



The European Organisation for Civil Aviation Equipment
L'Organisation Européenne pour l'Équipement de l'Aviation Civile

OPERATIONAL SERVICES AND ENVIRONMENT DEFINITION (OSED) FOR TRAFFIC AWARENESS AND COLLISION AVOIDANCE (TAACAS) IN CLASS A, B AND C AIRSPACE FOR REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS) OPERATING UNDER INSTRUMENT FLIGHT RULES

This document is the exclusive intellectual and commercial property of EUROCAE.

It is presently commercialised by EUROCAE.

This electronic copy is delivered to your company/organisation for internal use exclusively.

In no case it may be re-sold, or hired, lent or exchanged outside your company.

ED-238

April 2017

Le Triangle, 9-23 rue Paul Lafargue
93200 Saint-Denis
Email : eurocae@eurocae.net

Tel : 33 1 40 93 70 20
Web Site : www.eurocae.net
Documents
Document Sharing Hub

OPERATIONAL SERVICES AND ENVIRONMENT DEFINITION (OSED) FOR TRAFFIC AWARENESS AND COLLISION AVOIDANCE IN CLASS A, B AND C AIRSPACE FOR REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS) OPERATING UNDER INSTRUMENT FLIGHT RULES

This document is the exclusive intellectual and commercial property of EUROCAE.

It is presently commercialised by EUROCAE.

This electronic copy is delivered to your company/organisation for internal use exclusively.

In no case it may be re-sold, or hired, lent or exchanged outside your company.

ED-238

May 2017

FOREWORD

1. This document was prepared jointly by EUROCAE Working Group 73 “Unmanned Aircraft Systems”, and was approved by the Council of EUROCAE on 25 April 2017.
2. EUROCAE is an international non-profit making organisation in Europe. Membership is open to manufacturers and users of equipment for aeronautics, trade associations, national civil aviation administrations, and, under certain conditions, non-European organisations. Its work programme is principally directed to the preparation of performance specifications and guidance documents for civil aviation equipment, for adoption and use at European and world-wide levels.
3. The findings of EUROCAE are resolved after discussion amongst Members of EUROCAE and in collaboration with RTCA Inc, Washington D.C., and/or the Society of Automotive Engineers (SAE), Warrendale PA, U.S.A., through their appropriate committees.
4. EUROCAE performance specifications and other documents are recommendations only. EUROCAE is not an official body of the European Governments. Its recommendations are valid as statements of official policy only when adopted by a particular government or conference of governments.
5. Copies of this document may be obtained from:

EUROCAE
9-23 rue Paul Lafargue
93200 Saint-Denis
France
Telephone: 33 1 40 92 79 30
Email: eurocae@eurocae.net
Website: www.eurocae.net

