.1 The requirements contained in this AIC, apply to all air operators operating an aeroplane equipped with TCAS/ACAS II as required by AIC 06/2000 dated 10 March 2000.

3. GENERAL

- 3.1 Traffic/Airborne Collision Avoidance System (TCAS/ACAS) indications shall be used by pilots in the avoidance of potential collisions, the enhancement of situational awareness, and the active search for, and visual acquisition of conflicting traffic.
 - 3.1.1 Nothing in the procedures specified in 4.1c hereunder shall prevent pilots-in-command from exercising their best judgement and full authority in the choice of the best course of action to resolve a traffic conflict or avert a potential collision.

Note 1. - The ability of TCAS/ACAS to fulfill its role of assisting pilots in the avoidance of potential collisions is dependent on the correct and timely response by pilots to TCAS/ACAS indications. Operational experience has shown that the correct response by pilots is dependent on the effectiveness of initial and recurrent training in TCAS/ACAS procedures.

Note 2. - TCAS/ACAS II Training Guidelines for Pilots are provided in Appendix A to this AIC.

4. USE OF TCAS/ACAS INDICATIONS

- 4.1 The indications generated by TCAS/ACAS shall be used by pilots in conformity with the following safety considerations:
 - (a) Pilots shall not manoeuvre their aircraft in response to traffic advisories (TAs) only.

Note 1.- TAs are intended to alert pilots to the possibility of a resolution advisory (RA), to enhance situational awareness, and to assist in visual acquisition of conflicting traffic. However, visually acquired traffic may not be the same traffic causing a TA. Visual perception of an encounter may be misleading, particularly at night.

Note 2. - The above restriction in the use of TAs is due to the limited bearing accuracy and to the difficulty in interpreting altitude rate from displayed traffic information.

- (b) On receipt of a TA, pilots shall use all available information to prepare for appropriate action if an RA occurs.
- (c) In the event of an RA, pilots shall:
 - (1) Respond immediately by following the RA as indicated, unless doing so would jeopardize the safety of the aeroplane.

Note 1. - Stall warning, wind shear, and ground proximity warning system alerts have precedence over TCAS/ACAS.

Note 2. - Visually acquired traffic may not be the same traffic causing an RA. Visual perception of an encounter may be misleading, particularly at night.

- (2) Follow the RA even if there is a conflict between the RA and air traffic control (ATC) instruction to manoeuvre.
- (3) Not manoeuvre in the opposite to an RA.

Note. - In the case of an TCAS/ACAS-TCAS/ACAS coordinated encounter, the RAs complement each other in order to reduce the potential for collision. Manoeuvres, or lack of manoeuvres, that result in vertical rates opposite to the sense of an RA could result in a collision with the threat aircraft

- (4) As soon as possible, as permitted by flight crew workload, notify the appropriate ATC unit of the RA, including the direction of any deviation from the current air traffic control instruction or clearance.

Note. - Unless informed by the pilot, ATC does not know when TCAS/ACAS issues RAs. It is possible for ATC to issue instructions that are unknowingly contrary to TCAS/ACAS RA indications. Therefore, it is important that ATC be notified when an ATC instruction or clearance is not being followed because it conflicts with an RA

- (5) Promptly comply with any modified RAs.
- (6) Limit the alterations of the flight path to the minimum extent necessary to comply with the RAs.
- (7) Promptly return to the terms of the ATC instruction or clearance when the conflict is resolved.
- (8) Notify ATC when returning to the current clearance.

5. REQUIREMENTS

- 5.1 The following requirements as to be adhered to by all operators operating TCAS/ACAS II equipped aeroplane as required by AIC 06/2000 dated 10 March 2000.
- (a) To incorporate the procedures for the operation of TCAS/ACAS II equipment as laid out in 4.1 of this AIC in the operations manual.
 - (b) Procedure to be followed when there is a conflict between the RA and an air traffic control (ATC) is to be written in bold in the operations manual and to be emphasized during initial and recurrent training.

