DANGEROUS GOODS PANEL (DGP)

TWENTY-EIGHTH MEETING

Virtual, 15 to 19 November 2021

Agenda Item 6: Coordination with other panels
6.4: Remotely Piloted Aircraft Systems Panel (RPASP) ***(Ref: ROI-7-2020-2)***

REVIEW OF DRAFT ANNEX 6, PART IV — REMOTELY PILOTED AIRCRAFT

(Presented by the Secretary)

SUMMARY

The attached draft Standards and Recommended Practices (SARPs) for a new Part IV — *International IFR Operations — Remotely Piloted Aircraft Systems* to Annex 6 — *Operation of Aircraft* were endorsed by the eighteenth meeting of the Remotely Piloted Aircraft Systems Panel (RPASP/18) held from 25 to 29 October 2021. An briefing to the DGP on the outcome of RPASP/18 and next steps will be provided by the Secretariat during DGP/28.

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AMENDMENTS

Amendments are announced in the supplements to the *Products and Services Catalogue;* the Catalogue and its supplements are available on the ICAO website at www.icao.int. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

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No.	Date applicable	Date entered	Entered by

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

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ABBREVIATIONS AND SYMBOLS

(used in this Annex)

Abbreviations

ACAS	airborne collision avoidance system
ADRS	aircraft data recording system
ACP	Aeronautical Communications Panel
ADS-B	automatic dependent surveillance — broadcast
AFIS	aerodrome flight information service
AGL	above ground level
AIR	airborne image recorder
AIRS	airborne image recording system
ANC	Air Navigation Commission
ANSP	air navigation service provider
ATC	air traffic control
ATCO	air traffic control officer
ATM	air traffic management
ATPL	airline transport pilot licence
ATS	air traffic services
BRLOS	beyond radio line-of-sight
BVLOS	beyond visual line-of-sight
C2	command and control
CA	collision avoidance
CARS	cockpit audio recording system
CDL	configuration deviation list
CofA	certificate of airworthiness
CNS	communication, navigation and surveillance
COMAT	operator material
CPA	closest point of approach
CPDLC	controller-pilot data link communications

315	CVR	cockpit voice recorder
316	DAA	detect and avoid
317	ELT	emergency locator transmitter
318	EM	electromagnetic
319	EUROCAE	European Organisation for Civil Aviation Equipment
320	FCC	flight control computer
321	FDR	flight data recorder
322	FMS	flight management system
323	FRMS	fatigue risk management system
324	FSS	fixed satellite service
325	FSTD	flight simulation training device
326	GPWS	ground proximity warning system
327	HALE	high-altitude, long-endurance
328	HF	high frequency
329	HMI	human-machine interface
330	ICA	instructions for continuing airworthiness
331	IFR	instrument flight rules
332	IMC	instrument meteorological conditions
333	ITU/WRC	International Telecommunication Union/World Radiocommunication Conference
334	LIDAR	light detection and ranging
335	MA	manoeuvre advisories
336	MAC	mid-air collision
337	MAWS	minimum altitude warning system
338	MCM	maintenance control manual
339	METAR	aerodrome routine meteorological report
340	MMEL	master minimum equipment list
341	MPL	multi-crew pilot licence
342	MTOM	maximum take-off mass
343	NextGen	next generation air transportation system

344	NM	nautical mile
345	NMAC	near mid-air collision
346	NOTOC	Notice to the remote pilot-in-command
347	PBN	performance-based navigation
348	PIC	pilot-in-command
349	PPL	private pilot licence
350	RCP	required communication performance
351	RF	radio frequency
352	RLOS	radio line-of-sight
353	ROC	RPAS operator certificate
354	RPA	remotely piloted aircraft
355	RPA-RS	remotely piloted aircraft-recorder system
356	RPAS	remotely piloted aircraft system(s)
357	RPAS-RS	remotely piloted aircraft system-recorder system
358	RPL	remote pilot licence
359	RPASP	Remotely Piloted Aircraft Systems Panel
360	RPS	remote pilot station(s)
361	RPS-RS	remote pilot station-recorder system
362	RVSM	reduced vertical separation minimum
363	RWC	remain-well-clear
364	SARPs	Standards and Recommended Practices
365	SATCOM	satellite communication
366	SESAR	single European Sky ATM research
367	SIP	structural integrity programme
368	SLA	service level agreement
369	SLS	service level specifications
370	SMS	safety management system
371	SSP	State Safety Programme
372	SSR	secondary surveillance radar

373	TAWS	terrain awareness warning system
374	TC	type certificate
375	TCDS	type certificate data sheet
376	TEM	threat and error management
377	TLS	target level of safety
378	Tsloss	time (sustained loss of link)
379	TSO	technical standard order
380	UAS	unmanned aircraft system
381	UASSG	Unmanned Aircraft Systems Study Group
382	UAV	unmanned aerial vehicle (obsolete term)
383	VFR	visual flight rules
384	VHF	very high frequency
385	VLL	very low level
386	VLOS	visual line-of-sight
387	VMC	visual meteorological conditions
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PUBLICATIONS

(referred to in this Annex)

ICAO Publications

Convention and Related Acts

Convention on International Civil Aviation (Doc 7300)

Protocol Relating to an Amendment to the Convention on International Civil Aviation (Article 83 bis) (Doc 9318)

Annexes to the Convention on International Civil Aviation

Annex 1 — *Personnel Licensing*

Annex 2 — *Rules of the Air*

Annex 4 — *Aeronautical Charts*

Annex 5 — *Units of Measurement to be Used in Air and Ground Operations*

Annex 6 — *Operation of Aircraft*

Part I — *International Commercial Air Transport — Aeroplanes*

Part II — *International General Aviation — Aeroplanes*

Part III — *International Operations — Helicopters*

Annex 7 — *Aircraft Nationality and Registration Marks*

Annex 8 — *Airworthiness of Aircraft*

Annex 9 — *Facilitation*

Annex 10 — *Aeronautical Telecommunications*

Volume III — *Communication Systems (Part I — Digital Data Communication Systems; Part II — Voice Communication Systems)*

Volume IV —*Surveillance and Collision Avoidance Systems*

Annex 11 — *Air Traffic Services*

Annex 12 — *Search and Rescue*

Annex 13 — *Aircraft Accident and Incident Investigation*

Annex 14 — *Aerodromes*

Volume I — *Aerodrome Design and Operations*

Volume II - Heliports

Annex 15 — *Aeronautical Information Services*

Annex 16 — *Environmental Protection*

Volume I — *Aircraft Noise*

Annex 18 — *The Safe Transport of Dangerous Goods by Air*

Annex 19 — *Safety Management*

Procedures for Air Navigation Services

ATM — Air Traffic Management (Doc 4444)

OPS — Aircraft Operations (Doc 8168)

Volume I — Flight Procedures

Volume II — Construction of Visual and Instrument Flight Procedures

TRG — Training (Doc 9868)

Regional Supplementary Procedures (Doc 7030)

Manuals

Aeronautical Surveillance Manual (Doc 9924)

Airworthiness Manual (Doc 9760)

Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods (Doc 9481)

Flight Planning and Fuel Management (FPFM) Manual (Doc 9976)

Human Factors Training Manual (Doc 9683)

Manual for the Oversight of Fatigue Management Approaches (Doc 9966)

Manual of Aircraft Ground De-icing/Anti-icing Operations (Doc 9640)

Manual of All-Weather Operations (Doc 9365)

Manual of Criteria for the Qualification of Flight Simulation Training Devices (Doc 9625)

Manual of Evidence-based Training (Doc 9995)

Manual of Procedures for Establishment and Management of a State's Personnel Licensing System (Doc 9379)

Manual of Procedures for Operations Inspection, Certification and Continued Surveillance (Doc 8335)

Manual on a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (Doc 9574)

Manual on Aeroplane Upset Prevention and Recovery Training (Doc 10011)

Manual on Flight Data Analysis Programmes (FDAP) (Doc 10000)

Manual on Location of Aircraft in Distress and Flight Recorder Data Recovery (Doc 10054)

Performance-based Communication and Surveillance (PBCS) Manual (Doc 9869) (previously titled the Manual on Required Communication Performance (RCP).)

Performance-based Navigation (PBN) Manual (Doc 9613)

Performance-based Navigation (PBN) Operational Approval Manual (Doc 9997)

Policy and Guidance Material on the Economic Regulation of International Air Transport (Doc 9587)

Preparation of an Operations Manual (Doc 9376)

Safety Management Manual (SMM) (Doc 9859)

Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc 9284)

Training Manual (Doc 7192)

Part D-3 — *Flight Operations Officers/Flight Dispatchers*

Circulars

Guidance Material on SST Aircraft Operations (Cir 126)

Guidance on the Implementation of Article 83 bis of the Convention on International Civil Aviation (Cir 295)

Other Publications

European Organisation for Civil Aviation Equipment (EUROCAE) Documents ED-76, ED-77, ED-112A and ED-155

International Maritime Organization, *International Regulations for Preventing Collisions at Sea*

Radio Technical Commission for Aeronautics, RTCA DO-200A and RTCA DO-201A

ANNEX 6 — PART IV

INTERNATIONAL OPERATIONS — REMOTELY PILOTED AIRCRAFT SYSTEMS

FOREWORD

Overview

An aircraft is defined as any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface. An aircraft which is intended to be operated with no pilot on board is classified as unmanned. An unmanned aircraft which is piloted from a remote pilot station is an RPA.

Therefore, remotely piloted aircraft (RPA) are one type of unmanned aircraft[1]. All unmanned aircraft, whether remotely piloted, fully autonomous or combinations thereof, are subject to the provisions of Article 8 of the Convention on International Civil Aviation (Chicago Convention, Doc 7300), signed at Chicago on 7 December 1944 and amended by the ICAO Assembly.

Introduction

Standards and Recommended Practices for the Operation of Aircraft — International Commercial Air Transport were first adopted by the Council on 10 December 1948 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago, 1944) and designated as Annex 6 to the Convention. They became effective on 15 July 1949.On 2 December 1968, Standards and Recommended Practices for the Operation of Aircraft — International General Aviation — Aeroplanes was added and on 14 March 1986, Standards and Recommended Practices for the Operation of Aircraft, International Operations — Helicopters was also added. The documents containing these Standards and Recommenced Practices are now designated as Annex 6, Parts I, II and III respectively, to the Convention. All three parts, however, are specifically applicable to aircraft operations where the flight crew and, in most cases passengers, are on board the aircraft. The operation of aircraft which are remotely piloted is not addressed.

Part IV was created as a means of providing Standards and Recommended Practices for the operations of a remotely piloted aircraft systems (RPAS). This first edition introduces the initial provisions required for RPAS operations and details the information that is required for a State to issue an RPAS Operator certificate (ROC). These requirements were developed by the RPAS Panel on behalf of by the Air Navigation Commission and adopted by the Council on …… They became effective on …… and applicable on …….. Further, more comprehensive, Standards and Recommended Practices (SARPs) covering other aspects of RPAS operations will be contained within future amendments. Until these additions are fully developed, it is intended that RPAS should be operated in a manner that is consistent with the provisions of Parts I, II and III as appropriate, of Annex 6.

In developing this material, the RPASP was guided by the following philosophies:

Presentation and conformity with Annex 6, Parts I, II and III. The Annex should be, as far as practicable, equivalent in scope and conform as closely as possible to the other Parts of Annex 6.

Level of safety, the Annex should ensure a tolerable level of risk to persons on the ground and persons in

[1] Annex 7 — Aircraft Nationality and Registration Marks.

other aircraft, and that operations do not pose an unacceptable risk to health, safety, property or the environment.

Table A shows the origin of subsequent amendments together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council when they became effective and when they became applicable.

Categories of operation

The operation of Unmanned Aircraft Systems (UAS)[2] should be regulated in a manner that is proportionate to the risk of the specific operation. Considering the broad range of operations and types of UAS, it is appropriate that categories for operations and an associated regulatory regime covering the whole range of possible operations be established by States. An example of a categorization scheme is outlined below:

a) Open (low risk). Provided that operations are conducted within defined limitations (e.g. Visual line-of-sight (VLOS) only, specified distances from aerodromes and people, maximum height above ground level (AGL), etc.), flights can take place without the need for any authorization from the appropriate authority.

b) Specific (medium risk/regulated lower risk). This category of operation would require an operational authorization from an appropriate authority prior to the flight(s) taking place; appropriate limitations/restrictions would be applied based on the type of operation, complexity of the UAS and the specific qualifications and experience of operating personnel. Approval for the operation would be based on analysis of a safety risk assessment and any mitigations employed to reduce any risks to an acceptable level. This category encompasses operations where the risk to persons being overflown is greater than what would be permitted in Category A, or involves sharing the airspace with other manned or unmanned aircraft, but is at a level below that where the full application of manned aviation principles would be warranted.

c) Certified (certified airworthiness approach). This category utilises the same method used for regulating manned aviation, because the aviation risks, and hence the aviation safety requirements, associated with the operation have increased to an equivalent level. Operator certification, remote flight crew licensing and RPA certification will be required due to the higher associated risk. Operations in this category are primarily considered to be flown beyond visual line-of-sight (BVLOS), however portions of the flight (e.g., launch and recovery) may operate within VLOS.

The SARPs within Part IV to Annex 6 fit within this category.

Applicability

Rationale/justification: A reference to the potential for the categorisation of UAS has been requested to be included in Annex 6, Part IV, by ICAO. Although there has been some discussion with regard to its final location within the document, the final decision was that it should be placed within the Foreword, hence it has been initially placed here.

The Standards and Recommended Practices in Annex 6, Part IV, are applicable to all RPAS operations by operators authorized to conduct international RPAS operations. Although the foundation of these SARPs were

[2] UAS refers to any aircraft and its systems that is flown without a pilot on board. Remotely piloted aircraft systems (RPAS) are a subset of UAS which are piloted from remote pilot stations. ICAO Annex 2 (at Amendment 43) Appendix 4 para. 2, requires that RPAS have a Certificate of Airworthiness, the remote pilot be licenced, and the operator hold an RPAS operator certificate. As a categorization scheme may contain both certified and non-certified unmanned aircraft, the broader term of UAS is used.

largely developed based on operations under instrument flight rules (IFR), the SARPs provided herein could be adopted/adapted by States for international or domestic operations under flight rules specifically adapted for RPAS operations which may be developed in the future. Unlike Parts I, II and III, which are specific to either aeroplanes or helicopters, Part IV applies to aeroplane and helicopter categories that can be remotely piloted. In cases where a particular aircraft design can be flown with a pilot on board or be piloted remotely, Part IV only applies when the aircraft is being remotely piloted.

Note 1.— Annex 6, Part IV, is applicable to RPAS operations related to the conduct of any international operation (e.g., commercial air transport operations, aerial work operations, etc.).

Note 2.— Standards and Recommended Practices applicable to international commercial air transport with aeroplanes are to be found in Annex 6, Part I.

Note 3.— Standards and Recommended Practices applicable to international general aviation operations with aeroplanes are to be found in Annex 6, Part II.

Note 4.— Standards and Recommended Practices applicable to international commercial air transport operations or international general aviation operations with helicopters are to be found in Annex 6, Part III.

Actions by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex, and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

Attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. The establishment, withdrawal of and changes to facilities, services and procedures affecting RPAS operations provided in accordance with the Standards and Recommended Practices specified in this Annex should be notified and take effect in accordance with the provisions of Annex 15.

Use of the text of the Annex in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as is practicable, the precise language of those ICAO Standards that are of a regulatory character and also of indicating departures from the Standards, including any additional national regulations that are important for the safety or regularity of air navigation. Wherever possible, the provisions of this Annex have been written in such a way as would facilitate incorporation, without major textual changes, into national legislation.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1. — *Material comprising the Annex proper:*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention.

They are defined as follows:

Standard: Any specification for physical characteristics, configuration, materiel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, materiel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice, and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2. — *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption;

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text;

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices;

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of language

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement:

Standards have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status

being indicated by the prefix *Note*.

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb "shall" is used, and for Recommended Practices the operative verb "should" is used.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5 to the Convention on International Civil Aviation. Where Annex 5 permits the use of non-SI alternative units, these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number, includes all subdivisions of the portion.

Throughout this Annex, the use of the male gender should be understood to include male and female persons.

Table A. Amendments to Annex 6, Part IV

Amendment	*Source(s)*	*Subject(s)*	*Adopted* *Effective* *Applicable*
1st Edition	xxth meeting of the RPAS Panel	Initial RPAS operating requirements	xx March 20xx xx August 20xx xx September 20xx

INTERNATIONAL STANDARDS

AND RECOMMENDED PRACTICES

CHAPTER 1. DEFINITIONS

When the following terms are used in the Standards and Recommended Practices for International Operations of RPAS, they have the following meanings:

> **Rationale/justification:** — Terms and definitions have been sourced from other ICAO documents. RPAS related terms have been sourced from the RPAS Manual and CONOPS as appropriate. Other terms have been sourced from the remaining parts of Annex 6, primarily Part 1, and other Annexes as necessarv.

Aerial work. An aircraft operation in which an aircraft is used for specialized services such as agriculture, construction, photography, surveying, observation and patrol, search and rescue, aerial advertisement, etc.

Aerodrome. A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

Aerodrome operating minima. The limits of usability of an aerodrome for:

a) take-off, expressed in terms of runway visual range and/or visibility and, if necessary, cloud conditions;

b) landing in 2D instrument approach operations, expressed in terms of visibility and/or runway visual range minimum descent altitude/height (MDA/H) and, if necessary, cloud conditions; and

c) landing in 3D instrument approach operations, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H) as appropriate to the type and/or category of the operation.

Aeroplane. A power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Aircraft operating manual. A manual, acceptable to the State of the Operator, containing normal, abnormal and emergency procedures, checklists, limitations, performance information, details of the aircraft systems and other material relevant to the operation of the aircraft.

Note 1.— The aircraft operating manual is part of the operations manual.

Note 2.— For RPAS, this includes information related to the whole system, including the RPS.

Alternate aerodrome. An aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed to or to land at the aerodrome of intended landing where the necessary services and facilities are available, where aircraft performance requirements can be met and which is operational at the expected time of use. Alternate aerodromes include the following:

Take-off alternate. An alternate aerodrome at which an aircraft would be able to land should this become necessary shortly after take-off and it is not possible to use the aerodrome of departure.

En-route alternate. An alternate aerodrome at which an aircraft would be able to land in the event that a diversion becomes necessary while en-route.

Destination alternate. An alternate aerodrome at which an aircraft would be able to land should it become either impossible or inadvisable to land at the aerodrome of intended landing.

Note.— The aerodrome from which a flight departs may also be an en-route or a destination alternate aerodrome for that flight.

Automatic deployable flight recorder (ADFR). A combination flight recorder installed on the aircraft which is capable of automatically deploying from the aircraft.

C2 Link. The data link between the remotely piloted aircraft and the remote pilot station for the purpose of managing the flight.

C2 Link Communications Service Provider (C2CSP). An entity or entities which provide a portion of or all of the C2 Link service for operation of an RPAS.

Note.— An RPAS operator may also be its own C2CSP. Additionally, a C2CSP may use a service from other communications operators, such as satellite operators or ground network operators to provide a portion of the C2 Link.

C2 Link Interruption. Any temporary situation where the C2 Link is unavailable, discontinuous, introduces too much delay, or lacks integrity; but where the lost C2 Link Decision Time has not been exceeded.

COMAT. Operator material carried on an operator's aircraft for the operator's own purposes.

Combined vision system (CVS). A system to display images from a combination of an enhanced vision system (EVS) and a synthetic vision system (SVS).

Configuration deviation list (CDL). A list established by the organization responsible for the type design with the approval of the State of Design which identifies any external parts of an aircraft type which may be missing at the commencement of a flight, and which contains, where necessary, any information on associated operating limitations and performance correction.

Continuing airworthiness. The set of processes by which an aircraft, engine, propeller or part complies with the applicable airworthiness requirements and remains in a condition for safe operation throughout its operating life.

Note.— For RPAS this includes all parts and components of the RPAS, not only the RPA.

Continuing airworthiness records. Records which are related to the continuing airworthiness status of an aircraft, engine, propeller or associated part.

Note.— For RPAS this includes all parts and components of the RPAS, not only the RPA.

Dangerous goods. Articles or substances which are capable of posing a risk to health, safety, property or the environment and which are shown in the list of dangerous goods in the Technical Instructions or which are classified according to those Instructions.

Note.— The provisions of Annex 18 govern the international transport of dangerous goods by air including their classification.

Defined point after take-off (DPATO). The point, within the take-off and initial climb phase, before which the helicopter's ability to continue the flight safely, with one engine inoperative, is not assured and a forced

landing may be required.

Note.— For RPAS, defined points apply to remotely piloted helicopters operating in performance Class 2 only.

Defined point before landing (DPBL). The point, within the approach and landing phase, after which the helicopter's ability to continue the flight safely, with one engine inoperative, is not assured and a forced landing may be required.

Note.— For RPAS, defined points apply to remotely piloted helicopters operating in performance Class 2 only.

Detect and avoid. The capability to see, sense or detect conflicting traffic or other hazards and take the appropriate action.

Duty. Any task that flight or cabin crew members are required by the operator to perform, including, for example, flight duty, administrative work, training, positioning and standby when it is likely to induce fatigue.

Note.— For RPAS this includes remote crew members.

Duty period. A period which starts when a flight or cabin crew member is required by an operator to report for or to commence a duty and ends when that person is free from all duties.

Note.— For RPAS this includes remote flight crew members and remote crew members.

Enhanced vision system (EVS). A system to display electronic real-time images of the external scene achieved through the use of image sensors.

Note.— EVS does not include night vision imaging systems (NVIS).

Flight manual. A manual, associated with the certificate of airworthiness, containing limitations within which the aircraft is to be considered airworthy, and instructions and information necessary to the flight crew members for the safe operation of the aircraft.

Note.— For RPAS, this includes information related to the whole system, including the RPS and remote flight crew members.

Flight simulation training device. Any one of the following three types of apparatus in which flight conditions are simulated on the ground:

*A flight simulator****,*** which provides an accurate representation of the flight deck of a particular aircraft type to the extent that the mechanical, electrical, electronic, etc. aircraft systems control functions, the normal environment of flight crew members, and the performance and flight characteristics of that type of aircraft are realistically simulated;

*A flight procedures trainer****,*** which provides a realistic flight deck environment, and which simulates instrument responses, simple control functions of mechanical, electrical, electronic, etc. aircraft systems, and the performance and flight characteristics of aircraft of a particular class;

A basic instrument flight trainer, which is equipped with appropriate instruments, and which simulates the flight deck environment of an aircraft in flight in instrument flight conditions.

Note.— For RPAS, the RPS is the equivalent to the "flight deck," and is not necessarily related to the type of RPA being used.

Flight termination system. A system intended to terminate flight and minimize the possibility of injury or damage to persons, property or other aircraft.

Handover. The act of passing piloting control from one remote pilot station to another.

Helicopter. A heavier-than-air aircraft supported in flight chiefly by the reactions of the air on one or more power-driven rotors on substantially vertical axes.

Note.— Some States use the term "rotorcraft" as an alternative to "helicopter".

Lost C2 Link. An operational event while the RPAS is in a Lost C2 Link state.

***Lost C2 Link Decision Time*.** The maximum length of time permitted before declaring a Lost C2 Link state during which the C2 Link performance is not sufficient to allow the remote pilot to actively manage the flight in a safe and timely manner appropriate to the airspace and operational conditions.

***Lost C2 Link State*.** The state of the RPAS in which the C2 Link performance has degraded, as a result of a C2 Link interruption that is longer than the lost C2 Link decision time, to a point where it is not sufficient to allow the remote pilot to actively manage the flight in a safe and timely manner.

Low-visibility operations (LVO). Approach operations in RVRs less than 550m and/or with a DH less than 60m (200 ft), or take-off operations in RVRs less than 400m.

Maintenance. The performance of tasks on an aircraft, engine, propeller or associated part required to ensure the continuing airworthiness of an aircraft, engine, propeller or associated part including any one or combination of overhaul, inspection, replacement, defect rectification, and embodiment of a modification or repair.

Note.— For RPAS this includes all parts and components of the RPAS, not only the RPA.

Master minimum equipment list (MMEL). A list established for a particular aircraft type by the organization responsible for the type design with the approval of the State of Design containing items, one or more of which is permitted to be unserviceable at the commencement of a flight. The MMEL may be associated with special operating conditions, limitations or procedures.

Minimum equipment list (MEL). A list which provides for the operation of aircraft, subject to specified conditions, with particular equipment inoperative, prepared by an operator in conformity with, or more restrictive than, the MMEL established for the aircraft type.

Note.— For RPAS this includes inoperative equipment of the RPAS, not only the RPA.

NOTAM. A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.

Operational control. The exercise of authority over the initiation, continuation, diversion or termination of a flight in the interest of the safety of the aircraft and the regularity and efficiency of the flight.

Operations in performance Class 1. Operations with performance such that, in the event of a critical engine failure, performance is available to enable the helicopter to safely continue the flight to an appropriate landing area, unless the failure occurs prior to reaching the take-off decision point (TDP) or after passing the landing decision point (LDP), in which cases the helicopter must be able to land within the rejected take-off or landing area.

Note.— For RPAS, this refers to remotely piloted helicopters only.

Operations in performance Class 2. Operations with performance such that, in the event of critical engine failure, performance is available to enable the helicopter to safely continue the flight to an appropriate landing area, except when the failure occurs early during the take-off manoeuvre or late in the landing manoeuvre, in which cases a forced landing may be required.

Note.— For RPAS, this refers to remotely piloted helicopters only.

Operations in performance Class 3. Operations with performance such that, in the event of an engine failure at any time during the flight, a forced landing will be required.

Note.— For RPAS, this refers to remotely piloted helicopters only.

Operations manual. A manual containing procedures, instructions and guidance for use by operational personnel in the execution of their duties.

Operations specifications. The authorizations, including specific approvals, conditions and limitations associated with the air operator certificate and subject to the conditions in the operations manual.

Note.— For RPAS these specifications are associated with the RPAS operator certificate.

Operator. The person, organization or enterprise engaged in or offering to engage in an aircraft operation.

Note.— In the context of remotely piloted aircraft, an aircraft operation refers to the operation of an RPAS.

Operator's maintenance control manual. A document which describes the operator's procedures necessary to ensure that all scheduled and unscheduled maintenance is performed on the operator's aircraft on time and in a controlled and satisfactory manner.

Note.— For RPAS this includes all parts and components of the RPAS, not only the RPA.

Psychoactive substances. Alcohol, opioids, cannabinoids, sedatives and hypnotics, cocaine, other psychostimulants, hallucinogens, and volatile solvents, whereas coffee and tobacco are excluded.

Place of technical activities. The location where the majority of the technical support for the RPAS operation is being provided.

Note.— See the definition of 'State of the C2 CSP' for context.

Remote crew member. A person, other than a remote flight crew member, assigned by the operator, charged with duties regarded to the operation of an RPAS during a duty period.

Remote flight crew member. A licensed crew member charged with duties essential to the operation of a remotely piloted aircraft system during a duty period.

Remote pilot. A person charged by the operator with duties essential to the operation of a remotely piloted aircraft and who manipulates the flight controls, as appropriate, during flight time.

Remote pilot-in-command (RPIC). The remote pilot designated by the operator as being in command and charged with the safe conduct of a flight.

Remote pilot station (RPS). The component of the remotely piloted aircraft system containing the equipment used to pilot the remotely piloted aircraft.

Remotely piloted aircraft (RPA). An unmanned aircraft which is piloted from a remote pilot station.

Remotely piloted aircraft system (RPAS). A remotely piloted aircraft, its associated remote pilot station(s), the required command and control links and any other components as specified in the type design.

Rest period. A continuous and defined period of time, subsequent to and/or prior to duty, during which flight or cabin crew members are free of all duties.

Note.— For RPAS, this applies to remote flight crew members and remote crew members.

RPA observer. A trained and competent person designated by the operator who, by visual observation of the remotely piloted aircraft, assists the remote pilot in the safe conduct of the flight.

RPAS operator certificate (ROC). A certificate authorizing an operator to carry out specified RPAS operations.

RPAS-recorder system (RPAS-RS). The recorder system installed in the remotely piloted aircraft system for the purpose of complementing accident/incident investigation. RPAS recorder systems consists of the following:

An RPA-recorder system (RPA-RS). Any type of recorder system installed in the remotely piloted aircraft for the purpose of complementing accident/incident investigation.

An RPS-recorder system (RPS-RS). Any type of recorder system installed in the RPS for the purpose of complementing accident/incident investigation.

Specific approval. A specific approval is an approval which is documented in the Operations Specifications for commercial air transport operations or in the list of specific approvals for non-commercial operations.

Note.— The terms authorization, specific approval, approval and acceptance are further described in Attachment D.

State of Registry. The State on whose register the aircraft is entered.

Note 1.— In the case of the registration of aircraft of an international operating agency on other than a national basis, the States constituting the agency are jointly and severally bound to assume the obligations which, under the Chicago Convention, attach to a State of Registry. See, in this regard, the Council Resolution of 14 December 1967 on Nationality and Registration of Aircraft Operated by International Operating Agencies which can be found in Policy and Guidance Material on the Economic Regulation of International Air Transport (Doc 9587).

Note 2.— For RPAS, this refers to the State on whose register the RPA is entered.

State of the Aerodrome. The State in whose territory the aerodrome is located.

Note.— For RPAS, the aerodrome includes a heliport or landing location for which the State has jurisdiction over.

State of the C2CSP. The State where the C2CSP has its primary place of technical activities.

State of the Operator. The State in which the operator's principal place of business is located or, if there is no such place of business, the operator's permanent residence.

State of the RPS service provider. The State where the RPS service provider has its primary place of business.

Switchover. The act of transferring the active datalink between the RPS and the RPA from one of the links or networks that constitutes the C2 Link to another link or network that constitutes the C2 Link.

Synthetic vision system (SVS). A system to display data-derived synthetic images of the external scene from the perspective of the flight deck.

Visual line-of-sight (VLOS) operation. An operation in which the remote pilot or RPA observer maintains direct unaided visual contact with the remotely piloted aircraft

CHAPTER 2. APPLICABILITY

The Standards and Recommended Practices contained in Annex 6, Part IV, shall be applicable to the operation of RPAS, by operators authorized to operate internationally from aerodromes and/or heliports. The intent is for these SARPs to provide for the minimum safe operation of RPAS in order to give States confidence to approve the operation of RPAS in their airspace. This approach is consistent with the existing requirements found in Annex 6, Parts I, II and III

The Annex 6, Part IV, SARPs do not currently support operations of RPA carrying persons.

Rationale/justification: — The applicability for the SARPS within this document reflect the scope of the RPAS Panel's work, as defined by the ANC and reflected within the ICAO RPAS CONOPS document:

The scope is currently limited to certificated RPAS operating internationally in non-segregated airspace and at aerodromes in the 2031 onward timeframe. Although the foundation of these Annex 6, Part IV, SARPs was largely focused on instrument flight rules (IFR) operations, the SARPs provided herein could be adopted by States for international or domestic visual flight rules (VFR) operations, or potentially for operations conducted under RPAS/UAS specific flight rules which may be developed in the future.

The scope of the CONOPS does not consider fully autonomous aircraft and operations, visual line-of-sight (VLOS) (except for visual launch/take-off or landing/recovery where applicable), very low altitude airspace operations and very high altitude operations (e.g. above FL600), carriage of persons, and domestic operations.

The time frame aligns with ICAO's Aviation System Block Upgrade2 (ASBU) estimated completion date for RPAS Block 3 activities. Block 3 represents a period when RPAS certification processes will be complete; avionics and ground systems made available; and State policies, regulations, procedures and guidance permitting routine and safe operations are in place.

The ability to pilot an aircraft remotely offers a vast potential for new types of aircraft and their operation that are not constrained by the need to accommodate human beings on board. This impacts the design of aircraft, e.g. mass, size, performance, endurance, where and how they can operate and how they can be assimilated into the airspace and its air traffic management system. There are also implications on the safety assurance processes, as the focus can move from protecting the persons on board an aircraft to those potentially affected by undesirable events, such as mid-air collisions or injury to people and damage to property on the ground.

Future iterations of this document may expand this scope where evidence indicates needs resulting from market growth, technology advances or other unforeseen conditions. This expansion is likely to include operations at very high altitude, very low altitude, autonomous aircraft and remote pilot control of multiple RPA as these activities are already being actively pursued by operators.

CHAPTER 3. GENERAL AND OPERATOR RESPONSIBILITIES

Note 1.— The Convention on International Civil Aviation allocates to the State of Registry certain functions which that State is entitled to discharge, or obligated to discharge, as the case may be. The State of Registry may be unable to fulfil its responsibilities adequately in instances where aircraft are leased, chartered or interchanged — in particular without crew — by the operator of another State. The Assembly recognized, in Resolution A23-13 that added Article 83bis a way to address these instances. If, in the above-mentioned instances, the State of Registry finds itself unable to discharge adequately the functions allocated to it by the Convention, it delegates to the State of the Operator, subject to acceptance by the latter State, those functions of the State of Registry that can more adequately be discharged by the State of the Operator. Such transfer agreements will have effect in respect of Contracting States, which have ratified the related Protocol (Doc 9318) upon fulfilment of the conditions established in Article 83 bis.

Note 2.— In the case of international operations effected jointly with several RPAS not all of which are registered in the same Contracting State, nothing in this Part prevents the States concerned entering into an agreement for the joint exercise of the functions placed upon the State of Registry by the provisions of the relevant Annexes.

3.1 COMPLIANCE WITH LAWS, REGULATIONS AND PROCEDURES

3.1.1 The operator shall ensure that all those involved in the RPAS operation know that they must comply with the laws, regulations and procedures applicable to the airspace of those State) in which:

a) the RPA is being operated, and/or

b) the RPSs are located.

Rationale/justification: This general principle that the operator has overall responsibility for the operations, which include the flight, is consistent with the intent of paragraph 3.1 in Part I of Annex 6.

In 1944 (Articles 31 and 32 of Convention) the emphasis was only on the pilot and on the aircraft. Nowadays aviation safety relies more and more on organisations and therefore an overarching standard centred on the operator is necessary.

Note.— For operations over the high seas, the standards contained in Annex 2 (Rules of the Air) to the Chicago convention apply, without exception.

Rationale/justification: Consistent with Note to paragraph 2.1.1 of Annex 2.

3.1.2 The operator shall ensure that all remote pilots are familiar with the laws, regulations and procedures, pertinent to the performance of their duties, prescribed for the areas to be traversed, the aerodromes to be used and the air navigation facilities relating thereto. The operator shall ensure that other members of the remote flight crew are familiar with such of these laws, regulations and procedures as are pertinent to the performance of their respective duties in the operation of the RPAS.

Rationale/justification: Annex 6, Part 1, Chapter 3, Para 3.1.2 — Compliance with laws, regulations, and procedures

Note.— Information for remote pilots and flight operations personnel on flight procedure parameters and operational procedures is contained in the Manual on Remotely Piloted Aircraft Systems (RPAS) (Doc 10019) and PANS-OPS (Doc 8168), Volume I. Criteria for the construction of instrument flight procedures are contained in PANS-OPS (Doc 8168), Volume II. Obstacle clearance criteria and procedures used in certain States may differ from PANS-OPS, and knowledge of these differences is important for safety reasons

3.1.3 The operator or a designated representative shall have responsibility for operational control.

Rationale/justification: Same intent of paragraph 3.1.3 of Part I of Annex 6.

3.1.4 Responsibility for operational control shall be delegated only to the remote pilot-in-command and to a flight operations officer/flight dispatcher if the operator's approved method of control and supervision of flight operations requires the use of flight operations officer/flight dispatcher personnel.

Note.— Guidance on the operational control organization and the role of the flight operations officer/flight dispatcher is contained in the Manual of Procedures for Operations Inspection, Certification and Continued Surveillance (Doc 8335). Detailed guidance on the authorization, duties and responsibilities of the flight operations officer/flight dispatcher is contained in the Preparation of an Operations Manual (Doc 9376). The requirements for age, skill, knowledge and experience for licensed flight operations officers/flight dispatchers are contained in Annex 1.

3.1.5 If an emergency situation which endangers the safety of the RPA or persons becomes known first to the flight operations officer/flight dispatcher, action by that person in accordance with 4.6.2 shall include, where necessary, notification to the appropriate authorities of the nature of the situation without delay, and requests for assistance if required.

3.1.6 If an emergency situation which endangers the safety of the RPA or persons necessitates the taking of action which involves a violation of local regulations or procedures, the remote pilot-in-command shall notify the appropriate local authority without delay. If required by the State in which the incident occurs, the remote pilot-in-command shall submit a report on any such violation to the appropriate authority of such State; in that event, the remote pilot-in-command shall also submit a copy of it to the State of the Operator. Such reports shall be submitted as soon as possible and normally within ten days.

Rationale/justification: Annex 6, Part 1, Chapter 3, Para 3.1.6 — Compliance with laws, regulations, and procedures

3.1.7 Operators shall ensure that remote pilots-in-command have available at the RPS all the essential information concerning the search and rescue services in the area over which the RPA will be flown.

Note.— This information may be made available to the remote pilot by means of the operations manual or such other means as is considered appropriate.

3.1.8 Operators shall ensure that remote flight crew members demonstrate the ability to speak and understand the language used for radiotelephony communications as specified in Annex 1.

Rationale/justification: Annex 1, Chapter 1, Para 1.2.9 — Language proficiency

3.2 COMPLIANCE BY A FOREIGN OPERATOR WITH LAWS, REGULATIONS AND PROCEDURES OF A STATE

3.2.1 When a State identifies a case of non-compliance or suspected non-compliance of a foreign operator with laws, regulations and procedures applicable within that State's territory, or a similar serious safety issue with that operator, that State shall immediately notify the operator and, if the issue warrants it, the State of the Operator. Where the State of the Operator and the State of Registry are different, such notification shall also be made to the State of Registry, if the issue falls within the responsibilities of that State and warrants a notification.

3.2.2 In the case of notification to States as specified in 3.2.1, if the issue and its resolution warrant it, the State in which the operation is conducted shall engage in consultations with the State of the

Operator and the State of Registry, as applicable, concerning the safety standards maintained by the operator.