TABLE OF CONTENT

CHAPTER 1	SCOPE.....	1
1.1	OBJECTIVE OF THE DOCUMENT	1
1.2	SCOPE AND BACKGROUND	1
1.3	DEFINITION OF TERMS	2
1.4	DOCUMENT OVERVIEW	3
1.5	REFERENCES.....	3
1.6	ACRONYMS.....	4
CHAPTER 2	CURRENT SITUATION.....	8
2.1	OPERATIONAL POLICIES AND CONSTRAINTS	8
2.2	RULES OF THE AIR	8
2.3	CONFLICT MANAGEMENT AND MID AIR COLLISION AVOIDANCE RESPONSIBILITIES.....	9
2.4	SEPARATION DISTANCES	11
2.5	NEAR MID-AIR COLLISION DISTANCES.....	12
CHAPTER 3	OPERATING CONSTRAINTS AND OPERATIONAL SERVICES.....	13
3.1	PROCEDURE DESCRIPTION	13
3.1.1	<i>Operation in Class A B or C airspace.....</i>	<i>14</i>
3.1.2	<i>Reduced RPAS performance</i>	<i>15</i>
3.1.3	<i>Abnormal operation in Airspace D,E, F and G</i>	<i>15</i>
3.1.4	<i>Operational considerations.....</i>	<i>17</i>
3.1.5	<i>Interface Requirements</i>	<i>17</i>
3.1.6	<i>Personnel requirements</i>	<i>18</i>
3.1.7	<i>Support requirements</i>	<i>18</i>
3.2	RPAS COLLISION AVOIDANCE CONCEPT	18
3.2.1	<i>Collision avoidance definition</i>	<i>18</i>
3.2.2	<i>Collision volume (CV)</i>	<i>19</i>
CHAPTER 4	SYSTEM DESCRIPTION	20
4.1	FUNCTIONAL DESCRIPTION OF TRAFFIC AWARENESS AND COLLISION AVOIDANCE SYSTEM	20
4.1.1	<i>Operational sequence</i>	<i>20</i>
4.2	FUNCTIONAL ELEMENTS.....	22
4.2.1	<i>Overview.....</i>	<i>22</i>
4.2.2	<i>Traffic Awareness.....</i>	<i>23</i>
4.2.3	<i>Collision Threat Evaluation.....</i>	<i>24</i>
4.2.4	<i>CA manoeuvre generation.....</i>	<i>24</i>
4.2.5	<i>Auto CA manoeuvre initiation and termination</i>	<i>25</i>
4.3	COLLISION AVOIDANCE TIMELINE	26
4.3.1	<i>Remote pilot interaction with CA function.....</i>	<i>27</i>
4.3.1.1	<i>..... Cases for and implications of CA inhibit</i>	<i>27</i>

4.3.2 Remote pilot communication with ATC	27
4.3.3 Data communication by TAACAS.....	27
4.4 ACAS COMPATIBILITY	28
CHAPTER 5 C2 DATA LINK INTERFACE	29
CHAPTER 6 REMOTE PILOT STATION FEATURES	30
6.1 HUMAN MACHINE INTERFACE.....	31
6.2 RPS FAILURES	33
CHAPTER 7 SUMMARY OF ASSUMPTIONS, REQUIREMENTS AND INITIAL IMPACTS ON EXCHANGES	34
7.1 ASSUMPTIONS	34
7.2 REQUIREMENTS	36
7.3 IMPACTS ON EXCHANGES.....	38
7.3.1 Phraseology.....	38

LIST OF FIGURES

FIGURE 2-1 MAC AVOIDANCE RESPONSIBILITIES	10
FIGURE 3-1 DEFINITION OF COLLISION AVOIDANCE GEOMETRY	19
FIGURE 4-1 GENERIC OVERVIEW OF TRAFFIC AWARENESS AND COLLISION AVOIDANCE INTERACTION WITH RPAS SUB-SYSTEMS	22
FIGURE 4-2 COLLISION AVOIDANCE TIMELINE	26

CHAPTER 1

SCOPE

1.1 OBJECTIVE OF THE DOCUMENT

This document is the Operational Services and Environment Definition (OSED) for the Traffic Awareness and Collision Avoidance capability of a Remotely Piloted Aircraft System (RPAS) operating in Class A, B and C Airspace under Instrument Flight Rules and abnormal operation in the other airspace from D to G

It is intended to be used as a supporting document for implementation of ED78 process [Ref 1] in the definition of Safety and Performances Requirements (SPR) and Interoperability requirements (INTEROP). And has been developed in order to meet the specific requirements of the EUROCAE/ EUROCONTROL Scenario 1 (Enroute operation in class A B and C airspace defined in EUROCONTROL 'Generic UAS ATM Safety Assessment Baseline Scenario 1 – Classes A, B or C En-Route Airspace' (October 2008).

1.2 SCOPE AND BACKGROUND

Today, manned aviation safety is ensured by application of regulations concerning materials, procedures and flight rules derived from.

One of the most fundamental capabilities is the "See and Avoid" capability. The pilot of an aircraft is required to be able to see other aircraft and avoid collision, whatever the airspace and environment he/she is flying through. For flight outside controlled airspace, visual acquisition may be the only means available to detect potential conflicting traffic, to achieve safe separation and to avoid collision.