6. APPENDIX

- 6.1 The Appendix 1 to this AIC shall be taken, construed, read and be part of this AIC.
7. **This AIC supersedes AIC 02/2003 dated 09 January 2003.**

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TCAS/ACAS II TRAINING GUIDELINES FOR PILOTS

Note.-The acronym "TCAS/ACAS" is used in this appendix to indicate TCAS/ACAS II

1. INTRODUCTION

1.1 During the implementation of TCAS/ACAS and the operational evaluations conducted by States, several operational issues were identified that were attributed to deficiencies in pilot training programmes. To address these deficiencies, a set of performance-based training objectives for TCAS/ACAS pilot training was developed. The training objectives cover: theory of operation; pre-flight operations; general in-flight operations; response to traffic advisories (TAs); and response to resolution advisories (RAs). The training objectives are further divided into the areas of TCAS/ACAS academic training; TCAS/ACAS manoeuvre training; TCAS/ACAS initial evaluation; and TCAS/ACAS recurrent qualification.

1.2 TCAS/ACAS academic training material has been divided into items that are considered essential training and those that are considered desirable. Those items that are deemed to be essential are a requirement for each TCAS/ACAS operator. In each area, a list of objectives and acceptable performance criteria is defined. All manoeuvre training is considered essential.

1.3 In developing this material, no attempt was made to define how the training programme should be implemented. Instead, objectives were established that define the knowledge a pilot operating TCAS/ACAS is expected to possess and the performance expected from a pilot who has completed TCAS/ACAS training. Therefore, all pilots who operate TCAS/ACAS equipment should receive the TCAS/ACAS training described below.

2. TCAS/ACAS ACADEMIC TRAINING

2.1 General

2.1.1 This training is typically conducted in a classroom environment. The knowledge demonstrations specified in this section may be achieved through the successful completion of written tests or providing correct responses to non-real-time computer-based training (CBT) questions.

2.2 Essential items

2.2.1 *Theory of operation.* The pilot must demonstrate an understanding of TCAS/ACAS operation and the criteria used for issuing TAs and RAs. This training should address the following topics:

2.2.1.1 System operation

OBJECTIVE: Demonstrate knowledge of how TCAS/ACAS functions.

CRITERIA: The pilot must demonstrate an understanding of the following functions:

a. Surveillance:

- (1) TCAS/ACAS interrogates other transponder-equipped aircraft within a nominal range of 26 km (14 NM); and
- (2) TCAS/ACAS surveillance range can be reduced in geographic areas with a large number of ground interrogators and/or TCAS/ACAS-equipped aircraft. A minimum surveillance range of 8.5 km (4.5 NM) is guaranteed for TCAS/ACAS aircraft that are airborne.

Note.-If the operator's TCAS/ACAS installation provides for the use of the Mode S extended squitter, the normal surveillance range may be increased beyond the nominal 14 NM. However, this information is not used for collision avoidance purposes

b. Collision avoidance:

- (1) TAs can be issued against any transponder-equipped aircraft that responds to the ICAO Mode C interrogations, even if the aircraft does not have altitude-reporting capability;

Note.-SSR transponders having only Mode A capability do not generate TAs. TCAS/ACAS does not use Mode A interrogations; therefore, the Mode A transponder codes of nearby aircraft are not known to TCAS/ACAS. In ICAO Standard and Recommended Practices(SARPs), Mode C minus the altitude is not considered Mode A because of the difference in the pulse intervals. TCAS/ACAS uses the framing pulses of replies to Mode C interrogations and will track and may display aircraft equipped with an operating Mode A/C transponder whether or not the altitude-reporting function has been enabled.

- (2) RAs can be issued only against aircraft that are reporting altitude and in the vertical plane only;
- (3) RAs issued against a TCAS/ACAS-equipped intruder are coordinated to ensure that complementary RAs are issued;
- (4) Failure to respond to an RA deprives the aircraft of the collision protection provided by its TCAS/ACAS. Additionally, in TCAS/ACAS-TCAS/ACAS encounters, it also restricts the choices available to the other aircraft's TCAS/ACAS and thus renders the other aircraft's TCAS/ACAS less effective than if the first aircraft were not TCAS/ACAS-equipped; and
- (5) Manoeuvring in a direction opposite to that indicated by an RA is likely to result in further reduction in separation. This is particularly true in the case of an TCAS/ACAS-TCAS/ACAS coordinated encounter.