Note.— The Manual of Procedures for Operations Inspection, Certification and Continued Surveillance (Doc 8335) provides guidance on the surveillance of operations by foreign operators. The manual also contains guidance on the consultations and related activities, as specified in 3.2.2, including the ICAO model clause on aviation safety, which, if included in a bilateral or multilateral agreement, provides for consultations among States, when safety issues are identified by any of the parties to a bilateral or multilateral agreement on air services.

Rationale/justification: Annex 6, Part 1, Chapter 3, Para 3.2.2 — Compliance by a foreign operator with laws, **regulations**, and procedures of a state.

3.3 SAFETY MANAGEMENT

3.3.1 The operator shall implement a safety management system that incorporates the framework and principles defined in Annex 19, Chapter 4 and Appendix 2, and in this Chapter.

3.3.2 The safety management system shall be commensurate with the size of the operator and the nature and complexity of its activities, taking into account the hazards and associated risks inherent in these activities.

Note.— Annex 19 includes safety management provisions for air operators. Further guidance is contained in the Safety Management Manual (SMM) (Doc 9859).

Rationale/justification: This proposed standard ensure safety of operations, including the capability to continually manage operational risks, aims at promotion of safety culture, in line with Annex 19 par 4.1.1

3.3.3 **Recommendation -** *The operator of an RPAS should establish and maintain a flight data analysis programme as part of its safety management system, which includes the flight data, including C2 Link data, required to be recorded at the RPS, the RPA and any other data designated by the State of the Operator.*

Rationale/justification: The objective of these specifications is to support safety in line with the framework and principles defined in Annex 19 Chapter 5 including the establishment of an SDCPS. Made into a recommendation at the request of the FLTREWG

Note.— The operator may contract the operation of a flight data analysis programme to another party while retaining overall responsibility for the maintenance of such a programme.

3.3.4 A flight data analysis programme shall contain adequate safeguards to protect the source(s) of the data in accordance with Appendix 3 to Annex 19.

Note.— Guidance on the establishment of flight data analysis programmes is included in the Manual on Flight Data Analysis Programmes (FDAP) (Doc 10000).

3.3.5 States shall not allow the use of audio or images of persons by an RPA recorder system (RPA-RS) or an RPS recorder systems (RPS-RS) for purposes other than the investigation of an accident or incident as per Annex 13, except where the recordings or transcripts are:

a) related to a safety-related event identified in the context of a safety management system; are restricted to the relevant portions of a de-identified transcript of the recording; and are subject to the protections accorded by Annex 19;

b) sought for use in criminal proceedings not related to an event involving an accident or incident investigation and are subject to the protections accorded by Annex 19; or

c) used for inspections of recorder systems as provided in Section 7 of Appendix 8.

Note.— Provisions on the protection of safety data, safety information and related sources are contained in Appendix 3 to Annex 19. When an investigation under Annex 13 is instituted, investigation records are subject to the protections accorded by Annex 13.

3.3.6 States shall not allow the use of recordings made by RPA-RS and RPS-RS and that are not addressed by 3.3.5,as well as transcripts of such recordings, for purposes other than the investigation of an accident or incident as per Annex 13, except where the recordings or transcripts are subject to the protections accorded by Annex 19 and are:

a) used by the operator for airworthiness or maintenance purposes;

b) used by the operator in the operation of a flight data analysis programme required in this Annex;

c) sought for use in proceedings not related to an event involving an accident or incident investigation;

d) de-identified; or

e) disclosed under secure procedures.

Note.— Provisions on the protection of safety data, safety information and related sources are contained in Appendix 3 to Annex 19.

3.3.7 The operator shall establish a flight safety documents system, for the use and guidance of operational personnel, as part of its safety management system.

3.3.8 Compliance monitoring

The safety management system shall include a function to monitor compliance of the operator with the relevant requirements. Compliance monitoring shall include a feedback system of findings to the accountable manager to ensure effective implementation of corrective actions as necessary.

Rationale/justification: This ensure the capability to continually manage operational risks, aims at promotion of safety culture

3.4 USE OF PSYCHOACTIVE SUBSTANCES

Note.— Provisions concerning the use of psychoactive substances are contained in Annex 1, 1.2.7 and Annex 2, 2.5.

Rationale/justification: Same text as used in Annex 6, Part 1, Para 3.4 — Use of psychoactive substances

3.5 REGISTRATION

3.5.1 RPA used for international operations shall be registered in accordance with the provisions in Annex 7, *Aircraft Nationality and Registration Marks*.

Rationale/justification: This is a simple instruction to ICAO contracting States to ensure that they have appropriate registration procedures in place for this type of RPA

3.5.2 RPS Identification

3.5.2.1 The operator shall include within the operations manual the following details for all RPS that it operates:

a) the individual or legal entity holding ownership of each RPS;

b) the RPS manufacturer and manufacturer's designation of RPS;

c) the serial number of each RPS;

d) indication of the type, model and identification number of each RPA an RPS is capable of controlling; and

e) other relevant data as required by applicable legislation.

Rationale/justification: This reflects the fact that the RPS is also a part of the RPAS and that, while the current intent is not to register the RPS (in the style of Annex 7), it must be appropriately 'identified' and hence a similar level of information is required.

3.6 SAFETY-CRITICAL SERVICES

3.6.1 The operator shall ensure that the provider of safety-critical services shall have an organizational structure, documented procedures, resources and personnel sufficient to ensure the safe provision of services.

Rationale/justification: The principle that the operator shall monitor the safety and quality of provided information is already contained in Part I, e.g. in 5.3.2 (Charting accuracy) and 7.4.1 (Electronic navigation data). In case of RPAS new and even more safety critical service providers may emerge. It is therefore appropriate to devote to them the entire section 3.6, keeping however in mind that ultimate responsibility for safety of operations indeed rests with the RPAS operator, under oversight by the State of the Operator.

3.6.2 Safety-critical services shall include, but are not limited to:

a) providing geographical data and limitations;

b) collecting and forwarding occurrence data;

c) the training of remote pilots;

d) communication services supporting the C2 Link;

e) provisions of services through RPS located anywhere in the world; and

f) provisions of services related to flight planning and management including related safety assessments.

Rationale/justification: This list is only for explanatory purposes, like all Notes in the Annexes and definitely not exhaustive. Some providers are already well known in aviation, such as providers of geographical data covered by Annex 15 and training organisations covered by Annex 1. Other providers may instead emerge specifically for RPAS, such as those in letters d), e) and f). Furthermore at Very Low Level (VLL), below the minimum heights standardised in Annex 2, additional providers may emerge in the context of the so called 'UAS Traffic Management' or 'U-Space', such as providers of registration

data bases. However, these additional providers, since not serving certificated RPAS operating internationally, are out of scope of the current ICAO efforts.

3.6.3 Safe operation of the C2 Link.

3.6.3.1 When the operator exercises direct operational control over the C2 Links, the operator shall be responsible for the safe operation of all C2 Link components.

Rationale/justification: by definition the C2 Link comprises radio waves between the RPA and the RPS. And of course radio equipment (i.e. transceivers, antennas, cables, etc.) is necessary at either end. This end equipment is either integrated in the aircraft or connected to the RPS. Like for any other equipment, the RPAS operator shall take responsibility for correct operations of such equipment.

3.6.3.2 When any of the C2 Link components are under the operational control of a C2 Link communications service provider (C2CSP), the C2CSP shall be under the safety oversight of the State of the Operator.

Rationale/justification: Paragraph 1.2.1.4 (Subcontracting implications) in 4th edition of the Safety Management Manual (Doc 9859) clearly states that, for the Safety Risk Management to be effective across service providers, it is important to clearly define the responsibilities for the identification of hazards and management of associated safety risks to the entire chain of services within the system, without gaps or overlaps. Where a service provider (e.g. the RPAS operator) with an SMS requirement contracts to an organization not subject to SMS, the hazards and safety risks potentially introduced by the contractor are to be addressed by the SMS of the RPAS operator. Since the safety criticality of the emerging service providers is unprecedented (e.g. the C2 Link CSP ensuring the connection between the cockpit controls and the autopilot and the RPS SP providing piloting services during take-off and landing) it is felt appropriate to escalate the level of such provisions to international mandatory standard. This is especially the case when contracting a Service from an industry fully regulated by other parties. Please note that the intent is that the C2CSPs are pre-approved and that the provision is contracted. It is also expected that a service level agreement would be required between the RPAS operator and the C2CSP detailing the required performance levels and safety management considerations.

3.6.3.3 The Quality of Service Required (QoSR) of the C2 Link service shall be acceptable to the State of the Operator.

Rationale/justification: Note 1 to Chapter 3 of Part I of Annex 6 already reminds that some responsibilities may be transferred between the State of Registry and the State of the Operator. In case of RPAS, C2 Link may rely on systems (e.g. wide-area communication networks or satellite constellations) which are not in the scope of continuing airworthiness and therefore beyond the scope of the State of Registry. A standard is hence necessary to close the safety gap and clearly establish the responsibility of the State of the RPAS Operator in relation to the oversight of the C2 Link CSP.

3.6.3.4 When a C2CSP that is not the operator is used, prior to commencing operations, the C2CSP and the operator shall establish a service level agreement (SLA) that shall be approved by the State of the Operator.

3.6.3.4.1 When the C2CSP is also the Operator, prior to commencing operations, the Operator shall establish the Quality of Service Required (QoSR) that shall be approved by the State of the Operator, against which the QoSD will be monitored.

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Rationale/justification: The State of Design, based on evidence provided by the RPAS designer/Type Certificate holder, will assess that the Quality of Service Required (QoSR) defined for the C2 Link is sufficient to ensure safe operations, based on provisions contained in Annex 8. However some components (e.g. wide-area networks or satellite) necessary to provide coverage of the C2 Link throughout the flight, will neither be sold by the RPAS manufacturer nor purchased by the RPAS Operator. The latter would in fact contract a third party service provider to acquire not physical assets, but indeed a communication service. In this case it is of course necessary through monitoring during operations to ensure that the Quality of Service Delivered (QoSD) offered by the C2CSP is not worse than what is specific in the data associated to the Type Certificate.

3.6.3.4.2 The SLA shall cover the safety, performance and security of the C2 Link provision, as required for the operator's intended operations.

Rationale/justification: As logical consequence of the above provisions, it is reasonable to mandate that the main parameters linked to the C2 Link provision be auditable by the State of the Operator on the basis of a written SLA. This provision is in line with current industry practices

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3.6.3.4.3 The SLA shall contain at least:

a) Legal identification of the parties;

b) Scope of the provided service, including hours of service and coverage;

c) C2 Link provision QoSR under normal conditions which is commensurate with the C2 Link Specification required for the operator's intended operations;

d) Security measures and management of these measures;

e) Procedures for planned outages and contingencies;

f) Safety management responsibilities, safety reporting, SPIs and oversight arrangement; and

g) The CSP's emergency response plan (ERP) including how they would address service losses and how they would be restored.

Rationale/justification: To guide States, RPAS Operators and C2CSP to envisage which must be the minimum content of the SLA. It has been made at the level of a standard so that the requirements of 3.6.3.6 below can be implemented

3.6.3.5 The operator shall be responsible for the monitoring of the C2 Link service provision QoSD meets the QoSR (including its security) and shall report any observed anomalies to the C2CSP, when the C2CSPis not the operator..

Rationale/justification: Obvious provision linked to the responsibilities of the RPAS operator or operational control.

3.6.3.6 The operator shall notify the State of the Operator of all C2 Link provision degradations with regards to the SLA that occur during operations and that cannot be resolved by direct interaction between the operator and the C2CSP.

3.6.3.7 The C2CSP shall establish and document processes to perform C2CSP monitoring of the QoSD as part of their routine operations, with the objective of ensuring that the C2 Link provision meets the applicable requirements, including the C2 Link QoSR,

Rationale/justification: Like any other organisation providing safety critical services, the C2CSP shall established documented processes, e.g. in the form of a Manual, to maintain its operational functions under continuous monitoring.

3.6.3.8 The State conducting the C2CSP oversight function in accordance with 3.6.3.2 shall be responsible for:

a) initial approval of C2CSP;

b) continuous oversight of the C2CSP; and the

c) resolution of issues linked to C2 Link service provision.

Rationale/justification: In case State decide to directly oversee C2CSPs (e.g. through certification), then of course the State(s) become responsible for initial approval and continuous oversight.

3.6.3.9 The State conducting the C2CSP oversight function in accordance with 3.6.3.2 shall:

a) before granting initial approval, establish and document processes and procedures to ensure that the C2CSP can meet the established requirements including C2 Link QoSR and security;

Rationale/justification: Implementing Critical Element CE-6 from Appendix 1 to Annex 19, as necessary since C2CSP are not in current or envisaged scope of that Annex.

b) establish and document monitoring processes, to ensure that the C2CSP maintains the established requirements including C2 Link QoSR and security;

Rationale/justification: Implementing Critical Element CE-7 from Appendix 1 to Annex 19, as necessary since C2CSP are not in current or envisaged scope of that Annex.

c) establish and document monitoring processes to raise findings, and to request and monitor corrective actions by the C2CSP;

Rationale/justification: Implementing Critical Element CE-8 from Appendix 1 to Annex 19, as necessary since C2CSP are not in current or envisaged scope of that Annex.

d) take appropriate measures when necessary, to resolve C2CSP issues identified in application of the continuous monitoring processes; and

Rationale/justification: Implementing Critical Element CE-8 from Appendix 1 to Annex 19, as necessary since C2CSP are not in current or envisaged scope of that Annex.

e) grant initial approval in accordance with its national regulations.

3.6.4 Safe operation of the RPS

3.6.4.1 The operator shall be responsible for the safe operation of all RPS involved in the operation, as well as the competency of related remote flight crew that are under its operational control.

Rationale/justification: Obvious corollary of the responsibility of the RPAS operator.

3.6.4.2 Each RPS used shall be installed by its installer with required level of expertise for the task.

3.6.4.3 The installation of the RPS shall be certified by the installer verifying that it meets airworthiness and operational requirements and that it provides proper connection with the specified RPA.

Rationale/justification: The uncertainties on RPS interactions and interfaces with the external environment and resources, require some sort of installation approval to address both system and operational aspects.

This approval is to be performed at operational level to ensure that the installation of each individual RPS as installed does not affect the compliance with airworthiness requirements as shown during the RPA type design approval and that all installation assumptions used for obtaining RPS type design approval (and outlined in maintenance documentation provided by the TC holder) are still valid.

It is proposed that such approval to be issued by the operator under the oversight of the competent authority (State of the Operator). In the case that the RPS involved in the operation is controlled by a service provider, the verification of these safety aspects and issuance of the installation approval shall be addressed under the service level agreement described under 3.6.4.4.2.

Reference — RPAS P meeting No.15, WP2

3.6.4.4 When one or more of the RPS involved in the operation are controlled by a service provider, this service provider, depending on law applicable in the State where the RPS is located, shall be under the safety oversight of either:

a) the State of the RPS service provider; or

b) the State of the Operator.

Rationale/justification: Same as in 3.6.3.2 above.

3.6.4.5 When one or more of the RPS involved in the operation are controlled by a service provider, this service provider shall only allocate tasks to:

a) remote flight crews which are properly trained and competent;

b) remote pilots holding a valid remote pilot licence (RPL) issued or validated by the State of the Operator, complemented by appropriate ratings; and

c) remote flight crews which are medically fit.

Rationale/justification: Consistent with the intent of par. 9.1 in Part I of Annex 6, addressing in this case the provision to the RPS SP, which indeed could employ remote pilots and other operational personnel.

3.6.4.5.1 The safety, security and performance of the provided RPS service shall be acceptable to the State of the Operator and to the State of the RPS service provider.

Rationale/justification: Same justification as for paragraph 3.6.3.3 above.

3.6.4.5.2 If operated under a service provider, the safety and security aspects of the provided RPS shall be managed by a service level agreement between the operator and the contracted RPS service provider.

Rationale/justification: Same justification as for paragraph 3.6.4.4.1 above.

3.6.4.5.3 Any service level agreement with an RPS service provider shall include the continuing airworthiness records addressed in 8.4.

3.7 RPAS SPECIFIC OPERATING RULES

Note.— See Annex 2, Appendix 4, for general operating rules applicable to RPAS.

3.7.1 Visual Line of Sight

For portions of the flight requiring VLOS procedures, including night-time operations, the remote pilot or an RPA observer shall maintain direct unaided visual contact with the RPA.

3.7.2 Take-off and Landing

Rationale/justification: Annex 2, Chapter 1 - Definitions

Note 1.— RPAS may be operated from aerodrome/heliport open to public use or other location fulfilling the operational requirements and system configuration, design and performance.

Note 2.— This section also applies to Launch and Recovery operations.

For operations from other than aerodromes/heliports open to public use, the operator or remote pilot shall consider the following:

a) take-off and landing area and condition, to include protections for persons and property on the surface of the earth;

b) meteorological conditions appropriate to the intended flight;

c) location and height of all obstacles that could hinder take-off or landing;

d) performance and capability related to obstacle clearance, departure or arrival procedures (if applicable) and any flight restrictions;

e) communications with the appropriate ATS unit, if required;

f) service provision ensuring required C2 Link performance (transaction time, availability, continuity and integrity);

g) compliance with ATC clearances and instructions in controlled airspace or remaining well clear from other air traffic in uncontrolled airspace; and

h) availability of services ground infrastructure and equipment required for take-off/launch, landing/recovery and taxing (if applicable).

3.7.3 Launch and Recovery Equipment

3.7.3.1 Where required, the positioning, set-up, and operation of the launch and recovery equipment shall be coordinated with the aerodrome/heliport operator to ensure there is no adverse impact on safety.

3.7.3.2 The RPAS ground crew and/or the remote flight crew shall position, prepare, set up and check that the condition and operability of all required launch and recovery equipment is:

a) in accordance with the instructions provided by the manufacturer;

b) in a position coordinated with the aerodrome operator if located at an aerodrome/heliport; and

c) for operations from other than aerodromes/heliports open to public use, in a position to afford protection to persons and property on the surface of the earth.

3.7.3.3 The operator shall ensure that the required launch and recovery equipment is serviceable for each RPA being used.

3.7.3.4 Only persons and vehicles authorized by the operator shall be permitted within the launch and recovery area of the RPA.

Note.— Further guidance regarding the launch and recovery area can be found within volume 2 of the Manual on Remotely Piloted Aircraft Systems (RPAS) Manual (Doc 10019).

3.7.4 Emergencies and Contingencies

The RPAS operations manual shall contain procedures to mitigate at least the following:

a) Lost C2 Link

b) Loss of essential systems or navigational data

c) Unavailability of required services or equipment

d) Unscheduled closure of airspace or aerodromes

e) Emergency landing

f) RPS crew incapacitation

g) Inadvertent release of dangerous goods

3.7.5 Emergency landing, ditching locations, flight termination

Note .— Depending on the configuration of the RPA, remote pilots may have little chance to observe actual details on the ground in the vicinity of the RPA during an emergency. The remote pilot may rely to a much greater extent on preplanning emergency scenarios that may occur along the intended route of flight.

3.7.5.1.1 When planning for or selecting emergency landing locations, remote pilots shall prioritize the safety of persons on the ground over RPA recovery.

3.7.5.1.2 When the flight is in progress, remote pilots shall reassess the selected emergency landing areas so that they minimize the risks to people and property on the ground, considering the following:

a) type of terrain, ground obstructions;

b) population density, open air assemblies of persons;

c) accessibility for recovery or fire suppression;

d) proximity of aerodromes, heliports;

e) possibility of landing on open water; and

f) type and quantity of dangerous goods.

3.7.5.1.3 The operator shall establish procedures for the use of a flight termination system, if the RPA is so equipped.

3.7.6 Lost C2 Link

3.7.6.1 In the event of a Lost C2 Link, an RPA shall be capable of following a pre-programmed and predictable flight profile.

3.7.6.2 Prior to flight, the operator shall ensure that if the RPAS enters a Lost C2 Link state, the RPA will follow the procedures contained in Annex 2 or the relevant State AIP.

Note 1.— Lost C2 Link is considered to be any situation where the length of an interruption has exceeded the lost C2 Link Decision Time and so the RPA can no longer be actively managed by the remote pilot in a safe and timely manner.

3.7.6.3 The operator shall establish crew procedures for C2 Link interruption and lost C2 Link operations.

Note.— Additional procedures related to emergencies, communication failure and contingencies are described in Doc 4444 chapter 15.

3.7.6.4 When operating in airspace where SSR transponder carriage is required, the RPAS/RPA shall be capable of setting the transponder to Mode A Code 7400 to indicate a Lost C2 Link state.

Rationale/justification: Mode a code 7400 is the SSR code currently proposed for the indication of a lost C2 Link state but this will be changed to reflect any final decisions

3.7.6.5 When operating in airspace where ADS-B carriage is required, the RPAS/RPA shall be capable of selecting the appropriate functionality to indicate a Lost C2 Link state.

3.7.6.6 Special operations

Reserved for future use.

CHAPTER 4. FLIGHT OPERATIONS

4.1 OPERATING FACILITIES

4.1.1 An operator shall ensure that a flight will not be commenced unless it has been ascertained by every reasonable means available that the ground and/or water facilities including communication facilities and navigation aids available and directly required, for the safe operation of the RPAS, are adequate for the type of operation under which the flight is to be conducted and are adequately operated for this purpose.

Note.— "Reasonable means" in this Standard is intended to denote the use of information available to the operator either through official information published by the aeronautical information services or readily obtainable from other sources.

4.1.2 An operator shall ensure that any inadequacy of facilities observed in the course of operations is reported to the authority responsible for the facilities, without undue delay.

4.2 OPERATIONAL CERTIFICATION AND SUPERVISION

4.2.1 RPAS operator certificate (ROC)

4.2.1.1 The operator shall not engage in international RPAS operations unless in possession of a valid RPAS Operator Certificate (ROC) issued by the State of the Operator.

Rationale/justification: The requirement for the continued validity of a ROC shall be subject to the operator maintaining the requirements of Chapter 3, under the supervision of the State of the Operator, is consistent with Article 1 and Article 8 (Part I) of the Chicago Convention (1944).

In addition, the obligation of granting access to any facilities, documents, records and equipment as required for the State of the Operator to perform oversight is aligned with Article 3 bis (Part I) of the Chicago Convention (1944) and Appendix 5 of Annex 6.

4.2.1.2 **Recommendation**. — *Each State should extend the requirement to hold a valid operator certificate for other RPAS operations accounting for the nature and complexity of RPAS operations and considering airspace usage and mitigations appropriate to the risk to third parties*.

4.2.1.3 The ROC shall authorize the operator to conduct RPAS operations in accordance with the operations specifications.

4.2.1.4 The issue of an ROC by the State of the Operator shall be dependent upon the operator demonstrating an adequate organization, a method of identifying, assessing, and mitigating the risks associated with flight operations, training, ground handling and maintenance requirements, consistent with the nature and extent of the operations specified.

Note — Attachment D contains guidance on the issue of an air operator certificate.

4.2.1.5 **Recommendation**. — *For operators that also hold an Air Operator Certificate (AOC), based on Annex 6 Part I or Part III, the State of the Operator should define an integrated oversight schedule to include all applicable audit items. In order to avoid duplication of audits, credit may be granted for specific audit items already completed during the AOC oversight planning cycle, subject to four conditions:*

a) *the specific audit item should be the same for all certificates under consideration;*

b) *there should be satisfactory evidence on record that such specific audit items were carried out and that all corrective actions have been implemented to the satisfaction of the State of the Operator;*

c) *the State of the Operator should be satisfied that there is no evidence that standards have deteriorated in respect of those specific audit items being granted a credit;*

d) *the interval between two audits for the specific item being granted a credit should not exceed the applicable oversight planning cycle.*

4.2.1.6 The operations specifications associated with the ROC shall follow the layout of and contain at least the information listed in Appendix 6.

4.2.1.7 **Recommendation**. — *The State of the Operator should grant to manned or unmanned aircraft operators, appropriate privileges for the activities that the operator is approved to conduct, through a single 'merged' certificate, listing the privileges in operations specification attached to the certificate.*

Note — The merged certificate may encompass the privileges of an AOC based on Annex 6 Part I or Part III and the privileges of an ROC.

Rationale/justification: The general principle here is to allow an existing AOC holder (for a manned aircraft operation) to be able to use this as a degree of 'credit' in order to obtain an ROC without the need to repeat the same details in a completely new application. Text inspired by similar entries in current EU Regulations.

4.2.1.8 The operator shall appoint an accountable manager, who has the authority for ensuring that all activities can be financed and carried out in accordance with the ROC.

Note. — The accountable manager is responsible for establishing and maintaining an effective safety management system (ICAO Annex 19, Appendix 2. Std 1.2).

Rationale/justification: The general principle that the operator shall appoint an accountable manager, is in line with the safety accountabilities requirements established in Appendix 2 to Annex 19.

4.2.1.9 A person or group of persons shall be nominated by the operator, with the management responsibility of ensuring that the operator remains in compliance with the ROC, laws, regulations and procedures of those States in which operations are conducted.

Note. — Areas for which a person or persons are nominated typically include: RPAS operations, continuing airworthiness, crew training, safety management.

4.2.1.10 The ROC shall contain at least the following information and follow the layout of Appendix 6:

a) the State of the Operator and the issuing authority;

b) the ROC number and its expiration date;

c) the operator name, trading name (if different) and address of the principal place of business;

d) the date of issue and the name, signature and title of the authority representative; and

e) the location, in a controlled document which shall be easily accessible, where the contact details of operational management can be found.

4.2.1.11 The format (e.g. paper and electronic) of the ROC document shall be acceptable to the State of the Operator and to all other States in which the RPA is to be operated.

4.2.1.12 The application for an ROC shall be made to the State(s) of the Operator.

4.2.1.13 The continued validity of an ROC shall be subject to the operator:

a) maintaining the requirements of 4.2.1.4 under the supervision of the State of the Operator, and

Rationale/justification: This proposed standard aims to ensure the same level of safety as in traditional manned aviation. Proposed standard is based on requirements coming from manned aviation e.g. Annex 6 Part I, but is fine tuned in order to take into account the special characteristics of unmanned aviation. As there is a possibility that unmanned aircraft might be relatively small, the option to carry these documents also in electronic format is essential.

b) granting access to any facilities, documents, records and equipment as required for the State of the Operator to perform oversight.

Rationale/justification: Clarify that the RPAS operator shall receive the ROC by the State of the Operator.

For RPAS operation, ROC is necessary to clarify the State of the Operator of RPA and RPS.

4.2.1.14 The State of the Operator shall establish a system for both the certification and the continued surveillance of the operator in accordance with Appendix 5 to this Annex and Appendix 1 to Annex 19 to ensure that the required standards of operations established in 4.2 are maintained.

4.2.1.15 The State of the Operator shall ensure that the operator's actions are in compliance with the approvals and limitations established by the State of Registry.

Note 1.— The system for the initial certification and the continued surveillance of the operator may be based on the process described in the Manual of Procedures for Operations Inspection Certification and Continued Surveillance Doc 8335, for commercial air transport operators, with possible adaptations to cover specific features of RPAS operations (e.g. handover between RPS).

Note 2.— Guidance concerning the transfer of responsibilities by the State of Registry to the State of the Operator in accordance with Article 83 bis is contained in the Manual on the Implementation of Article 83 bis of the Convention on International Civil Aviation (Doc 10059).

4.2.2 Contracted services

4.2.2.1 When the operator contracts any safety or security related services in support of its operations to a third party that is not certified (in accordance with this Section) by State(s) to carry out such an activity, the contracted third party shall comply with all the operator's procedures, including those for safety and security management.

Note.— This applies to any operator activities that are subject to the Standards and Recommended Practices and that are performed under a valid ROC.

Rationale/justification: The ultimate responsibility for safety of operations is with the RPAS Operator. This proposed standard emphasis such responsibility and define that the operator shall manage and monitor the safety and security of the contracted services.

4.2.2.2 The operator shall ensure that the regulatory authorities of the State of the Operator have access to the documents of the contracted organization to the extent required for determining continued compliance with the Standards and Recommended Practices.

4.2.2.3 The operator shall ensure that the authorities in the State where the contracted services are provided are given access to the premises, facilities, equipment and documents of the contracted organization to the extent required for determining continued compliance with the Standards and Recommended Practices set.

4.2.3 Surveillance of operations conducted by a foreign operator

4.2.3.1 Contracting States shall recognize as valid an ROC issued by another Contracting State provided that the requirements under which the certificate was issued are at least equal to the applicable Standards specified in this Annex.

4.2.3.2 States shall establish a programme with procedures for the surveillance of RPAS operations in their territory conducted by a foreign operator and for taking appropriate action when necessary to preserve safety.

4.2.3.3 An operator shall meet and maintain the requirements established by the States in which the operations are conducted.

Note.— Guidance on the surveillance of operations by foreign operators may be found in the Manual of Procedures for Operations Inspection, Certification and Continued Surveillance (Doc 8335).

4.2.3.4 If the operator intends to have an operating base, a location from which operational control is exercised, in a State other than the State of the Operator, the operator shall notify the State in which the operating base will be located.

Note.— An operating base is normally the location where personnel involved in the operation of the RPAS work and the records associated with the operation are located.

Rationale/justification: This is *consistent with the intent of paragraph 4.2.1.5 in Part I of Annex 6.*

4.2.4 Operations manual

4.2.4.1 The operator shall provide, for the use and guidance of operations personnel concerned, an operations manual in accordance with Appendix 2. The operations manual shall be amended or revised as is necessary to ensure that the information contained therein is kept up to date. All such amendments or revisions shall be issued to all personnel that are required to use this manual.

Rationale/justification: Same intent and wording to paragraph 4.2.3.1 in Part I of Annex 6.

4.2.4.2 The State of the Operator shall establish a requirement for the operator to provide a copy of the operations manual together with all amendments and/or revisions, for review and acceptance and, where required, approval. The operator shall incorporate in the operations manual such mandatory material as the State of the Operator may require.

Note 1. — Requirements for the organization and content of an operations manual are provided in Appendix 2

Note 2. — Specific items in the operations manual require the approval of the State of the Operator in accordance with the Standards in 4.2.8, 6.1.3, 9.3.1 and 13.4.1.

Rationale/justification: Same intent and wording very similar to paragraph 4.2.3.2 in Part I of Annex 6.

4.2.5 Operating instructions — general

4.2.5.1 The operator shall ensure that all operations personnel are properly instructed in their particular duties and responsibilities and the relationship of such duties to the operation as a whole.

4.2.5.2 An RPA shall not be taxied on the movement area of an aerodrome unless the person at the controls:

a) has been duly authorized by the operator or a designated agent

b) is fully competent to taxi the RPA;

c) is qualified to use the radiotelephone; and

d) has received instruction from a competent person in respect of aerodrome layout, routes, signs, marking, lights, air traffic control (ATC) instructions, phraseology and procedures, and is able to conform to the operational standards required for safe movement at the aerodrome.

4.2.5.3 **Recommendation. —** *The operator should issue operating instructions and provide information on RPA climb performance with all engines operating to enable the remote pilot-in-command to determine the climb gradient that can be achieved during the departure phase for the existing take-off conditions and intended take-off technique. This information should be included in the operations manual.*

Note. — Performance requirements are covered more widely in 5.2

4.2.6 In-flight simulation of abnormal and emergency situations

4.2.6.1 The operator shall ensure that when cargo is being carried, no emergency or abnormal situations are simulated.

4.2.6.2 The operator shall ensure that in-flight training of simulated emergency and abnormal situations are only conducted following careful consideration and mitigation of the risks to third parties.

4.2.7 Checklists

The checklists provided in accordance with 6.1.4 shall be used by remote flight crews prior to, during and after all phases of operations, and in emergencies, to ensure compliance with the operating procedures contained in the flight manual or other documents associated with the certificate of airworthiness and otherwise in the operations manual. The design and utilization of checklists shall observe Human Factors principles.

Note.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual (Doc 9683).

4.2.8 Minimum flight altitudes

4.2.8.1 The operator shall be permitted to establish minimum flight altitudes for those routes flown for which minimum flight altitudes have been established by the State being overflown or the responsible State, provided that they shall not be less than those established by that State.

4.2.8.2 The operator shall specify the method by which it is intended to determine minimum flight altitudes for operations conducted over routes for which minimum flight altitudes have not been established by the State being overflown or the responsible State, and shall include this method in the operations manual. The minimum flight altitudes determined in accordance with the above method shall not be lower than specified in Annex 2.

4.2.8.3 **Recommendation**. — *The method for establishing the minimum flight altitudes should be approved by the State of the Operator.*

4.2.8.4 **Recommendation. —** *The State of the Operator should approve such method only after careful consideration of the probable effects of the following factors on the safety of the operation in question:*

a) the accuracy and reliability with which the position of the RPA can be determined;

b) the inaccuracies in the indications of the altimeters used;

c) the characteristics of the terrain (e.g. sudden changes in the elevation);

d) the probability of encountering unfavourable meteorological conditions (e.g. severe turbulence and descending air currents);

e) possible inaccuracies in aeronautical charts; and

f) airspace restrictions.

4.2.9 Aerodrome operating minima

4.2.9.1 The operator shall establish aerodrome operating minima, in accordance with criteria specified by the State of the Operator, for each aerodrome to be used in operations. Such minima shall not be lower than any that may be established for such aerodromes by the State of the Aerodrome, except when specifically approved by that State for RPAS operations.

Note.— This Standard does not require the State of the Aerodrome to establish aerodrome operating minima.

4.2.9.2 The State of the Operator shall require that in establishing the aerodrome operating minima, which will apply to any RPAS operation, the operator shall take full account of:

a) the type, performance and handling characteristics of the RPA and any conditions or limitations stated in the flight manual;

b) the composition of the remote flight crew, their competence and experience;

c) the dimensions and characteristics of the runways which may be selected for use;

d) the adequacy and performance of the approach and automatic landing capabilities of the RPAS;

e) the equipment available to the remote pilot-in-command for the purpose of navigation and/or control of the flight path during the approach to landing and the missed approach;

f) the obstacles in the approach and missed approach areas and the obstacle clearance altitude/height for the instrument approach procedures;

g) the means used to determine and report meteorological conditions;

h) the obstacles in the climb-out areas and necessary clearance margins;

i) the conditions prescribed in the operations specifications; and

j) any minima that may be promulgated by the State of the Aerodrome.

Note.— Guidance on the establishment of aerodrome operating minima is contained in the Manual of All-Weather Operations (Doc 9365).

4.2.9.3 The State of the Operator shall issue a specific approval for operations that involve the use of an automatic landing capability, irrespective of the prevailing weather conditions.

4.2.9.3.1 For landing in low visibility, if the design of the RPAS enables this to be conducted visually, the State of the Operator shall issue a specific approval for instrument approach operations in low visibility which shall only be conducted when RVR information is provided.

Note.— In this case, 'visually' can refer to a VLOS operation or any synthetic/camera based solution which enables the remote pilot to monitor and correct the RPA's track along the ground.

4.2.9.4 The State of the Operator shall issue a specific approval for operations that involve the use of an automatic take-off capability, irrespective of the prevailing weather conditions.

4.2.9.4.1 For take-off in low visibility, if the design of the RPAS enables this to be conducted visually, the State of the Operator shall issue a specific approval for the minimum take-off RVR.

Note 1.— In this case, 'visually' can refer to a VLOS operation or any synthetic/camera based solution which enables the remote pilot to monitor and correct the RPA's track along the ground.

Note 2.— In general, visibility for take-off is defined in terms of RVR. An equivalent horizontal visibility may also be used.

4.2.9.5 The operating minima for 3D instrument approach RPAS operations using instrument approach procedures where the final part of the landing is conducted visually, shall be determined by establishing a decision altitude (DA) or decision height (DH) and the minimum visibility or RVR.

Note .— In this case, 'visually' can refer to a VLOS operation or any synthetic/camera based solution which enables the remote pilot to monitor and correct the RPA's track when below the DA or DH.

4.2.10 Threshold crossing height for automatic landing or 3D instrument approach operations

The operator shall establish operational procedures designed to ensure that an RPA being used to conduct automatic landing or 3D instrument approach operations crosses the threshold by a safe margin, with the RPA in the landing configuration and attitude.

Rationale/justification: This whole section has been made much more generic than in Annex 6 Part I in order to accommodate the requirements of RPAS, but not mention specific systems. It is intended to be more performance based)

4.2.11 Fuel and oil records

Note.— For the remainder of this Part of this Annex, the term "fuel" is intended to include all sources of energy, to include (but not limited to) petroleum based, solar, battery or any future source that provides energy to the RPA.

4.2.11.1 The operator shall maintain fuel records to enable the State of the Operator to ascertain that, for each flight, the requirements of 4.3.6 and 4.3.7.1 have been complied with.

4.2.11.2 If an engine relies on oil for lubrication, the operator shall maintain oil records to enable the State of the Operator to ascertain that trends for oil consumption are such that an RPA has sufficient oil to complete each flight.

4.2.11.3 Fuel and oil records shall be retained by the operator for a period of three months.

4.2.12 Crew

4.2.12.1 *Remote pilot-in-command.* For each flight, the operator shall designate a remote pilot to act as remote pilot-in-command.

4.2.12.2 The operator shall only designate one remote pilot to act as remote pilot-in-command for an RPA, at any given time.

4.2.12.3 The operator may designate more than one remote pilot-in-command for an RPA over the course of an entire RPAS operation.

Note 1.— While there may be multiple changes of the individual designated as remote pilot-in-command during the flight of an RPA, each RPA will have a dedicated remote pilot-in-command that has been designated by the operator.

Note 2.— Details regarding handovers and the transfer of control between remote pilots is provided at 4.4.12 and 4.4.13

Rationale/justification: This is consistent with the intent of paragraph 4.2.11.1 and 9.4 in Part I of Annex 6.

4.2.13 Passengers

Reserved for future use.