This See and Avoid capability is expected to be replicated in RPAS where the pilot is remote.

ICAO RPAS Manual Doc 10019 [Ref 3] and ICAO Rules of the Air amendment 43 [Ref 2] define Detect and Avoid as, 'the capability to see, sense or detect conflicting traffic or other hazards and take the appropriate action'. Depending on the type and location of the operations the RPA will conduct, Detect and Avoid would include the ability to:

1. recognize and understand aerodrome signs, markings and lighting;
2. recognize visual signals (e.g. interception);
3. identify and avoid terrain;
4. identify and avoid severe weather;
5. maintain applicable distance from cloud;
6. provide "visual" separation from other aircraft or vehicles; and
7. avoid collisions.

With such a wide range of differing requirements, it is likely that numerous different systems and sensors will be required to collect process and display information to the remote pilot and, where appropriate, automatically initiate RPA manoeuvres or other actions based upon the information received

NOTE: *There are alternative definitions of Detect and Avoid in use outside of ICAO.*

This OSED is addressing the collision avoidance capability, during en-route operation under Instrument Flight Rules (IFR) in Class A, B and C airspace. This capability is defined as Traffic Awareness And Collision Avoidance and includes

- The provision of traffic situation awareness information to the remote pilot
- The provision of collision avoidance manoeuvre guidance to the remote pilot in the event that a collision risk is detected
- The initiation of an automatic collision avoidance manoeuvre in the event that the remote pilot does not respond to a proposed collision avoidance manoeuvre (for whatever reason) in an appropriate time
- Full traffic awareness and collision avoidance operation, in situations when due to exceptional, circumstances, the Remotely Piloted Aircraft (RPA) is operating in airspace where non cooperative VFR traffic is present, however it does not provide specific guidance for 'traffic avoidance'(rules of the air separation).

Self-separation and Traffic avoidance functions are out of scope as these are not allowed in Class A, B or C Airspace in which an aircraft may not manoeuvre without an ATC clearance except in an emergency (such as the need to avoid a collision) or to avoid hazardous weather.

The restriction to Class A, B and C arises because it is assumed that the RPA is receiving a separation service, which negates the need for a self-separation function. Apart from this restriction, the document describes a system potentially able to meet the requirements of certain classes of operations for the longer term. It is not intended that anything written here precludes the use of systems with more limited capability should such systems be approved by the appropriate regulators. The guidance in this document may apply to such systems provided it is interpreted appropriately in the light of their limitations. For example, a collision avoidance function with no ability to track non-cooperative traffic might prove acceptable in certain airspace environments.

1.3

DEFINITION OF TERMS

En Route operation in IFR is defined in [Ref 3] as: "From completion of Initial Climb through cruise altitude and completion of controlled descent to the Initial Approach Fix" with Cruise including "Any level flight segment after arrival at initial cruise altitude until the start of descent to the destination".

ICAO Annex 11 on Air Traffic Service Appendix 4 [Ref 5] provides a definition of Airspace, associated services provided and flight requirements. In airspace class A, B and C, ATC is required to provide separation provision between all traffic, whether operating under Visual Flight Rules (VFR) and/ or Instrument Flight Rules (IFR). However, in emergency situations the RPA may have to transit through other airspace class including, F and G) where ATC is not responsible for separation provision.

A 'Cooperative intruder' is an aircraft that transmits information that allows its position (including approximate relative position) to be determined by an appropriate sensor on the RPAS. In European airspace this normally implies the use of a Mode S transponder and ADS-B Out. The minimum RPAS equipment for operation in class A B and C airspace is a transponder interrogation capability and (recommended) ADS-B IN. Non-Cooperative intruders are defined as aircraft, proximate to the RPA, which do not provide data which can be detected by the RPA and used to provide situational awareness for detecting and assessing potential conflicts.