2.2.1.2 *Advisory thresholds*

OBJECTIVE: Demonstrate knowledge of the criteria for issuing TAs and RAs.

CRITERIA: The pilot must be able to demonstrate an understanding of the methodology used by TCAS/ACAS to issue TAs and RAs and the general criteria for the issuance of these advisories to include:

- a. TCAS/ACAS advisories are based on time to closest point of approach (CPA) rather than distance. The time must be short and vertical separation must be small, or projected to be small, before an advisory can be issued. The separation standards provided by air traffic services are different from those against which TCAS/ACAS issues alerts;
- b. Thresholds for issuing a TA or RA vary with altitude. The thresholds are larger at higher altitudes;
- c. TAs generally occur from 20 to 48 seconds prior to CPA. When TCAS/ACAS is operated in TA-only mode, RAs will be inhibited;
- d. RAs occur from 15 to 35 seconds before the projected CPA, and

- e. RAs are chosen to provide the desired vertical separation at CPA. As a result, RAs can instruct a climb or descent through the intruder aircraft's altitude.

2.2.1.3 TCAS/ACAS limitations

OBJECTIVE: To verify that the pilot is aware of the limitations of TCAS/ACAS.

CRITERIA: The pilot must demonstrate a knowledge and understanding of the TCAS/ACAS limitations including:

- a. TCAS/ACAS will neither track nor display non-transponder-equipped aircraft, nor aircraft with an inoperable transponder, nor aircraft with a Mode A transponder;
- b. TCAS/ACAS will automatically fail if the input from the aircraft's barometric altimeter, radio altimeter, or transponder is lost;

Note.-In some installations, the loss of information from other on-board systems such as an inertial reference system (IRS) or attitude and heading reference system (AHRS) may result in an TCAS/ACAS failure. Individual operators should ensure that their pilots are aware of what types of aircraft system failures will result in an TCAS/ACAS failure.

- c. Some aircraft within 116 m (380 ft) above ground level (AGL) (nominal value) will not be displayed. If TCAS/ACAS is able to determine that an aircraft below this altitude is airborne, it will be displayed;
- d. TCAS/ACAS may not display all proximate transponder-equipped aircraft in areas of high-density traffic; however, it will still issue RAs as necessary;
- e. Because of design limitations, the bearing displayed by TCAS/ACAS is not sufficiently accurate to support the initiation of horizontal manoeuvres based solely on the traffic display;
- f. Because of design limitations, TCAS/ACAS will neither display nor give alerts against intruders with a vertical speed in excess of 3048 m/min (10 000 ft/min). In addition, the design implementation may result in some short-term errors in the tracked vertical speed of an intruder during periods of high vertical acceleration by the intruder; and
- g. Stall warnings, ground proximity warning system (GPWS) enhanced ground proximity warning system (EGPWS) warnings, and wind shear warnings take precedence over TCAS/ACAS advisories. When either a GPWS/EGPWS or wind shear warning is active, TCAS/ACAS will automatically switch to the TA-only mode of operation except that TCAS/ACAS aural annunciations will be inhibited. TCAS/ACAS will remain in TA-only mode for 10 seconds after the GPWS/EGPWS or wind shear warning is removed.

2.2.2.4 TCAS/ACAS inhibits

OBJECTIVE: To verify that the pilot is aware of the conditions under which certain functions of TCAS/ACAS are inhibited.