4.3 FLIGHT PREPARATION

4.3.1 A flight shall not be commenced until flight preparation forms have been completed certifying that the remote pilot-in-command is satisfied that:

Note.— This responsibility applies to the first remote pilot-in-command responsible for the flight of the RPA.

a) the RPA is airworthy, duly registered and that appropriate certificates with respect thereto are on board the RPA;

b) the instruments and equipment installed in the RPAS are appropriate, taking into account the expected flight conditions and airspace requirements;

c) the RPS(s) used for the flight is (are) serviceable and compatible with the RPA used;

d) a C2 Link with the RPA is expected to be available for the duration of the flight and meets the performance criteria. The Service level agreement of a given operation will be available to the remote pilot. The SLA will contain a simple description of the QoSR for each phase of the flight. This description will be added to the flight documents provided to the remote pilot by the operator;

e) a maintenance release as prescribed in 8.8 has been issued in respect of the RPA;

f) the mass of the RPA and centre of gravity location are such that the flight can be conducted safely, taking into account the flight conditions expected;

g) any load carried is properly distributed and safely secured; and

h) the RPA operating limitations, contained in the flight manual, or its equivalent, will not be exceeded.

i) approval has been obtained in accordance with Annex 2 Appendix 4.

4.3.2 Completed flight preparation forms shall be kept by the operator for a period of three months.

4.3.3 Operational flight planning

4.3.3.1 An operational flight plan shall be completed for every intended flight. The operational flight plan shall be approved and signed by the remote pilot-in-command and, where applicable, signed by the flight operations officer/flight dispatcher, and a copy shall be filed with the operator or a designated agent, or, if these procedures are not possible, it shall be left with the aerodrome authority or on record in a suitable place at the point of departure.

Note.— The duties of a flight operations officer/flight dispatcher are contained in 4.6.

4.3.3.2 Whenever there is a change of the remote pilot-in-command, the incoming remote pilot-in-command shall approve the operational flight plan before accepting command for the subsequent segments of the flight.

Note.— Procedures for changing the remote pilot-in-command can be found in 4.4.12 and 4.4.13.

4.3.3.3 The approval(s) of the operational flight plan shall be recorded and retained in a method acceptable to the State of the Operator.

4.3.3.4 The operator shall specify flight planning procedures to provide for the safe conduct of the flight based on considerations of RPAS performance, other operating limitations and relevant expected conditions on the route to be followed and at the aerodromes, including alternate aerodromes, concerned.

4.3.3.5 Flight planning procedures shall be included in the operations manual.

4.3.3.6 The operator shall ensure that the remote pilot is provided with information regarding factors that could affect the quality of the C2 Link for each segment of the operation.

4.3.3.7 Remote pilots shall notify the ATC unit immediately upon the Lost C2 Link procedures being activated for any flight under ATC or any flight that may affect controlled flights.

4.3.3.8 **Recommendation**.— *Operational flight planning should include specific needs for RPAS such as the number of remote pilots and crew duty time planning for long endurance missions. The future availability of RPS may also need to be considered. Such requirements may not be available at the time of departure but may be necessary for operation in a later phase of the flight.*

4.3.3.9 **Recommendation.—** *The operator should establish procedures in the operations manual to ensure a seamless operation throughout the duration of the flight including the different phases of the flight such as take-off, climb, en-route, approach, and landing carried out by remote pilots responsible for each phase of flight.*

Note.— The requirements for flight plans are contained in Annex 2 — Rules of the Air and Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444).

4.3.4 Alternate aerodromes

For an aerodrome to be selected as an alternate the available information shall indicate that, at the estimated time of use, the required C2 Link will be available.

4.3.4.1 *Take-off alternate aerodrome*

4.3.4.1.1 A take-off alternate aerodrome shall be selected and specified in the flight plan if either the meteorological conditions at the aerodrome of departure are below the applicable aerodrome landing minima for that operation or if it would not be possible to return to the aerodrome of departure for other reasons.

4.3.4.1.2 The take-off alternate aerodrome shall be located at a distance and within a flight time from the aerodrome of departure that is readily attainable with regard to the RPA's calculated performance and endurance.

4.3.4.1.3 For an aerodrome to be selected as a take-off alternate the available information shall indicate that, at the estimated time of use, the conditions will be at or above the applicable aerodrome operating minima for that operation.

4.3.4.2 *En-route alternate aerodromes*

4.3.4.2.1 En-route alternate aerodromes shall be selected and specified in the operational and air traffic services flight plans.

4.3.4.2.2 **Recommendation.—** *When conducting operations beyond 60 minutes from a point on a route to an en-route alternate or destination alternate aerodrome operators should ensure that:*

a) en-route destination alternates are identified; and

b) the remote pilot-in-command has access to current information on the identified en-route alternate, including operational status and meteorological conditions.

Rationale/justification: Adapted from Part I of Annex 6 and Annex 1, 4.3.4.2 *En-route alternate aerodromes*.

4.3.4.3 *Destination alternate aerodromes*

4.3.4.3.1 For a flight to be conducted in accordance with the instrument flight rules, at least one destination alternate aerodrome shall be selected and specified in the operational and ATS flight plans, unless:

a) the duration of the flight from the departure aerodrome, or from the point of in-flight re-planning, to the destination aerodrome is such that, taking into account all meteorological conditions and operational information relevant to the flight, at the estimated time of use, a reasonable certainty exists that:

1) the approach and landing may be made without reliance on an instrument approach procedure; and

2) separate runways are usable at the estimated time of use of the destination aerodrome with at least one runway having an operational instrument approach procedure; or

b) the aerodrome is isolated. Operations into isolated aerodromes do not require the selection of a destination alternate aerodrome(s) and shall be planned in accordance with 4.3.6.3 d) 4);

1) for each flight into an isolated aerodrome a point of no return shall be determined; and

2) a flight to be conducted to an isolated aerodrome shall not be continued past the point of no return unless a current assessment of meteorological conditions, traffic and other operational conditions indicate that a safe landing can be made at the estimated time of use.

Note 1.— Separate runways are two or more runways at the same aerodrome configured such that if one runway is closed, operations to the other runway(s) can be conducted.

Note 2.— Guidance on planning operations to isolated aerodromes is contained in the Flight Planning and Fuel Management Manual (Doc 9976).

4.3.4.3.2 Two destination alternate aerodromes shall be selected and specified in the operational and ATS flight plans when, for the destination aerodrome:

a) meteorological conditions at the estimated time of use will be below the operator's established aerodrome operating minima for that operation; or

b) meteorological information is not available.

4.3.4.4 Notwithstanding the provisions in 4.3.4.1, 4.3.4.2 and 4.3.4.3, the State of the Operator may approve operational variations to alternate aerodrome selection criteria. This will be based on the results of a specific safety risk assessment conducted by the operator which demonstrates how an equivalent level of safety will be maintained. The specific safety risk assessment shall include at least the:

a) capabilities of the operator;

b) overall capability of the RPAS;

c) available aerodrome technologies, capabilities and infrastructure;

d) quality and reliability of meteorological information;

e) identified hazards and safety risks associated with each alternate aerodrome variation; and

f) specific mitigation measures.

Note.— Guidance on performing a safety risk assessment and on determining variations, including examples of variations, is contained in the Flight Planning and Fuel Management Manual (Doc 9976) and the Safety Management Manual (SMM) (Doc 9859).

4.3.5 Meteorological conditions

4.3.5.1 A flight to be conducted in accordance with the instrument flight rules shall not:

a) take off from the departure aerodrome unless the meteorological conditions, at the time of use, are at or above the operator's established aerodrome operating minima for that operation; and

b) take off or continue beyond the point of in-flight re-planning unless at the aerodrome of intended landing or at each alternate aerodrome to be selected in compliance with 4.3.4, current meteorological reports or a combination of current reports and forecasts indicate that the meteorological conditions will be, at the estimated time of use, at or above the operator's established aerodrome operating minima for that operation.

4.3.5.2 To ensure that an adequate margin of safety is observed in determining whether or not an approach and landing can be safely carried out at each alternate aerodrome, the operator shall specify appropriate incremental values for height of cloud base and visibility, acceptable to the State of the Operator, to be added to the operator's established aerodrome operating minima.

Note.— Guidance on the selection of these incremental values is contained in the Flight Planning and Fuel Management (FPFM) Manual (Doc 9976).

4.3.5.3 The State of the Operator shall approve a margin of time established by the operator for the estimated time of use of an aerodrome.

Note.— Guidance on establishing an appropriate margin of time for the estimated time of use of an aerodrome is contained in the Flight Planning and Fuel Management (FPFM) Manual (Doc 9976).

4.3.5.4 A flight to be operated in known or expected icing conditions shall not be commenced unless the RPA is certificated and equipped to cope with such conditions.

4.3.5.5 A flight to be planned or expected to operate in suspected or known ground icing conditions shall not take off unless the RPA has been inspected for icing and, if necessary, has been given appropriate de-icing/anti-icing treatment. Accumulation of ice or other naturally occurring contaminants shall be removed so that the RPA is kept in an airworthy condition prior to take-off.

Note.— Guidance material is given in the Manual of Aircraft Ground De-icing/Anti-icing Operations (Doc 9640).

4.3.6 Fuel requirements

4.3.6.1 An RPA shall have available a sufficient amount of usable fuel and reserves to complete the planned flight safely and to allow for deviations from the planned operation.

Note.— If fuel is planned to be generated or supplied during flight (e.g. air refuelling or charging of batteries via solar energy), the RPA shall maintain sufficient capability at any given time to continue to a safe landing including the necessary reserves.

4.3.6.2 The amount of usable fuel available shall, as a minimum, be based on:

a) Fuel consumption data:

1) Provided by the RPAS manufacturer; or

2) If available, current RPA-specific data derived from a fuel consumption monitoring system; and

Note.— Where no specific fuel consumption data exist for the precise conditions of the flight, the RPA may be operated in accordance with estimated fuel consumption data.

b) the operating conditions for the planned flight including:

1) anticipated RPA mass;

2) NOTAM;

3) current meteorological reports or a combination of current reports and forecasts;

4) air traffic services procedures, restrictions and anticipated delays; and

5) the effects of deferred maintenance items and/or configuration deviations.

c) the efficiency and capacity of fuel storage devices (e.g. batteries) for the planned operating conditions considering degradation of those fuel storage devices as appropriate.

4.3.6.3 The pre-flight calculation of usable fuel required shall include:

a) *Taxi fuel*, which shall be the amount of fuel expected to be consumed before take-off taking into account local conditions at the point of departure and auxiliary power unit (APU) fuel consumption;

b) *Trip fuel*, which shall be the amount of fuel required to enable the RPA to fly from take-off until landing at the destination aerodrome taking into account the operating conditions of 4.3.6.2 b);

Note . — The trip fuel at the beginning of the flight may be reduced for some types of RPA or types of operation (e.g. solar powered RPA or in-flight refuelling)

c) *contingency fuel*, which shall be the amount of fuel required to compensate for unforeseen factors.

Note.— Unforeseen factors are those which could have an influence on the fuel consumption to the destination aerodrome, such as deviations of an individual RPA from the expected fuel consumption data, deviations from forecast meteorological conditions, extended delays and deviations from planned routings and/or cruising levels.

d) destination alternate fuel, which shall be:

1) where an destination alternate is required, the amount of fuel required to enable the RPA to:

i. perform a missed approach at the destination;

ii. climb to the expected cruising altitude;

iii. fly the expected routing;

iv. descend to the point where the expected approach is initiated; and

v. conduct the approach and landing at the destination alternate; or

2) where two destination alternate aerodromes are required, the amount of fuel, as calculated in 4.3.6.3 d) 1), required to enable the RPA to proceed to the destination alternate aerodrome which requires the greater amount of alternate fuel; or

3) where a flight is operated without an destination alternate, the amount of fuel required to enable the RPA to fly 15 minutes at holding speed at 450 m (1 500 ft.) above destination elevation in standard conditions; or

4) where the intended destination is isolated:

i. for a non-turbine engine RPA, the amount of fuel required to fly for 45 minutes plus 15 per cent of the flight time planned to be spent at cruising level, including final reserve fuel, or two hours, whichever is less; or

ii. for a turbine-engine RPA, the amount of fuel required to fly for two hours at normal cruise consumption above the destination, including final reserve fuel;

e) *final reserve fuel,* which shall be the amount of fuel on arrival at the destination alternate, or the intended destination when no destination alternate is required:

1) for a non-turbine engine RPA, the amount of fuel required to fly for 45 minutes; or

2) for a turbine-engine RPA, the amount of fuel required to fly for 30 minutes at holding speed at 450 m (1 500 ft.) above intended destination elevation in standard conditions;

f) additional fuel, which shall be the supplementary amount of fuel required if the minimum fuel calculated in accordance with 4.3.6.3 b), c), d) and e) is not sufficient to:

1) allow the RPA to descend as necessary and proceed to an alternate aerodrome in the event of engine failure based on the assumption that such a failure occurs at the most critical point along the route;

i. fly for 15 minutes at holding speed at 450 m (1 500 ft.) above aerodrome elevation in standard conditions; and

ii. make an approach and landing;

2) meet additional requirements not covered above;

Note.— Fuel planning for a failure that occurs at the most critical point along a route (4.3.6.3 f) 1)) may place the RPA in a fuel emergency situation based on 4.3.7.2.

g) *discretionary fuel*, which shall be the extra amount of fuel to be carried at the discretion of the remote pilot-in-command.

Rationale/justification: Text based on equivalent section within Annex 6 Part I. Future research may determine more appropriate times at a later date, or may indeed need to be more performance based rather than prescriptive, but at present, a requirement equivalent to that of manned aviation is considered most appropriate

4.3.6.4 **Recommendation**. — *Operators should determine one final reserve fuel value for each RPA type and variant in their fleet rounded up to an easily recalled figure.*

4.3.6.5 A flight shall not commence unless the usable fuel on board meets the requirements in 4.3.6.3 a), b), c), d), e) and f) if required and shall not continue from the point of in-flight re-planning unless the usable fuel on board meets the requirements in 4.3.6.3 b), c), d), e) and f) if required.

4.3.6.6 Notwithstanding the provisions in 4.3.6.3 a), b), c), d) and f), the State of the Operator may, based on the results of a specific safety risk assessment conducted by the operator which demonstrates how an equivalent level of safety will be maintained, approve variations to the pre-flight fuel calculation of taxi fuel, trip fuel, contingency fuel, destination alternate fuel, and additional fuel. The specific safety risk assessment shall include at least the:

a) flight fuel calculations;

b) capabilities of the operator to include:

1) a data-driven method that includes a fuel consumption monitoring programme; and/or

2) the advanced use of alternate aerodromes; and

c) specific mitigation measures.

Note.— Guidance on the specific safety risk assessment, fuel consumption monitoring programmes and the advanced use of alternate aerodromes is contained in the Flight Planning and Fuel Management (FPFM) Manual (Doc 9976).

4.3.6.7 The use of fuel after flight commencement for purposes other than originally intended during pre-flight planning shall require a re-analysis and, if applicable, adjustment of the planned operation.

Note.— Guidance on procedures for in-flight fuel management including re-analysis, adjustment and/or re-planning considerations when a flight begins to consume contingency fuel before take-off is contained in the Flight Planning and Fuel Management (FPFM) Manual (Doc 9976).

4.3.7 In-flight fuel management

4.3.7.1 The operator shall establish policies and procedures, approved by the State of the Operator, to ensure that in-flight fuel checks and fuel management are performed.

4.3.7.2 The remote pilot-in-command shall continually ensure that the amount of usable fuel remaining on board is not less than the fuel required to proceed to a destination where a safe landing can be made with the planned final reserve fuel remaining upon landing.

Note.— The protection of final reserve fuel is intended to ensure a safe landing at any destination when unforeseen occurrences may not permit safe completion of an operation as originally planned. Guidance on flight

planning including the circumstances that may require re-analysis, adjustment and/or re-planning of the planned operation before take-off or en-route, is contained in the Flight Planning and Fuel Management (FPFM) Manual *(Doc 9976).*

4.3.7.3 The remote pilot-in-command shall request delay information from ATC when unanticipated circumstances may result in landing at the destination with less than the final reserve fuel plus any fuel required to proceed to a destination alternate or the fuel required to operate to a destination which is isolated.

4.3.7.4 The remote pilot-in-command shall advise ATC of a minimum fuel state by declaring MINIMUM FUEL when, having committed to land at a specific destination, the pilot calculates that any change to the existing clearance to that destination may result in landing with less than the planned final reserve fuel.

Note 1.— The declaration of MINIMUM FUEL informs ATC that all planned destination options have been reduced to a specific aerodrome of intended landing and any change to the existing clearance may result in landing with less than the planned final reserve fuel. This is not an emergency situation but an indication that an emergency situation is possible should any additional delay occur.

Note 2.— Guidance on declaring minimum fuel is contained in the Flight Planning and Fuel Management (FPFM) Manual (Doc 9976).

4.3.7.5 The remote pilot-in-command shall declare a situation of fuel emergency by broadcasting MAYDAY MAYDAY MAYDAY FUEL when the calculated usable fuel estimated to be available upon landing at the nearest destination where a safe landing can be made is less than the planned final reserve fuel.

Note 1.— The planned final reserve fuel refers to the value calculated in 4.3.6.3 e) and is the minimum amount of fuel required upon landing at any aerodrome.

Note 2.— The words "MAYDAY FUEL" describe the nature of the distress conditions as required in Annex 10, Volume II, 5.3.2.1.1, b) 3.

Note 3.— Guidance on procedures for in-flight fuel management is contained in the Flight Planning and Fuel Management (FPFM) Manual (Doc 9976).

4.3.8 Refuelling with passengers on board

Reserved for future use.

4.3.9 Oxygen supply

Reserved for future use.

4.3.10 Time capability of cargo compartment fire suppression system

Recommendation. — *All flights should be planned so that the diversion time to an aerodrome where a safe landing could be made does not exceed the cargo compartment fire suppression time capability of the RPA, when one is identified in the relevant RPA documentation, reduced by an operational safety margin specified by the State of the Operator.*

Note 1.— Cargo compartment fire suppression time capabilities will be identified in the relevant RPA documentation when they are to be considered for the operation.

Note 2.— Fifteen minutes is an operational safety margin commonly retained for that purpose.

4.4 IN-FLIGHT PROCEDURES

4.4.1 Aerodrome operating minima

4.4.1.1 A flight shall not be continued towards the aerodrome of intended landing, unless the latest available information indicates that at the expected time of arrival, a landing can be effected at that aerodrome or at least one destination alternate aerodrome, in compliance with the operating minima established in accordance with 4.2.9.1.

4.4.1.2 An instrument approach shall not be continued below 300 m (1 000 ft.) above the aerodrome elevation or into the final approach segment unless the reported visibility or controlling RVR is at or above the aerodrome operating minima.

Note.— Criteria for the final approach segment is contained in PANS-OPS (Doc 8168), Volume II.

4.4.1.3 For approaches to aerodromes where the final part of the landing is to be conducted visually, if, after entering the final approach segment or after descending below 300 m (1 000 ft.) above the aerodrome elevation, the reported visibility or controlling RVR falls below the specified minimum, the approach may be continued to DA/H or MDA/H. In any case, an RPA shall not continue its approach-to-land at any aerodrome beyond a point at which the limits of the operating minima specified for that aerodrome would be infringed.

Note 1.— In this case, 'visually' can refer to a VLOS operation or any synthetic/camera based solution which enables the remote pilot to monitor and correct the RPA's track when below the DA or DH

Note 2.— Controlling RVR means the reported values of one or more RVR reporting locations (touchdown, mid-point and stop-end) used to determine whether operating minima are or are not met. Where RVR is used, the controlling RVR is the touchdown RVR, unless otherwise specified by State criteria.

4.4.2 Meteorological observations

The pilot-in-command shall report the runway braking action special air-report (AIREP) when the runway braking action encountered is not as good as reported.

Note.— The procedures for making special air-reports regarding runway braking action are contained in the PANS-ATM (Doc 4444), Chapter 4 and Appendix 1.

4.4.3 Hazardous flight conditions

Recommendation. — *Hazardous flight conditions encountered, other than those associated with meteorological conditions, should be reported to the appropriate aeronautical station as soon as possible. The reports so rendered should give such details as may be pertinent to the safety of other aircraft.*

4.4.4 Remote flight crew members at duty stations

4.4.4.1 *Take-off and landing.* All remote flight crew members required for take-off and landing shall be at their duty stations.

4.4.4.2 *En route*. All remote crew members required to be at their stations shall remain at their stations except when their absence is necessary for the performance of duties in connection with the operation of the RPA or for physiological needs.

4.4.5 Use of oxygen

Reserved for future use.

4.4.6 Safeguarding of cabin crew and passengers

Reserved for future use.

4.4.7 In-flight operational instructions

Operational instructions involving a change in the ATS flight plan shall be coordinated with the appropriate ATS unit before transmission to the remote pilot, when practicable.

Note.— When the above coordination has not been possible, operational instructions do not relieve a remote pilot of the responsibility for obtaining an appropriate clearance from an ATS unit, if applicable, before making a change in flight plan.

4.4.8 Instrument flight procedures

4.4.8.1 One or more instrument approach procedures designed to support instrument approach operations shall be approved and promulgated by the State in which the aerodrome is located to serve each instrument runway or aerodrome utilized for instrument flight operations.

4.4.8.2 All RPAS operated in accordance with instrument flight rules shall comply with the instrument flight procedures approved by the State in which the aerodrome is located.

Note 1.— See 4.2.9.4 for instrument approach operation classifications.

Note 2.— Information for remote pilots on flight procedure parameters and operational procedures is contained in PANS-OPS (Doc 8168), Volume I. Criteria for the construction of instrument flight procedures for the guidance of procedure specialists are provided in PANS-OPS (Doc 8168), Volume II. Obstacle clearance criteria and procedures used in certain States may differ from PANS-OPS, and knowledge of these differences is important for safety reasons (see Chapter 3, 3.1.1).

4.4.9 RPA operating procedures for noise abatement

4.4.9.1 **Recommendation. —** *RPA operating procedures for noise abatement should comply with the provisions of PANS-OPS (Doc 8168), Volume III.*

4.4.9.2 **Recommendation. —** *Noise abatement procedures specified by an operator for any one RPA type should be the same for all aerodromes.*

Note.— A single procedure may not satisfy the requirements at some aerodromes.

4.4.10 RPAS operating procedures for rates of climb and descent

Recommendation. — *Unless otherwise specified in an air traffic control instruction, to avoid unnecessary airborne collision avoidance system (ACAS II) resolution advisories in aircraft at or approaching adjacent altitudes or flight levels, remote pilots should consider using appropriate procedures to ensure that a rate of climb or descent of less than 8 m/s or 1 500 ft./min (depending on the instrumentation available) is achieved throughout the last 300 m (1 000 ft.) of climb or descent to the assigned altitude or flight level, when made aware of another aircraft at or approaching an adjacent altitude or flight level.*

Note.— Material concerning the development of these procedures is contained in PANS-OPS (Doc 8168), Volume I, Part III, Section 3, Chapter 3.

4.4.11 RPAS operating procedures for landing performance

An approach to land shall not be continued below 300 m (1 000 ft.) above aerodrome elevation unless the remote pilot-in-command is satisfied that, with the runway surface condition information available, the RPA performance information indicates that a safe landing can be made.

Note 1.— The procedures used by aerodromes to assess and report runway surface conditions are contained in the PANS-Aerodromes (Doc 9981) and those for using runway surface condition information on board aircraft are in the Aeroplane Performance Manual (Doc 10064).

Note 2.— Guidance on development of RPA performance information is contained in the Aeroplane Performance Manual (Doc 10064).

4.4.12 Handovers

4.4.12.1 RPS involved in the handover shall be under the operational control of the operator.

Note.— Operational control refers to the responsibility of the operator for the initiation, continuation, termination or diversion of a flight, including services provided by third parties.

4.4.12.2 The operator shall develop procedures for the handover of control of an RPA from one RPS to another that ensure:

a) the availability of the gaining RPS;

b) the remote pilot initiating the handover retains responsibility for the RPA until handover is complete and the remote pilot in the gaining RPS has confirmed that control has been established;

c) the gaining remote pilot is notified of or briefed on the current ATC clearance and the current radio communication frequency and/or data link authority;

d) the gaining RPS control settings are correctly aligned to the configuration of the RPA;

e) the gaining RPS is specified in the certificate of airworthiness of the RPA involved in the handover;

f) the RPA is within C2 Link range of the gaining RPS;

g) communication between the RPS involved in the handover is available and as near real-time as possible;

h) that the RPS can retain or regain control of the RPA in the event of handover failure by the gaining RPS;

i) notices to the remote pilot-in-command (NOTOC) regarding the carriage of dangerous goods are transferred to the gaining remote pilot□in□command; and

j) the journey log is transferred and that the RPA technical log is accessible to the gaining RPS.

4.4.12.3 There shall be only one RPS actively controlling an RPA at any one time.

Note.— RPS may monitor the activities of the controlling RPS to gain situational awareness or facilitate communications between remote pilots, but should not send commands to the RPA until control has been transferred.

4.4.12.4 The remote crew members involved in the handover shall be qualified for:

a) The RPS they are operating;

b) The RPA being transferred; and

c) The portion of the handover which they are accomplishing.

Note.— An electronic method for an operator to verify the qualification of the remote crew members involved in handovers may be used, if required.

4.4.12.5 Handovers may be conducted when the RPA is on the ground for maintenance or other purposes if:

a) the RPA is secured so as to prevent inadvertent ground movements or flight; and

b) the C2 Link is approved for use on the ground where the RPS are located.

Rationale/justification: Added to account for maintenance being done that requires a handover or a RPS handover before take-off that may not require a remote pilot to be present.

4.4.13 Transfer of control between remote pilots at a single RPS

4.4.13.1 The operator shall develop procedures for the transfer of control of an RPA between remote pilots as one remote pilot relieves the other at the same RPS. These procedures shall include the following minimum information shall be provided to the oncoming remote pilot:

a) current status of the RPAS, to include any faults/system failures;

b) location of the RPA;

c) the current ATC clearance and the current radio communication frequency and/or data link authority

d) meteorological conditions;

e) destination forecast or conditions;

f) status of fuel/energy and other consumables;

g) C2 Link configuration;

h) changes or limitations to the intended flight or RPA performance; and

i) notices to the remote pilot-in-command (NOTOC) regarding the carriage of dangerous goods, as applicable.

4.4.13.2 If flight operations will necessitate transfer of remote pilot-in-command responsibility during flight, the operator shall establish transfer procedures that ensure the safe continuity of the operation.

4.5 DUTIES OF REMOTE PILOT-IN-COMMAND

Note.— 4.2.11 permits the use of multiple remote pilots-in-command during a complete flight.

4.5.1 The operator shall be responsible for ensuring that a remote pilot-in-command is responsible for the operation and safety of the RPA from the moment the RPA is ready to move for the purpose of taking off until the moment it finally comes to rest at the end of the flight and the engine(s) used as primary propulsion units are shut down.

4.5.1.1 An individual person shall hold the duties and responsibilities of remote pilot-in-command during the period detailed in 4.5.1 above, or for flights involving the use of multiple remote pilots-in command, from the point where that person has assumed the duty from the previous remote pilot-in-command, or until the duty has been accepted by another remote pilot-in-command, as appropriate.

4.5.2 The remote pilot-in-command shall ensure that the checklists specified in 4.2.7 are complied with in detail.

4.5.3 The remote pilot-in-command shall be responsible for notifying the nearest appropriate authorities, by the quickest available means, of any accident or serious incident involving the RPAS.

Note.— The appropriate authorities would be, the civil aviation authority and the accident investigation authority in the State of Occurrence, and in the State where the RPS is located, if different. Further details on the notification of accidents and serious incidents are contained in Annex 13, Chapter 4 – Notification and associated guidance material.

4.5.3.1 In the event that the remote pilot-in-command is incapacitated during the flight, the operator shall take the above action.

4.5.3.2 **Recommendation**. — In the event that the remote pilot-in-command is incapacitated during the flight, the operator should designate a substitute remote pilot to act as remote pilot-in-command.

4.5.4 The remote pilot-in-command or a person designated by the operator shall be responsible for reporting all known or suspected defects in the RPAS to the operator at the earliest practicable time.

4.5.5 The remote pilot-in-command shall be responsible for the journey log book.

4.6 DUTIES OF FLIGHT OPERATIONS OFFICER/FLIGHT DISPATCHER

4.6.1 Where required in the operations manual, a flight operations officer/flight dispatcher in conjunction with a method of control and supervision of flight operations in accordance with 4.2.1.4 shall:

a) assist the remote pilot-in-command in flight preparation and provide the relevant information;

b) assist the remote pilot-in-command in preparing the operational and ATS flight plans, sign when applicable and file the ATS flight plan with the appropriate ATS unit;

c) furnish the remote pilot-in-command while in flight, by appropriate means, with information which may be necessary for the safe conduct of the flight; and

d) notify the appropriate ATS unit when the position of the RPA cannot be determined by an aircraft tracking capability and attempts to establish communication are unsuccessful.

4.6.2 In the event of an emergency, a flight operations officer/flight dispatcher shall:

a) initiate such procedures as outlined in the operations manual while avoiding taking any action that would conflict with ATC procedures; and

b) convey safety-related information to the remote pilot-in-command that may be necessary for the safe conduct of the flight, including information related to any amendments to the flight plan that become necessary in the course of the flight.

Note.— It is equally important that the remote pilot-in-command also convey similar information to the flight operations officer/ flight dispatcher during the course of the flight, particularly in the context of emergency situations.

4.7 CARRY ON BAGGAGE

Reserved for future use.

4.8 FATIGUE MANAGEMENT

4.8.1 The State of the Operator shall establish regulations for the purpose of managing fatigue. These regulations shall be based upon scientific principles, knowledge and operational experience with the

aim of ensuring that remote flight crew members are performing at an adequate level of alertness. Accordingly, the State of the Operator shall establish:

a) prescriptive regulations for scheduling duty periods, duty period limitations and rest period requirements; and

b) where authorizing the operator to use an FRMS to manage fatigue, FRMS regulations in accordance with Appendix 7.

4.8.2 The State of the Operator shall require that the operator, in compliance with 4.8.1 and for the purposes of managing its fatigue-related safety risks, establish either:

a) duty period schedules, duty period limitations and rest period requirements that are within the prescriptive fatigue management regulations established by the State of the Operator; or

b) an FRMS in compliance with 4.8.1 b) for all operations; or

c) an FRMS in compliance with 4.8.1 b) for a defined part of its operations and the requirements of 4.8.2 a) for the remainder of its operations.

4.8.3 Where the operator adopts prescriptive fatigue management regulations for part or all of its operations, the State of the Operator:

a) shall require evidence that the limitations are not exceeded and that non-duty period requirements are met;

b) shall require that the operator familiarizes its personnel with the principles of fatigue management and its policies with regard to fatigue management;

c) shall establish a process to allow variations from the prescriptive fatigue management regulations to address any additional risks associated with sudden, unforeseen operational circumstances; and

d) may approve, in exceptional circumstances, variations to these regulations on the basis of a risk assessment provided by the operator. Approved variations shall provide a level of safety equivalent to, or better than, that achieved through the prescriptive fatigue management regulations.

Note.— Complying with the prescriptive fatigue management regulations does not relieve the operator of the responsibility to manage its risks, including fatigue-related risks, using its safety management system (SMS) in accordance with the provisions of Annex 19.

4.8.4 Where an operator implements an FRMS to manage fatigue-related safety risks in the provision of part or all of its operations in accordance with 4.8.2 b), the State shall:

a) require the operator to have processes to integrate FRMS functions with its other safety management functions; and

b) approve an FRMS, according to a documented process, that provides a level of safety acceptable to the State.

Note.— Provisions on the protection of safety information, which support the continued availability of information required by an FRMS, are contained in Annex 19.

4.8.5 Where the operator implements an FRMS to manage fatigue-related safety risks, the operator shall, as a minimum:

a) incorporate scientific principles and knowledge within the FRMS;

b) identify fatigue-related safety hazards and the resulting risks on an ongoing basis;

c) ensure that remedial actions, necessary to effectively mitigate the risks associated with the hazards, are implemented promptly;

d) provide for continuous monitoring and regular assessment of the mitigation of fatigue risks achieved by such actions; and

e) provide for continuous improvement to the overall performance of the FRMS.

Note.— Detailed requirements for an FRMS are in Appendix 7.

4.8.6 **Recommendation**. — *States should require that, where the operator has an FRMS, it is integrated with the operator's SMS.*

Note.— The integration of FRMS and SMS is described in the Manual for the Oversight of Fatigue Management Approaches (Doc 9966).

4.8.7 The operator shall maintain records for all its remote crew members of duty periods and rest periods for a period of time specified by the State of the Operator.

R**ationale/justification:** Text taken from a merging between Annex 6 Part I and Annex 11. This reflects the fact that the mode of operation for remote pilots within an RPS is more likely to reflect that of an ATC unit, rather than the more confined flight crew compartment of a manned aircraft, and that remote pilots may well experience a 'shift working' pattern type of duty period

CHAPTER 5. RPAS PERFORMANCE OPERATING LIMITATIONS

5.1 GENERAL

5.1.1 RPA shall be operated in accordance with a comprehensive and detailed code of performance established by the State of Registry in compliance with the applicable Standards of this chapter.

R**ationale/justification:** Text taken from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (5.1.1) and Part III – *International Commercial Air Transport – Helicopters* (3.11). In some cases, replaces aeroplane and helicopter references to remotely piloted aircraft (RPA).

Note 1.— The code of performance reflects, for the conduct of operations, both the various phases of flight and the operational environment. The Helicopter Code of Performance Development Manual (Doc 10110) provides guidance to assist States in establishing a code of performance.

Note 2.— Concerning compliance with codes of performance, Chapter 1 of this Section requires operators to comply with the laws, regulations and procedures of the States in which their helicopters are operated. Article 11 of the Convention forms the basis for this requirement.

5.1.2 Except as provided in 5.4 and 5.5, RPA shall only be operated over such routes and diversions of population density, that permit a safe forced landing to be executed in the event of a critical engine failure.

R**ationale/justification:** Text taken from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (5.1.1) and Part III – *International Commercial Air Transport – Helicopters* (3.11). Text adapted to reflect 'critical engine' loss as opposed to specifically highlighting 'single engine' loss. As there are no persons onboard the RPA, the emphasis of 'safe forced landing' is placed on the protection of uninvolved persons on the ground and other airspace users.

5.1.2.1 For remotely piloted helicopter notwithstanding the provisions of 5.1.2, the State of the Operator may, based on the result of a risk assessment, allow for variations without a safe forced landing to be included in the Code of Performance established in accordance with the provisions of 5.1.1. The risk assessment shall take into consideration at least the following:

a) the type and circumstances of the operation;

b) the area/terrain over which the operation is being conducted and the population density;

c) the probability of, and length of exposure to, a critical engine failure and the tolerability of such an event;

d) the procedures and systems for monitoring and maintaining the reliability of the engine(s);

e) the training and operational procedures to mitigate the consequences of the critical engine failure; and

f) helicopter equipment.

Note.— Guidance on conduct of the risk assessment to allow for variations to the need for a safe forced landing, including mitigation strategies to reduce the risk, is contained in the Helicopter Code of Performance Development Manual (Doc 10110).

5.1.2.2 Where the State of the Operator permits operations over heavily populated areas with remotely piloted helicopters in performance Class 3, such operations shall be conducted in accordance with the provisions of 5.5.

R**ationale/justification:** Text adapted from Annex 6 — *Operation of Aircraft*, Part III — *International Operations — Helicopters*. Reference amended to remotely piloted aircraft system.

5.1.3 **Recommendation**. — *For RPAS for which Parts VIII, IX and X of Annex 8 are not applicable because of the exemption provided for in article 41 of the Convention, the State of Registry should ensure that the level of performance specified in 5.2 should be met as far as practicable.*

5.2 RPA CERTIFICATED IN ACCORDANCE WITH PARTS VIII AND IX OF ANNEX 8

5.2.1 The Standards contained in 5.2.2 to 5.2.12 inclusive are applicable to the large RPA to which Parts VIII, IX and X of Annex 8 are applicable.

Note.— The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 5.1.1, they are to be supplemented by national requirements prepared by Contracting States.

5.2.2 The level of performance defined by the appropriate parts of the comprehensive and detailed national code referred to in 5.1.1 for RPA designated in 5.2.1 shall be at least substantially equivalent to the overall level embodied in the Standards of this chapter.

5.2.3 An RPA shall be operated in compliance with the terms of its certificate of airworthiness and within the approved operating limitations contained in its flight manual.

R**ationale/justification:** Text adapted from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (5.2.3) and Part III – *International Air transport Helicopters* (3.2.3). Replaces aeroplane and helicopter references to RPAS.

5.2.4 The State of Registry shall take such precautions as are reasonably possible to ensure that the general level of safety contemplated by these provisions is maintained under all expected operating conditions, including those not covered specifically by the provisions of this chapter.

R**ationale/justification:** Text copied from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (5.2.4).

5.2.5 A flight shall not be commenced unless the performance information provided in the flight manual, supplemented as necessary with other data acceptable to the State of the Operator, indicates that the Standards of 5.2.6 to 5.2.12 can be complied with for the flight to be undertaken.

R**ationale/justification:** Text adapted from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (5.2.6). Provision added for C2 Link as a unique RPAS capability.

5.2.6 In applying the Standards of this chapter, account shall be taken of all factors that significantly affect the performance of the RPA, including but not limited to:

a) the mass of the RPA;

b) the operating procedures;

c) the pressure-altitude appropriate to the elevation of the aerodrome;

d) the runway slope;

e) the ambient temperature;

f) the wind;

g) surface conditions of the runway at the expected time of use, i.e. presence of snow, slush, water, and/or ice for land RPAs, water surface condition for sea RPA;

h) C2 Link specification and performance for the RPS.

5.2.7 Such factors as addressed in 5.2.6 above, shall be taken into account directly as operational parameters or indirectly by means of allowances or margins, which may be provided in the scheduling of performance data or in the comprehensive and detailed code of performance in accordance with which the RPA is being operated.

Note.— For remotely piloted aeroplanes, guidelines for using runway surface condition information in accordance with 4.4.11 are contained in the Aeroplane Performance Manual (Doc 10064).