1.4 DOCUMENT OVERVIEW

This document aims to describe the characteristics, behaviour and conditions of operation of an RPAS equipped with a Traffic Awareness and Collision Avoidance system (TAACAS), flying in non-segregated airspace classes A, B and C.

The TAACAS is planned for use in Europe and possibly worldwide, so the OSED is derived from ICAO rules and not from any national rules. This is also in line with the desire for the development of international standards. Nevertheless, national rules will need to be respected by the RPAS.

The intended audience is the future users and personnel whose work will be affected by the introduction of TAACAS. This includes RPAS operators, remote pilots) RPAS system developers, Air Navigation Service Providers (ANSPs) air traffic controllers, EUROCONTROL, Civil Aviation Authorities, Regulatory Authorities Aircraft Operators, flight crew, Aircraft Manufacturers, Avionics Manufacturers, Military Authorities and Military Aircraft Operators.

This document builds on earlier unmanned aircraft systems Concept work of EUROCAE WG-73 which is documented in ER-004 and ER-010.

The document is organized as follows:

- Section 1 – Scope;
- Section 2 – Current situation;
- Section 3 – Operating constraints;
- Section 4 – System Description;
- Section 5 – C2 Data Link Interface
- Section 6 – Remote Pilot Station
- Section 7 – Summary of Assumptions, Initial Requirements and Impacts

Appendices:

Appendix A –WG-73 Membership

Appendix B – History and Terms of Reference

This document leverages information from the on-going MIDCAS program, in particular the MIDCAS CONOPS [Ref 6].

1.5 REFERENCES

- [Ref 1] EUROCAE ED-78A/RTCA DO-264, Guidelines for Approval of the Provision and Use of Air Traffic Services Supported by Data Communications.
- [Ref 2] ICAO, Convention on International Civil Aviation, annex 2 – Rules of the air, Tenth edition, 2005 incorporating amendments 1-42 plus amendment 43 (applicable 15/11/12). Parts of this document have been reprinted below in chapter 2.2 with the express permission of ICAO.
- [Ref 3] ICAO Manual on Remotely Piloted Aircraft Systems(RPAS) Doc 10019 First Edition — 2015
- [Ref 4] Commercial Aviation Safety Team – Phase of Flight Definitions and Usage Notes, 2013
- [Ref 5] ICAO, Convention on International Civil Aviation, annex 11 - Air Traffic Service
- [Ref 6] MIDCAS CONOPS Doc T-0017 issue 3 (EDA Contract No B-0802-ARM-GC)
- [Ref 7] ICAO, Doc 4444 Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM), Fifteenth edition, 2007
- [Ref 8] ICAO Document 9854 Global Air Traffic Management – Operational Concept – 2005
- [Ref 9] FAA, Aeronautical Information Manual – Official Guide to Basic Flight Information and ATC procedures – 2006

- [Ref 10] ED-143 Minimum Operational Performance Standards for Traffic Alert and Collision Avoidance System II (TCAS II)
- [Ref 11] EUROCONTROL Study "Collision risk due to TCAS safety issues – Investigation and analysis of TCAS safety issues in the European airspace – 2010
- [Ref 12] Sense and Avoid (SAA) for Unmanned Aircraft Systems (UAS) Second Caucus Workshop Report - January 18, 2013
- [Ref 13] ICAO , Convention on International Civil Aviation, annex 10: Aeronautical telecommunications (ACAS)
- [Ref 14] NATO STANAG 4671 – Unmanned aerial vehicles Systems Airworthiness Requirements (USAR), Edition 1, 2009-09-03
- [Ref 15] ICAO, Doc 9863 Airborne Collision Avoidance System (ACAS) Manual, Second Edition — 2012
- [Ref 16] ICAO UASSG 15 SN 03 - CERES TN1 3 RCP and stakeholder responsibilities , July 2014
- [Ref 17] ICAO DOC 9869 RCP manual
- [Ref 18] EASA CS 23 Certification Specifications for Normal, Utility, Aerobatic, and Commuter Category Aeroplanes
- [Ref 19] ICAO PANS-OPS Doc 8168
- [Ref 20] EASA Safety Information Bulletin SIB No.: 2013-11 Issued: 19 July 2013
- [Ref 21] ICAO Doc 9689 Manual on Airspace Planning Methodology for the Determination of Separation Minima (),