CRITERIA: The pilot must demonstrate a knowledge and understanding of the various TCAS/ACAS inhibits including:

- a. Increase descent RAs are inhibited below 442 (+/-30) m (1450 (+/-100) ft) AGL;
- b. Descend RAs are inhibited below 335 (+/- 30) m (1100 (+/- 100) ft) AGL;

- c. All RAs are inhibited below 305 (+/- 30) m (1000 (+/- 100) ft) AGL;
- d. All TCAS/ACAS aural annunciations are inhibited below 152 (+/- 30) m (500 (+/- 100) ft) AGL. This includes the aural annunciation for TAs; and annunciation for TAs; and
- e. Altitude and configuration under which climb and increase climb RAs are inhibited. TCAS/ACAS can still issue climb and increase climb RAs when operating at the aircraft's maximum altitude or certified ceiling. However, if aeroplane performance at maximum altitude is not sufficient to enable compliance with the climb rate required by a climb RA, the response should still be in the required sense but not beyond the extent permitted by aeroplane performance limitations.

Note.-In some aircraft type, climb or increase climb RAs are never inhibited.

2.2.2 *Operating procedures.* The pilot must demonstrate the knowledge required to operate TCAS/ACAS and interpret the information presented by TCAS/ACAS. This training should address the following topics:

2.2.2.1 *Use of controls*

OBJECTIVE: To verify that the pilot can properly operate all TCAS/ACAS and display controls

CRITERIA: Demonstrate the proper use of controls including:

- a. Aircraft configuration required to initiate a self-test;
- b. Steps required to initiate a self-test;
- c. Recognizing when the self-test is successful and when it is unsuccessful. When the self-test is unsuccessful, recognizing the reason for the failure, and, if possible, correcting the problem;
- d. Recommended usage of traffic display range selection. Low ranges are used in the terminal area, and the higher display ranges are used in the en-route environment and in the transition between the terminal and en-route environment;
- e. if available, recommended usage of the "Above/Below" mode selector. "Above" mode should be used during climb, and "Below" mode should be used during descent;\
- f. Recognition that the configuration of the traffic display, i.e. range and "Above/Below" selection, does not affect the TCAS/ACAS surveillance volume;
- g. Selection of lower ranges on the traffic display to increase display resolution when an advisory is issued;
- h. If available, proper selection of the display of absolute or relative altitude and the limitations of using the absolute display option if a barometric correction is not provided to ACAS; and
- i. Proper configuration to display the appropriate TCAS/ACAS information without eliminating the display of other needed information.

Note.-The wide variety of display implementations makes it difficult to establish more definitive criteria. When the training programme is developed, these general criteria should be expanded to cover specific details for an operator's specific display implementation.

2.2.2.2 Display interpretation

OBJECTIVE: To verify that a pilot understands the meaning of all information that can be displayed by TCAS/ACAS.

CRITERIA: The pilot must demonstrate the ability to properly interpret information displayed by TCAS/ACAS

- a. Other traffic, i.e. traffic within the selected display range that is not proximate traffic, or causing a TA or RA to be issued;
- b. Proximate traffic, i.e. traffic that is within 11 km (6 NM) and +366 m (1200 ft);
- c. Non-altitude reporting traffic;
- d. No bearing TAs and RAs;
- e. off-scale TAs and RAs. The selected range should be changed to ensure that all available information on the intruder is displayed;
- f. Traffic advisories. The minimum available display range that allows the traffic to be displayed should be selected to provide the maximum display resolution;
- g. Resolution advisories (traffic display). The minimum available display range of the traffic display that allows the traffic to be displayed should be selected to provide the maximum display resolution;
- h. Resolution advisories (RA display). Pilots should demonstrate knowledge of the meaning of the red and green areas or the meaning of pitch or flight path angle cues displayed on the RA display. For displays using red and green areas, pilots should demonstrate knowledge of when the green areas will and will not be displayed. Pilots should also demonstrate an understanding of the RA display limitations, i.e. if a vertical speed tape is used and the range of the tape is less than 762 m/min (2 500 ft/min), how an increase rate RA will be displayed; and
- i. If appropriate, awareness that navigation displays oriented "Track-Up" may require a pilot to make a mental adjustment for drift angle when assessing the bearing of proximate traffic.

Note.-The wide variety of display implementations will require the tailoring of some criteria. When the training programme is developed, these criteria should be expanded to cover details for an operator's specific display implementation.