5.2.8 Mass limitations

5.2.8.1 The mass of the RPA at the start of take-off shall not exceed the mass at which 5.2.9 is complied with, or the mass at which 5.2.10, 5.2.11 and 5.2.12 are complied with, allowing for expected reductions in mass as the flight proceeds, and for such fuel jettisoning as is envisaged in applying 5.2.10 and 5.2.11 and, in respect of alternate aerodromes, 5.2.7 c) and 5.2.12.

R**ationale/justification:** Text adapted from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (5.2.7 a.

5.2.8.2 In no case shall the mass at the start of take-off exceed the maximum take-off mass specified in the flight manual for the pressure altitude appropriate to the elevation of the aerodrome, and if used as a parameter to determine the maximum take-off mass, any other local atmospheric condition.

R**ationale/justification:** Text taken from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (5.2.7 b).

5.2.8.3 In no case shall the estimated mass for the expected time of landing at the destination of intended landing and at any destination alternate aerodromes, exceed the maximum landing mass specified in the flight manual for the pressure altitude appropriate to the elevation of those aerodromes, and if used as a parameter to determine the maximum landing mass, any other local atmospheric condition.

R**ationale/justification:** Text taken from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (5.2.7 c.

5.2.8.4 *Take-off phase.* In no case shall the mass at the start of take-off, or at the expected time of landing at the aerodrome and at any destination alternate aerodrome, exceed the relevant maximum masses at which compliance has been demonstrated with the applicable noise certification Standards in Annex 16, Volume I, unless otherwise authorized in exceptional circumstances for a certain destination or a runway where there is no noise disturbance problem, by the State of the Aerodrome in which the aerodrome is situated.

R**ationale/justification:** Text taken from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (5.2.7 d).

5.2.8.5 *Remotely piloted aeroplanes.* The RPA shall be able, in the event of a critical engine failing, or for other reasons, at any point in the take-off, either to discontinue the take-off and stop within either the accelerate-stop distance available or the runway available, or to continue the take-off and clear all obstacles along the flight path by an adequate vertical or horizontal distance until the RPA is in a position to comply with 5.2.10. When determining the resulting take-off obstacle accountability area, the operating conditions, such as the crosswind component and navigation accuracy, must be taken into account.

R**ationale/justification:** Text adapted from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (5.2.8). Replaces aeroplane reference to RPA.

5.2.8.6 *Remotely piloted helicopter operations in performance Class 1*. The helicopter shall be able, in the event of the failure of the critical engine being recognized at or before the take-off decision point, to discontinue the take off and stop within the rejected take-off area available or, in the event of the failure of the critical engine being recognized at or after the take-off decision point, to continue the take-off, clearing all obstacles along the flight path by an adequate margin until the helicopter is in a position to comply with 5.2.9.3.

5.2.8.7 *Remotely piloted helicopter operations in performance Class 2*. The helicopter shall be able, in the event of the failure of the critical engine at any time after reaching DPATO, to continue the take-off, clearing all obstacles along the flight path by an adequate margin until the helicopter is in a position to comply with 5.2.9.3. Before the DPATO, failure of the critical engine may cause the helicopter to force-land; therefore the conditions stated in 5.1.2 shall apply.

5.2.8.8 *Remotely piloted helicopter operations in performance Class* 3. At any point of the flight path, failure of an engine will cause the helicopter to force-land; therefore, the conditions stated in 5.1.2 shall apply.

5.2.8.9 For remotely piloted aeroplanes, in determining the length of the runway available, account shall be taken of the loss, if any, of runway length due to alignment of the RPA prior to take-off.

5.2.9 *En route phase*

5.2.9.1 *Remotely piloted aeroplanes — one engine inoperative*. The RPA shall be able, in the event of the critical engine becoming inoperative at any point along the route or planned diversions therefrom, to continue the flight to an aerodrome at which the Standard of 5.2.12 can be met, without flying below the minimum obstacle clearance altitude at any point.

5.2.9.2 *Remotely piloted aeroplanes — two engines inoperative*. In the case of an RPA having three or more engines, on any part of a route where the location of en-route alternate aerodromes and the total duration of the flight are such that the probability of a second engine becoming inoperative must be allowed for if the general

R**ationale/justification:** Text adapted from Annex 6 — *Operation of Aircraft*, Part II — *International General Aviation — Aeroplanes* (3.5.2.8).

level of safety implied by the Standards of this chapter is to be maintained, the RPA shall be able, in the event of any two engines becoming inoperative, to continue the flight to an en-route alternate aerodrome and land.

5.2.9.3 *Remotely piloted helicopters - operations in performance Classes 1 and 2.* The helicopter shall be able, in the event of the failure of the critical engine at any point in the en-route phase, to continue the flight to a site at which the conditions of 5.2.10.2 for operations in performance Class 1, or the conditions of 5.2.10.3 for operations in performance Class 2 can be met, without flying below the appropriate minimum flight altitude at any point.

5.2.9.4 *Remotely piloted helicopters - operations in performance Class 3.* The helicopter shall be able, with all engines operating, to continue along its intended route or planned diversions without flying at any point below the appropriate minimum flight altitude. At any point of the flight path, failure of an engine will cause the helicopter to force-land; therefore the conditions stated in 5.1.2 shall apply.

R**ationale/justification:** Text adapted from Annex 6 — *Operation of Aircraft*, Part III — *International Air transport - Helicopters* (3.2.7.3) – additional guidance will be added within Doc 10110 to address the RPAS related aspects related to flight over populated areas.

5.2.10 *Approach and Landing phase*.

5.2.10.1 *Remotely piloted aeroplanes.* The RPA shall, at the aerodrome of intended landing and at any alternate aerodrome, after clearing all obstacles in the approach path by a safe margin, be able to land, with assurance that it can come to a stop or, for a sea RPA, to a satisfactorily low speed, within the landing distance available. Allowance shall be made for expected variations in the approach and landing techniques, if such allowance has not been made in the scheduling of performance data.

Note.— Guidelines on appropriate margins for the "at time of landing" distance assessment is contained in the Aeroplane Performance Manual (Doc 10064).

R**ationale/justification:** Text adapted from Annex 6 — *Operation of Aircraft*, Part I — *Commercial Air Transport — Aeroplanes* (3.5.2.11).

5.2.10.2 *Remotely piloted helicopters - operations in performance Class 1*. In the event of the failure of the critical engine being recognized at any point during the approach and landing phase, before the landing decision point, the helicopter shall, at the destination and at any alternate, after clearing all obstacles in the approach path, be able to land and stop within the landing distance available or to perform a balked landing and clear all obstacles in the flight path by an adequate margin equivalent to that specified in 5.2.8.4.2 . In case of the failure occurring after the landing decision point, the helicopter shall be able to land and stop within the landing distance available.

5.2.10.3 *Remotely piloted helicopters - operations in performance Class 2*. In the event of the failure of the critical engine before the DPBL, the helicopter shall, at the destination and at any alternate, after clearing all obstacles in the approach path, be able either to land and stop within the landing distance available or to perform a balked landing and clear all obstacles in the flight path by an adequate margin equivalent to that specified in 5.2.8.4.3. After the DPBL, failure of an engine may cause the helicopter to force-land; therefore, the conditions stated in 5.1.2 shall apply.

5.2.10.4 *Remotely piloted helicopters - operations in performance Class 3*. At any point of the flight path, failure of an engine will cause the helicopter to force-land; therefore, the conditions stated in 5.1.2 shall apply.

5.3 OBSTACLE DATA

5.3.1 The operator shall use available obstacle data to:

a) for remotely piloted aeroplanes, develop procedures to comply with 5.2.10.

b) for remotely piloted helicopters, develop procedures to comply with the take-off, initial climb, approach and landing phases detailed in the code of performance established by the State of the Operator.

Note.— See Annex 4 and Annex 15, Chapter 5 and Appendix 1 and the Procedures for Air Navigation Services — Aeronautical Information Management (PANS-AIM), Chapter 5 for methods of presentation of certain obstacle data.

5.3.2 The operator shall take account of charting accuracy when assessing compliance with 5.2.9.

5.4 ADDITIONAL REQUIREMENTS FOR OPERATIONS OF REMOTELY PILOTED APPROVED SINGLE-ENGINE REMOTELY PILOTED AEROPLANES OVER HEAVILY POPULATED AREAS

5.4.1 In approving operations by single-engine remotely piloted aeroplanes over heavily populated areas, the State of the Operator shall ensure that the airworthiness certification of the RPA is appropriate and that the overall level of safety intended by the provisions of Annexes 6 and 8 is provided by:

a) the reliability of the engine;

b) the operator's maintenance procedures, operating practices, flight dispatch procedures and crew training programmes; and

c) equipment and other requirements provided in accordance with Appendix 3.

5.4.2 All single-engine remotely piloted aeroplanes operated over heavily populated areas shall have an automatic engine trend monitoring system.

5.5 ADDITIONAL REQUIREMENTS FOR OPERATIONS OF REMOTELY PILOTED HELICOPTERS IN PERFORMANCE CLASS 3 OVER HEAVILY POPULATED AREAS

5.5.1 Remotely piloted helicopter operations in performance Class 3 shall be conducted only over a surface environment acceptable to the competent authority of the State over which the operations are performed.

5.5.2 In approving operations by remotely piloted helicopters operating in performance Class 3 over heavily populated areas, the State of the Operator shall ensure that the remotely piloted helicopter is certificated for flight under IFR and that the overall level of safety intended by the provisions of Annexes 6 and 8 is provided by:

a) the reliability of the engines;

b) the operator's maintenance procedures, operating practices and crew training programmes; and

c) equipment and other requirements provided in accordance with Appendix 3.

Note.— Guidance on additional requirements for operations of helicopters in performance Class 3 over heavily populated areas is contained in The Manual on Remotely Piloted Aircraft Systems (Doc 100019).

5.5.3 Operators of remotely piloted helicopters operating in performance Class 3 over heavily populated areas shall have a programme for engine trend monitoring and shall utilize the engine and helicopter manufacturers' recommended instruments, systems and operational/maintenance procedures to monitor the engines.

5.5.4 **Recommendation.—** *In order to minimize the occurrence of mechanical failures, remotely piloted helicopters operating over heavily populated areas in performance Class 3 should utilize vibration health monitoring for the tail-rotor drive system*.

Rationale/justification 5.4 and 5.5: Annex 6 Part I and Annex 6 Part III provisions relating to single engine turbine reliability have been significantly repurposed for RPAS. In the remotely piloted environment concerns about safety of persons on board are superseded by the safety of exposed third parties on the ground. Furthermore, the highly automated nature of RPAS and the limited ability for the pilot to use visual references, make the probability of the pilot using visual cues to address emergency situations at night and in IMC less likely. However, the reliability of engines and associated critical systems for RPAS operations over heavily populated areas is important regardless of visibility.

The applicability of specialized requirements for remotely piloted approved single-engine remotely piloted aeroplanes, and remotely piloted helicopters in performance class 3 over heavily populated areas is recognized.

Turbine power may not be the only propulsion means that should be regulated in this way in the future. Therefore, this section has been reconfigured to reflect any means of propulsion that meets (and continues to meet) the goal of reliability shown to have a power loss rate of less than 1 per 100 000 engine hours

While turbine is the only power technology that currently meets that standard, it seems likely that other technologies will potentially meet this reliability going forward. If electric/petrol/diesel engines cannot meet the reliability standards they are not suitable for unmitigated operations over heavily populated areas, hence the references to ‘turbine’ have been deleted and instead reliability standards for all engine/motor types and associated flight critical systems would be applied equally.

For this first iteration of Annex 6, Part IV, it was originally considered reasonable to limit this section to ‘aeroplanes’, but on reflection the same requirements can reflect helicopters as well, thus two separate sections have been inserted.

CHAPTER 6. RPAS INSTRUMENTS, EQUIPMENT AND FLIGHT DOCUMENTS

6.1 GENERAL

6.1.1 In addition to the minimum equipment necessary for the issuance of a certificate of airworthiness, where applicable, the instruments, data and equipment prescribed in the following paragraphs shall be installed or carried, as appropriate, in the RPA or RPS according to the RPAS used and to the circumstances under which the operation is to be conducted. The prescribed instruments and equipment, including their installation, shall be approved or accepted by the State of Registry.

Note.— Information regarding equipment required for operations in a given airspace can be found in Regional Supplementary Procedures (Doc 7030) and Aeronautical Information Publications (AIPs).

6.1.2 For operations conducted under a ROC the instruments and equipment, including their installation, shall be approved as part of the type certificate.

6.1.3 The operator shall provide a minimum equipment list (MEL) in the operations manual, approved by the State of the Operator which will enable the remote pilot-in-command to determine whether a flight may be commenced or continued from any intermediate stop should any instrument, equipment or systems become inoperative. Where the State of the Operator is not the State of Registry, the State of the Operator shall ensure that the MEL does not affect the RPA's compliance with the airworthiness requirements applicable in the State of Registry.

Note.— Attachment E contains guidance on the minimum equipment list

6.1.4 The operator shall provide operations staff and remote flight crew with an RPAS operating manual, for each RPA type operated, containing the normal, abnormal and emergency procedures relating to the operation of the RPA/RPS. The manual shall include details of the RPA/RPS systems and of the checklist to be used. The design of flight manuals shall observe human performance principles.

Note 1.— Appendix 2 contains requirements on the organization and content of an operations manual.

Note 2.— States may reference accepted and recognized industry codes of practice as the basis for the development of an operations manual.

Note 3.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual (Doc 9683).

6.2 ALL RPAS ON ALL FLIGHTS

An RPAS shall be equipped with the systems and instruments necessary to enable the remote pilot to control the flight path of the RPA, carry out any required procedural manoeuvres and observe the operating limitations of the RPA in the expected operating conditions.

6.3 C2 LINK

The C2 Link shall comply with the requirements defined in Annex 10 Volume VI.

6.4 REMOTE PILOT STATION

6.4.1 General

Note.— Configuration management aspects of RPAS are addressed in Annex 8, Part 10.

6.4.1.1 The RPS shall be equipped with suitable controls and displays which will enable the remote pilot(s) to monitor and control the intended operation of the RPA on the ground and in the air.

Rationale/justification: Within the RPS(s), the remote pilot(s) need(s) to monitor and control remotely the operation of the RPA in real time, and therefore, they need all the necessary equipment, controls and displays in order to complete this task.

6.4.1.2 The RPS shall enable the remote pilot (s) to carry out any required manoeuvres and deal with emergencies while observing the operating limitations in the expected operating conditions.

6.4.1.3 The RPS shall provide the means for the remote pilot(s) to communicate with ATS and other airspace users as appropriate.

Rationale/justification: As for manned aviation where the pilot shall be able to communicate with ATS and other airspace users, the remote pilot shall have the means to communicate as well from the RPS.

6.4.1.4 The RPS shall provide the remote pilot with all the relevant information, alerts and warnings pertaining to the operation in a timely and distinctive manner.

6.4.2 RPS work environment

6.4.2.1 The operator shall ensure that the RPS is located in an environment which:

a) allows the remote pilot(s) to concentrate on his/her tasks; and

b) minimizes distractions.

6.4.2.2 The operator shall ensure that the working environment for the remote crew takes into account the application of Human Factors principles.

Note 1.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual (Doc 9683).

Note 2.— Considerations related to the working environment may include appropriate space, lighting, air conditioning, ergonomic furniture and required information or tools for the operation to be readily available.

Rationale/justification: As for an aircraft cockpit or an ATC working station, the working environment within the RPS shall be air conditioned, lit, ergonomic, adapted and appropriate for the work to be done by the Remote pilot.

6.4.2.3 The display(s) shall be so arranged as to permit the remote pilot(s) to see their indications readily from his or her station.

Rationale/justification: The displays of the RPS need to be arranged in such a way that all the necessary and relevant information and indications is ‘easily available’ and ‘readable’ to the remote pilot, as well as in ‘real time’ (which is the meaning of “readily”).

6.4.2.4 A means of measuring and displaying time in hours, minutes and seconds shall be available to the remote crew.

6.4.3 Manuals, charts and information

6.4.3.1 The remote pilot shall have readily available at the RPS the following manuals, charts and information:

a) the flight manual for the RPAS, or other documents containing performance data required for the application of Chapter 5, Operating Limitations, and any other information necessary for the operation of the RPAS within the terms of its certificate of airworthiness, unless these data are available in the operations manual;

b) current and suitable charts for the route of the proposed flight and all routes along which it is reasonable to expect that the flight may be diverted;

c) procedures, as prescribed in Annex 2, for pilots-in-command of intercepted aircraft;

d) visual signals for use by intercepting and intercepted aircraft, if relevant for the RPA being used, as contained in Annex 2;

e) the appropriate licence for each crew member;

f) the operations manual prescribed in 4.2.4 or those parts of it that pertain to flight operations;

g) the checklists to which 4.2.7 refers; and

h) any information and procedure identified as relevant in the safety assessment performed by the operator including emergency and contingency procedures.

Rationale/justification: A similar list of “Manuals, charts and information” is found in Annex 6, Part II 2.4.2.2.

6.4.3.2 Each RPS shall have available an aircraft flight manual for each RPA type capable of being operated from the RPS.

6.4.4 Contingency plans

6.4.4.1 The operator shall provide RPAS crew with capability to contact and coordinate with the appropriate ATS unit in the event of an evacuation of the RPS.

6.4.4.2 The remote flight crew shall contact and coordinate with the appropriate ATS unit in the event of an evacuation of the RPS.

6.4.4.3 The operator shall develop, promulgate and implement contingency plans to provide alternative RPS facilities when assigned RPS facilities are unavailable.

Note.— A widespread capability loss may require alternatives to be developed at other locations.

6.4.4.4 Contingency plans shall include, as a minimum, the following:

a) provisions for alternative facilities and services;

b) detailed agreements among the parties concerned before the occurrence of the event requiring contingency action, including the manner and timing of promulgating such arrangements; and

c) details regarding alternative RPS, infrastructure and remote pilots.

6.4.4.5 **Recommendation.** — *Such plans should be developed in consultation with affected stakeholders.*

Note 1.— The operator may consider enhancing contingency arrangements if an RPS is to be located in a geographical area susceptible to adverse natural phenomena (e.g. earthquakes or floods), to ensure that an

alternate RPS facility is suitable for long term operations at short notice in the event of the total destruction of the original RPS.

6.5 RPAS RECORDER SYSTEMS

Rationale/justification: Text adapted from Annex 6 part I, with additional inputs as received from the Flight Recorders Panel during a previous request for comments.

Note 1.— RPAS recorder systems comprise recording of any system on-board the RPA and of the RPS (e.g. video from the RPA, audio, data, and C2 Link).

Note 2.— Detailed guidance on RPAS recorder systems is contained in Appendix 8.

Note 3.— European Organisation for Civil Aviation Equipment (EUROCAE) EUROCAE ED-112A, Minimum Operational Performance Specifications (MOPS) for Flight Recorders and EUROCAE ED-155, Minimum Operational Performance Specifications (MOPS) for Lightweight Flight Recording Systems, may provide information that may aid in the design of a recorder used on an RPAS.

Rationale/justification: Same note as Note 5. of 6.3, Annex 6 Part I, but updated based on text supplied by the FLTRECSWG

6.5.1 Applicability

6.5.1.1 For all RPA of a MCTOM of over 2 250 kg, and that are first issued with a certificate of airworthiness on or after [date of adoption of Part IV + 3 years] an RPA-RS on board the RPA shall record the data associated with the RPA functions defined in Appendix 8, Section 3.

6.5.1.2 **Recommendation.** — For all RPA of a MCTOM of 2 250 kg or less, the data associated with the RPA functions defined in Appendix 8 should be recorded on board the RPA. .

6.5.1.3 All RPS controlling RPA operating under Annex 6, Part IV, and that are manufactured on or after [date of adoption of Part IV + 3 years] shall be equipped with an RPS-RS that records data associated with the functions defined in Appendix 8, Section 4 (including C2 Link). Where more than one RPS is utilised to conduct a flight of an RPA, each RPS shall record the required data for its segment of the flight including any handovers from or to other RPS.

6.5.1.4

6.5.1.5 .

Rationale/justification: 6.5.1.1 and 6.5.1.2 text based on related text from Annex 6 Part 1. 6.5.1.3 and 6.5.1.4 text provided by FLTRECWG - flight recorders (lightweight or crash-protected) are only required to be carried on board manned aeroplanes and manned helicopters that have a MCTOM of more than 2 250 kg. Therefore, under a given MCTOM threshold a recording system should not be required for the RPA and transmitting the data throughout the flight for recording by the RPS-recorder system should be considered sufficient. This MCTOM threshold to require on-board recording could be less than 2 250 kg, to account for the fact that RPAs are usually lighter than manned aircraft for the same performance.

6.5.2 Duration

6.5.2.1 All RPA-RS shall be capable of retaining the information recorded during the period that the RPA begins moving under its own power and record continuously until the termination of the flight when the RPA is no longer capable of moving under its own power, or the last 25 hours, whichever is longer.

Rationale/justification: RPAS operation may exceed 25 hours, requirement of recording during at least the complete flight is added to the requirement for any other aircraft like 6.3.1.4, Annex 6 Part I.

6.5.2.2 The RPS-RS shall begin recording continuously from the commencement of the RPS checks prior to connecting to a specific RPA until connection with the specific RPA is terminated and RPS post flight checks are completed. The RPS-RS shall be capable of recording data for the entire time it controls a specific RPA.

Note.— The intention is to capture all RPA remote pilot activities that have an effect on the operation, from RPA pre-flight checks to completion of the flight

6.5.2.3 For multiple RPS operations, each RPS shall record data from the point at the beginning of the flight as stated in 6.5.2.2, or if the flight has already commenced, from the point where hand-over of the RPA to that RPS is initiated until hand-over of the RPA to another RPS is accomplished or when the flight is completed as stated in 6.5.2.2.

6.5.3 Construction and installation.

6.5.3.1 RPA-RS shall be constructed, located and installed so as to provide maximum practical protection for the recordings in order that the recorded information may be preserved, recovered and analysed. The recorder systems shall meet the prescribed crashworthiness and fire protection specifications.

6.5.3.2 The manufacturer shall provide the appropriate certificating authority with the following information in respect of the RPS-RS, and if applicable of the RPA-RS :

a) manufacturer’s operating instructions, equipment limitations and installation procedures;

b) parameter origin or source and equations which relate counts to units of measurement; and

c) manufacturer’s test reports.

6.5.4 Preservation of data.

6.5.4.1 In the case of an accident or incident occurring during a flight, the data recorded by the RPA-RS and RPS-RS shall be preserved for investigation purposes.

6.5.4.2 *RPA-RS crash protection*. All certificated RPA conducting international operations shall be equipped with an RPA-RS protected with Flight Recorder Systems industry crashworthiness and fire protection. The crashworthiness and fire protection shall be based on analysis of potential damages to the recording media

6.5.4.3 *RPS-RS protection*. RPS-RS shall ensure the recorded data is safely maintained with respect to environmental conditions, security and emergencies that could affect the integrity of the RPS. Where the RPS is carried on board a vehicle, vessel or another aircraft, the RPS-RS shall include crashworthiness and fire protection.

6.5.4.4 The RPA-RS shall be deactivated whenever possible upon completion of the flight if an accident or incident has occurred or is suspected of having occurred and shall not be reactivated before the disposition of the recorders is determined in accordance with Annex 13.

6.5.4.5 The RPS-RS shall be deactivated whenever possible upon end of operation of the RPS and shall not be reactivated before the disposition of the recorders is determined in accordance with Annex 13.

Note 1.— The need for recovery of the recorded data from the RPA-RS and RPS-RS will be determined by the investigation authority in the State conducting the investigation with due regard to the seriousness of an occurrence and the circumstances, including the impact on the operation.

Note 2.— The operator(s)' responsibilities regarding the retention of RPA-RS and RPS-RS records are contained in 11.7

Rationale/justification: Based on the requirement in 6.3.5.2.2, Annex 6 Part I. Additional text provided by FLTRECWG

6.5.5 RPAS recorder system data recovery

6.5.5.1 An RPA meeting the applicability standards outlined in Section 2 of this part shall be equipped with a means approved by the State of the Operator to locate and recover RPAS-RS data, and make it available in a timely manner.

6.5.5.2 In approving the means to make the RPAS recording system (RPAS-RS) data available in a timely manner, the State of the Operator shall take into account the following:

a) the capabilities of the operator;

b) overall capability of the RPAS as certified by the State of Design;

c) the reliability of the means to recover the appropriate RPS-RS voice recorder channels; and

d) specific mitigation measures.

Note.— Guidance on approving the means to make flight recorder data available in a timely manner is contained in the Manual on Location of Aircraft in Distress and Flight Recorder Data Recovery (Doc 10054).

Rationale/justification: Although no flight crew and passengers on board, The RPA is expected to be equipped with the locator system in order to quick recovery and inspection.

6.5.6 Continued serviceability

Operational checks and evaluations of recordings from the recording systems shall be conducted to ensure the continued serviceability of the recorders.

Note.— Procedures for the inspections of the recording systems are given in Appendix 8.

6.5.7 RPS recorder systems

6.5.7.1 *Applicability*

6.5.7.1.1 All RPAS required to meet the operational requirements of this part (defined in section 2.1), shall record audio at the RPAS. Appendix 8 contains the information to be recorded.

6.5.7.1.2 All RPS required to meet the operational requirements of this document (defined in section 2.1) shall record the information displayed to the remote flight crew from electronic displays, as well as the operation of switches and selectors by the remote flight crew as defined in Appendix 8.

6.5.7.1.2.1 Remote flight crew-machine interface recording shall be able to be correlated to the recorded RPS audio.

6.5.7.1.3 All RPS shall record on an RPS-RS the data associated with the functions defined in Section 3 of Appendix 8.

6.5.7.2 RPS-RS Documentation

6.5.7.2.1 The operator shall retain the documentation necessary to convert the recorded flight data into flight parameters expressed in engineering units. This documentation shall be provided upon request to the accident investigation authorities.

6.5.7.2.2 **Recommendation.—** *The documentation necessary to convert the recorded data into data usable by an accident investigation team should be provided in electronic format.*

Note. — Industry specification for documentation concerning flight recorder parameters may be found in the ARINC 647A, Flight Recorder Electronic Documentation, or equivalent document..

6.5.7.2.3 The operator shall maintain a record of each RPS that has controlled an RPA during each flight.

Rationale/justification: Based on the requirement 6.3.5.4, Annex 6 part 1. RPA may be controlled from multiple RPS during the flight and some of the RPS may be owned by the contracted service provider. So it is necessary to clarify the operator's responsibility to maintain the record of each RPS.

6.5.7.3 Data Security.

Data shall be secured in a manner that prevents readout of the data without the use of special tools or techniques. Data encryption of the RPAS-RS or RPS-RS shall not be used as it may affect data recovery if the memory or media is damaged.

6.5.8 Data link recorders

6.5.8.1 Applicability

All RPS which utilize any of the data link communications applications listed in Appendix 8 and are required to be equipped with an RPS voice recorder or an RPS audio recording system, shall record the data link communications.

6.5.8.2 Duration

The minimum recording duration shall be equal to the duration of the RPS voice recorder.

6.5.8.3 Correlation

Data link recording shall be able to be correlated to the recorded RPS audio.

6.6 ALL RPAS ON FLIGHTS OVER WATER

6.6.1 Sea RPA

6.6.1.1 For all flights, sea RPA shall be equipped with equipment for making the sound signals prescribed in the *International Regulations for Preventing Collisions at Sea*, where applicable.

6.6.1.2 ***Recommendation.*** *— A sea RPA should be equipped with:*

a) an anchor, unless it is intended to secure the sea RPA to a fixed berth; and

b) a sea anchor (drogue), when necessary to assist in manoeuvring.

Note.— "Sea RPA" includes amphibians operated as sea RPA.

Rationale/justification: The sea RPA is expected to be equipped same as any other aircraft like 6.5.1 of Annex 6 Part I

6.6.2 RPA not configured for sea operations

Reserved for future use.

6.6.3 All RPA on long-range over-water flights

Reserved for future use.

6.7 ALL RPA CARRYING LIVE ANIMALS OR PASSENGERS OVER DESIGNATED LAND AREAS

Reserved for future use.

6.8 ALL RPA CARRYING LIVE ANIMALS OR PASSENGERS ON HIGH ALTITUDE FLIGHTS

Reserved for future use.

6.9 ALL RPA IN ICING CONDITIONS

All RPA shall be equipped with suitable de-icing and/or anti-icing devices when operated in circumstances in which icing conditions are reported to exist or are expected to be encountered.

6.10 ALL RPAS OPERATED IN ACCORDANCE WITH INSTRUMENT FLIGHT RULES

6.10.1 All RPAS when operated in accordance with the instrument flight rules shall be equipped with a means of detecting as a minimum the following information:

a) magnetic heading;

b) pressure altitude;

c) airspeed;

d) RPA attitude;

e) outside air temperature;

f) rate-of-climb and descent; and

g) failures of an altitude, airspeed or attitude system.

Note.— 6.10.1 may be met by one or a combination of systems provided that the safeguards against total failure are retained.

Rationale/justification: The information listed above is a subset of the requirements of Annex 6, Part 1, §6.4 (VFR) and §6.9 (IFR). Note that some other requirements of Annex 6, Part 1 (e.g. GPWS, ACAS-2, EVS, etc. and §6.22 (IFR at night)?) have not been considered relevant for RPS.

6.10.2 For operations in accordance with instrument flight rules, the information in 6.10.1 shall be displayed at the RPS to the remote pilot(s).

Note.— 6.10.1 may be met by one or a combination of displays provided that the safeguards against total failure are retained.

6.10.3 RPAS shall be equipped with such additional instruments and equipment as may be prescribed by the appropriate authority.

Note.— Additional requirements regarding authorizations for RPAS engaged in international air navigation are contained within Annex 2, Appendix 4.

6.11 RPS EMERGENCY POWER SUPPLY

6.11.1 The RPS shall be fitted with an emergency power supply, independent of the main electrical supply or generated power supply systems, which is capable of providing power for a duration that is sufficient to implement contingency actions or transfer control of the RPA to an alternate RPS.

6.11.2 The emergency power supply shall be automatically operative after the total failure of the main electrical generating system and clear indication shall be given that the RPS is being operated on emergency power.

6.11.3 When operating on emergency power supply, the RPS shall provide the remote pilot with, as a minimum, the essential flight information required to conduct a safe recovery.

6.12 ALL RPA WHEN OPERATED AT NIGHT

All RPA when operated at night shall be equipped with:

a) all equipment as specified in 6.10;

b) the lights required by Annex 2 for aircraft in flight or operating on the movement area of an aerodrome;

Note.— Specifications for lights meeting the requirements of Annex 2 for navigation lights are contained in Appendix 1. The general characteristics of lights are specified in Annex 8.

c) two landing lights.

6.13 PRESSURIZED RPA WHEN CARRYING ANIMALS OR PASSENGERS — WEATHER RADAR

Reserved for future use.

6.14 ALL RPA OPERATED ABOVE 15 000 M (49 000 FT) — RADIATION INDICATOR

Reserved for future use.

6.15 MACH NUMBER INDICATOR

RPA with speed limitations expressed in terms of Mach number shall be equipped with a means of displaying Mach number in the RPS.

6.16 GROUND PROXIMITY WARNING SYSTEMS (GPWS)

6.16.1 Applicability

6.16.1.1 Unless the design of the RPAS already includes a capability to fully address the risk of ground collision, all RPA conducting IFR operation shall be equipped with a GPWS which has a forward-looking terrain avoidance function.

6.16.1.2 When a GPWS is installed in an RPA, the operator shall implement database management procedures that ensure the timely distribution and update of current terrain and obstacle data to the GPWS.

6.16.1.3 A GPWS shall provide automatically a timely and distinctive warning to the remote flight crew when the RPA is in potentially hazardous proximity to the Earth's surface.

6.16.1.4 A GPWS shall provide, unless otherwise specified herein, warnings of the following circumstances:

a) excessive descent rate;

b) excessive terrain closure rate;

c) excessive altitude loss after take-off or go-around;

d) unsafe terrain clearance while not in landing configuration:

1) gear not locked down;

2) flaps not in a landing position; and

e) excessive descent below the instrument glide path.

Rationale/justification: Whole section based on the equivalent requirement in Annex 6 Part I, but adjusted due to the fact that, unlike manned aircraft, all RPAS are designed with the avoidance of ground collisions being one of the primary aims (as the pilot is not on board to do this) – therefore, an 'unless otherwise equipped' possibility has been added. Additionally, the requirements for equipage of GPWS within the other parts of Annex 6 all primarily stem from the carriage of passengers, and thus until passengers are carried in RPA, the specific 'need' for a GPWS does not exist. This function is most likely to be incorporated into a DAA capability in the future, but the SARPS development work on this has not yet commenced. GPWS is an existing means from manned aviation that has the potential of supporting a remote pilot with information and awareness of proximity to ground and obstacles, hence the text remains appropriate.

6.17 RPA CARRYING PASSENGERS — CABIN CREW SEATS

Reserved for future use.

6.18 EMERGENCY LOCATOR TRANSMITTER (ELT)

RPA with no persons on board shall not be equipped with an ELT.

6.19 LOCATION OF AN RPA IN DISTRESS

In order to limit any potential environmental impact, the operator shall make position information of any RPA flight in a distress situation available to the appropriate organizations, as established by the State of the Operator.

Note 1. — All RPA autonomously transmit information to the RPS, more than once every minute, from which the position of the RPA can be determined by the operator

Note 2.— Appendix 9 provides information on search criteria and recovery of RPA in distress.

6.20 DETECT AND AVOID CAPABILITY

Note.— The operational requirements specified herein for conflicting traffic are intended to meet the requirements of Annex 2 for avoidance of collisions, including proximity and right-of-way.

6.20.1 DAA operational requirements

6.20.1.1 The State of the Operator shall ensure that the operator has established and documented the operational limitations, procedures for the use of, and training requirements for, the DAA equipment.

6.20.1.2 Any RPAS operated in accordance with IFR shall have a DAA capability which enables the remote pilot to avoid conflicting traffic and other hazards.

6.20.1.3 A DAA airborne collision avoidance capability shall operate in accordance with the relevant provisions of Annex 10, Volume IV, Parts 1 and 2.

Note 1.— DAA capability does not necessarily require RPAS installed equipment. It may be supported by other forms of external equipment, if necessary, to perform its function.

Note 2.— The loss of a DAA capability is addressed in the Manual on Remotely Piloted Aircraft Systems (RPAS) (Doc 10019, Volume I).

Note 3.— DAA equipment SARPs in Annex 10 only address the hazard of conflicting airborne traffic.

6.20.1.4 DAA shall provide the remote pilot with the capability of exercising vigilance for the purpose of detecting and avoiding potential collisions with other aircraft.

6.20.1.5 DAA shall provide the remote pilot with the capability of ensuring appropriate action is taken when different hazards are present at the same time whether DAA for these hazards is provided by one system or different systems.

6.20.1.6 The remote pilot shall be able to intervene in the management of automated hazard avoidance manoeuvres except when the C2 Link to the RPA is not available.

6.20.1.7 RPAS controls, displays and alerting shall enable the remote pilot to recognize when an action may be necessary to override an automated hazard avoidance manoeuvre.

6.20.2 Automated collision avoidance

6.20.2.1 The RPA shall be equipped with an automated system that performs appropriate collision avoidance manoeuvres, except where the collision avoidance responsibilities of the remote pilot can be adequately exercised otherwise.

6.20.2.2 **Recommendation**. — *The remote pilot should only override an automated DAA collision avoidance manoeuvre if that manoeuvre is considered to be a greater danger to the safety of other traffic or persons and property on the surface than the response planned or being executed by the remote pilot at the time the automated response is initiated.*

6.20.2.3 Notwithstanding the provisions in 6.20.2.1, the State of the Operator may approve RPAS operations without automated collision avoidance, based on the results of a specific safety risk assessment conducted by the operator which demonstrates how an equivalent level of safety will be maintained. The specific safety risk assessment shall include at least the:

a) integrity and performance of the C2 Link;

b) diversity of multiple links, if installed; and

c) reliability of other systems that are required to allow the remote pilot to exercise control of the RPA flight trajectory.

Note 1.— The presence of any single-point failures in one or more RPAS systems that could lead to frequent and/or long-duration loss of the pilot's ability to control the RPA flight trajectory will require an automated means to conduct manoeuvres to avoid conflict traffic.

Note 2.— Guidance on safety risk assessments is contained in the Safety Management Manual (SMM) (Doc 9859)

6.21 REQUIREMENTS FOR PRESSURE-ALTITUDE REPORTING TRANSPONDERS

6.21.1 All RPA shall be equipped with a Mode S transponder which operates in accordance with the relevant provisions of Annex 10, Volume IV.

6.21.2 All RPA shall be equipped with a data source that provides pressure-altitude information with a resolution of 7.62 m (25 ft.), or better.

6.21.3 The Mode S transponder shall be provided with the airborne/on-the-ground status of the RPA.

Note.— These provisions will improve the effectiveness of airborne collision avoidance systems as well as air traffic services that employ Mode S radar. In particular, tracking processes are significantly enhanced with a resolution of 7.62 m (25 ft.), or better.

6.22 MICROPHONES

All remote flight crew members required to be on duty at the RPS shall communicate through hands-free microphones whenever the situation is such that they must not be distracted by the overall environment within the RPS and at all times during:

d) the departure and arrival phases of the flight; and

e) periods when close monitoring of the flight is deemed to be essential.

Note .— Appendix 8, paragraph 3-2 refers to the recording of the operational environment of the RPS.

Rationale/justification: Principle largely based on that of Part I, but it is considered that specifying 'cruise altitude' is too high. In general, the consideration is more one of distraction within the environment of RPS, and is more similar to an ATC environment. In some cases, hands free communication may be required for the whole flight if the RPS environment demands it, but it has been specified as being required during departure and approach and periods when 'close monitoring' is essential.