1.6

ACRONYMS

A(n)	Assumption (number)
ACAS	Airborne Collision Avoidance System
ADS-B IN	Automatic Dependent Surveillance - In
ADS-B Out	Automatic Dependent Surveillance - Out
AIAA	American Institute of Aeronautics and Astronautics
AIM	Aeronautical Information Manual
ANSP	Air Navigation Service Provider
ASAS	Airborne Separation Assistance System
ATC	Air Traffic Control
ATCo	Air Traffic Controller
ATM	Air Traffic Management
ATS	Air Traffic Services
BRLOS	Beyond Radio Line of Sight
BVLOS	Beyond Visual Line of Sight
C2 Link	Control data link between RPA and RPS
CA	Collision Avoidance
CAS	Collision Avoidance System
CAT	Collision Avoidance Threshold
CDTI	Cockpit Display of Traffic Information
CERES	CERTification REquirements and performance Standards of satcom links for RPAS C2/ATS/D&A - A European Space Agency ARTES project

CONOPS	CONcept of OPerationS
CPA	Closest Point of Approach
CPDLC	Controller Pilot Data Link Communication
CS	Certification Specifications
CTR	ConTRol zone
CV	Collision Volume
D&A	Detect and Avoid
DAA	Detect and Avoid
DAAS	Detect and Avoid System
DA	Decision Altitude
DUO	Designated UAV Operator
EASA	European Aviation Safety Agency
EDA	European Defence Agency
ELINT	ELectronic INTelligence
ELOS	Equivalent Level of Safety
EO	Electro-Optical (sensor)
EUROCAE	European Organisation for Civil Aviation Equipment
EUROCONTROL	European Organisation for the Safety of Air Navigation
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FCS	Flight Control System
FH	Flight Hours
FINAS	Flight in Non-Segregated Airspace (NATO WG)
FIS	Flight Information Service
FL	Flight Level
FLT	Flight
FP	Flight Plan
GAT	General Air Traffic
GCS	Ground Control Station
HALE	High Altitude Long Endurance
HLTR	High Level Technical Requirements
HMI	Human Machine Interface
IAS	Indicated Air Speed
ICAO	International Civil Aviation Organization
IEEE	Institute of Electrical and Electronics Engineers
IFR	Instrument Flight Rules
ILS	Integrated Logistic Support
INTEROP	Interoperability
IMC	Instrument Meteorological Conditions

JARUS	Joint Authorities for Rulemaking on Unmanned Systems
Kts	Knots -Nautical miles per hour
LIM	Last Instant Manoeuvre
LOS	Line of Sight
MAC	Mid Air Collision
MALE	Medium Altitude Long Endurance
MDA	Minimum Descent Altitude
MHz	Mega Hertz
MIDCAS	MID air Collision Avoidance System
MTI	Moving Target Indicator
NAS	National Air Space
NATO	North Atlantic Treaty Organisation
NIAG	NATO Industrial Advisory Group
NM	Nautical Miles
NMAC	Near Mid-Air Collision
NOTAM	Notice To Air Men
OSED	Operational Services and Environment Definition
OPS	Operations
PANS	Procedures for Air Navigation Services
PF	Pilot Flying
PIC	Pilot-in-command.
r	Range
R(n)	Requirement (number)
RA	Resolution Advisory
RCP	Required Communication Performance
RLP	Required Link Performance
RPA	Remotely Piloted Aircraft
RPS	Remote Pilot Station
ROA	Rules of the Air
RPAS	Remotely Piloted Aircraft System
RVSM	Reduced Vertical Separation Minimum
SAA	Sense and avoid
SAR	Synthetic Aperture Radar
SERA	Standardised European Rules of the Air (EASA)
SEP	Self Separation
SESAR	Single European Sky ATM Research
SIB	Safety Information Bulletin
SPR	Safety and Performance Requirements