2.2.2.3 Use of the TA-only mode

OBJECTIVE: To verify that a pilot understands the appropriate times to select the TA-only mode of operation and the limitations associated with using this mode.

CRITERIA: The pilot must demonstrate the following:

- a. Knowledge of the operator's guidance for the use of TA-only mode;
- b. Reasons for using this mode and situations in which its use may be desirable. These include operating in known close proximity to other aircraft such as when visual approaches are being used to closely spaced parallel runways or taking off towards aircraft operating in a VFR corridor. If TA-only mode is not selected when an airport is

conducting simultaneous operations from parallel runways separated by less than 366 m (1200 ft), and to some intersecting runways, RAs can be expected. If an RA is received in these situations, the response should comply with the operator's approved procedures; and

- c. The TA aural annunciation is inhibited below 152 m (500 ft) AGL. As a result, TAs issued below 152 m (500 ft) AGL may not be noticed unless the TA display is included in the routine instrument scan.

2.2.2.4 Crew coordination

OBJECTIVE: To verify that pilots adequately brief other crew members on how ACAS advisories will be handled.

CRITERIA: Pilots must demonstrate that their pre-flight briefing addresses the procedures that will be used in responding to TAs and RAs including:

- a. Division of duties between the pilot flying and the pilot not flying, including a clear definition of whether the pilot flying or the pilot-in-command will fly the aircraft during a response to an RA,
- b. expected call-outs;
- c. Communications with ATC; and
- d. Conditions under which an RA may not be followed and who will make this decision.

Note 1.-Different operators have different procedures for conducting pre-flight briefings and for responding to ACAS advisories. These factors should be taken into consideration when implementing the training programme.

Note 2.-The operator must specify the conditions under which an RA need not be allowed, reflecting advice published by States' Civil Aviation Authorities. This should not be an item left to the discretion of a crew.

Note 3.-This portion of the training may be combined with other training such as crew resource management (CRM).

2.2.2.5 Reporting requirements

OBJECTIVE: TO verify that the pilot is aware of the requirements for reporting RAs to the controller and other authorities.

CRITERIA: The pilot must demonstrate the following:

- a. the use of the phraseology contained in the *Procedures for Air Navigation Services -Air Traffic Management* (PANS-ATM, Doc 4444); and
- b. where information can be obtained regarding the need for making written reports to various States when an RA is issued. Various States have different reporting requirements and the material available to the pilot should be tailored to the airline's operating environment.

2.3 Desirable items

2.3.1 Advisory - thresholds

OBJECTIVE: Demonstrate knowledge of the criteria for issuing TAs and **RAs**.

CRITERIA: The pilot must be able to demonstrate an understanding of the methodology used by TCAS/ACAS to issue TAs and RAs and the general criteria for the issuance of these advisories to include:

- a. The TA altitude threshold is 259 m (850 ft) below FL 420 and 366 m (1 200 ft) above FL 420;
- b. When the vertical separation at CPA is projected to be less than the TCAS/ACAS-desired separation, an RA requiring a change to the existing vertical speed will be issued. The TCAS/ACAS-desired separation varies from 91 m (300 ft) at low altitude to a maximum of 213 m (700 ft) above FL 300;
- c. when the vertical separation at CPA is projected to be greater than the TCAS/ACAS-desired separation, an RA that does not require a change to the existing vertical speed will be issued. This separation varies from 183 to 244 m (600 to 800 ft); and
- d. RA fixed-range thresholds vary between 0.4 km(0.2 NM) at low altitude and 2 km(1.1 NM) at high altitude. These fixed-range thresholds are used to issue RAs in encounters with slow closure rates.

3. TCAS/ACAS MANOEUVRE TRAINING

3.1 When training pilots to properly respond to TCAS/ACAS-displayed information, TAs and RAs are most effective when accomplished in a flight simulator equipped with an TCAS/ACAS display and controls similar in appearance and operation to those in the aircraft. If a simulator is utilized, CRM aspects of responding to TAs and RAs should be practiced during this training.