6.23 REMOTELY PILOTED AEROPLANES — FORWARD-LOOKING WIND SHEAR WARNING SYSTEM

6.23.1 **Recommendation.** — *All remotely piloted aeroplanes should be equipped with a forward-looking wind shear warning system.*

6.23.2 **Recommendation**. — *A forward-looking wind shear warning system should be capable of providing the remote pilot with a timely aural and visual warning of wind shear ahead of the remotely piloted aeroplane, and the information required to permit the remote pilot to safely commence and continue a missed approach or go-around or to execute an escape manoeuvre if necessary. The system*

should also provide an indication to the remote pilot when the limits specified for the certification of automatic landing equipment are being approached, when such equipment is in use.

Rationale/justification: Principle based on that of Part I. Noting that a similar requirement does not exist for helicopters in Part III, the text has been limited to 'aeroplanes' that are remotely piloted only, as opposed to all RPAs.

6.24 DOCUMENTS HELD BY THE OPERATOR

6.24.1 General

The following documents, manuals and information specific to the operator, shall be available, in the authentic form, at the location of the operator's operational management location or other location specified by the State of the Operator:

a) the ROC;

b) operations specifications relevant to the RPA and RPS models, associated with the ROC;

c) special authorizations obtained from States different from the State of the Operator, as required by Appendix 4 to Annex 2;

d) certificate of registration of each RPA;

e) certificate of airworthiness of each RPA;

f) radio station licence(s), if applicable;

g) noise certificate(s), if applicable;

h) documents of any additional RPAS components, if applicable;

i) flight manual(s) of each model of RPA;

j) operations manual;

k) maintenance control manual (MCM);

l) contract(s) and service level agreement(s) with third parties providing safety related services, if applicable;

m) third party liability insurance certificate(s) if required;

n) emergency Response Plan (to cover actions resulting from risks to the RPS, such as earthquakes, floods, security incidents etc); and

o) any other document required by the State of the Operator.

6.25 DOCUMENTS CARRIED ON BOARD THE RPA

6.25.1 A certified true copy of the ROC specified in Chapter 4, 4.2.1, and a copy of the operations specifications relevant to the RPA, issued in conjunction with the certificate shall be carried on the RPA or be available at the RPS. When the ROC and the associated operations specifications are issued by the State of the Operator in a language other than English, an English translation shall be included.

6.25.2 Additionally, the following documents shall be readily accessible on board each RPA or available at the RPS, for inspection by authorized inspection authorities. When these documents are issued in a language other than English, an English translation shall be included:

a) RPA certificate of registration;

b) RPA certificate of airworthiness;

c) for RPA equipped with radio equipment, the aircraft radio station licence;

d) noise certificate, if applicable;

e) RPA journey log book; and

Note— An RPA journey log may also consist of a section that stays in the RPA and an RPS section at each remote pilot station.

f) RPA technical log.

6.25.3 The format and access (e.g. electronic) of the documents listed above (at the RPS or on board the RPA or electronically accessible through information on board the RPA) shall be acceptable to the State of the Operator and to all other States involved in the operation.

Note.— Other States would include, the State of Registry, the State where the RPA departed from, the State of intended landing and any States that are overflown.

6.26 DOCUMENTS AT THE RPS

Rationale/justification: Replication of the documents that are currently required to be carried on board manned aircraft, but accepting that the flight crew will not be with the aircraft. There is also the additional recognition that these documents may not need to be in a traditional 'paper' format, but could feasibly be moved to an electronic format.

6.26.1 As a minimum, the following documents, manuals and information shall be available at the RPS:

a) Licences of all remote pilots involved in the operation, during respective duty periods;

b) RPA flight manual, or pertinent subset thereof, including configuration deviation list (CDL);

c) operations manual or pertinent subset thereof, including the minimum equipment list (MEL);

d) applicable check lists;

e) operations specifications relevant to the RPA and RPS models;

Rationale/justification: Simple list of the documents that the RPAS operator is required to hold

f) journey log book for the RPA;

Note— An RPA journey log may also consist of a section that stays in the RPA and an RPS section at each remote pilot station.

g) technical log for the RPA;

h) technical log for the RPS;

i) details of the filed and the current ATS and operational flight plans, if applicable;

j) current and suitable aeronautical charts for the route of flight and all routes along which it is reasonable to expect that the flight may be diverted, including departure, arrival and approach charts for all relevant aerodromes/heliports, or electronic access to it;

k) information concerning search and rescue services for the area of the intended flight;

f) NOTAM and aeronautical information service (AIS) briefing documentation or electronic access to it;

l) meteorological information;

m) fuel requirements, fuel load and records;

n) cargo manifests, if applicable;

o) notification of dangerous goods, if applicable;

p) mass and balance documentation; and

q) any other documentation that may be pertinent to the flight or required by the State(s) involved in the operation.

6.26.2 The format and access (e.g. electronic) of the documents listed above shall be acceptable to the State of the Operator and also to the State where the RPS is located.

6.26.3 Documents, manuals and information retained at the RPS shall be provided upon request to a State authority inspecting the RPS or the RPA, in the most efficient manner available.

CHAPTER 7. RPAS COMMUNICATION, NAVIGATION AND SURVEILLANCE EQUIPMENT

7.1 COMMUNICATION EQUIPMENT

7.1.1 For the intended operation, the RPAS communication equipment readily available to the remote pilot shall be capable of:

a) conducting two-way communication for aerodrome control purposes;

b) receiving meteorological information at any time during flight; and

c) conducting two-way communication at any time during flight with at least one aeronautical station and with such other aeronautical stations and on such frequencies as may be prescribed by the appropriate authority.

Note.— The requirements of 7.1.1 are considered fulfilled if the ability to conduct the communications specified therein is established during radio propagation conditions which are normal for the route.

Rationale/justification: Similar to Annex 6, Part 1, §7.1.1.

7.1.2 The radio communication equipment shall provide for communication on the aeronautical emergency frequency 121.5 MHz.

7.1.3 For operations where communication equipment is required to meet RCP specification for performance-based communication (PBC), the RPAS shall, in addition to the requirements specified in 7.1.1:

a) be provided with communication equipment which will enable it to operate in accordance with the prescribed required communication performance (RCP) specification(s)

b) have information relevant to the RCP specification capabilities listed in the flight manual or other RPAS documentation approved by the State of Design or State of Registry; and

c) have information relevant to the RCP specification capabilities included in the MEL.

Note.— Information on the performance-based communication and surveillance (PBCS) concept and guidance material on its implementation are contained in the Performance-based Communication and Surveillance (PBCS) Manual (Doc 9869)*.*

Rationale/justification: Since an RPAS is composed of an RPA, a RPS and a C2 Link, there may be more than one way to ensure that the remote pilot can communicate with ATC. The decision to rely on more than one link will be dependent on the communication performance requirements

7.1.4 The State of the Operator shall, for operations where an RCP specification for PBC has been prescribed, ensure that the operator has established and documented:

a) normal and abnormal procedures, including contingency procedures;

b) remote flight crew qualification and proficiency requirements, in accordance with appropriate RCP specifications;

c) a training programme for relevant personnel consistent with the intended operations; and

d) appropriate maintenance procedures to ensure continuing airworthiness, in accordance with appropriate RCP specifications.

Note.— The State of the Operator may require an alternate means of communication with ATC, if ATC communications are relayed via the RPA, in order to mitigate failure of the RPA relay function.

Rationale/justification: The RPAS is expected to follow the communication requirements expressed for the airspace like any other aircraft to ensure a seamless integration

7.1.5 The State of the Operator shall ensure that, in respect of those RPA mentioned in 7.1.3, adequate provisions exist for:

a) receiving the reports of observed communication performance issued by monitoring programmes established in accordance with Annex 11, Chapter 3, 3.3.5.2; and

b) taking immediate corrective action for individual RPA, RPA types or operators, identified in such reports as not complying with the RCP specification(s).

7.2 NAVIGATION EQUIPMENT

7.2.1 An RPAS shall be provided with navigation equipment which will enable the remote pilot to proceed:

a) in accordance with the operational flight plan; and

b) in accordance with the requirements of air traffic services;

7.2.2 For operations where a navigation specification for performance-based navigation (PBN) has been prescribed, an RPAS shall, in addition to the requirements specified in 7.2.1:

a) be provided with navigation equipment which will enable it to operate in accordance with the prescribed navigation specification(s);

b) have information relevant to the RPAS navigation specification capabilities listed in the flight manual or other RPAS documentation approved by the State of Design or State of Registry; and

c) have information relevant to the RPAS navigation specification capabilities included in the MEL.

Note.— Guidance on the navigation specification is contained in the Performance-based Navigation (PBN) Manual (Doc 9613).

Rationale/justification: The RPAS is expected to follow the navigation requirements expressed for the airspace like any other aircraft to ensure a seamless integration.

Since the remote pilot may not belong to the RPA operator, it is important that he has access to the RPA navigation capability in the flight manual and be aware if any of the RPA navigation specification capabilities are included in the MEL.

7.2.3 The State of the Operator shall, for operations where a navigation specification for PBN has been prescribed, ensure that the operator has established and documented:

a) normal and abnormal procedures including contingency procedures;

b) remote flight crew qualification and proficiency requirements in accordance with the appropriate navigation specifications;

c) a training programme for relevant personnel consistent with the intended operations; and

d) appropriate maintenance procedures to ensure continuing airworthiness in accordance with the appropriate navigation specifications.

Note 1.— Guidance on safety risks and mitigations for PBN operations, in accordance with Annex 19, are contained in the Performance-based Navigation (PBN) Operational Approval Manual (Doc 9997).

Note 2.— Electronic navigation data management is an integral part of normal and abnormal procedures.

7.2.4 The State of the Operator shall issue a specific approval for operations based on PBN authorization required (AR) navigation specifications.

Note.— Guidance on specific approvals for PBN authorization required (AR) navigation specifications is contained in the Performance-based Navigation (PBN) Operational Approval Manual (Doc 9997).

7.2.5 For flights in defined portions of airspace where, based on Regional Air Navigation Agreement, minimum navigation performance specifications (MNPS) are prescribed, an RPAS shall include navigation equipment which:

a) continuously provides indications to the remote flight crew of adherence to or departure from track to the required degree of accuracy at any point along that track; and

b) has been authorized by the State of the Operator for the MNPS operations concerned.

Note.— The prescribed minimum navigation performance specifications and the procedures governing their application are published in the Regional Supplementary Procedures (Doc 7030).

7.2.6 For flights in defined portions of airspace where, based on Regional Air Navigation Agreement, a reduced vertical separation minimum (RVSM) of 300 m (1 000 ft.) is applied between FL 290 and FL 410 inclusive:

a) an RPAS shall be provided with equipment which is capable of:

1) indicating to the remote pilot the flight level being flown;

2) automatically maintaining a selected flight level;

3) providing an alert to the remote pilot when a deviation occurs from the selected flight level. The threshold for the alert shall not exceed ±90 m (300 ft.); and

4) automatically reporting pressure-altitude;

b) the State of the Operator shall issue a specific approval for RVSM Operations.

Rationale/justification: The RPAS is expected to comply with the RVSM requirements expressed for the airspace like any other aircraft to ensure a seamless integration.

This include providing to the remote pilot the same alerts that a pilot would get in the cockpit when a deviation occurs from the flight level.

Demonstration of the vertical navigation performance of an RPA is no different than what a manned aircraft would do.

7.2.7 Prior to granting the RVSM specific approval required in accordance with 7.2.5 b), the State shall be satisfied that:

a) the vertical navigation performance capability of the RPAS satisfies the requirements specified in

Appendix 4;

b) the operator has instituted appropriate procedures in respect of continuing airworthiness (maintenance and repair) practices and programmes; and

c) the operator has instituted appropriate remote flight crew procedures for operations in RVSM airspace.

Rationale/justification: An RPAS operator is no different than any other aircraft operator, and as such should have in place procedures to ensure that the RPA is fit for purpose and that procedures for flying in a RVSM airspace have been developed and made known to the remote flight crew

Note.— An RVSM specific approval is valid globally on the understanding that any operating procedures specific to a given region will be stated in the operations manual or appropriate crew guidance.

7.2.8 The State of the Operator, in consultation with the State of Registry if appropriate, shall ensure that, in respect of those RPAS mentioned in 7.2.5, adequate provisions exist for:

a) receiving the reports of height-keeping performance issued by the monitoring agencies established in accordance with Annex 11, 3.3.5.1; and

b) taking immediate corrective action for individual RPAS, or type of RPAS, identified in such reports as not complying with the height-keeping requirements for operation in airspace where RVSM is applied.

7.2.9 The State of the Operator that has issued an RVSM specific approval to an operator shall establish a requirement which ensures that a minimum of two RPA from each RPA type grouping of the operator have their height keeping performance monitored, at least once every two years or within intervals of 1,000 flight hours per RPA, whichever period is longer. If an operator RPA type grouping consists of a single RPA, monitoring of that RPA shall be accomplished within the specified period.

Note.— Monitoring data from any regional monitoring programme established in accordance with Annex 11, 3.3.5.2, may be used to satisfy the requirement.

Rationale/justification: An RPAS operator is no different than any other aircraft operator and as such, needs to follow the same rules than commercial air transport to guarantee that the RPA RVSM capability is maintained over time

7.2.10 All States that are responsible for airspace where RVSM has been implemented, or that have issued RVSM specific approvals to owners/operators within their State, shall establish provisions and procedures which ensure that appropriate action will be taken in respect of RPAS and owners/operators found to be operating in RVSM airspace without a valid RVSM specific approval.

Note 1.— These provisions and procedures need to address both the situation where the RPAS in question was operating without a specific approval in the airspace of the State, and the situation where an operator for which the State has regulatory oversight responsibility is found to be operating without the required specific approval in the airspace of another State.

Note 2.— Guidance material relating to the specific approval for operation in RVSM airspace is contained in the Manual on a 300 m (1 000 ft.) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (Doc 9574).

Rationale/justification: An RPAS operator is no different than any other aircraft operator and as such, needs to follow the same rules than commercial air transport

7.2.11 The RPAS shall be sufficiently provided with navigation equipment to ensure that, in the event of the failure of one item of equipment at any stage of the flight, the remaining equipment will enable the RPAS to navigate in accordance with 7.2.1 and where applicable 7.2.2, 7.2.5 and 7.2.6.

Note 1.— This requirement may be met by means other than the duplication of equipment.

Note 2.— Guidance material relating to RPAS equipment necessary for flight in airspace where a 300 m (1 000 ft.) RVSM is applied above FL 290 is contained in the Manual on a 300 m (1 000 ft.) Vertical Separation Minimum between FL 290 and FL 410 Inclusive (Doc 9574).

7.2.12 At each aerodrome at which an RPAS operator intends to execute an instrument approach and landing by an RPA, including at any designated alternate aerodromes, an RPAS shall be provided with a navigation capability that provides:

a) sufficient performance and functionality to guide the RPA to landing; or

b) to allow the remote pilot to conduct a landing under VLOS or through indirect observation utilizing appropriately certified visual surveillance system or methodology.

Rationale/justification: An RPAS operator is no different than any other aircraft operator and as such, needs to be equipped with navigation systems that will allow the RPA to execute instrument approach and landing procedures. This includes providing at the RPS enough information to allow the remote pilot to execute a landing under VLOS or through indirect observation since the remote pilot may not be physically present at the landing site.

7.2.13 When the RPA is taxiing, the RPAS shall be provided with a navigation capability providing sufficient performance and functionality to guide the RPA to a designated point on the movement area.

Note. — This requirement applies equally for situations where the RPA is being taxied under the direct control of the remote pilot, or where the RPA is taxiing under an automated function.

Rationale/justification: Since the remote pilot is not physically in the RPA, the navigation capability needs to be able to provide the RPS with enough information to allow the remote pilot to move the RPA on the ground. Similarly, if an automated taxiing function is being employed, the navigation capability needs to be able to provide sufficient information to enable the RPA to be moved safely on the ground.

7.3 SURVEILLANCE EQUIPMENT

7.3.1 An RPAS shall be provided with surveillance equipment which will enable it to operate in accordance with the requirements of air traffic services.

7.3.2 For operations where surveillance equipment is required to meet an RSP specification for performance-based surveillance (PBS), an RPAS shall, in addition to the requirements specified in 7.3.1:

a) be provided with surveillance equipment which will enable it to operate in accordance with the prescribed RSP specification(s);

b) have information relevant to the RPAS RSP specification capabilities listed in the flight manual or other RPAS documentation approved by the State of Design or State of Registry; and

c) have information relevant to the RPAS RSP specification capabilities included in the MEL.

Note 1.— Information on surveillance equipment is contained in the Aeronautical Surveillance Manual (Doc 9924).

Note 2.— Information on RSP specifications for performance-based surveillance is contained in the Performance-based Communication and Surveillance (PBCS) Manual (Doc 9869).

7.3.3 The State of the Operator shall, for operations where an RSP specification for PBS has been prescribed, ensure that the operator has established and documented:

a) normal and abnormal procedures, including contingency procedures;

b) remote flight crew qualification and proficiency requirements, in accordance with appropriate RSP specifications;

c) a training programme for relevant personnel consistent with the intended operations; and

d) appropriate maintenance procedures to ensure continuing airworthiness, in accordance with appropriate RSP specifications.

7.3.4 The State of the Operator shall ensure that, in respect of those RPAS mentioned in 7.3.2, adequate provisions exist for:

a) receiving the reports of observed surveillance performance issued by monitoring programmes established in accordance with Annex 11, Chapter 3, 3.3.5.2; and

b) taking immediate corrective action for individual RPAS, RPAS types or operators, identified in such reports as not complying with the RSP specification(s).

Rationale/justification: The RPAS is expected to follow the surveillance requirements expressed for the airspace like any other aircraft to ensure a seamless integration.

7.4 INSTALLATION

The equipment installation shall be such that the failure of any single unit required for communication, navigation or surveillance purposes or any combination thereof will not result in the failure of another unit required for communication, navigation or surveillance purposes.

Note.— For more information on safety-significant factors such as reliance upon a common source for surveillance and/or navigation, refer to PANS-ATM (Doc 4444) Chapter 2.

7.5 ELECTRONIC NAVIGATION DATA MANAGEMENT

7.5.1 The operator shall not employ electronic navigation data products that have been processed for application in the air and on the ground unless the State of the Operator has approved the operator's procedures for ensuring that the process applied and the products delivered have met acceptable standards of integrity and that the products are compatible with the intended function of the equipment that will use them. The State of the Operator shall ensure that the operator continues to monitor both process and products.

Note.— Guidance relating to the processes that data suppliers may follow is contained in RTCA DO-200A/EUROCAE ED-76 and RTCA DO-201A/EUROCAE ED-77.

Note2.— Specifications concerning the order of accuracy, resolution, integrity classification and digital data error detection techniques related to aeronautical data are contained in the PANS-AIM (Doc 10066).

7.5.2 The operator shall implement procedures that ensure the timely distribution and insertion of current and unaltered electronic navigation data to all necessary RPAS.

Rationale/justification: This is an exact copy of the requirements that applies to commercial aviation. Since RPAS are to be seamlessly integrated with manned aviation, it is important to ensure that the requirements regarding electronic navigation data to be used by RPAS are the same.

7.6 ESTABLISHMENT, ASSURANCE AND TERMINATION OF C2 LINK

7.6.1 When managed through the C2 Link, taxiing or ground movement shall not be initiated or shall be aborted if the Quality of Service Experienced (QoSE) does not provide the required performance for the remote pilot to safely control the RPA.

Rationale/justification: The RPA must not taxi or perform ground movement if the C2 Link QoSE does not provide sufficient confidence to the remote pilot for a safe and secured flight.

7.6.2 Take-off shall not be initiated or, if safe to do so, shall be aborted if the QoSE does not provide the required performance for the remote pilot to safely control the RPA.

7.6.3 A switchover to another link or network shall be conducted in accordance with the procedures defined in the operations manual, to include confirming the QoSE of the accepting link or network.

7.6.4 The remote pilot shall initiate the condition of a Lost C2 Link state if, while in flight, the QoSE has been determined by the remote pilot to be insufficient to actively manage the flight in a safe and timely manner.

7.7 C2 LINK CONTINGENCY AND EMERGENCY PROCEDURES

7.7.1 If any of the C2 Link components fail, then actions shall be taken to minimize the time that the remote pilot is not actively managing the flight of the RPA.

7.7.2 The RPAS operations manual shall state the actions to be taken by the remote pilot to minimize the time that the RPAS is in a Lost C2 Link state.

7.7.3 Contingency switchovers shall be performed in line with security measures and procedures that ensure that the accepting link or network is authenticated and authorized.

7.7.4 Contingency handovers shall be performed in line with security measures and procedures that ensure that the accepting RPS is authenticated and authorized to take control of the RPA.

7.7.5 A means or process for anticipating C2 Link interruptions or Lost C2 Link states shall be provided to the remote pilot.

7.7.6 When the RPA is operating in controlled airspace, the remote pilot shall inform ATC as soon as practicable:

a) that the RPAS has entered a Lost C2 Link state, by any means available; and

b) once the RPAS C2 Link has been successfully restored after a Lost C2 Link state has occurred.

Rationale/justification: (for whole of section 7.7)

7.7.1 - A Lost C2 Link situation must be swiftly addressed so that the communications with the RPA are restored as soon as possible.

7.7.2 - A procedure to recover from a Lost C2 Link state is required. The remote pilot must have effective and safe piloting and management of the flight. In the case of events such as repetitive C2 Link interruptions which do not fall under the criteria of Lost C2 Link decision times, and if those interruptions strongly degrade the ability of safe control, then the remote pilot must carry out the Lost C2 Link procedures. Procedures to achieve this objective are required and must be documented in the RPAS operations manual. Airworthiness issues must also be addressed.

7.7.3 and 7.7.4 - Even during a contingency situation, security measures must be applied during a handover, especially those related to unauthorized control.

7.7.5 - When applying the Lost C2 Link state recovery procedure, the remote pilot should be provided with the best support from the RPAS to minimize the operational consequences of the Lost C2 Link state contingency.

7.7.6 - The status of the RPAS C2 Link is a fundamental piece of information for ATC. ATC actions and responsibility do not depend on the technical status of the aircraft, but solely on procedures and the operational need. The handovers or switchovers internal to the operation of the RPAS itself must not interfere with that safety requirement.

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CHAPTER 8. RPA CONTINUING AIRWORTHINESS

Note 1.— For the purpose of this chapter, "RPA" includes: engines, propellers, components, accessories, instruments, equipment and apparatus including emergency equipment.

Note 2.— While a certificate of airworthiness is only issued to the aircraft component of an RPAS, the continuing airworthiness aspects of RPS are also indirectly provided in this chapter

Note 3.— Reference is made throughout this chapter to the requirements of the State of Registry. When the State of the Operator is not the same as the State of Registry, it may be necessary to consider any additional requirements of the State of the Operator.

Note 4.— Guidance on continuing airworthiness requirements is contained in the Airworthiness Manual (Doc 9760).

8.1 OPERATOR'S CONTINUING AIRWORTHINESS RESPONSIBILITIES

8.1.1 Operators shall ensure that, in accordance with procedures acceptable to the State of Registry:

a) each RPA is maintained in an airworthy condition;

b) the operational and emergency equipment necessary for an intended flight is serviceable;

c) the certificate of airworthiness of the RPA remains valid; and

d) each RPS conforms to the approved design and is maintained in a condition for the safe operation of the RPAS.

R**ationale/justification:** Text adapted from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (8.1.1). Replaces aeroplane reference to RPA. Provision added for RPS(s) as a unique RPAS capability.

8.1.2 The operator shall not operate an RPAS unless maintenance on the RPAS, including any associated engine, propeller and part, is carried out:

a) by an organization complying with Annex 8, Part II, Chapter 6 that is either approved by the State of Registry of the RPA or is approved by another Contracting State and is accepted by the State of Registry; or

b) by a person or organization in accordance with procedures that are authorized by the State of Registry;

c) and there is a maintenance release in relation to the maintenance carried out.

R**ationale/justification:** Text adapted from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (8.1.2).

8.1.3 The operator shall employ a person or group of persons to ensure that all maintenance is carried out in accordance with the maintenance control manual.

8.1.4 The operator shall ensure that the maintenance of its RPAS is performed in accordance with the maintenance programme.

8.1.5 The operator shall ensure that maintenance personnel receive initial and continuation training acceptable to the State of the Operator that includes the application of Human Factors principles.

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R**ationale/justification:** Text adapted from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (8.1.5).

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2808 *Note.— Guidance material on the application of Human Factors principles can be found in the Human Factors*
2809 *Training Manual (Doc 9683).*

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R**ationale/justification:** Text added to ensure Human Factors principles are adequately applied throughout the maintenance process. State of the Operator included in accordance with ANC guidance regarding licensing.

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2813 **8.2 OPERATOR'S MAINTENANCE CONTROL MANUAL**

2814 8.2.1 The operator shall provide, for the use and guidance of maintenance and operational personnel
2815 concerned, a maintenance control manual for the RPA and RPS, acceptable to the State of
2816 Registry, in accordance with the requirements of 11.2. The design of the manual shall observe
2817 Human Factors principles.

2818 *Note 1.— Guidance material on the application of Human Factors principles can be found in the Human*
2819 *Factors Training Manual (Doc 9683).*

2820 *Note 2.— This document may consist of separate parts, or even separate manuals, split between the RPA*
2821 *and the RPS.*

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R**ationale/justification:** Text copied from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (8.2.1).

2824 8.2.2 The operator shall ensure that the maintenance control manual is amended as necessary to keep
2825 the information contained therein up to date.

R**ationale/justification:** Text copied from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (8.2.2).

2826 8.2.3 Copies of all amendments to the operator's maintenance control manual shall be furnished promptly
2827 to all organizations or persons to whom the manual has been issued.

R**ationale/justification:** Text copied from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (8.2.3).

2828 8.2.4 The operator shall provide the State of the Operator and the State of Registry with a copy of the
2829 operator's maintenance control manual, together with all amendments and/or revisions to it and
2830 shall incorporate in it such mandatory material as the State of the Operator or the State of Registry
2831 may require.

R**ationale/justification:** Text copied from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (8.2.4).

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8.3 MAINTENANCE PROGRAMME

8.3.1 The operator shall provide, for the use and guidance of maintenance and operational personnel concerned, maintenance programme(s), approved by the State of Registry, containing the information required by 11.3 for RPA, the RPS, any ground-based infrastructure and ground-based equipment under the direct control of the operator. The design and application of the operator's maintenance programme shall observe Human Factors principles.

Note.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual (Doc 9683).

R**ationale/justification:** Text adapted from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (8.2.1 + note). Elements unique to RPAS added.

8.3.2 Copies of all amendments to the maintenance programme(s) shall be furnished promptly to all organizations or persons to whom the maintenance programme has been issued.

R**ationale/justification:** Text copied from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (8.2.3).

8.4 CONTINUING AIRWORTHINESS RECORDS

8.4.1 The operator shall ensure that the following records are kept for the periods mentioned in 8.4.2:

a) the total time in service (hours, calendar time and cycles, as appropriate) of the RPA and all life-limited components of the RPAS;

b) the current status of compliance with all applicable mandatory continuing airworthiness information;

c) appropriate details of modifications and repairs;

d) the time in service (hours, calendar time and cycles, as appropriate) since the last overhaul of the RPA or RPAS components subject to a mandatory overhaul life;

e) the current status of the RPAS compliance with the maintenance programme(s); and

f) the detailed maintenance records to show that all requirements for the signing of a maintenance release have been met.

R**ationale/justification:** Text adapted from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (8.4.1). Replaces aeroplane references to RPAS.

8.4.2 The records in 8.4.1 a) to e) shall be kept for a minimum period of 90 days after the unit to which they refer has been permanently withdrawn from service and the records in 8.4.1 f) for a minimum period of one year after the signing of the maintenance release.

R**ationale/justification:** Text copied from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (8.4.2).

8.4.3 In the event of a temporary change of operator, the records shall be made available to the new operator. In the event of any permanent change of operator, the records shall be transferred to the new operator.

R**ationale/justification:** Text copied from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (8.4.3).

Note 1.— For a temporary change of operator, continuing airworthiness records or related documents must be provided to the contracting State in a format acceptable to the State of Registry, on request.

R**ationale/justification:** Text added in case the RPA cannot accommodate carriage of the documents, but to ensure that documentation can be provided to the State of Registry.

Note 2.— In the context of 8.4.3, a judgement on what should be considered as a temporary change of operator will need to be made by the State of Registry in the light of the need to exercise control over the records, which will depend on access to them and the opportunity to update them.

R**ationale/justification:** Text copied from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (note for 8.4.3).

8.4.4 For each RPA and for each RPS, records kept and transferred in accordance with 8.4 shall be maintained in a form and format that ensures readability, security and integrity of the records at all times.

Note 1.— The form and format of the records may include, for example, paper records, film records, electronic records or any combination thereof.

Note 2.— Guidance regarding electronic aircraft continuing airworthiness records is included in the Airworthiness Manual (Doc 9760).

8.5 CONTINUING AIRWORTHINESS INFORMATION

8.5.1 The operator of an RPAS approved in accordance with Annex 8 shall monitor and assess maintenance and operational experience with respect to continuing airworthiness and provide the information as prescribed by the State of Registry and report through the system specified in Annex 8, Part II, Chapter 4, 4.2.3 f) and 4.2.4.

8.5.2 The operator of an RPAS approved in accordance with Annex 8 shall obtain and assess continuing airworthiness information and recommendations available from the organization responsible for the type design and shall implement resulting actions considered necessary in accordance with a procedure acceptable to the State of Registry.

R**ationale/justification:** Text adapted from Annex 6 — *Operation of Aircraft*, Part II — *International General Aviation — Aeroplanes* (3.8.4). Replaces aeroplane reference to RPA.

Note.— Guidance on the interpretation of "the organization responsible for the type design" is contained in the Airworthiness Manual (Doc 9760).

8.6 MODIFICATIONS AND REPAIRS

All modifications and repairs shall comply with airworthiness requirements acceptable to the State of Registry.

R**ationale/justification:** Section copied from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (8.6).

Procedures shall be established to ensure that the substantiating data supporting compliance with the airworthiness requirements are retained.

8.7 APPROVED MAINTENANCE ORGANIZATION

An approved maintenance organization shall comply with Annex 8, Part II, Chapter 6 — Maintenance organization approval.

8.8 MAINTENANCE RELEASE

8.8.1 When maintenance is carried out by an approved maintenance organization, the maintenance release shall be issued by the approved maintenance organization in accordance with the provisions of Annex 8, Part II, Chapter 6, 6.8.

8.8.2 When maintenance is not carried out by an approved maintenance organization, the maintenance release shall be completed and signed by a person appropriately licensed in accordance with Annex 1 to certify that the maintenance work performed has been completed satisfactorily and in accordance with approved data and procedures acceptable to the State of Registry.

8.8.3 When maintenance is not carried out by an approved maintenance organization, the maintenance release shall include the following:

a) basic details of the maintenance carried out including detailed reference of the approved data used;

b) the date such maintenance was completed; and

c) the identity of the person or persons signing the release.

R**ationale/justification:** Section adapted from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (8.8), as applicable from 5 November 2020. Added requirement for acceptance by the State of Registry.

CHAPTER 9. REMOTE FLIGHT CREW

9.1 COMPOSITION OF THE REMOTE FLIGHT CREW

9.1.1 The number and composition of the remote flight crew shall not be less than that specified in the operations manual. The remote flight crews shall include remote flight crew members in addition to the minimum numbers specified in the flight manual or other documents associated with the certificate of airworthiness, when necessitated by considerations related to the type(s) of RPA and RPS used, the type of operation involved and the duration of flight between points where remote flight crews are changed.

9.1.2 The remote flight crew shall include remote flight crew members in addition to the minimum numbers specified in the flight manual, other documents associated with the certificate of airworthiness or operating limitations prescribed for the RPAS type or class, when necessitated by considerations related to the type(s) of RPA and RPS used, the type of operation involved and the duration of flight.

9.1.3 The operator shall establish procedures for remote flight crew rostering.

9.1.4 Radio Operator

At all times during an RPAS operation, the remote flight crew shall include at least one member who holds a valid licence, issued by, or rendered valid by, the State of the Operator authorizing operation of the type of communication equipment to be used.

9.2 REMOTE FLIGHT CREW MEMBER DUTIES

9.2.1 The operator shall define the roles and task allocation of the remote flight crew for the operation of the RPAS.

9.2.2 The operator shall, for each type of RPS, assign to all remote flight crew members the necessary functions they are to perform in an emergency or in a situation requiring emergency evacuation of the RPS.

9.2.3 Recurrent training in accomplishing these functions shall be contained in the operator's training programme and shall include instruction in the use of all emergency and life-saving equipment required to be installed, and drills in the emergency evacuation of the RPS (when appropriate).

9.3 REMOTE FLIGHT CREW MEMBER TRAINING PROGRAMMES

9.3.1 The operator shall establish and maintain a training programme, approved by the State of the Operator, covering as a minimum the training standards for remote flight crew, key personnel including management system personnel and support personnel.

Note.— The training programme typically addresses, in particular, operational procedures, including handover, contingency and emergency procedures, dangerous goods, security and management system.

Rationale/justification: The general principle that the operator has overall responsibility for the operations and the personnel involved, it is consistent with the intent of paragraph 3.1 in Part I of Annex 6 and Annex 1.

9.3.2 The operator shall establish and maintain a ground and flight training programme, approved by the State of the Operator, which ensures that all remote flight crew members are adequately trained to perform their assigned duties. The training programme shall:

a) include ground and flight training facilities and properly qualified RPAS instructors as determined by the

State of the Operator;

b) consist of ground and flight training in the class or type of RPAS for which the remote flight crew will be assigned;

c) include appropriate remote flight crew coordination and training in all types of emergency and abnormal situations or procedures caused by engine, airframe or systems malfunctions;

d) include RPS malfunctions, including fire, natural disaster (e.g. high winds, earthquakes), or other abnormalities;

e) include training on the causes of upsets and means of prevention;

f) include training in knowledge and skills related to flight procedures for the intended area of operation, human performance including threat and error management and in the transport of dangerous goods;

g) ensure that all remote flight crew members know the duties for which they are responsible and the relation of these duties to the duties of other remote flight crew members, particularly in regard to abnormal or emergency procedures;

h) be given on a recurrent basis, as determined by the State of the Operator and shall include an assessment of competence;

i) establish a recurrent crew resource management (CRM) training programme for the remote flight crew; and

j) for RPAS equipped with a DAA capability, ensure that each remote flight crew member has been appropriately trained to be competent in the use of such equipment.

Note 1.— Paragraph 4.2.6 prohibits the in-flight simulation of emergency or abnormal situations when cargo is being carried.

Note 2.— Flight training may, to the extent deemed appropriate by the State of the Operator, be given in flight simulation training devices approved by the State for that purpose.

Note 3.— The scope of the recurrent training required by 9.2 and 9.3 may be varied and need not be as extensive as the initial training given in a particular type of RPA and RPS.

Note 4.— The use of correspondence courses and written examinations as well as other means may, to the extent deemed feasible by the State of the Operator, be utilized in meeting the requirements for periodic ground training.

Note 5.— For more information on dangerous goods training requirements, see Chapter 14.

Note 6.— Guidance material to design training programmes to develop knowledge and skills in human performance can be found in the Human Factors Training Manual (Doc 9683).

Note 7.— Information for pilots and flight operations personnel on flight procedure parameters and operational procedures is contained in PANS-OPS (Doc 8168), Volume I. Criteria for the construction of flight procedures are contained in PANS-OPS (Doc 8168), Volume II. Obstacle clearance criteria and procedures used in certain States may differ from PANS-OPS, and knowledge of these differences is important for safety reasons.

Note 8.— Guidance material to design remote flight crew training programmes can be found in the Manual of Evidence-based Training (Doc 9995).

Note 9.— Guidance material on the different means used to assess competence can be found in the Attachment to Chapter 2 of the Procedures for Air Navigation Services — Training (PANS-TRG, Doc 9868).

Note 10.— Procedures for upset prevention and recovery training in a flight simulation training device are contained in the Procedures for Air Navigation Services — Training (PANS-TRG, Doc 9868).

Note 11.— Guidance on upset prevention and recovery training in a flight simulation training device is contained in the Manual on Aeroplane Upset Prevention and Recovery Training (Doc 10011).

9.3.3 The requirement for recurrent flight training for a particular type of RPA or RPS shall be considered fulfilled by:

a) the use, to the extent deemed feasible by the State of the Operator, of flight simulation training devices approved by that State for that purpose; or

b) the completion within the appropriate period of the proficiency check required by 9.4.5 in that type of RPAS.

Rationale/justification: This is consistent with the intent of paragraph 9.1 and 9.3 in Part I of Annex 6.

9.4 QUALIFICATIONS

Note.— See the Manual of Procedures for Establishment and Management of a State's Personnel Licensing System (Doc 9379) for guidance of a general nature on cross-crew qualification, mixed-fleet flying and cross-credit.

9.4.1 The operator shall only designate a remote pilot to act as remote pilot-in-command with:

a) the minimum level of training, experience and currency specified in the operations manual;

b) in the case of multi-crew operations, completed a command course appropriate for the envisaged operations.

9.4.2 The operator shall ensure each remote flight crew member:

a) holds a valid licence issued by or rendered valid by the State of the Operator;

b) is properly rated; and

c) is competent to carry out assigned duties.

9.4.3 Recent experience

9.4.3.1 The operator shall not assign a remote pilot to act as remote pilot-in-command to perform take-off and landing duties unless that remote pilot has made at least three take-offs and landings within the preceding 90 days with the same combination of RPA and RPS or a flight simulation training device approved for that purpose.

9.4.3.2 The operator shall not assign a remote pilot to operate the flight controls of an RPAS during take-off and landing unless that remote pilot has made at least three take-offs and landings within the preceding 90 days on the same combination of RPA and RPS or in a flight simulation training device approved for that purpose.

9.4.3.3 The operator shall not assign a remote pilot to act as remote pilot-in-command or remote co-pilot for any portion of a flight unless that remote pilot has made at least three flights within the preceding 90 days with the same combination of RPA and RPS or a flight simulation training device approved for that purpose.