SSR	Secondary Surveillance Radar
STANAG	Standardization Agreement (NATO)
TA	Traffic Advisory
TAACAS	Traffic Awareness and Collision Avoidance System
TBC	To Be Confirmed
TBD	To Be Defined
TCAS	Traffic Alert and Collision Avoidance System
TIS-B	Traffic Information Service - Broadcast
TLS	Target Level of Safety
TTG	Time-to-go
USAR	Unmanned aerial vehicles Systems Airworthiness Requirements
UASSG	Unmanned Aircraft Study Group (ICAO)
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VTOL	Vertical Take-Off and Landing
WG	Work Group

CHAPTER 2

CURRENT SITUATION

2.1 OPERATIONAL POLICIES AND CONSTRAINTS

Regarding the prevention of mid-air collision, the main regulation that applies in non-segregated airspace is the ICAO “Rules of the air” provided in ICAO Annex 2 [Ref 2], as applied within the legislation in the respective nations responsible for the airspace (sometimes with minor modifications). Another important document is ICAO Doc 4444 “Procedures for Air Navigations Services, Air Traffic Management” [Ref 7]. This document is also subject to per-nation acceptance, sometimes with modifications (all national difference are declared in relevant ICAO supplements).

This section highlights the mid-air collision avoidance issue by citing relevant paragraphs of the rules of the air, as they are stated today (with the implicit environmental assumption that they are used by human pilots in manned aircraft).

In addition, responsibilities for traffic separation and collision avoidance, for specific air space classes and flight conditions, are also addressed in this section. This OSED is intended to provide compliance with International rules of the Air. Any Specific differences between SERA and ICAO affecting the OSED will need to be addressed by the responsible authorities.

2.2 RULES OF THE AIR

The most relevant paragraphs from Chapter 3.2 Avoidance of collisions of the “Rules of the air” are reprinted here for reference with the express permission of ICAO.

ROA 3.2 Avoidance of Collisions

Nothing in these rules shall relieve the pilot-in-command of an aircraft from the responsibility of taking such action, including collision avoidance manoeuvres based on resolution advisories provided by ACAS equipment, as will best avert collision.

Note 1. It is important that vigilance for the purpose of detecting potential collisions be -exercised on board an aircraft regardless of the type of flight or the class of airspace in which the aircraft is operating, and while operating on the movement area of an aerodrome.

Note 2.— Operating procedures for use of ACAS detailing the responsibilities of the pilot-in-command are contained in PANS-OPS (Doc 8168), Volume I, Part VIII, Chapter 3.

Note 3.— Carriage requirements for ACAS equipment are addressed in Annex 6, Part I, Chapter 6 and Part II, Chapter 6

ROA 3.2.1 Proximity

An aircraft shall not be operated in such proximity to other aircraft as to create a collision hazard.

ROA 3.2.2 Right-of-way

The aircraft that has the right-of-way shall maintain its heading and speed.

ROA 3.2.2.1 *An aircraft that is obliged by the following rules to keep out of the way of another shall avoid passing over, under or in front of the other, unless it passes well clear and takes into account the effect of aircraft wake turbulence.*

ROA 3.2.2.2 *Approaching head-on. When two aircraft are approaching head-on or approximately so and there is danger of collision, each shall alter its heading to the right.*

ROA 3.2.2.3 Converging. When two aircraft are converging at approximately the same level, the aircraft that has the other on its right shall give way, except as follows:

- a) power-driven heavier-than-air aircraft shall give way to airships, gliders and balloons;
- b) airships shall give way to gliders and balloons;
- c) gliders shall give way to balloons;
- d) power-driven aircraft shall give way to aircraft which are seen to be towing other aircraft or objects.