3.2 If an operator does not have access to an TCAS/ACAS-equipped simulator, the initial TCAS/ACAS evaluation should be conducted by means of an interactive CBT with an TCAS/ACAS display and controls similar in appearance and operation to those in the aircraft the pilot will fly. This interactive CBT should depict scenarios in which real-time responses must be made. The pilot should be informed whether or not the responses made were correct. If the response was incorrect or inappropriate, the CBT should show what the correct response should be.

3.3 The scenarios in the manoeuvre training should include initial RAs that require a change in vertical speed; initial RAs not requiring a change in vertical speed; maintain rate RAs; altitude crossing RAs; increase rate RAs; RA reversals; weakening RAs; RAs issued while the aircraft is at a maximum altitude, and multi-aircraft encounters. In all scenarios, excursions should be limited to the extent required by the RA. The scenarios should be concluded with a return to the original flight profile. The scenarios should also include demonstrations of the consequences of not responding to RAs, slow or late responses, and manoeuvring opposite to the direction called for by the displayed RA as follows:

3.3.1 TA responses

OBJECTIVE: To verify that the pilot properly interprets and responds to TAs.

CRITERIA: The pilot must demonstrate:

- a. Proper division of responsibilities between the pilot flying and the pilot not flying. The pilot flying should continue to fly the aeroplane and be prepared to respond to any RA that might follow. The pilot not flying should provide updates on the traffic location shown on the TCAS/ACAS traffic display and use this information to help visually acquire the intruder;
- b. Proper interpretation of the displayed information. Visually search for the traffic causing the TA at a location shown on the traffic display. Use should be made of all information shown on the display, note being taken of the bearing and range of the intruder (amber circle), whether it is above or below (data tag), and its vertical speed direction (trend arrow);
- c. Other available information is used to assist in visual acquisition. This includes ATC "party-line" information, traffic flow in use, etc.;
- d. Because of the limitations described in 2.2.1.3 e), that no manoeuvres are made based solely on the information shown on the TCAS/ACAS display; and
- e. When visual acquisition is attained, right of way rules are used to maintain or attain safe separation. No unnecessary manoeuvres are initiated. The limitations of making manoeuvres based solely on visual acquisition are understood.

3.3.2 *RA responses*

OBJECTIVE: To verify that the pilot properly interprets and responds to Ms.

CRITERIA: The pilot must demonstrate:

- a. Proper division of responsibilities between the pilot flying and the pilot not flying. The pilot flying should respond to the RA with positive control inputs, when required, while the pilot not flying is providing updates on the traffic location, checking the traffic display and monitoring the response to the RA. Proper CRM should be used. If the operator's procedures require the pilot-in-command to fly all RAs, transfer of aircraft control should be demonstrated;
- b. Proper interpretation of the displayed information. The pilot recognizes the intruder causing the RA to be issued (red square on display). The pilot responds appropriately;
- c. RAs requiring a change in vertical speed, initiation of a response in the proper direction is made within five seconds of the RA being displayed. After initiating the manoeuvre, and as soon as possible, as permitted by flight workload, ATC is notified using the standard phraseology;
- d. Recognition of and the proper response to modifications to the initially displayed RA:
 - (1) for increase rate RAs, the vertical speed is increased within 2 1/2 seconds of the RA being displayed;
 - (2) for RA reversals, the manoeuvre is initiated within 2 1/2 seconds of the RA being displayed;
 - (3) for RA weakenings, the vertical speed is modified to initiate a return towards level flight within 2 1/2 seconds of the RA being displayed; and
 - (4) for RAs that strengthen, the manoeuvre to comply with the revised RA is initiated within 2 1/2 seconds of the RA being displayed;
- e. Recognition of altitude crossing encounters and the proper response to these RAs;