9.4.3.4 When a remote pilot-in-command or a remote co-pilot is flying several variants of the same RPAS or different RPAS with similar characteristics in terms of operating procedures, systems and handling, the State of the Operator shall decide under which conditions the requirements of 9.4.2 a) for which variants of RPA and RPS can be combined.

9.4.4 Remote pilot-in-command area, route and aerodrome qualification

9.4.4.1 The operator shall not utilize a remote pilot as remote pilot-in-command on a route or route segment for which that remote pilot is not currently qualified until such remote pilot has complied with 9.4.4.2 and 9.4.4.3.

9.4.4.2 Each such remote pilot shall demonstrate to the operator an adequate knowledge of:

a) the route to be flown, and the aerodromes which are to be used. This shall include knowledge of:

1) the terrain and minimum safe altitudes;

2) the seasonal meteorological conditions;

3) the meteorological, communication and air traffic facilities, services and procedures;

4) the search and rescue procedures; and

5) the navigational facilities and procedures, including any long-range navigation procedures, associated with the route along which the flight is to take place; and

b) procedures applicable to flight paths over heavily populated areas and areas of high air traffic density, obstructions, physical layout, lighting, approach aids and arrival, departure, holding and instrument approach procedures, and applicable operating minima.

Note.— That portion of the demonstration relating to arrival, departure, holding and instrument approach procedures may be accomplished in an appropriate training device which is adequate for this purpose.

9.4.4.3 A remote pilot-in-command shall have made an actual approach into each aerodrome of landing on the route, accompanied by a remote pilot who is qualified for the aerodrome, as a member of the remote flight crew or as a remote pilot observing at the RPS, unless:

a) the approach to the aerodrome is not over difficult terrain and the instrument approach procedures and aids available are similar to those with which the remote pilot is familiar, and a margin to be approved by the State of the Operator is added to the normal operating minima, or there is reasonable certainty that approach and landing can be made in visual conditions; or

b) the descent from the initial approach altitude can be made by day in visual conditions; or

c) the operator qualifies the remote pilot-in-command to land at the aerodrome concerned by means of an adequate pictorial presentation; or

d) the aerodrome concerned is adjacent to another aerodrome at which the remote pilot-in-command is currently qualified to land.

9.4.4.4 The operator shall maintain a record, sufficient to satisfy the State of the Operator of the qualification of the remote pilot and of the manner in which such qualification has been achieved.

9.4.4.5 The operator shall not continue to utilize a remote pilot as a remote pilot-in-command on a route or within an area specified by the operator and approved by the State of the Operator unless, within the preceding 12 months, that remote pilot has made at least one trip as a remote pilot, or as a remote check pilot, or as a remote pilot observing at the RPS:

a) within that specified area; and

b) if appropriate, on any route where procedures associated with that route or with any aerodromes intended to be used for take-off or landing require the application of special skills or knowledge.

9.4.4.6 In the event that more than 12 months elapse in which a remote pilot-in-command has not made such a trip on a route in close proximity and over similar terrain, within such a specified area, route or aerodrome, and has not practised such procedures in a training device which is adequate for this purpose, prior to again serving as a remote pilot-in-command within that area or on that route, that remote pilot must requalify in accordance with 9.4.4.2 and 9.4.4.3.

9.4.5 Remote Pilot proficiency checks

9.4.5.1 The operator shall ensure that piloting technique and the ability to execute emergency procedures is checked periodically in such a way as to demonstrate the remote pilot's competence on each combination of RPA and RPS.

9.4.5.2 Where the operation may be conducted under IFR, the operator shall ensure that the remote pilot's competence to comply with such rules is demonstrated to either a check pilot of the operator or a representative of the State of the Operator.

9.4.5.3 Checks in 9.4.5.2 shall be performed twice within any period of one year. Any two such checks which are similar and which occur within a period of four consecutive months shall not alone satisfy this requirement.

Note 1.— Flight simulation training devices approved by the State of the Operator may be used for those parts of the checks for which they are specifically approved.

Note 2.— See the Manual of Criteria for the Qualification of Flight Simulation Training Devices (Doc 9625).

9.4.5.4 When the operator schedules remote flight crew on several combinations of RPA and RPS or different combinations of RPA and RPS with similar characteristics in terms of operating procedures, systems and handling, the State shall decide under which conditions the requirements of 9.4.5.1 for which variants of RPA and RPS can be combined.

9.5 REMOTE FLIGHT CREW EQUIPMENT

A remote flight crew member assessed as fit to exercise the privileges of a licence, subject to the use of suitable correcting lenses, shall have a spare set of the correcting lenses readily available when exercising those privileges.

CHAPTER 10. FLIGHT OPERATIONS OFFICER/ FLIGHT DISPATCHER

10.1. When the State of the Operator requires that a flight operations officer/flight dispatcher, employed in conjunction with an approved method of control and supervision of flight operations be licensed, that flight operations officer/flight dispatcher shall be licensed in accordance with the provisions of Annex 1.

10.2. In accepting proof of qualifications other than the option of holding of a flight operations officer/flight dispatcher licence, the state of the operator, in accordance with the approved method of control and supervision of flight operations, shall require that, as a minimum, such persons meet the requirements specified in Annex 1 for the flight operations officer/flight dispatcher licence.

10.3. A flight operations officer/flight dispatcher shall not be assigned to duty unless that person has:

a) satisfactorily completed the operator-specific training course that addresses all the specific components of its approved method of control and supervision of flight operations specified in 4.2.1.4;

Note.— Guidance on the composition of such training syllabi is provided in the Training Manual (Doc 7192), Part D-3 — Flight Operations Officers/Flight Dispatchers.

b) made, within the preceding 12 months, at least one qualification flight observing the remote flight crew at the RPS over any area for which that individual is authorized to exercise flight supervision. The flight should include landings at as many aerodromes as practicable;

Note.— For the purpose of the qualification flight, the flight operations officer/flight dispatcher must be able to monitor the remote flight crew intercommunication system and radio communications, and be able to observe the actions of the remote flight crew.

c) demonstrated to the operator a knowledge of:

1) the contents of the operations manual described in Appendix 2;

2) the radio equipment used by the RPAS; and

3) the navigation equipment used by the RPAS;

d) demonstrated to the operator a knowledge of the following details concerning operations for which the officer is responsible and areas in which that individual is authorized to exercise flight supervision:

1) the seasonal meteorological conditions and the sources of meteorological information;

2) the effects of meteorological conditions on C2 Link and communication with ATS used by the RPAS;

3) the peculiarities and limitations of each navigation system which is used by the operation; and

4) the RPA loading instructions;

e) demonstrated to the operator knowledge and skills related to human performance relevant to dispatch duties; and

f) demonstrated to the operator the ability to perform the duties specified in 4.6.

10.4. Recommendation. — A flight operations officer/flight dispatcher assigned to duty should maintain complete familiarization with all features of the operation which are pertinent to such duties, including knowledge and skills related to human performance.

Note.— Guidance material to design training programmes to develop knowledge and skills in human performance can be found in the Human Factors Training Manual (Doc 9683).

10.5. Recommendation. — Flight operations officer/flight dispatcher should not be assigned to duty after 12 consecutive months of absence from such duty, unless the provisions of 10.3 are met.

Rationale/justification: This is consistent with the intent of chapter 10 in Part I of Annex 6.

CHAPTER 11. MANUALS, LOGS AND RECORDS

Note.— The following additional manuals, logs and records are associated with this Annex but are not included in this chapter:

Fuel and oil records — see 4.2.11

Continuing airworthiness records — see 8.4

Flight time, flight duty periods, duty periods and rest periods records — see 4.9.8

Flight preparation forms — see 4.3

Operational flight plan — see 4.3.3.1

Pilot-in-command route and airport qualification records — see 9.4.4.4.

11.1 FLIGHT MANUAL

Note.— the flight manual contains the information specified in Annex 8.

The flight manual shall be updated by implementing changes made mandatory by the State of Registry

11.2 OPERATOR'S MAINTENANCE CONTROL MANUAL

The operator's maintenance control manual provided in accordance with 8.2, which may be issued in separate parts, shall contain the following information:

a) a description of the procedures required by 8.1.1 including, when applicable:

1) a description of the administrative arrangements between the operator and the approved maintenance organization;

2) a description of the RPA and RPS maintenance procedures and the procedures for completing and signing the RPA maintenance release when maintenance is based on a system other than that of an approved maintenance organization.

b) names and duties of the person or persons required by 8.1.3;

c) a reference to the maintenance programme(s) required by 8.3.1;

d) a description of the methods used for the completion and retention of the operator's continuing airworthiness records required by 8.4;

e) a description of the procedures for monitoring, assessing and reporting maintenance and operational experience required by 8.5.1;

f) a description of the procedures for complying with the service information reporting requirements of Annex 8, Part II, Chapter 4, 4.2.3 f) and 4.2.4;

g) a description of procedures for assessing continuing airworthiness information and implementing any resulting actions, as required by 8.5.2;

h) a description of the procedures for implementing action resulting from mandatory continuing

airworthiness information;

i) a description of establishing and maintaining a system of analysis and continued monitoring of the performance and efficiency of the maintenance programme(s), in order to correct any deficiency in that programme;

j) a description of the RPAS to which the manual applies;

k) a description of procedures for ensuring that unserviceabilities affecting airworthiness are recorded and rectified; and

l) a description of the procedures for advising the State of Registry of significant in-service occurrences.

R**ationale/justification:** Text adapted from Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* (8.7.2.1).

11.3 MAINTENANCE PROGRAMME

11.3.1 A maintenance programme for each RPA, each RPS and any ground-based communication infrastructure as required by 8.3 shall contain the following information:

a) maintenance tasks and the intervals at which these are to be performed, taking into account the anticipated utilization of the RPAS;

b) when applicable, a continuing structural integrity programme;

c) procedures for changing or deviating from a) and b) above; and

d) when applicable, condition monitoring and reliability programme descriptions for the RPAS and all its components.

11.3.2 Maintenance tasks and intervals that have been specified as mandatory in approval of the type design shall be identified as such.

11.3.3 **Recommendation.** — *The maintenance programme(s) should be based on maintenance programme information made available by the State of Design or by the organization responsible for the type design, and any additional applicable experience.*

11.4 JOURNEY LOG BOOK

11.4.1 A journey log book shall be maintained for every RPA engaged in international air navigation in which particulars of the RPAS and its crew shall be entered at the end of the duty period of each remote pilot-in-command.

Note.— An RPA journey log may also consist of a section that stays in the RPA and an RPS section at each remote pilot station.

11.4.2 **Recommendation. —** The RPA journey log should contain the following items:

a) RPA nationality and registration;

b) a record of each RPS used in the course of a flight;

c) the duration of use for each RPS and the times of transfer between RPS;

d) date;

e) remote crew member names and duty assignments;

f) departure and arrival points and times;

g) purpose and type of flight;

h) observations regarding the flight; and

i) signature of the remote pilot-in-command.

Rationale/justification: Replication of the requirements for the journey log book that are contained within chapter 11.4 of Annex 6 Pt 1

11.4.3 **Recommendation.** — A signature should be required for each instance in which the remote pilot-in-command is changed, which may include whilst the RPA is still airborne.

Note.— The journey log may need to accommodate multiple remote pilot-in-command signature blocks.

11.5 OPERATOR RECORD-KEEPING

11.5.1 The operator shall establish a system of record-keeping that allows adequate storage and reliable traceability of all activities, covering in particular all the elements related to RPAS operations as defined in the operations manual and management system processes as defined in this chapter.

11.5.2 The format of the records shall be specified in the operator's procedures.

11.5.3 Records shall be stored in a manner that ensures protection from damage, alteration and theft, for a period determined by the State of the Operator.

11.6 RECORDS OF EMERGENCY AND SURVIVAL EQUIPMENT CARRIED

Reserved for future use.

11.7 FLIGHT RECORDER RECORDS

The operator shall ensure, to the extent possible, in the event the RPAS becomes involved in an accident or incident, the preservation of all related RPA-RS and RPS-RS records and, if necessary, the associated recorders, and their retention in safe custody pending their disposition as determined in accordance with Annex 13.

CHAPTER 12. CABIN CREW

Reserved for future use.

CHAPTER 13. SECURITY

13.1 GENERAL

13.1.1 Each Contracting State shall establish the structure, responsibilities, processes and procedures to promote and establish a culture of continuous improvement and enhancement of aviation security for RPAS operations.

Note.— The Aviation Security Manual (Doc 8973 — Restricted) provides detailed procedures and guidance on aviation security, including on the protection of civil aviation infrastructure against unmanned aircraft. It is intended to assist States in the implementation of their respective national civil aviation security programmes required by the specifications in the Annexes to the Convention on International Civil Aviation

13.1.2 Each Contracting State shall ensure the development and implementation of RPAS-related training programmes and a certification system that ensures that instructors are qualified in the applicable subject matters in accordance with the national civil aviation security programme.

Rationale/justification: This proposed standard aims at promotion of security culture and 'just culture' also in the domain of security in a way similar to current thinking on safety promotion. Text provided by AVSEC Panel RPAS TF.

13.2 AERODROME OPERATIONS

Each Contracting State shall require aerodromes serving RPAS operations to include within their written airport security programme measures for RPAS operations appropriate to meet the requirements of the national civil aviation security programme.

13.3 RPAS OPERATORS

Each Contracting State shall ensure that operators of RPAS have established, implemented and maintained a written RPAS operator security programme that meets the requirements of the national civil aviation security programme of that State.

Note.— *The Manual on Remotely Piloted Aircraft Systems (Doc 10019) provides additional guidance on security requirements for RPAS*.

Rationale/justification: (13.2 and 13.3) Text provided by AVSEC Panel RPAS TF. The structure is reworked to place emphasis on the need to capture RPAS security measures in the ASP, as well as the need for RPAS operators to have a RPAS operator security programme. This is consistent with Annex 17.

13.4 REPORTING ACTS OF UNLAWFUL INTERFERENCE

Each Contracting State concerned with an act of unlawful interference involving RPAS shall provide ICAO with all pertinent information concerning the security aspects of the act of unlawful interference as soon as practicable after the act is resolved.

13.5 DOMESTIC COMMERCIAL RPAS OPERATIONS

Rationale/justification: Text provided by AVSEC Panel. Amended using language from A17 S5.3.1 – Exchange of Information and Reporting RPAS TF.

Recommendation. — The International Standards and Recommended Practices set forth in this chapter should be applied by all Contracting States also in the case of domestic RPAS operations.

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CHAPTER 14. DANGEROUS GOODS

14.1 STATE RESPONSIBILITIES

Note 1.— Annex 18, Chapter 11, contains requirements for each Contracting State to establish oversight procedures for all entities (including packers, shippers, ground handling agents and operators) performing dangerous goods functions.

Note 2.— Operator responsibilities for the transport of dangerous goods are contained in Chapters 8, 9 and 10 of Annex 18. Part 7 of the Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc 9284) *(Technical Instructions) contains the operator's responsibilities and requirements for incident and accident reporting.*

Note 3.— Operator material (COMAT) that meets the classification criteria of the Technical Instructions for dangerous goods are considered cargo and must be transported in accordance with Part 1; 2.2.2 or Part 1; 2.2.3 of the Technical Instructions (e.g. aircraft parts such as lithium ion batteries, lithium metal batteries, chemical oxygen generators, fuel control units, fire extinguishers, oils, lubricants, cleaning products).

Note 4.— See also Chapter 15 regarding cargo compartment safety.

14.2 GENERAL

Transport of dangerous goods as cargo on board RPA shall not be permitted unless the State of the Operator has issued a specific approval.

14.3 OPERATORS WITH NO SPECIFIC APPROVAL FOR THE TRANSPORT OF DANGEROUS GOODS AS CARGO

14.3.1 The State of the Operator shall ensure that operators with no specific approval to transport dangerous goods have:

a) established a dangerous goods training programme that meets the requirements of Annex 18, the applicable requirements of Technical Instructions, Part 1, Chapter 4, and the requirements of the State's regulations, as appropriate. Details of the dangerous goods training programme shall be included in the operator's operations manuals;

b) established dangerous goods policies and procedures in its operations manual to meet, at a minimum,

Rationale/justification: Annex 18, Chapter 4, Limitations on the transport of dangerous goods by air.

the requirements of Annex 18, the Technical Instructions and the State's regulations to allow operator personnel to:

1) identify and reject undeclared dangerous goods, including COMAT classified as dangerous goods; and

2) report to the appropriate authorities of the State of the Operator and the State in which it occurred any:

i) occasions when undeclared dangerous goods are discovered in cargo or mail; and

ii) dangerous goods accidents and incidents

14.4 OPERATORS WITH A SPECIFIC APPROVAL FOR THE TRANSPORT OF DANGEROUS GOODS AS CARGO

14.4.1 The State of the Operator shall issue specific approval for the transport of dangerous goods and ensure that the operator:

a) establishes a dangerous goods training programme that meets the requirements of Annex 18, the Technical Instructions, Part 1, Chapter 4, and the requirements of the State regulations, as appropriate. Details of the dangerous goods training programme shall be included in the operator's operations manuals;

b) establishes dangerous goods policies and procedures in its operations manual to meet, at a minimum, the requirements of Annex 18, the Technical Instructions and the State's regulations to enable operator personnel to:

1) identify and reject undeclared or mis-declared dangerous goods, including COMAT classified as dangerous goods;

2) report to the appropriate authorities of the State of the Operator and the State in which it occurred any:

i) occasions when undeclared or mis-declared dangerous goods are discovered in cargo or mail; and

ii) dangerous goods accidents and incidents;

3) report to the appropriate authorities of the State of the Operator and the State of Origin any occasions when dangerous goods are discovered to have been carried;

i) when not loaded, segregated, separated or secured in accordance with Technical Instructions, Part 7, Chapter 2; and

ii) without information having been provided to the remote pilot-in-command;

4) accept, handle, store, transport, load and unload dangerous goods, including COMAT classified as dangerous goods as cargo on board an RPA; and

5) provide the remote pilot-in-command with accurate information concerning dangerous goods that are to be carried as cargo in the format required in Annex 18 and the Technical Instructions.

6) develops procedures for the remote pilot to notify emergency services at the scene of an incident or accident of the information provided to the remote pilot on the NOTOC.

Note.— Article 35 of the Convention refers to certain classes of cargo restrictions.

14.5 PROVISION OF INFORMATION

The operator shall ensure that all personnel, including third-party personnel, involved in the acceptance, handling, loading and unloading of cargo are informed of the operator's specific approval and limitations with regard to the transport of dangerous goods.

14.6 DOMESTIC COMMERCIAL RPAS OPERATIONS

Recommendation. — *The International Standards and Recommended Practices set forth in this chapter should*

be applied by all Contracting States also in the case of domestic RPAS operations.

Note.— Annex 18 contains a similar provision in this regard.

CHAPTER 15. CARGO COMPARTMENT SAFETY

Note.— Guidance on the hazards associated with the transport of items in the cargo compartment, the conduct of a specific safety risk assessment in accordance with the Safety Management Manual (SMM) (Doc 9859), and the responsibilities for the transport of dangerous goods, is contained in the Guidance for Safe Operations Involving Cargo Compartments (Doc10102).

15.1 TRANSPORT OF ITEMS IN THE CARGO COMPARTMENT

15.1.1 The State of the Operator shall ensure that the operator establishes policies and procedures for the transport of items in the cargo compartment, which include the conduct of a specific safety risk assessment. The risk assessment shall include at least the:

a) hazards associated with the properties of the items to be transported;

b) capabilities of the operator;

c) operational considerations (e.g. area of operations, diversion time);

d) capabilities of the RPA and its systems (e.g. cargo compartment fire suppression capabilities);

e) containment characteristics of unit load devices;

f) packing and packaging;

g) safety of the supply chain for items to be transported; and

h) quantity and distribution of dangerous goods items to be transported.

Note.— Additional operational requirements for the transport of dangerous goods are contained in Chapter 14.

15.2 FIRE PROTECTION

15.2.1 The elements of the cargo compartment(s) fire protection system, as approved by the State of Design or State of Registry, and a summary of the demonstrated cargo compartment fire protection certification standards, shall be provided in the RPA flight manual or other documentation supporting the operation of the RPAS.

Note.— Guidance on the elements of cargo compartment fire protection and associated demonstrated standards are provided in the Guidance for Safe Operations Involving Cargo Compartments (Doc 10102).

15.2.2 The Operator shall establish policies and procedures that address the items to be transported in the cargo compartment. These shall ensure, to a reasonable certainty, that in the event of a fire involving those items, it can be detected and sufficiently suppressed or contained by the elements of the RPA design associated with cargo compartment fire protection, until the RPA makes a safe landing.

Note.— Guidance on policies and procedures that address the items to be transported in the cargo compartment are provided in the Guidance for Safe Operations Involving Cargo Compartments (Doc 10102).

APPENDIX 1. LIGHTS TO BE DISPLAYED BY RPA

(Chapter 6, 6.12, refers)

2. TERMINOLOGY

When the following terms are used in this Appendix, they have the following meanings:

Angles of coverage.

a) Angle of coverage A is formed by two intersecting vertical planes making angles of 70 degrees to the right and 70 degrees to the left respectively, looking aft along the longitudinal axis to a vertical plane passing through the longitudinal axis.

b) Angle of coverage F is formed by two intersecting vertical planes making angles of 110 degrees to the right and 110 degrees to the left respectively, looking forward along the longitudinal axis to a vertical plane passing through the longitudinal axis.

c) Angle of coverage L is formed by two intersecting vertical planes, one parallel to the longitudinal axis of the RPA, and the other 110 degrees to the left of the first, when looking forward along the longitudinal axis.

d) Angle of coverage R is formed by two intersecting vertical planes, one parallel to the longitudinal axis of the RPA, and the other 110 degrees to the right of the first, when looking forward along the longitudinal axis.

Horizontal plane. The plane containing the longitudinal axis and perpendicular to the plane of symmetry of the RPA.

Longitudinal axis of the RPA. A selected axis parallel to the direction of flight at a normal cruising speed, and passing through the centre of gravity of the RPA.

Making way. An RPA on the surface of the water is “making way” when it is under way and has a velocity relative to the water.

Under command. An RPA on the surface of the water is “under command” when it is able to execute manoeuvres as required by the International Regulations for Preventing Collisions at Sea for the purpose of avoiding other vessels.

Under way. An RPA on the surface of the water is “under way” when it is not aground or moored to the ground or to any fixed object on the land or in the water.

Vertical planes. Planes perpendicular to the horizontal plane.

Visible. Visible on a dark night with a clear atmosphere.

3. NAVIGATION LIGHTS TO BE DISPLAYED IN THE AIR

Note.— The lights specified herein are intended to meet the requirements of Annex 2 for navigation lights.

As illustrated in Figure 1, the following unobstructed navigation lights shall be displayed:

a) a red light projected above and below the horizontal plane through angle of coverage L;

b) a green light projected above and below the horizontal plane through angle of coverage R;

c) a white light projected above and below the horizontal plane rearward through angle of coverage A.

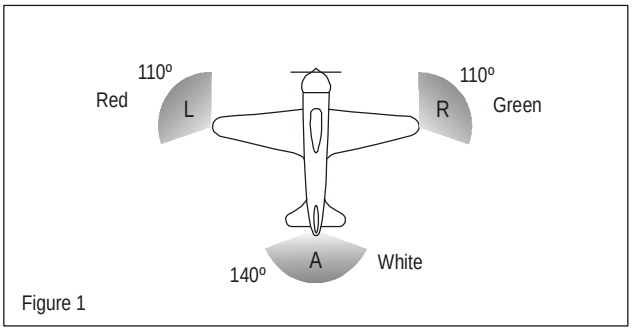


Figure 1

4. LIGHTS TO BE DISPLAYED ON THE WATER

4.1 General

Note.— The lights specified herein are intended to meet the requirements of Annex 2 for lights to be displayed by RPAs on the water.

The International Regulations for Preventing Collisions at Sea require different lights to be displayed in each of the following circumstances:

a) when under way;

b) when towing another vessel, or aircraft;

c) when being towed;

d) when not under command and not making way;

e) when making way but not under command;

f) when at anchor;

g) when aground.

The lights required by RPA in each case are described below.

4.2 When under way

As illustrated in Figure 2, the following appearing as steady unobstructed lights:

a) a red light projected above and below the horizontal through angle of coverage L;

b) a green light projected above and below the horizontal through angle of coverage R;

c) a white light projected above and below the horizontal through angle of coverage A; and

d) a white light projected through angle of coverage F.

The lights described in 3.2 a), b) and c) should be visible at a distance of at least 3.7 km (2 NM). The light described in 3.2 d) should be visible at a distance of 9.3 km (5 NM) when fitted to an RPA of 20 m or more in length or visible at a distance of 5.6 km (3 NM) when fitted to an RPA of less than 20 m in length.

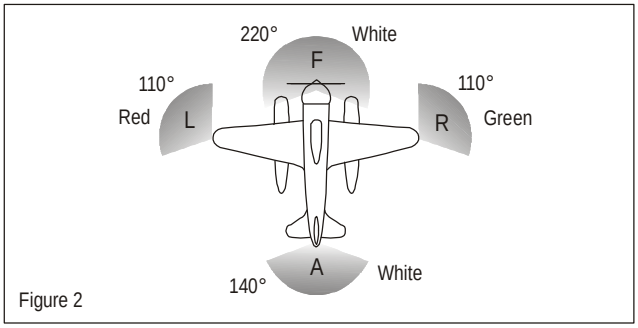


Figure 2

4.3 When towing another vessel or RPA

1. As illustrated in Figure 3, the following appearing as steady, unobstructed lights:

a) the lights described in 3.2;

b) a second light having the same characteristics as the light described in 3.2 d) and mounted in a vertical line at least 2 m above or below it; and

c) a yellow light having otherwise the same characteristics as the light described in 3.2 c) and mounted in a vertical line at least 2 m above it.

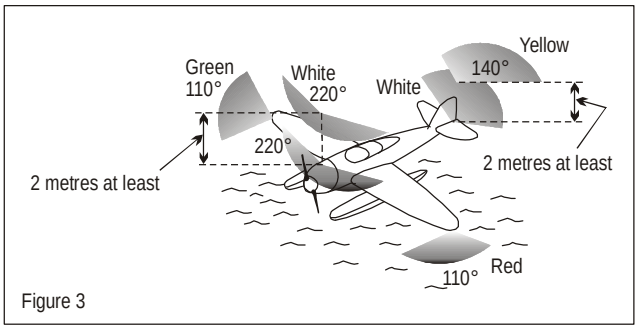


Figure 3

4.4 When being towed

The lights described in 3.2 a), b) and c) appearing as steady, unobstructed lights.

4.5 When not under command and not making way

As illustrated in Figure 4, two steady red lights placed where they can best be seen, one vertically over the other and not less than 1 m apart, and of such a character as to be visible all around the horizon at a distance of at least 3.7 km (2 NM).

4.6 When making way but not under command

2. As illustrated in Figure 5, the lights described in 3.5 plus the lights described in 3.2 a), b) and c).

Note.— The display of lights prescribed in 3.5 and 3.6 is to be taken by the crews of other aircraft as signals that the RPA showing them is not under command and cannot therefore get out of the way. They are not signals of RPA in distress and requiring assistance.

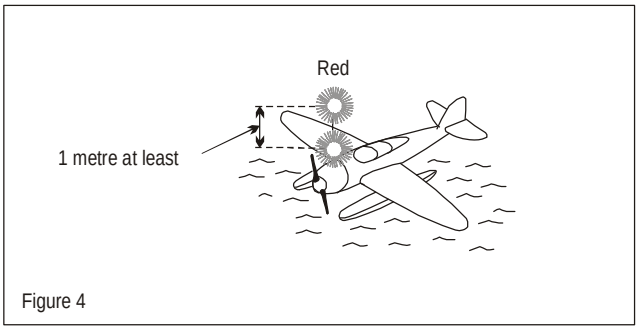


Figure 4

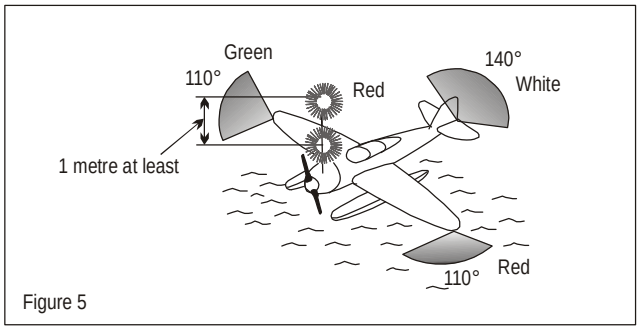


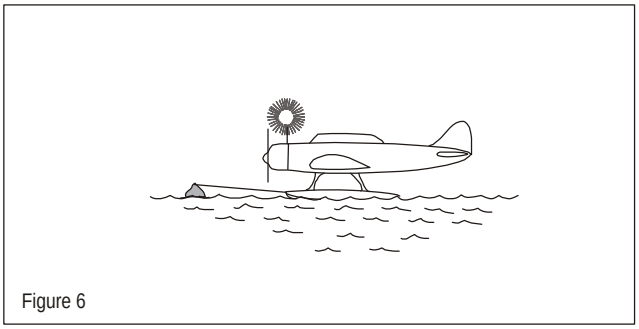
Figure 5

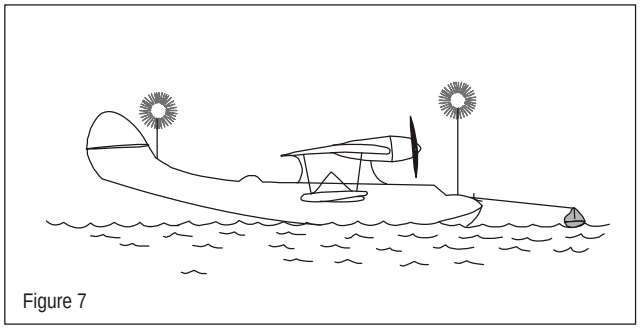
4.7 When at anchor

a) If less than 50 m in length, where it can best be seen, a steady white light (Figure 6), visible all around the horizon at a distance of at least 3.7 km (2 NM).

b) If 50 m or more in length, where they can best be seen, a steady white forward light and a steady white rear light (Figure 7) both visible all around the horizon at a distance of at least 5.6 km (3 NM).

c) If 50 m or more in span a steady white light on each side (Figures 8 and 9) to indicate the maximum span and visible, so far as practicable, all around the horizon at a distance of at least 1.9 km (1 NM).


Figure 6


Figure 7

4.8 When aground

The lights prescribed in 3.7 and in addition two steady red lights in vertical line, at least 1 m apart so placed as to be visible all around the horizon.

APPENDIX 2. ORGANIZATION AND CONTENTS OF AN OPERATIONS MANUAL

(Chapter 4, 4.2.4.1, refers)

1. ORGANIZATION

An operations manual, which may be issued in separate parts corresponding to specific aspects of RPAS operations, provided in accordance with Chapter 4, 4.2.4.1, shall be organized with the following structure:

a) General;

b) RPA operating information;

c) RPS operating information:

d) Areas, routes and aerodromes; and

e) Training.

2. CONTENTS

The operations manual referred to in 1 shall contain at the least the following:

2.1 General

2.1.1 Instructions outlining the responsibilities of operations personnel pertaining to the conduct of flight operations.

2.1.2. Information and policy relating to fatigue management including:

a) policies pertaining to flight time, flight duty period, duty period limitations and rest requirements for remote flight crew members in accordance with Chapter 4, 4.9.2 a); and

b) where applicable, policy and documentation pertaining to the operator's FRMS in accordance with Appendix 7.

2.1.3. A list of the navigational equipment to be carried including any requirements relating to operations where performance-based navigation is prescribed.

2.1.4. Where relevant to the operations, the long-range navigation procedures and the nomination and utilization of diversion aerodromes.

2.1.5. The circumstances in which a radio listening watch is to be maintained.

2.1.6. The method for determining minimum flight altitudes.

2.1.7. The methods for determining aerodrome operating minima.

2.1.8. Ground handling arrangements and procedures.

2.1.9. Procedures, as prescribed in Annex 12, for remote pilots in command observing an accident.

2.1.10. The remote flight crew for each type of operation including the designation of the succession of command.

2.1.11. Specific instructions for the computation of the quantities of fuel and oil to be carried, taking into account

all circumstances of the operation including the possibility of the failure of one or more engines while en-route.

2.1.12. Instructions for mass and balance control.

2.1.13. Instructions for the conduct and control of ground de-icing/anti-icing operations.

2.1.14. The specifications for the operational flight plan.

2.1.15. Standard operating procedures (SOPs) for each phase of flight.

2.1.16. Instructions on the use of normal checklists and the timing of their use.

2.1.17. Departure contingency procedures.

2.1.18. Instructions on the maintenance of altitude awareness and the use of automated or remote flight crew altitude call-out.

2.1.19. Instructions on the use of autopilots and auto-throttles in IMC.

Note.— Instructions on the use of autopilots and auto-throttles, together with 2.1.24 and 2.1.28, are essential for avoidance of approach and landing accidents and controlled flight into terrain accidents.

2.1.20. Instructions on the clarification and acceptance of ATC clearances, particularly where terrain clearance is involved.

2.1.21. Departure and approach briefings.

2.1.22. Procedures for familiarization with areas, routes and aerodromes.

2.1.23. Stabilized approach procedure.

2.1.24. Limitation on high rates of descent near the surface.

2.1.25. Conditions required to commence or to continue an instrument approach.

2.1.26. Instructions for the conduct of Precision approach (PA) procedures, approach procedures with vertical guidance (APV) and Non-precision approach (NPA) procedures.

2.1.27. Allocation of remote flight crew duties and procedures for the management of remote crew workload during night and IMC instrument approach operations.

2.1.28. Instructions and training requirements for the avoidance of controlled flight into terrain and, when installed, policy for the use of the ground proximity warning system (GPWS).

2.1.29. Policy, instructions, procedures and training requirements for the avoidance of collisions and the use of the detect and avoid capability (DAA).

Note.— Procedures for the operation of ACAS are contained in PANS-OPS (Doc 8168), Volume I, and in PANS-ATM (Doc 4444), Chapters 12 and 15.

2.1.30. Information and instructions relating to the interception of civil RPA including:

a) procedures, as prescribed in Annex 2, for remote pilots-in-command of intercepted aircraft; and

b) visual signals for use by intercepting and intercepted aircraft, as contained in Annex 2.

2.1.31. For RPA intended to be operated above 15 000 m (49 000 ft.), procedures in the event that a decision to descend is taken, covering:

a) the necessity of giving the appropriate ATS unit prior warning of the situation and of obtaining a provisional descent clearance; and

b) the action to be taken in the event that communication with the ATS unit cannot be established or is interrupted.

Note.— Guidance material on the information to be provided is contained in Circular 126 — Guidance Material on SST Aircraft Operations.

2.1.32. Details of the safety management system (SMS) provided in accordance with Chapters 3 and 4 of Annex 19.

2.1.33. Information and instructions on the carriage of dangerous goods, in accordance with Chapter 14, including action to be taken in the event of an emergency.

Note.— Guidance material on the development of policies and procedures for dealing with dangerous goods incidents on board aircraft is contained in Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods (Doc 9481).

2.1.34. Security instructions and guidance.

2.1.35. Instructions and training requirements for the use of head-up displays (HUD) and enhanced vision systems (EVS) equipment as applicable.

2.2 RPAS operating information

2.2.1. Certification limitations and operating limitations.

2.2.2. The normal, abnormal and emergency procedures to be used by the remote flight crew and the checklists relating thereto as required by Chapter 6, 6.1.4.

2.2.3. Operating instructions and information on climb performance with all engines operating, if provided in accordance with Chapter 4, 4.2.5.3.

2.2.4. Flight planning data for pre-flight and in-flight planning with different thrust/power and speed settings.

2.2.5. The maximum crosswind and tailwind components for each RPA type operated and the reductions to be applied to these values having regard to gusts, low visibility, runway surface conditions, remote crew experience, use of autopilot, abnormal or emergency circumstances, or any other relevant operational factors.

2.2.6. Instructions and data for mass and balance calculations.

2.2.7. Instructions for RPA loading and securing of load.

2.2.8. RPAS systems, associated controls and instructions for their use, as required by Chapter 6, 6.1.4.

2.2.9. The minimum equipment list and configuration deviation list for the RPA types operated and specific operations authorized, including any requirements relating to operations where performance-based navigation is prescribed.

2.2.10. Checklist of emergency and safety equipment and instructions for its use.

2.2.11. Emergency evacuation procedures for the RPS, including type-specific procedures, remote crew

coordination, assignment of remote crew's emergency positions and the emergency duties assigned to each remote crew member.

2.2.12. Procedures to mitigate at least the emergencies and contingencies as required by Chapter 3, 3.7.8.

2.3 Routes and aerodromes

2.3.1. A route guide to ensure that the remote flight crew will have, for each flight, information relating to communication facilities, navigation aids, aerodromes, instrument approaches, instrument arrivals and instrument departures as applicable for the operation, and such other information as the operator may deem necessary for the proper conduct of flight operations.

2.3.2. The minimum flight altitudes for each route to be flown.

2.3.3. Aerodrome operating minima for each of the aerodromes that are likely to be used as aerodromes of intended landing or as alternate aerodromes.

2.3.4. The increase of aerodrome operating minima in case of degradation of approach or aerodrome facilities.

2.3.5. Instructions for determining aerodrome operating minima for instrument approaches using HUD and EVS.

2.3.6. The necessary information for compliance with all flight profiles required by regulations, including but not limited to, the determination of:

a) take-off runway length requirements for dry, wet and contaminated conditions, including those dictated by system failures which affect the take-off distance;

b) take-off climb limitations;

c) en-route climb limitations;

d) approach climb limitations and landing climb limitations;

e) landing runway length requirements for dry, wet and contaminated conditions, including systems failures which affect the landing distance; and

f) supplementary information, such as tire speed limitations.

2.4 Training

2.4.1. Details of the remote flight crew training programme, as required by Chapter 9, 9.3.

2.4.2. Details of the flight operations officer/flight dispatcher training programme when employed in conjunction with a method of flight supervision in accordance with Chapter 4, 4.2.1.

Note.— Details of the flight operations officer/flight dispatcher training programme are contained in Chapter 10, 10.2.