ROA 3.2.2.4 Overtaking. An overtaking aircraft is an aircraft that approaches another from the rear on a line forming an angle of less than 70 degrees with the plane of symmetry of the latter, i.e. is in such a position with reference to the other aircraft that at night it should be unable to see either of the aircraft's left (port) or right (starboard) navigation lights. An aircraft that is being overtaken has the right-of-way and the overtaking aircraft, whether climbing, descending or in horizontal flight, shall keep out of the way of the other aircraft by altering its heading to the right, and no subsequent change in the relative positions of the two aircraft shall absolve the overtaking aircraft from this obligation until it is entirely past and clear.

It should be noted that the concept of 'right of way' has little meaning when aircraft are flying on an ATC clearance. If an aircraft pilot believes that the clearance that has been issued will result in the aircraft being operated in such *proximity to other aircraft as to create a collision hazard* the pilot is expected to contact ATC for guidance

This is clarified by a further paragraph from the "Rules of the air" relating to the flight plan adherence:

ROA 3.6.2.1 Except as provided for in 3.6.2.2 and 3.6.2.4, [ICAO Annex 2] an aircraft shall adhere to the current flight plan or the applicable portion of a current flight plan submitted for a controlled flight unless a request for a change has been made and clearance obtained from the appropriate air traffic control unit, or unless an emergency situation arises which necessitates immediate action by the aircraft, in which event as soon as circumstances permit, after such emergency authority is exercised, the appropriate air traffic services unit shall be notified of the action taken and that this action has been taken under emergency authority.

Where 3.6.2.2 relates to 'Inadvertent changes' from flight plan and 3.6.2.4 relates to 'Weather deterioration below the VMC'.

2.3

CONFLICT MANAGEMENT AND MID AIR COLLISION AVOIDANCE RESPONSIBILITIES

Chapter 2.7 of Conflict Management of ICAO Document 9854 AN/458 - Global Air Traffic Management Operational Concept [Ref 8] provides a description of this function intended to limit, to an acceptable level, the risk of collision between aircraft and hazards. Considering conflict as any situation involving aircraft and hazards in which the applicable separation minima may be compromised, this section directly applies to the mid-air collision issue, relevant to this OSED.

Mid Air Collision (MAC) avoidance is applied in three layers, depicted in [FIGURE 2-1](#) below:



FIGURE 2-1: MAC AVOIDANCE RESPONSIBILITIES

Strategic Conflict Management

Strategic conflict management is the first layer of conflict management and is achieved through the airspace organization and management, demand and capacity balancing and traffic synchronization. It includes airspace organisations and management, level of ATC Service and the need to file a flight plan with the relevant the Air Traffic Management (ATM) unit before the flight. Aircraft pilot¹ has to follow this flight plan and its agreed upon updates during the flight.

Separation Provision

Separation provision is the second layer of conflict management and is the tactical process of keeping aircraft away from hazards (other airborne traffic).

In all situations, the entity responsible for separation (the separator) must be known. [Ref 9] provides the following guidance on separator:

- 2.7.18 The separator is the agent responsible for separation provision for a conflict and can be either the airspace user or a separation provision service provider.
- 2.7.19 The separator must be defined (that is predetermined) prior to the commencement of separation provision; however, the role of separator may be delegated.

In airspace class A, B and C, the separator can be:

- the corresponding Air Traffic Control (ATC) Unit (on the civil side such unit usually belongs to an Air Navigation Service Provider – ANSP organization),
- the pilot, when separation responsibility is specifically delegated to him.

In airspace and under flight rules where separation is not provided by ATC, the pilot is the separator and is expected to exercise this responsibility by conforming to the applicable rules of the air: *'not be operated in such proximity to other aircraft as to create a collision hazard'*. There are no numerically defined separation minima when the pilot is the separator, unless one is specified as part of the delegation from ATC.

¹ In section 2 the terms 'aircraft' and 'pilot' also include 'remotely piloted aircraft' and 'remote pilots'