- f. For RAs that do not require a change in vertical speed, the vertical speed needle or pitch angle remains outside the red area on the RA display;
- g. For maintain rate RAs, the vertical speed is not reduced. Pilots should recognize that a maintain rate RA may result in crossing through the intruder's altitude;
- h. That if a justified decision is made to not follow an RA, the resulting vertical rate is not in a direction opposite to the sense of the displayed RA;
- i. That the deviation from the current clearance is minimized by levelling the aircraft when the RA weakens and when "Clear of Conflict" is annunciated, executing a prompt return to the current clearance; and notifying ATC as soon as possible, as permitted by flight crew workload;
- j. That when possible, an ATC clearance is complied with while responding to an RA. For example, if the aircraft can level at the assigned altitude while responding to a reduce climb or reduce descent RA, it should be done;
- k. That when simultaneous conflicting instructions to manoeuvre are received from ATC and an RA, the RA is followed and, as soon as possible, as permitted by flight crew workload, ATC is notified using the standard phraseology;
- l. A knowledge of the TCAS/ACAS multi-aircraft logic and its limitations, and that ACAS can optimize separation from two aircraft by climbing or descending towards one of them. For example, TCAS/ACAS considers as intruders only aircraft that it finds to be a threat when selecting an RA. As such, it is possible for TCAS/ACAS to issue an RA against one intruder, which results in a manoeuvre towards another intruder that is not classified as a threat. If the second intruder becomes a threat, the RA will be modified to provide separation from that intruder;
- m. A knowledge of the consequences of not responding to an RA and manoeuvring in the direction opposite to the RA; and
- n. That a prompt response is made when a climb RA is issued while the aircraft is at the maximum altitude

4. TCAS/ACAS INITIAL EVALUATION

4.1 The pilot's understanding of the academic training items should be assessed by means of a written test or interactive CBT that records correct and incorrect responses to questions.

4.2 The pilot's understanding of the manoeuvre training items should be assessed in a flight simulator equipped with an TCAS/ACAS display and controls similar in appearance and operation to those in the aircraft the pilot will fly, and the results assessed by a qualified instructor, inspector, or check pilot. The range of scenarios should include: initial RAs requiring a change in vertical speed; initial RAs that do not require a change in vertical speed; maintain rate RAs; altitude crossing RAs; increase rate RAs; RA reversals; weakening RAs; RAs issued while the aircraft is at the maximum altitude, and multi-aircraft encounters. In all scenarios, excursions should be limited to the extent required by the RA. The scenarios should be concluded with a return to the original flight profile. The scenarios should also include demonstrations of the consequences of not responding to RAs, slow or late responses, and manoeuvring opposite to the direction called for by the displayed RA.

4.3 If an operator does not have access to an TCAS/ACAS-equipped simulator, the initial TCAS/ACAS evaluation should be conducted by means of an interactive CBT with an TCAS/ACAS

display and controls similar in appearance and operation to those in the aircraft the pilot will fly. This interactive CBT should depict scenarios in which real-time responses must be made, and a record should be made of whether or not each response was correct. The CBT should include all types of RAs described in 4.2.

5. TCAS/ACAS RECURRENT TRAINING

5.1 TCAS/ACAS recurrent training ensures that pilots maintain the appropriate TCAS/ACAS knowledge and skills. TCAS/ACAS recurrent training should be integrated into and/or conducted in conjunction with other established recurrent training programmes. An essential item of recurrent training is the discussion of any significant issues and operational concerns that have been identified by the operator.

5.2 TCAS/ACAS monitoring programmes periodically publish findings from their analyses of TCAS/ACAS events. The results of these analyses typically discuss technical and operational issues related to the use and operation of TCAS/ACAS. This information is available from ICAO or directly from the monitoring programmes. TCAS/ACAS recurrent training programmes should address the results of monitoring programmes in both the academic and simulator portions of recurrent training visits.

Note.-TCAS/ACAS monitoring programmes are carried out by some States and international organizations including the United States' Federal Aviation Administration (FAA) and the European Organization for the Safety of Air Navigation (EUROCONTROL).

5.3 Recurrent training should include both academic and manoeuvre training and address any significant issues identified by line operating experience, system changes, procedural changes, or unique characteristics such as the introduction of new aircraft¹ display systems or operations in airspace where high numbers of TAs and **RA**s have been reported.

5.4 Pilots should fly all scenarios once every four years

5.5 Pilots should complete all scenarios once every two years if CBT is used.