APPENDIX 3. ADDITIONAL REQUIREMENTS FOR APPROVED OPERATIONS BY APPROVED SINGLE-ENGINE RPA OVER HEAVILY POPULATED AREAS

(Chapter 5, 5.4.1, refers)

Rationale/justification: Annex 6 Part I and Annex 6 Part III provisions relating to single engine turbine reliability have been significantly repurposed for RPAS. In the remotely piloted environment concerns about safety of persons on board are superseded by the safety of exposed third parties on the ground. Furthermore, the highly automated nature of RPAS and the limited ability for the pilot to use visual references, make the probability of the pilot using visual cues to address emergency situations at night and in IMC less likely. However, the reliability of engines and associated critical systems for RPAS operations over highly populated areas is important regardless of visibility.

The applicability of specialized requirements for remotely piloted approved single-engine remotely piloted aeroplanes, and remotely piloted helicopters in performance class 3 over heavily populated areas is recognized.

Turbine power may not be the only propulsion means that should be regulated in this way in the future. Therefore, section has been reconfigured to reflect any means of propulsion that meets (and continues to meet) the goal of reliability shown to have a power loss rate of less than 1 per 100 000 engine hours.

While turbine is the only power technology that currently meets that standard, it seems likely that other technologies will potentially meet this reliability going forward. If electric/petrol/diesel engines cannot meet the reliability standards they are not suitable for unmitigated operations over heavily populated areas , hence the references to 'turbine' have been deleted and instead engine reliability standards for all engine/motor types and associated flight critical systems would be applied equally.

For this first iteration of Annex 6, Part IV, it was originally considered reasonable to limit this section to 'aeroplanes', but on reflection the same requirements can reflect helicopters as well, thus two separate sections have been inserted.

1. ENGINE RELIABILITY

1.1 Engine reliability shall be shown to have a power loss rate of less than 1 per 100 000 engine hours.

Note.— Power loss in this context is defined as any loss of power, the cause of which may be traced to faulty engine or engine component design or installation, including design or installation of the fuel ancillary or engine control systems. (See Attachment G.)

1.2 The operator shall be responsible for engine trend monitoring.

1.3 To minimize the probability of in-flight engine failure, the engine shall be equipped with:

a) For an engine that has an ignition system, an ignition system that activates automatically, or is capable of being operated manually, for take-off and landing, and during flight, in visible moisture;

b) a magnetic particle detection or equivalent system that monitors the engine, accessories gearbox, and reduction gearbox, and which includes a flight deck caution indication; and

c) an emergency engine power control device that permits continuing operation of the engine through a sufficient power range to safely complete the flight in the event of any reasonably probable failure of the

fuel control unit, batteries or fuel-cell systems.

2. SYSTEMS AND EQUIPMENT

2.1 Single-engine RPA approved to operate over heavily populated areas shall be equipped with the following:

a) Systems and equipment *capable of transmitting data or capability to the RPS* to ensure continued safe flight and to assist in achieving a safe forced landing after an engine failure, under all allowable operating conditions:

1) a radio altimeter;

2) two attitude indicators, powered from independent sources;

3) a means to provide for at least one attempt at engine re-start;

4) weather radar (if this capability is provided from the RPA);

5) a certified area navigation system capable of being programmed with the positions of aerodromes and safe forced landing areas, and providing instantly available track and distance information to those locations;

6) if the RPAS design is such that a means of external vision from the RPA is available to the remote pilot, a landing light that is independent of the landing gear and is capable of adequately illuminating the touchdown area in a night forced landing; and

7) an engine fire warning system.

b) Systems intended to ensure continued safe flight and to assist in achieving a safe forced landing after an engine failure, under all allowable operating conditions:

1) two separate electrical generating systems, each one capable of supplying all probable combinations of continuous in-flight electrical loads for instruments, equipment and systems; and

2) an emergency electrical supply system of sufficient capacity and endurance, following loss of all generated power, to as a minimum:

i. maintain the operation of the C2 Link, Detect and Avoid capabilities and all essential flight instruments, communication and navigation systems during a descent from the maximum certificated altitude in a glide configuration to the completion of a landing;

ii. lower the flaps and landing gear, if applicable;

iii. provide power to one pitot heater, which must serve an air speed indicator that provides indications to the remote pilot;

iv. provide for one engine restart, if applicable; and

v. provide for the operation of the radio altimeter.

3. MINIMUM EQUIPMENT LIST

The State of the Operator shall require the minimum equipment list of the operator approved in accordance with Chapter 5, 5.4 to specify the operating equipment required for over heavily populated areas.

4. FLIGHT MANUAL INFORMATION

The flight manual shall include limitations, procedures, approval status and other information relevant to operations by single-engine turbine-powered RPA over heavily populated areas.

5. EVENT REPORTING

5.1 The operator approved for operations by single-engine turbine-powered RPA over heavily populated areas shall report all significant failures, malfunctions or defects to the State of the Operator who in turn will notify the State of Design.

5.2 The State of the Operator shall review the safety data and monitor the reliability information so as to be able to take any actions necessary to ensure that the intended safety level is achieved. The State of the Operator will notify major events or trends of particular concern to the appropriate Type Certificate Holder and the State of Design.

6. OPERATOR PLANNING

6.1 Operator route planning shall take account of all relevant information in the assessment of intended routes or areas of operations, including the following:

a) the nature of the terrain to be overflown, including the potential for carrying out a forced landing without unreasonably elevating risk to persons on the surface or other airspace users in the event of an engine failure or major malfunction;

b) weather information, including seasonal and other adverse meteorological influences that may affect the flight; and

c) other criteria and limitations as specified by the State of the Operator.

6.2 The operator shall identify aerodromes or safe forced landing areas available for use in the event of engine failure, and the position of these shall be programmed into the area navigation system.

Note 1.— A 'safe' forced landing in this context means a landing in an area at which it can reasonably be expected that it will not lead to serious injury or loss of life, even though the RPA may incur extensive damage.

Note 2.— Operation over routes and in weather conditions that permit a safe forced landing in the event of an engine failure, as specified in Chapter 5, 5.1.2, is not required by Appendix 3, 6.1 and 6.2 for RPA approved in accordance with Chapter 5, 5.4. The availability of forced landing areas at all points along a route is not specified for these RPA because of the very high engine reliability, additional systems and operational equipment, procedures and training requirements specified in this Appendix.

7. REMOTE FLIGHT CREW EXPERIENCE, TRAINING AND CHECKING

7.1 The State of the Operator shall prescribe the minimum remote flight crew experience required for operations by approved single-engine RPA over heavily populated areas.

7.2 The operator's remote flight crew training and checking shall be appropriate to operations over heavily populated areas by approved single-engine RPA, covering normal, abnormal and emergency procedures and, in particular, engine failure, including descent to a forced landing.

8. ROUTE LIMITATIONS OVER WATER

Reserved for future use.

9. OPERATOR CERTIFICATION OR VALIDATION

The operator shall demonstrate the ability to conduct operations by approved single-engine RPA over heavily populated areas through a certification and approval process specified by the State of the Operator.

Note.— Guidance on the airworthiness and operational requirements is contained in Attachment G

APPENDIX 4. ALTIMETRY SYSTEM PERFORMANCE REQUIREMENTS FOR OPERATIONS IN RVSM AIRSPACE

(Chapter 7, 7.2.6 refers)

1. In respect of groups of RPA that are nominally of identical design and build with respect to all details that could influence the accuracy of height-keeping performance, the height-keeping performance capability shall be such that the total vertical error (TVE) for the group of RPA shall have a mean no greater than 25 m (80 ft.) in magnitude and shall have a standard deviation no greater than 28 — 0.013z2 for $0 \leq z \leq 25$ when z is the magnitude of the mean TVE in metres, or 92 — 0.004z2 for $0 \leq z \leq 80$ where z is in feet. In addition, the components of TVE shall have the following characteristics:

    a) the design of the altimetry system and any errors therein must be considered in context of the safety of the entirety of the RPAS flight systems; including but not limited to potential loss or latency of the C2 Link, and the ongoing valid operation of the Detect and Avoid capability.

    b) the mean altimetry system error (ASE) of the group shall not exceed 25 m (80 ft.) in magnitude;

    c) the sum of the absolute value of the mean ASE and of three standard deviations of ASE shall not exceed 75 m (245 ft.); and

    d) the differences between cleared flight level and the indicated pressure altitude actually flown shall be symmetric about a mean of 0 m, with a standard deviation no greater than 13.3 m (43.7 ft.), and in addition, the decrease in the frequency of differences with increasing difference magnitude shall be at least exponential.

2. In respect of RPA for which the characteristics of the airframe and altimetry system fit are unique and so cannot be classified as belonging to a group of RPA encompassed by paragraph 1, the height-keeping performance capability shall be such that the components of the TVE of the RPA have the following characteristics:

    a) the ASE of the RPA shall not exceed 60 m (200 ft.) in magnitude under all flight conditions; and

    b) the differences between the cleared flight level and the indicated pressure altitude actually flown shall be symmetric about a mean of 0 m, with a standard deviation no greater than 13.3 m (43.7 ft.), and in addition, the decrease in the frequency of differences with increasing difference magnitude shall be at least exponential.

APPENDIX 5. SAFETY OVERSIGHT OF RPAS OPERATORS

(Chapter 4, 4.2 refers)

Note 1.— Appendix 1 to Annex 19 contains the general provisions for a State safety oversight system.

Note 2.— This Appendix provides additional provisions for the safety oversight of international RPAS operators.

1. PRIMARY AVIATION LEGISLATION

The State of the Operator shall enact and implement laws that enable the State to regulate the certification and continued supervision of RPAS operators and the resolution of safety issues identified by the authority.

Note 1.— The term authority as used in this Appendix refers to the Civil Aviation Authority as well as equivalent organizations, including inspectors and staff.

Note 2.— Guidance on the inspection, certification and continued surveillance of operations is contained in the Manual of Procedures for Operations Inspection, Certification and Continued Surveillance (Doc 8335) and the Airworthiness Manual (Doc 9760).

2. SPECIFIC OPERATING REGULATIONS

The State of the Operator shall adopt regulations that provide for the certification and continued surveillance of RPAS operations and the maintenance of RPAS in conformity with the Annexes to the Convention on International Civil Aviation.

3. STATE SAFETY OVERSIGHT SYSTEM AND FUNCTIONS

3.1 The State of the Operator shall ensure that the authority is responsible for the safety oversight of RPAS operators.

3.2 The State of the Operator shall use a methodology to determine its inspector staffing requirements according to the size and complexity of civil RPAS operations in that State.

3.3 **Recommendation**. *The methodology in 3.2 should be documented*.

3.4 The State of the Operator shall ensure that authority inspectors have adequate support, credentials and transportation to accomplish, independently, their certification and continued surveillance tasks.

4. QUALIFIED TECHNICAL PERSONNEL

The State of the Operator shall require that the initial and recurrent training of the authority inspectors include RPAS-specific subjects.

Note.— Guidance on experience and training for inspectors is contained in the Manual of Procedures for Operations Inspection, Certification and Continued Surveillance (Doc 8335).

5. TECHNICAL GUIDANCE, TOOLS AND PROVISION OF SAFETY-CRITICAL INFORMATION

5.1 The State of the Operator shall ensure that authority inspectors are provided with technical guidance manuals containing the policies, procedures and standards to be used in the certification and continued surveillance of RPAS operators.

5.2 The State of the Operator shall ensure that authority inspectors are provided with technical guidance manuals containing the policies, procedures and standards to be used in the resolution of safety issues,

including enforcement.

5.3 The State of the Operator shall ensure that authority inspectors are provided with technical guidance manuals that address ethics, personal conduct and the avoidance of actual or perceived conflicts of interest in the performance of official duties.

6. CERTIFICATION OBLIGATIONS

The State of the Operator shall require, prior to commencement of new RPAS operations, RPAS operators to demonstrate that they can safely conduct the proposed operations.

Note.— Attachment D contains further information in this regard.

7. CONTINUED SURVEILLANCE OBLIGATIONS

The State of the Operator shall use an ongoing surveillance plan to confirm that operators continue to meet the relevant requirements for initial certification and that each RPAS operator is functioning satisfactorily.

8. RESOLUTION OF SAFETY ISSUES

Note.— Provisions for the resolution of safety issues are contained in Appendix 1 to Annex 19.

APPENDIX 6. FORMAT AND CONTENT OF REMOTE OPERATORS CERTIFICATE (ROC)

(Chapter 4, 4.2.1.10 refers)

1. PURPOSE AND SCOPE

1.1 The ROC and its associated specific operations specifications shall contain the minimum information required as detailed in the paragraphs below, in a standardized format.

1.2 The remote operator certificate and its associated operations specifications shall define the operations for which the operator is authorized including specific approvals, conditions and limitations.

Note.— Attachment D, paragraph 3.2.2, contains additional information that may be listed in the operations specifications associated with the remote operator certificate.

2. MINIMUM INFORMATION

2.1 The ROC shall contain at least the following information:

a) the State of the Operator and the issuing authority;
b) the ROC number and its expiration date;
c) the operator name, trading name (if different) and address of the principal place of business;
d) the date of issue and the name, signature and title of the authority representative; and
e) the location, in a controlled document which shall be easily accessible, where the contact details of operational management can be found.

Note.— The format (e.g. paper and electronic) of this document must be acceptable to the State of the Operator and to all other States involved in the operation.

3. ROC TEMPLATE

Note. .— An electronic copy of the ROC is required to be carried on board the RPA (see 6.26).

<table>
<tr><th colspan="3">RPAS OPERATOR CERTIFICATE</th></tr>
<tr><td>[1]</td><td>STATE OF THE OPERATOR[2]</td><td>[1]</td></tr>
<tr><td></td><td>ISSUING AUTHORITY[3]</td><td></td></tr>
<tr><td>ROC number[4]:

Expiration date[5]:</td><td>OPERATOR NAME[6]

Operator’s trading name[7]:

Operator address[8]:

Telephone[9]:

Email:</td><td>OPERATIONAL POINTS OF CONTACT[10]

Contact details, at which operational management can be contacted without delay, are listed in_____[11].</td></tr>
<tr><td colspan="3">This certificate certifies that _____[12] is authorized to perform international RPAS operations, as defined in the operations specifications, in accordance with the operations manual and the _ Insert reference to the appropriate civil aviation regulations._____[13].</td></tr>
<tr><td colspan="2">Date of issue[14]:</td><td>Name and signature[15]:

Title</td></tr>
</table>

Notes.—

1. For use of the State of the Operator.

2. Replace by the name of the State of the Operator.

3. Replace by the identification of the issuing authority of the State of the Operator.

4. Unique AOC number, as issued by the State of the Operator.

5. Date after which the AOC ceases to be valid (dd-mm-yyyy).

6. Replace by the operator’s registered name.

7. Operator’s trading name, if different. Insert “dba” before the trading name (for “doing business as”).

8. Operator’s principal place of business address.

9. Operator’s principal place of business telephone and fax details, including the country code. E-mail to be provided if available.

10. The contact details include the telephone numbers, including the country code, and the email address (if available) at which operational management can be contacted without undue delay for issues related

to flight operations, airworthiness, remote flight crew competency, dangerous goods and other matters, as appropriate.

11. Insert the controlled document, carried on board, in which the contact details are listed, with the appropriate paragraph or page reference, e.g.: "Contact details are listed in the operations manual, Gen/Basic, Chapter 1, 1.1" or "… are listed in the operations specifications, page 1" or "… are listed in an attachment to this document".

12. Operator's registered name.

13. Insertion of reference to the appropriate civil aviation regulations.

14. Issuance date of the AOC (dd-mm-yyyy).

15. Title, name and signature of the authority representative. In addition, an official stamp may be applied on the AOC.

4. OPERATIONS SPECIFICATIONS FOR EACH RPAS MODEL

Note.— Chapter 6, 6.26.1, requires a copy of the operations specifications of this section to be carried on board the RPA.

4.1 For each RPA model in the operator's fleet, identified by RPA make, model and series, the following information shall be included:

a) issuing authority contact details;

b) operator name and ROC number;

c) date of issue and signature of the authority representative;

d) RPA model;

e) RPS model;

f) types and areas of operations; and

g) special limitations and authorizations.

Note — If specific approvals and limitations are identical for two or more models, these models may be grouped in a single list.

4.2 The operations specifications layout referred to in Chapter 4, 4.2.1.3, shall be as follows:

Note.— The MEL constitutes an integral part of the operations manual.

RPAS OPERATIONS SPECIFICATIONS

(subject to the approved conditions in the operations manual)

ISSUING AUTHORITY CONTACT DETAILS[1]

Telephone: _____ Mobile telephone: _____

E-mail: _____

ROC#[2]: _____ Operator name[3]: _____ Date[4]: _____ Signature: _____

Operator trading name: _____

RPA model[5] and variant:

RPS model and variant:

Types of operation[6]:

Area(s) of operation[7]:

Limitations[8]:

SPECIFIC APPROVAL	**YES**	**NO**	**DESCRIPTION[9]**	**REMARKS**
Dangerous goods	☐	☐		
Low visibility operations				
Approach and landing	☐	☐	CAT[10]: _____ RVR: _____ m DH: _____ ft.	
Take-off	☐	☐	RVR[11]: _____ m	

Operational Credits	☐	☐	[12]	
RVSM[13] ☐ N/A	☐	☐		
EDTO[14] ☐ N/A			~~Threshold time[15]: _____ minutes~~ ~~Maximum diversion time[15]: _____ minutes~~	
PBN authorizations	☐	☐	[16]	
Continuing airworthiness			[17]	
EFB N/A	☐	☐	[18]	
Other [19]	☐	☐		

Notes:

1. *Telephone and contact details of the authority, including the country code. Email and fax to be provided if available.*
2. *Insert the associated ROC number.*
3. *Insert the operator's registered name and the operator's trading name, if different. Insert "dba" before the trading name (for "doing business as").*
4. *Issuance date of the operations specifications (dd-mm-yyyy) and signature of the authority representative.*
5. *Insert the Commercial Aviation Safety Team (CAST)/ICAO designation of the RPA make, model and series, or master series, if a series has been designated. The CAST/ICAO taxonomy is available at: http://www.intlaviationstandards.org/. Note— there could be multiple entries in this section*
6. *Very High Level (VHL) operations above FL 600, aerial work, long duration flight, commercial transport etc.*
7. *List the geographical area(s) of authorized operation (by geographical coordinates or specific routes, flight information region or national or regional boundaries), as defined by the issuing authority.*
8. *List the applicable special limitations (e.g. VFR-only, day-only, height, population density or altitude limitations).*
9. *List in this column the most permissive criteria for each specific approval (with appropriate criteria).*
10. *Insert the applicable precision approach category (CAT II, III). Insert the minimum RVR in metres and decision height in feet. One line is used per listed approach category.*

11. Insert the approved minimum take-off RVR in metres, or the equivalent horizontal visibility if RVR is not used. One line per approval may be used if different approvals are granted.

12. List the airborne capabilities (i.e. automatic landing, HUD, EVS, SVS, CVS) and associated operational credit(s) granted.

13. "Not applicable (N/A)" box may be checked only if the RPA maximum ceiling is below FL 290.

14. Reserved for future use.

15. Reserved for future use.

16. Performance-based navigation (PBN): one line is used for each PBN AR navigation specification approval (e.g. RNP AR APCH), with appropriate limitations listed in the "Description" column.

17. Insert the name of the person/organization responsible for ensuring that the continuing airworthiness of the RPAS is maintained and the regulation that requires the work, i.e. within the ROC regulation or a specific approval (e.g. EC2042/2003, Part M, Subpart G).

18. N/A.

19. Other authorizations or data can be entered here, using one line (or one multi-line block) per authorization (e.g. special approach authorization, approved navigation performance

APPENDIX 7. FATIGUE RISK MANAGEMENT SYSTEM REQUIREMENTS

Note.— Guidance on the development and implementation of FRMS regulations is contained in the Manual for the Oversight of Fatigue Management Approaches (Doc 9966).

A Fatigue Risk Management System (FRMS) established in accordance with Chapter 4, 4.8.1 b), shall contain, at a minimum:

1. FRMS POLICY AND DOCUMENTATION

1.1 FRMS policy

1.1.1 The operator shall define its FRMS policy, with all elements of the FRMS clearly identified.

1.1.2 The policy shall require that the scope of FRMS operations be clearly defined in the operations manual.

1.1.3 The policy shall:

a) reflect the shared responsibility of management, remote flight crews, and other involved personnel;

b) clearly state the safety objectives of the FRMS;

c) be signed by the accountable executive of the organization;

d) be communicated, with visible endorsement, to all the relevant areas and levels of the organization;

e) declare management commitment to effective safety reporting;

f) declare management commitment to the provision of adequate resources for the FRMS;

g) declare management commitment to continuous improvement of the FRMS;

h) require that clear lines of accountability for management, remote flight crews, and all other involved personnel are identified; and

i) require periodic reviews to ensure it remains relevant and appropriate.

Note.— Effective safety reporting is described in the Safety Management Manual (SMM) (Doc 9859).

1.2 FRMS documentation

The operator shall develop and keep current FRMS documentation that describes and records:

a) FRMS policy and objectives;

b) FRMS processes and procedures;

c) accountabilities, responsibilities and authorities for these processes and procedures;

d) mechanisms for ongoing involvement of management, remote flight crews members, and all other involved personnel;

e) FRMS training programmes, training requirements and attendance records;

f) scheduled and actual duty periods and rest periods between periods of time-in-position as a remote pilot

during a duty period with significant deviations and reasons for deviations noted; and

Note.— Significant deviations are described in the Manual for the Oversight of Fatigue Management Approaches (Doc 9966).

g) FRMS outputs including findings from collected data, recommendations, and actions taken.

2. FATIGUE RISK MANAGEMENT PROCESSES

2.1 Identification of hazards

Note.— Provisions on the protection of safety information are contained in Annex 19.

The operator shall develop and maintain three fundamental and documented processes for fatigue hazard identification:

2.1.1 *Predictive.* The predictive process shall identify fatigue hazards by examining remote crew scheduling and taking into account factors known to affect sleep and fatigue and their effects on performance. Methods of examination may include but are not limited to:

a) operator or industry operational experience and data collected on similar types of operations;

b) evidence-based scheduling practices; and

c) bio-mathematical models.

2.1.2 *Proactive.* The proactive process shall identify fatigue hazards within current remote flight operations. Methods of examination may include but are not limited to:

a) self-reporting of fatigue risks;

b) remote crew fatigue surveys;

c) relevant, remote flight crew performance data;

d) available safety databases and scientific studies; and

e) analysis of planned versus actual time worked.

2.1.3 *Reactive.* The reactive process shall identify the contribution of fatigue hazards to reports and events associated with potential negative safety consequences in order to determine how the impact of fatigue could have been minimized. At a minimum, the process may be triggered by any of the following:

a) fatigue reports;

b) confidential reports;

c) audit reports;

d) incidents; and

e) flight data analysis events.

2.2 Risk assessment

2.2.1 The operator shall develop and implement risk assessment procedures that determine the probability and potential severity of fatigue-related events and identify when the associated risks require mitigation.

2.2.2 The risk assessment procedures shall review identified hazards and link them to:

a) operational processes;

b) their probability;

c) possible consequences; and

d) the effectiveness of existing safety barriers and controls.

2.3 Risk mitigation

The operator shall develop and implement risk mitigation procedures that:

a) select the appropriate mitigation strategies;

b) implement the mitigation strategies; and

c) monitor the strategies' implementation and effectiveness.

3. FRMS SAFETY ASSURANCE PROCESSES

The operator shall develop and maintain FRMS safety assurance processes to:

a) provide for continuous FRMS performance monitoring, analysis of trends, and measurement to validate the effectiveness of the fatigue safety risk controls. The sources of data may include, but are not limited to:

1) hazard reporting and investigations;

2) audits and surveys; and

3) reviews and fatigue studies;

b) provide a formal process for the management of change. This shall include but is not limited to:

1) identification of changes in the operational environment that may affect FRMS;

2) identification of changes within the organization that may affect FRMS; and

3) consideration of available tools which could be used to maintain or improve FRMS performance prior to implementing changes; and

c) provide for the continuous improvement of the FRMS. This shall include but is not limited to:

1) the elimination and/or modification of risk controls that have had unintended consequences or that are no longer needed due to changes in the operational or organizational environment;

2) routine evaluations of facilities, equipment, documentation and procedures; and

3) the determination of the need to introduce new processes and procedures to mitigate emerging fatigue-related risks.

4. FRMS PROMOTION PROCESSES

FRMS promotion processes support the ongoing development of the FRMS, the continuous improvement of its overall performance, and attainment of optimum safety levels. The following shall be established and implemented by the operator as part of its FRMS:

a) training programmes to ensure competency commensurate with the roles and responsibilities of management, remote flight crew, and all other involved personnel under the planned FRMS; and

b) an effective FRMS communication plan that:

1) explains FRMS policies, procedures and responsibilities to all relevant stakeholders; and

2) describes communication channels used to gather and disseminate FRMS-related information.

APPENDIX 8. RPAS RECORDER SYSTEMS

(Chapter 6, 6.5, refers)

1. GENERAL REQUIREMENTS

1.1 Non-deployable RPA-RS containers shall be painted a distinctive orange colour.

1.2 Non-deployable RPA-RS crash-protected flight recorder containers shall:

a) carry reflective material to facilitate their location; and

b) have securely attached an automatically activated underwater locating device operating at a frequency of 37.5 kHz. This device shall operate for a minimum of 90 days.

1.3 Automatic deployable flight recorder containers shall:

a) be painted a distinctive orange colour, however the surface visible from outside the aircraft may be of another colour; and

b) carry reflective material to facilitate their location; and

1.4 The RPA-RS shall be installed so that:

a) the probability of damage to the recordings is minimized;

b) there is an aural or visual means for pre-flight checking that the RPA-RS are operating properly; and

c) if the RPA-RS have an erasure device, the installation shall be designed to prevent operation of the device during flight time or crash impact; and

d) a remote flight crew-operated erase function shall be provided at the RPS which, when activated, modifies the recording of an RPAS-RS so that it cannot be retrieved using normal replay or copying techniques. The installation shall be designed to prevent activation during flight. In addition, the probability of an inadvertent activation of an erase function during an accident shall also be minimized.

Note.— The erase function is intended to prevent access to RPAS-RS recordings by normal replay or copying means, but would not prevent accident investigation authorities access to such recordings by specialized replay or copying techniques.

1.5 Crash protected RPA-RS needs to be powered by the most reliable power source of the RPA or in the case of RPS, the RPS-RS should also be on the most reliable power source, without jeopardizing service to essential or emergency loads.

1.6 The RPAS-RS, when tested by methods approved by the appropriate certificating authority, shall be demonstrated to be suitable for the environmental extremes over which they are designed to operate.

1.7 Means shall be provided for an accurate time correlation between the RPAS-RS recordings.

1.8 The manufacturer shall provide the appropriate certificating authority with the following information in respect of the RPAS-RS:

a) manufacturer’s operating instructions, equipment limitations and installation procedures;

b) parameter origin or source and equations which relate counts to units of measurement; and

c) manufacturer's test reports.

1.9 The RPAS-RS needs to be considered taking into account three aspects: the data recording requirements and equipment needed in RPA, the recording of C2 Link and the data recording and equipment requirements in RPS. All the data received and transmitted needs to be recorded whether it is flight data, audio or image data used to manage the RPA, or flight data transmitted to the RPA. All recorded data provided needs to be time synchronized with UTC time, not encrypted (to ensure compatibility with 6.5.7.3) and provided with any documentation needed to extract the data. The data frame layout documentation should be in electronic format and, recorded on the ground. In addition, if practicable, depending on the size of the RPA, a copy of the data frame layout documentation pertaining to the RPA-RS data should be recorded on the RPA-RS'.

Note.— The limitation regarding encryption applies to recorded data and is not intended to limit the use of encryption on systems requiring such protection (e.g. the C2 Link).

1.10 Data protection is an important aspect when dealing with data recordings, aspects related to how the data may be used and especially accessibility to audio and image data used to manage the flight of the RPA should be regulated. The provisions in Annex 13 — *Aircraft Accident and Incident* Investigation, 5.12 and Attachment E are applicable during accident and incident investigations, and the provisions in Annex 19 are applicable for safety management considerations. Provisions specific to the protection of RPAS recordings can be found in 3.3 of this Part.

1.11 The data should be retained for a minimum period of 30 days, from the completion of the flight, or flight segment, on the RPS-RS, but the capability for extended flight should be recognized and the time for data retention needs to be extended accordingly, to encompass the type of operation the RPAS may be involved in.

1.12 As referred to in Section 6.5.1 of this Part, both the RPA and RPS may need to have capabilities to record flight information. The RPA should record the flight data needed to be able to accurately reconstruct the RPA flight. For extremely lightweight RPA, this flight data may be transmitted throughout the flight for recording by the RPS-RS. If the RPA is required to carry an RPA-RS, the RPS shall separately record the flight data to reconstruct the flight from the data received by the RPS. Data relating to the C2 Link between the RPA and RPS shall be recorded on both the RPA and RPS in order that the integrity of the C2 uplink during the flight be determined.

2. RPA-RECORDER SYSTEM

As referred to in Section 6.5.1 of this Part, for RPA less than 2 250 kg MCTOM an RPA-RS is not mandatory AS such, the type and size of the RPA-RS fitted to such an RPA should be in relation to the size of the RPA and the type of operations in which it is involved. In the case of larger RPA the same capability of RPA-RS as fitted to similar size manned aircraft should be used. In the case of smaller RPA where crash and fire protection standards are impractical, the recording of flight data should be in such a way that crash and fire protected provisions are commensurate to the risk of losing the flight information during an accident or serious incident.

3. RPA FUNCTIONS TO RECORD

An RPA is comprised of numerous complex systems which may require more and different functions be recorded than for typical manned aircraft (i.e. an aeroplane or a helicopter) of similar size, however when parameters in function lists are considered it will be in relation to the type of operation of the RPA. Functions that typically need to be recorded at the RPA are as follows:

a) Telecommand (C2 uplink information) and telemetry (C2 downlink information) received at and sent from the RPA via C2 Link;

b) information to be able to accurately reconstruct RPA flight path, speed, attitude and configuration at a minimum rate of once a second;

c) information to be recorded to determine operating status of RPA systems, at least flight controls, propulsion, power-supply, navigation, flight modes;

d) parameters relating to C2 Link operation for determining types of link errors;

e) contingency/emergency situations (Warning alerts indicating failure of an essential airborne system, TAWS warnings, detect-and-avoid warnings, fire warnings, etc.);

f) if image streaming was used to manage the RPA, images relating to the image streaming should be recorded.

4. RPS RECORDER SYSTEM

4.1 Recording data should not be restricted by the mass and power limitations that exist in manned aircraft. The recorder capabilities should be more expanded and larger amounts of data could be recorded with little to no limitations on the duration of recordings. Furthermore, there will be no need to fit crash protected RPS-RS in the RPS. So called “duplicate data” should be recorded in order to be able to reconstruct uplink errors if such errors occurred during the accident or incident flight. In the case of flight data streaming from the RPA, the RPS RS should be able to record these large amounts of flight data.

4.2 An RPS may control several RPA over the period of a particular RPA flight, and a single RPA flight might utilize several RPS. Flight data needs to be recorded in order to reconstruct the air situation display that was used to control an individual RPA. In the case of sequentially controlling multiple RPA, the data exchanged with each RPA needs to be identifiable in the recorded flight data.

4.3 In the case of many RPS controlling a RPA during its whole flight, data needs to be recorded in order to reconstruct the C2 uplink information that was used to manage the RPA.

4.4 Types of parameters and parameter list specifications will need to be determined for the RPS considering the scale and type of operation in which the RPAS is involved.

5. RPS FUNCTIONS TO RECORD

5.1 The RPS can range from a hand-held device up to a multi-console station. It may be stationary or mobile (installed in a vehicle/ship/aircraft). Parameters that typically need to be recorded at the RPS are as follows:

a) uplink and downlink parameters sent and received by the RPS via C2 Link;

b) parameters to be able to accurately determine what control inputs the remote pilot made to manage the RPA. In cases where the remote pilot has direct control of the RPA attitude then attitude data shall be recorded at appropriate rate;

c) parameters relating to significant pilot actions, for example switch operations, hand over procedures initiation/completions/attempts and associated time of their occurrences respectively the actual state of critical RPS systems including switch states and display settings;

d) parameters to be able to accurately reconstruct what was displayed to the RPA pilot during the occurrence flight in terms of flight path, speed, attitude and configuration of the RPA. If image streaming is used to manage the RPA, image streaming shall be recorded; and

e) data link communications applications, including digital communications with Air Traffic Management

(ATM), having an effect on the navigation and flight profile of the RPA;

5.2 To investigate the operational environment in which the pilots' work, audio and image data used to manage the RPA provide information for investigating how human factors contributed to the outcomes of the occurrence. The RPS environment is equivalent to the cockpit of a manned aircraft and all audio should be recorded. This will include the general environment audio and any operational discussions with ATC, other pilot, AOC/flight discussions and all telephone calls.

5.3 Commensurate with the scale of the RPAS, consideration should be given to audio recordings in cases of either single pilot, single pilots in multiple RPS or multi-pilot operations. An l area microphone should be used, and in multi-pilot operations pilot channel segregation of operating personnel should be incorporated.

5.4 Non-audio communications should be also recorded. For example, communications like text messages and communications similar to controller-pilot data link communications (CPDLC) and/or communication, navigation and surveillance (CNS) ATM messages.

5.5 Image data on the RPS needs to provide information about non-verbal communications, pilot actions and other external distractions that may have contributed to what caused the occurrence. Image data used to manage the RPA will also provide information about what was effectively displayed to the pilot in cases where parameters from flight data recordings were not recorded properly. The image data used to manage the RPA would also clarify what the pilot saw as captured by an on-board RPA camera and relayed to the RPS via the C2 Link in cases where the RPA is managed by means of video displayed to the RPS pilot.

Note.— To respect crew privacy, the cockpit area view should be designed, as far as practical, to exclude the head and shoulders of crew members whilst seated in their normal operating position.

6. INSPECTION OF RPAS RECORDER SYSTEMS

6.1 The built-in test features for the RPA-RS shall be monitored by automatic checks.

6.2 RPA-RS shall have recording inspection intervals of one year. Subject to the approval from the appropriate regulatory authority, this period may be extended to two years provided these systems have demonstrated a high integrity of serviceability and self-monitoring.

6.3 Recording inspections shall be carried out as follows:

a) an analysis of the recorded data from the RPA-RS shall ensure that the recording system operates correctly for the nominal duration of the recording;

b) the recording of the parameters from a complete flight shall be examined in engineering units to evaluate the validity of all recorded functions. Flights over 2 hours need to review all phases of flight including 30 minutes a at cruise or loiter. Particular attention shall be given to parameters from sensors dedicated to the RPA-RS. Parameters taken from the RPA's electrical bus system need not be checked if their serviceability can be detected by other RPA systems;

c) the readout facility shall have the necessary software to accurately convert the recorded values to engineering units and to determine the status of discrete signals;

d) an examination of the images used to manage the RPA, and required to be recorded, shall be carried out by replay of the image recording;

e) If a system if cameras is installed in the RPA or RPS, to record such images, this system shall record test images from each RPAS source and from relevant external sources to ensure that all required images meet recording quality standards.

6.4 RPA-RS and RPS-RS shall be considered unserviceable if there is a significant period of poor-quality data,

unintelligible signals, or if one or more of the mandatory functions is not recorded correctly

6.5 The most recent report of the recording inspection shall be made available on request to regulatory authorities for monitoring purposes.

APPENDIX 9. LOCATION OF AN RPA IN DISTRESS

(Chapter 6, 6.18, refers)

Note 1. —Although currently, ICAO RPAS SARPs have not been written with the intent that persons will be carried on board the RPA, the text has been included in order to reflect that the need to locate an RPA may be required in order to assist in any subsequent accident investigations, or in order to limit any environmental impact from any hazardous items in, or carried on board, the RPA.

Note 2. — To avoid the unnecessary deployment of, and risk to, Search and Rescue personnel, ELTs shall not be installed on RPA that do not have persons on board.

1. PURPOSE AND SCOPE

1.1 Location of an RPA in distress aims at establishing, to a reasonable extent, the location of an accident site within a 6 NM radius.

2. OPERATION

2.1 An RPA automatically transmits information from which its position can be determined by the operator and the position information contains a time stamp. It shall also be possible for this transmission to be activated manually from the RPS or other means. This transmission shall be received at an RPS capable of maintaining a record of the transmission. The system used for the transmission of position information shall continue to transmit that information in the event of a lost C2 Link.

Note.— Guidance on the location of an RPA in distress is provided in Attachment K.

2.2 When an operator or an air traffic service unit (ATSU) has reason to believe that an RPA is in distress, coordination shall be established between the ATSU and the operator.

2.3 The State of the Operator shall identify the organizations that will require the position information of an RPA in an emergency phase. Such notifications shall include the fact that there are zero souls on board. These shall include, as a minimum:

a) air traffic service unit(s) (ATSU); and

b) SAR rescue coordination centre(s) (RCC) and sub-centres.

Note 1.— Refer to Annex 11 for emergency phase criteria.

ATTACHMENT A. MEDICAL SUPPLIES AT THE RPS

TYPES AND LOCATION OF MEDICAL SUPPLIES

1. TYPES

1.1 Medical supplies should be provided as first-aid kit(s) for inclusion at an RPS in accordance with national standards and requirements for medical supplies in the work place.

2. LOCATION

2.1 First-aid and universal precaution kits should be distributed as evenly as practicable throughout the workplace, but should also be readily accessible to the remote flight crew.

2.2 The medical kit, when provided, should be stored in an appropriate secure location.

ATTACHMENT B. RPA PERFORMANCE OPERATING LIMITATIONS

Reserved for future use.

ATTACHMENT C. GUIDANCE FOR OPERATIONS BY TURBINE-ENGINED RPA BEYOND 60 MINUTES TO AN EN-ROUTE ALTERNATE AERODROME INCLUDING EXTENDED DIVERSION TIME OPERATIONS (ETDO)

Reserved for future use.

ATTACHMENT D. RPAS OPERATOR CERTIFICATION AND VALIDATION

Supplementary to Chapter 4, 4.2.1

1. PURPOSE AND SCOPE

1.1 Introduction

The purpose of this Attachment is to provide guidance concerning actions required by States in connection with the operator certification requirements in Chapter 4, 4.2.1, particularly the means of accomplishing and recording those actions.

1.2 Prior certification required

In accordance with Standard 4.2.1.4, the issuance of a RPAS operator certificate (ROC) is “dependent upon the operator demonstrating” to the State that its organization, training policy and programmes, flight operations, ground handling and maintenance arrangements are adequate considering the nature and extent of the operations to be conducted. The certification process involves the State’s evaluation of each operator and a determination that the operator is capable of conducting safe operations before initial issuance of an ROC or the addition of any subsequent authorizations to an ROC.

1.3 Standard certification practices

The State of the Operator is required by Standard 4.2.1.14 to establish a certification system to ensure compliance with the required standards for the type of operation to be conducted. Several States have developed policies and procedures to comply with this certification requirement as industry capabilities evolve. While those States did not develop their certification practices in coordination with each other, their practices are remarkably similar and consistent in their requirements. The effectiveness of their practices has been validated over many years, resulting in improved safety records of operators throughout the world. Many of these certification practices have been incorporated by reference in ICAO provisions.

2. REQUIRED TECHNICAL SAFETY EVALUATIONS

2.1 Specific approval, approval and acceptance actions

2.1.1 The certification and continued surveillance of an RPAS operator includes actions taken by a State on matters submitted for its review. The actions can be categorized as specific approvals, approvals or acceptances depending on the nature of the response by the State to the matter submitted for its review.

2.1.2 A specific approval is an approval which is documented in the Operations Specifications for applicable RPA models.

2.1.3 An acceptance does not necessarily require an active response by the State to a matter submitted for its review. A State may accept a matter submitted to it for review as being in compliance with the applicable standards if the State does not specifically reject all or a portion of the matter under review, usually after some defined period of time after submission.

2.1.4 The phrase “approved by the State” or similar phrases using the word “approval” are frequently used in Annex 6, Part IV. Provisions indicating a review and implying approval or at least “acceptance” by the State occur even more frequently in Annex 6, Part IV. In addition to these specific phrases, Annex 6, Part IV, contains numerous references to requirements which would, as a minimum, create the need for at least a technical review by the State. This Attachment groups and outlines those specific Standards and Recommended Practices for ease of use by States.

2.1.5 The State should make or arrange for a technical safety evaluation before issuing the specific approval, approval or acceptance. The evaluation should:

a) be accomplished by a person with specific qualifications to make such a technical evaluation;

b) be in accordance with written, standardized methodology; and

c) where necessary to safety, include a practical demonstration of the operator's actual ability to conduct such an operation.

2.2 Demonstrations before issuance of some specific approvals and approvals

2.2.1 Standard 4.2.1.4 obligates the State of the Operator, prior to certification of the operator, to require sufficient demonstrations by the operator to enable the State to evaluate the adequacy of the operator's organization, method of control and supervision of remote flight operations, ground handling and maintenance arrangements. These demonstrations should be in addition to the review or inspections of manuals, records, facilities and equipment. Some of the specific approvals and approvals required by Annex 6, Part IV, such as specific approval for low visibility operations, have significant safety implications and should be validated by demonstration before the State authorizes such operations.

2.2.2 While the specific methodology and extent of the required demonstrations and evaluations vary between States, the certification processes of States whose operators have good safety records are generally consistent. In these States, technically qualified inspectors evaluate a representative sample of the actual training, maintenance and operations prior to the issuance of an ROC or additional authorizations to the ROC.

2.3 Recording of certification actions

2.3.1 It is important that the certification, specific approval, approval and acceptance actions of the State are adequately documented. The State should issue a written instrument, such as a letter or formal document, as an official record of the action. These written instruments should be retained as long as the operator continues to exercise the authorizations for which the specific approval, approval or acceptance action was issued. These instruments are unambiguous evidence of the authorizations held by the operator and provide proof in the event that the State and the operator disagree on the operations that the operator is authorized to conduct.

2.3.2 Some States collect certification records such as inspections, demonstrations, specific approvals, approvals and acceptance instruments into a single file which is retained as long as the operator is active. Other States retain these records in files according to the certification action performed, and revise the file as the specific approvals, approvals or acceptance instruments are updated. Regardless of the method used, these certification records are persuasive evidence that a State is complying with its ICAO obligations regarding operator certification.

2.4 Coordination of operations and airworthiness evaluations

Some of the references to specific approval, approval or acceptance in Annex 6, Part IV, will require an operations evaluation and an airworthiness evaluation. Specific approvals for automatic landings, for example, require coordinated prior evaluation by operations and airworthiness specialists. Flight operations specialists should evaluate the operational procedures, training and qualifications. Airworthiness specialists should evaluate the RPA and the RPS, equipment reliability and maintenance procedures. These evaluations may be accomplished separately, but should be coordinated to ensure that all aspects necessary for safety have been addressed before any specific approval, approval or acceptance is issued.

2.5 State of the Operator and State of Registry responsibilities

2.5.1 Annex 6, Part IV, places the responsibility for initial certification, issuance of the ROC, and ongoing

surveillance of an RPAS operator on the State of the Operator. Annex 6, Part IV, also requires the State of the Operator to consider or act in accordance with various approvals and acceptances by the State of Registry. Under these provisions, the State of the Operator should ensure that its actions are consistent with the approvals and acceptances of the State of Registry and that the operator is in compliance with State of Registry requirements.

2.5.2 It is essential that the State of the Operator be satisfied with the arrangements by which its RPAS operators use RPA on the register of another State, particularly for maintenance and crew training. The State of the Operator should review such arrangements in coordination with the State of Registry. Where appropriate, an agreement transferring oversight responsibilities from the State of Registry to the State of the Operator pursuant to Article 83 bis to the Convention on International Civil Aviation should be arranged to preclude any misunderstandings regarding which State is responsible for specific oversight responsibilities.

Note.— Guidance concerning the responsibilities of the State of the Operator and the State of Registry in connection with lease, charter and interchange operations is contained in the Manual of Procedures for Operations Inspection, Certification and Continued Surveillance (Doc 8335). Guidance concerning the transfer of State of Registry responsibilities to the State of the Operator in accordance with Article 83 bis is contained in Guidance on the Implementation of Article 83 bis of the Convention on International Civil Aviation (Cir 295).

3. AUTHORIZATIONS

An authorization entitles an operator, owner or pilot-in-command to undertake the authorized operations. Authorizations can take the form of specific approvals, approvals or acceptances.

3.1 Specific approval actions

3.1.1 The term “specific approval” indicates a formal action on the part of the State of the Operator which results in an addition to the operations specification.

3.1.2 The following provisions make explicit reference to the need for a specific approval:

a) Automatic landing and take-off capabilities [4.2.8.3 and 4.2.8.4];

b) Low visibility Operations when conducted ‘visually’ [4.2.8.3.1 and 4.2.8.4.1];

c) RNP AR navigation specifications for PBN Operations [7.2.4];

d) Reduced Vertical Separation Minima [7.2.6]; and

e) Dangerous Goods [14.4].

3.1.3 An example of a Remote Operations Specification template is provided in Appendix 6.

3.2 RPAS operator certificate (ROC)

3.2.1 The ROC required by Annex 6, Part IV, Chapter 4, 4.2.1, is a formal instrument. Chapter 4, 4.2.1.10, lists the information to be included in the ROC.

3.2.2 In addition to the items in Appendix 6, paragraph 3, operations specifications may include other specific approvals, such as:

a) special aerodrome operations (e.g. short take-off and landing operations or land and hold short operations);

b) special approach procedures (e.g. steep gradient approach, instrument landing system precision runway monitor approach, localizer-type directional aid precision runway monitor approach); and

c) operations in areas with special procedures (e.g. operations in areas using different altimetry units or altimeter setting procedures).

3.3 Approval actions

3.3.1 The term “approval” indicates a more formal action on the part of the State with respect to a certification matter than does the term “acceptance”. Some States require the Director of the Civil Aviation Authority (CAA) or a designated lower-level CAA official to issue a formal written instrument for every “approval” action taken. Other States allow a variety of documents to be issued as evidence of an approval. The approval document issued and the matter addressed by the approval will depend on the delegated authority of the official. In such States, authority to sign routine approvals, such as operator minimum equipment lists for specific RPAS, is delegated to technical inspectors. More complex or significant approvals are normally issued by higher-level officials.

3.3.2 **Provisions that require an approval**

The following provisions require or encourage approval by specified States. The approval of the State of the Operator is required in all of the certification actions listed below that are not preceded by one or more asterisks. Certification actions listed below that are preceded by one or more asterisks require approval by the State of Registry (single asterisk or “*”), or by the State of Design (double asterisk or “**”). However, the State of the Operator should take the necessary steps to ensure that operators for which it is responsible comply with any applicable approvals issued by the State of Registry and/or State of Design, in addition to its own requirements.

Note.— Items that require a specific approval are not included here. Refer to 3.1.2 for a list of these provisions.

a) **Configuration deviation list (CDL) (Definitions);

b) **Master minimum equipment list (MMEL) (Definitions);

c) The method for establishing minimum flight altitudes (4.2.7.3);

d) The method of determining aerodrome operating minima (4.2.8.1);

e) Fatigue Management (4.8);

f) Additional requirements for operations of approved single-engine RPA over heavily populated areas (5.4);

g) RPAS specific minimum equipment list (MEL) (6.1.3);

h) Performance-based navigation operations (7.2.2);

i) RVSM operations (7.2.6 b));

j) Procedures for electronic navigation data management (7.5.1);

k) *RPA or RPS-specific maintenance programme (8.3.1);

l) *Approved maintenance organization (Annex 8, Part II, Chapter 6, 6.2);

m) *Maintenance quality assurance methodology (Annex 8, Part II, Chapter 6, 6.4.1);

n) Remote flight crew training programmes (9.3);

o) Training in the transport of dangerous goods (9.3.2, Note 5);

p) Aerodrome additional safety margin (9.4.4.3 a));

q) Remote pilot-in-command area, route and aerodrome qualifications (9.4.4.5);

r) Use of flight simulation training devices (9.3.2, Note 2 and 9.4.5.3, Note 1);

s) Method of control and supervision of remote or split flight operations (4.2.1.4 and 10.1);

t) **Mandatory maintenance tasks and intervals (11.3.2);

u) Security training programmes (13.1.2);

3.4 Provisions that require a technical evaluation

Other provisions in Annex 6, Part IV, require the State to have made a technical evaluation. These provisions contain the phrases “acceptable to the State”, “satisfactory to the State”, “determined by the State”, “deemed acceptable by the State”, and “prescribed by the State”. While not necessarily requiring an approval by the State, these Standards do require the State to at least accept the matter at issue after it conducts a specific review or evaluation. These provisions are:

a) details of the RPAS specific checklists (Definition: RPAS operating manual and 6.1.4);

b) details of the RPAS specific systems (Definition: RPAS operating manual and 6.1.4);

c) mandatory material for the operations manual (4.2..3.2/ Appendix 2);

d) engine trend monitoring systems (5.4.2);

e) requirements for approval to operate in RVSM airspace (7.2.6);

f) monitoring of height-keeping performance of RPA approved to operate in RVSM airspace (7.2.7);

g) procedures for distribution and insertion of electronic navigation data in RPAS (7.5.2);

h) *operator’s RPAS-specific maintenance responsibilities (8.1.1);

i) *method of maintenance and release (8.1.2);

j) *maintenance control manual (8.2.1);

k) *mandatory material for the maintenance control manual (8.2.4);

l) *reporting of maintenance experience information (8.5.1);

m) *implementing necessary maintenance corrective actions (8.5.2);

n) *modification and repair requirements (8.6);

o) *minimum competence level of maintenance personnel (Annex 8, Part II, Chapter 6, 6.6.4);

p) training facilities (9.3.2);

q) qualifications of remote flight instructors (9.3.2);

r) need for recurrent training (9.3.3);

s) use of correspondence courses and written examinations (9.3.2, Note 4);

t) use of flight simulation training devices (9.3.2, 9.3.3 and 9.3.5);

u) remote flight crew qualification records (9.4.4.4);

v) designated representative of the State of the Operator (9.4.5);

w) remote pilot experience, recency and training requirements for single remote pilot operations under IFR or at night (9.4.5.1 and 9.4.5.2);

x) *flight manual changes (11.1);

y) altimetry system performance requirements for operations in RVSM airspace (Appendix 4, 1 and 2);

Single-engine operations

z) engine reliability for approved operations by single-engine turbine-powered RPA over heavily populated areas (Appendix 3, 1.1);

aa) systems and equipment (Appendix 3, 2);

bb) minimum equipment list (Appendix 3, 3);

cc) flight manual information (Appendix 3, 4);

dd) event reporting (Appendix 3, 5);

ee) operator planning (Appendix 3, 6);

ff) remote flight crew experience, training and checking (Appendix 3, 7); and

gg) operator certification or validation (Appendix 3, 9).

4. ACCEPTANCE ACTIONS

4.1 Acceptance

4.1.1 The actual extent of the State's technical evaluation of the operator's readiness to conduct certain remote flight operations should be much broader than just those Standards which require or imply approval. During certification, the State should ensure that the operator will be in compliance with all requirements of Annex 6, Part IV, prior to conducting international RPAS operations.

4.1.2 The concept of "acceptance" is used by some States as a formal method of ensuring that all critical aspects of operator certification are reviewed by the State prior to the formal issuance of the ROC. Using this concept, these States exercise their prerogative to have technical inspectors review all operators' policies and procedures impacting operational safety. The actual execution of an instrument to reflect this acceptance (assuming such a document is issued) may be delegated to the technical inspector assigned to the certification.

4.2 Conformance report

Some States use a conformance report to document the acceptances it makes with regard to a particular operator. This is a document submitted by the operator detailing how, with specific references to operations or maintenance control manuals, it will comply with all applicable State regulations. This type of document is referenced in Doc 8335 and the Airworthiness Manual (Doc 9760). Such a conformance report should be actively used during the certification process and revised as necessary to reflect modifications required by the State in the operator's policies and procedures. Then a final conformance report is included in the State's certification records, along with other records of certification. The conformance report is an excellent method of demonstrating that the

operator was properly certificated with respect to all applicable regulatory requirements.

4.3 Operations and maintenance control manuals

4.3.1 Operations and maintenance control manuals, and any subsequent amendments should be submitted to the State (4.2.4.3, 8.1.1, 8.2.4, 8.3.2, and Annex 8, Part II, Chapter 6, 6.3.3). The State also establishes minimum contents for these manuals (11.2, 11.3, 11.4 and Appendix 2). The pertinent portions of the operator's manual for evaluation should be identified in the State's technical guidance, e.g. operations policy manual, operating manual, route guide, and training manual. Some States issue a formal instrument accepting each manual and any subsequent amendments.

4.3.2 The State's technical evaluation should, in addition to ensuring that all required contents are addressed, consider if the specific policies and procedures would result in the desired outcome. For example, the specifications for the operational flight plan (Appendix 2, 2.1.16) should provide the-step by-step completion guidance necessary for compliance with 4.3 concerning the content and retention of these plans.

4.3.3 Proven industry practices, such as an example of an actual completed operational flight plan for reference by the remote flight crew and dispatchers (although not a Standard), may also be required by a State's technical evaluator during certification. This aspect of the technical evaluation should be conducted by inspectors experienced in operator certification. A major consideration with respect to evaluating for proven industry practices that are RPAS specific, equipment-specific or have limited applications is the employment of evaluators who are currently qualified in the practice to be evaluated.

5. OTHER APPROVAL OR ACCEPTANCE CONSIDERATIONS

Some States provide for approval or acceptance of certain critical documents, records or procedures specified in Annex 6, Part IV, although the relevant Annex 6 Standards do not require approval or acceptance by the State of the Operator. The following are some examples:

a) flight data analysis programme (3.3.4);

b) method for obtaining aeronautical data (4.1.1);

c) adequacy of the fuel and oil records (4.2.10);

d) adequacy of remote flight time, remote flight duty and rest period records (4.8);

e) adequacy of the RPA and RPS technical logs (4.3.1 a), b), c), d) and e));

f) adequacy of the load manifest (4.3.1 f), g) and h));

g) adequacy of the operational plan (4.3.1 i));

h) method for obtaining weather data (4.3.5.1);

i) RPA performance operating limitations (5.2.4);

j) method of obtaining and applying aerodrome obstacle data (5.3);

k) contents of the journey log book (11.4.1); and

l) content of the security training programme (13.4).

6. VALIDATION OF THE STANDARD OF OPERATIONS

Standard 4.2.1.13 requires that the validity of an ROC shall depend upon the operator maintaining the original certification standards (4.2.1.4) under the supervision of the State of the Operator. This supervision requires that

a system of continued surveillance be established to ensure the required standards of operations are maintained (4.2.1.14). A good starting point in the development of such a system is to require annual or semi-annual inspections, observations and tests to validate the required certification specific approval, approval and acceptance actions.

7. AMENDMENT OF RPAS OPERATOR CERTIFICATES

The certification of the operator is an ongoing process. Few operators will be satisfied over time with the initial authorizations issued with their ROC. Evolving market opportunities will cause the operator to change RPAS models/types and seek approval for new operational areas requiring other additional capabilities. Additional technical evaluations should be required by the State before issuing the formal written instruments approving any changes to the original ROC and other authorizations. Where possible, each request should be “bridged”, using the original authorization as the foundation to determine the extent of the State’s impending evaluation before issuing the formal instrument.

ATTACHMENT E. MINIMUM EQUIPMENT LIST (MEL)

Supplementary to Chapter 6, 6.1.3

1. If deviations from the requirements of States in the certification of RPA were not permitted an RPAS could not be operated unless all systems and equipment were operable. Experience has proved that some unserviceability can be accepted in the short term when the remaining operative systems and equipment provide for continued safe operations.

2. Unless the State of the Operator has approved a minimum equipment list (MEL) specifying systems and items of equipment within the RPA and RPS permitted to be inoperative at commencement of flight, no flight can be conducted with inoperative systems or equipment

3. A minimum equipment list, approved by the State of the Operator, is therefore necessary for each RPA and RPS, based on the master minimum equipment list established for the RPA type and RPA type if applicable by the organization responsible for the type design in conjunction with the State of Design.

4. The State of the Operator should require the operator to prepare a minimum equipment list designed to allow the operation of an RPAS with certain systems or equipment inoperative provided an acceptable level of safety is maintained.

5. The minimum equipment list is not intended to provide for operation of the RPAS for an indefinite period with inoperative systems or equipment. The basic purpose of the minimum equipment list is to permit the safe operation of an RPAS with inoperative systems or equipment within the framework of a controlled and sound programme of repairs and parts replacement.

6. Operators are to ensure that no flight is commenced with multiple minimum equipment list items inoperative without determining that any interrelationship between inoperative systems or components will not result in an unacceptable degradation in the level of safety and/or undue increase in the remote flight crew workload.

7. The exposure to additional failures during continued operation with inoperative systems or equipment must also be considered in determining that an acceptable level of safety is being maintained. The minimum equipment list may not deviate from requirements of the flight manual limitations section, emergency procedures or other airworthiness requirements of the State of Registry or of the State of the Operator unless the appropriate airworthiness authority or the flight manual provides otherwise.

8. Systems or equipment accepted as inoperative for a flight should be suitably indicated (placarded) or disabled in the RPA and within the RPS where appropriate, and all such items should be noted in the RPA or RPS technical log to inform the remote flight crew and maintenance personnel of the inoperative system or equipment. This information should also be transferred as part of the handover process to another RPS.

9. For a particular system or item of equipment to be accepted as inoperative, it may be necessary to establish a maintenance procedure, for completion prior to flight, to de-activate or isolate the system or equipment. It may similarly be necessary to prepare an appropriate remote flight crew operating procedure.

10. The responsibilities of the remote pilot-in-command in accepting an RPAS for operation with deficiencies in accordance with a minimum equipment list are specified in Chapter 4, 4.3.1.

ATTACHMENT F. FLIGHT SAFETY DOCUMENTS SYSTEM

Supplementary to Chapter 3, 3.3.7

1. INTRODUCTION

1.1 The following material provides guidance on the organization and development of the operator's flight safety documents system. It should be understood that the development of a flight safety documents system is a complete process, and changes to each document comprising the system may affect the entire system. Guidelines applicable to the development of operational documents have been produced by government and industry sources and are available to operators. Nevertheless, it may be difficult for operators to make the best use of these guidelines, since they are distributed across a number of publications.

1.2 Furthermore, guidelines applicable to operational documents development tend to focus on a single aspect of documents design, for example, formatting and typography. Guidelines rarely cover the entire process of operational documents development. It is important for operational documents to be consistent with each other, and consistent with regulations, manufacturer requirements and Human Factors principles. It is also necessary to ensure consistency across departments as well as consistency in application. Hence the emphasis on an integrated approach, based on the notion of the operational documents as a complete system.

1.3 The guidelines in this Attachment address the major aspects of the operator's flight safety documents system development process, with the aim of ensuring compliance with Chapter 3, 3.3.7. The guidelines are based not only upon scientific research, but also upon current best industry practices, with an emphasis on a high degree of operational relevance.

2. ORGANIZATION

2.1 A flight safety documents system should be organized according to criteria which ensure easy access to information required for flight and ground operations contained in the various operational documents comprising the system and which facilitate management of the distribution and revision of operational documents.

2.2 Information contained in a flight safety documents system should be grouped according to the importance and use of the information, as follows:

a) time-critical information, e.g., information that can jeopardize the safety of the operation if not immediately available;

b) time-sensitive information, e.g., information that can affect the level of safety or delay the operation if not available in a short time period;

c) frequently used information;

d) information, e.g., information that is required for the operation but does not fall under b) or c) above; and

e) information that can be grouped based on the phase of operation in which it is used.

2.3 Time-critical information should be placed early and prominently in the flight safety documents system.

2.4 Time-critical information, time-sensitive information, and frequently used information should be placed in cards and quick-reference guides.

3. VALIDATION

The flight safety documents system should be validated before deployment, under realistic conditions. Validation

should involve the critical aspects of the information use, in order to verify its effectiveness. Interactions among all groups that can occur during operations should also be included in the validation process.

4. DESIGN

4.1 A flight safety documents system should maintain consistency in terminology and in the use of standard terms for common items and actions.

4.2 Operational documents should include a glossary of terms, acronyms and their standard definition, updated on a regular basis to ensure access to the most recent terminology. All significant terms, acronyms and abbreviations included in the flight documents system should be defined.

4.3 A flight safety documents system should ensure standardization across document types, including writing style, terminology, use of graphics and symbols, and formatting across documents. This includes a consistent location of specific types of information, consistent use of units of measurement and consistent use of codes.

4.4 A flight safety documents system should include a master index to locate, in a timely manner, information included in more than one operational document.

Note.— The master index must be placed in the front of each document and consist of no more than three levels of indexing. Pages containing abnormal and emergency information must be tabbed for direct access.

4.5 A flight safety documents system should comply with the requirements of the operator's quality system, if applicable.

5. DEPLOYMENT

Operators should monitor deployment of the flight safety documents system, to ensure appropriate and realistic use of the documents, based on the characteristics of the operational environment and in a way which is both operationally relevant and beneficial to operational personnel. This monitoring should include a formal feedback system for obtaining input from operational personnel.

6. AMENDMENT

6.1 Operators should develop an information gathering, review, distribution and revision control system to process information and data obtained from all sources relevant to the type of operation conducted, including, but not limited to, the State of the Operator, State of design, State of Registry, manufacturers and equipment vendors.

Note.— Manufacturers provide information for the operation of specific RPAS that emphasizes the systems and procedures under conditions that may not fully match the requirements of operators. Operators should ensure that such information meets their specific needs and those of the local authority.

6.2 Operators should develop an information gathering, review and distribution system to process information resulting from changes that originate within the operator, including:

a) changes resulting from the installation of new equipment;

b) changes in response to operating experience;

c) changes in the operator's policies and procedures;

d) changes in the operator certificate; and

e) changes for purposes of maintaining cross fleet standardization.

Note.— Operators should ensure that crew coordination philosophy, policies and procedures are specific to their operation.

6.3 A flight safety documents system should be reviewed:

a) on a regular basis (at least once a year);

b) after major events (mergers, acquisitions, rapid growth, downsizing, etc.);

c) after technology changes (introduction of new equipment); and

d) after changes in safety regulations.

6.4 Operators should develop methods of communicating new information. The specific methods should be responsive to the degree of communication urgency.

Note.— As frequent changes diminish the importance of new or modified procedures, it is desirable to minimize changes to the flight safety documents system.

6.5 New information should be reviewed and validated considering its effects on the entire flight safety documents system.

6.6 The method of communicating new information should be complemented by a tracking system to ensure currency by operational personnel. The tracking system should include a procedure to verify that operational personnel have the most recent updates.

ATTACHMENT G. ADDITIONAL GUIDANCE FOR APPROVED OPERATIONS BY SINGLE-ENGINE RPAS OVER HEAVILY POPULATED AREAS

Reserved for future use

ATTACHMENT H. AUTOMATIC LANDING SYSTEMS, HEAD-UP DISPLAY (HUD) OR EQUIVALENT DISPLAYS AND VISION SYSTEMS

Supplementary to Chapter 4, 4.2.9.2, and Chapter 6, 6.23

Note.- Guidance provided in AWO Manual DOC 9365 should be followed. This attachment will be completed as specific RPAS design solutions are developed.

ATTACHMENT I. RESCUE AND FIRE-FIGHTING SERVICE (RFFS) LEVELS

Supplementary to Chapter 4

Note.— This text has been transferred in its exact form from Annex 6 Part I. Although currently, ICAO RPAS SARPS have not been written with the intent that persons will be carried on board the RPA, the text has been included in order to reflect the level of cover that would be required in order to minimise the effects of an accident involving an RPA at an aerodrome, which includes any cargo that is being carried on board.

1. PURPOSE AND SCOPE

1.1 Introduction

The purpose of this Attachment is to provide guidance for assessing the level of RFFS deemed acceptable by RPA operators using aerodromes for differing purposes. This guidance does not relieve the operator from the obligation to ensure that an acceptable level of protection is available for the RPA intended to be used.

1.2 Basic concepts

1.2.1 For flight planning purposes, an RPA operator should utilize an aerodrome or heliport whose RFFS category, as required by Annex 14, Volume I, Chapter 9, 9.2 (for aeroplanes), or Annex 14, Volume II, Chapter 6 (for helicopters), matches or exceeds the RPA's RFFS category. Some aerodromes currently used do not, however, meet these requirements. Furthermore, Annex 14, Volume I and Annex 14, Volume II, provisions relate to the level of aerodrome or heliport RFFS to be provided for RPA normally using an aerodrome; hence, this level of RFFS protection does not take into account RPA for which the aerodrome is selected as an alternate aerodrome.

1.2.2 If an aerodrome is exposed to a temporary reduction of its RFFS capability, Annex 14, Volume I, 2.11.3, and Annex 14, Volume II, 2.7.3, requires that: Changes in the level of protection normally available at an aerodrome, or heliport, for rescue and firefighting shall be notified to the appropriate air traffic services units and aeronautical information services units to enable those units to provide the necessary information to arriving and departing aircraft. When such a change has been corrected, the above units shall be advised accordingly.

1.2.3 In order to determine the acceptability of an aerodrome RFFS protection level, the operator should consider:

a) *for a departure or destination aerodrome*, the difference between the aerodrome RFFS category and the RPA RFFS category, and the frequency of flights to that aerodrome; and

b) *for an alternate aerodrome*, the difference between the aerodrome RFFS category and the RPA RFFS category, and the probability that this alternate aerodrome will be used.

1.2.4 The intention is that the operator will consider the available RFFS as one element of a risk assessment process conducted under their safety management system (SMS), to ensure that the overall safety of the operation can be maximized. This risk assessment would also include considerations of aerodrome facilities, availability, terrain, weather conditions, etc. to ensure that the most appropriate aerodrome is selected.

Note.— Annex 19 includes safety management provisions for air operators. Further guidance is contained in the Safety Management Manual (SMM) (Doc 9859).

1.2.5 The following guidance is intended to assist operators in making the assessment required by Chapter 4, 4.1.4 with due consideration of the basic principles described in 1.2.1 to 1.2.4. It is not intended that this

guidance limit or regulate the operation of an aerodrome.

2. GLOSSARY OF TERMS

***Aerodrome RFFS category*.** The RFFS category for a given aerodrome, as published in the appropriate Aeronautical Information Publication (AIP).

***RPA RFFS category*.** The category derived from Annex 14, Volume I, Table 9-1 (for aeroplanes) or Annex 14,Volume II, Table 6-1 (for helicopters) for a given RPA type.

***Temporary downgrade*.** RFFS category as notified, including by NOTAM, and resulting from the downgrade of the level of RFFS protection available at an aerodrome.

3. MINIMUM ACCEPTABLE AERODROME RFFS CATEGORY

3.1 Planning

3.1.1 In principle, the published RFFS category for each of the aerodromes used for a given flight should be equal to or better than the RPA's RFFS category. However, if the RPA's RFFS category is not available at one or more of the aerodromes required to be specified in the operational flight plan, the operator should ensure that the aerodrome has a level of RFFS category which is deemed acceptable, based on a risk assessment conducted as part of the operator's safety management system (SMS). When establishing acceptable levels of RFFS category for these situations, the operator may use the criteria in Table I-1 and Table I-2. Notwithstanding these criteria, the operator may determine other acceptable levels of RFFS category in accordance with 3.1.3 of this attachment.

3.1.1.1 Intended operations to aerodromes with RFFS categories below the levels specified in Annex 14, Volume I, Chapter 9, 9.2 (for aeroplanes), or Annex 14, Volume II, Chapter 6 (for helicopters), should be coordinated between the RPA operator and the aerodrome operator.

3.1.1.2 For departure and destination aerodromes, during flight planning, the acceptable RFFS protection level should equal or exceed the values specified in Table I-1.

Table I-1. Acceptable aerodrome category for rescue and firefighting (departure and destination aerodrome)

Aerodromes (Required to be specified in the operational flight plan)[1] *Note.— If an individual aerodrome serves more than one purpose, the highest required category corresponding to that purpose at the time of expected use applies.*	**Acceptable aerodrome RFFS category** (Based on published aerodrome RFFS category, including any modification by NOTAM)

Departure and destination aerodrome	RFFS category for each aerodrome should be equal to or better than the RPA RFFS category. Where a suitable risk assessment has been conducted by the operator: **One** category below the RPA RFFS category, or **Two** categories below the RPA RFFS category, in the case of a temporary downgrade of 72 hours or less but not lower than aerodrome RFFS Category 4 for RPA with maximum certificated take-off mass of over 27 000 kg and not lower than Category 1 for other RPA.

3.1.1.3 So as to comply with the operational regulations applicable to a given flight, the operator selects alternate aerodrome(s) for various uses. During flight planning, the acceptable aerodrome RFFS category at a selected alternate aerodrome may equal or exceed the values specified in Table I-2.

Table I-2. Acceptable aerodrome category for rescue and firefighting (alternate aerodromes)

Aerodromes (Required to be specified in the operational flight plan) *Note.— If an individual aerodrome serves more than one purpose, the highest required category corresponding to that purpose at the time of expected use applies.*	**Acceptable aerodrome RFFS protection level** (Based on published aerodrome RFFS category, including any modification by NOTAM)
Take-off alternate and destination alternate aerodromes	Where a suitable risk assessment has been conducted by the operator: **Two** categories below the RPA RFFS category, or **Three** categories below the RPA RFFS category in the case of a temporary downgrade of 72 hours or less but not lower than aerodrome RFFS Category 4 for RPA with maximum certificated take-off mass of over 27 000 kg and not lower than Category 1 for other RPA.

En-route alternate aerodromes	If at least 30 minutes notice is given to the aerodrome operator prior to the arrival of the RPA, a minimum of RFFS Category 4 for RPA with maximum certificated take-off mass of over 27 000 kg, and RFFS Category 1 for other RPA. If less than 30 minutes notice can be given to the aerodrome operator prior to the arrival of the RPA: **Two** categories below the RPA RFFS category, or **Three** categories below the RPA RFFS category in the case of a temporary downgrade of 72 hours or less but not lower than aerodrome RFFS Category 4 for RPA with maximum certificated take-off mass of over 27 000 kg and not lower than Category 1 for other RPA.

3.1.2 *Variations*

3.1.2.1 Notwithstanding the guidance developed in 3.1.1, an aerodrome RFFS category below the protection levels defined in Tables I-1 and I-2 may be acceptable if other considerations prevail, such as weather conditions, runway(s) characteristics, or length of diversion. Such variations should be based on a specific risk assessment conducted by the operator as part of its safety management system (SMS).

3.1.2.2 Variations to the aerodrome RFFS category may concern, among other cases:

a) an occasional flight; or

b) temporary downgrades exceeding 72 hours.

Where applicable, a variation may be used for a group of aerodromes selected for the same purpose, for a given RPA type.

3.1.2.3 The aforementioned variations may be based on additional or other criteria relevant to the type of operations. For instance, the 72-hour threshold for RFFS temporary downgrades may not be relevant for a single flight to or from the aerodrome concerned, such as a non-scheduled flight, whereas it is fully relevant for operations carried out on a continuous and daily basis. A variation may be time limited. A variation may also be modified to reflect the changes of the RFFS protection level available at the aerodrome(s) concerned. In accordance with Chapter 4, 4.1.5, the variations and their validity periods should be included in the operations manual.

3.1.2.4 For variations to the acceptable RFFS category at departure and destination aerodromes, the RPA operator's specific safety risk assessment for an aerodrome intended to be used as a departure or destination aerodrome may be based on the following elements:

a) the frequency of flights intended by the RPA operator in relation to a lowered aerodrome RFFS category;

b) coordination between the RPA operator and the aerodrome operator (for instance, reducing intervention time by prepositioning the existing RFFS means along the runway before the intended take-off or landing).

3.1.2.5 For regular flights, the coordination should take into account the principles of Annex 14, Volume I, Chapter 9, 9.2.5 and 9.2.6 or Annex 14, Chapter 6, 6.2.2, which are applicable to the aerodrome or heliport operator, as well as the possibilities to modulate the aerodrome RFFS category available on a daily cycle or seasonal cycle.

3.1.2.6 For variations in acceptable RFFS for an alternate aerodrome, the RPA operator's specific safety risk assessment for an aerodrome selected as a take-off alternate aerodrome, a destination alternate aerodrome or an en-route alternate aerodrome may be based on the following elements:

a) the probability of effective use of the aerodrome concerned; and

b) the frequency of selection of the aerodrome for the respective purpose of use.

3.2 In flight

3.2.1 The information contained in the operations manual according to Chapter 4, 4.1.5 about the aerodrome RFFS category acceptable at the planning stage (including Tables I-1, I-2 and, where usable, the variations under the specifications in 3.1.3) is applicable at the in-flight re-planning point.

3.2.2 In flight, the remote pilot-in-command may decide to land at an aerodrome regardless of the RFFS category if, in the remote pilot's judgement after due consideration of all prevailing circumstances, to do so would be safer than to divert.

ATTACHMENT J. DANGEROUS GOODS

Supplementary to Chapter 14

1. PURPOSE AND SCOPE

The material in this attachment provides guidance regarding the carriage of dangerous goods as cargo. Chapter 14, includes dangerous goods operational requirements that apply to all operators. Operators that have a specific approval to transport dangerous goods as cargo need to meet additional requirements. In addition to the operational requirements contained in Annex 6, there are other requirements in Annex 18 and the Technical Instructions that also need to be complied with.

2. DEFINITIONS

Where the following term is used in this attachment, it has the meaning indicated:

Cargo. Any property carried on an RPA other than mail.

Note 1.— This definition differs from the definition of "cargo" given in Annex 9 — Facilitation.

Note 2.— COMAT that meets the classification criteria of dangerous goods and which is transported in accordance with Part 1;2.2.2 or Part 1;2.2.3 or Part 1;2.2.4 of the Technical Instructions are considered as "cargo" (e.g. aircraft parts such as lithium ion batteries, lithium metal batteries, chemical oxygen generators, fuel control units, fire extinguishers, oils, lubricants, cleaning products).

3. STATES

3.1 The State of the Operator should indicate in the operations specification if an operator has been issued a specific approval to transport dangerous goods as cargo. Any limitations should be included.

3.2 A specific approval may be granted for the transport of specific types of dangerous goods only (e.g. dry ice; biological substance, Category B; and dangerous goods in excepted quantities) or COMAT.

3.3 The Supplement to the Technical Instructions contains guidance on a State's responsibilities with respect to operators. This includes additional information to Part 7 of the Technical Instructions on storage and loading, provision of information, inspections, enforcement and Annex 6 information relevant to the State's responsibilities for dangerous goods.

4. OPERATOR

4.1 Operators are required to establish a dangerous goods training programme regardless of whether or not they have specific approval to transport dangerous goods as cargo. The training programme should meet, as a minimum, the provisions in Part 1.4 of the Technical Instructions. The objective of the training programme is to ensure that personnel are competent to perform any function for which they are responsible prior to performing any of these functions. Recurrent training must be provided within 24 months of previous training, except as otherwise provided by the Technical Instructions.

4.2 Details of the dangerous goods training programme including the policies and procedures regarding third-party personnel involved in the acceptance, handling, loading and unloading of dangerous goods cargo should be included in the operations manual.

4.3 The Technical Instructions require that operators provide information in the operations manual and/or other appropriate manuals that will enable remote flight crews, other employees and ground handling agents to carry out their responsibilities with regard to the transport of dangerous goods and that initial training be

conducted prior to performing a job function involving dangerous goods.

4.4 Operators should meet and maintain requirements established by the States in which operations are conducted in accordance with 4.2.3.3 of this Annex.

4.5 Operators may seek a specific approval to transport, as cargo, specific dangerous goods only, such as dry ice, biological substance, Category B, COMAT and dangerous goods in excepted quantities.

4.6 Attachment 1 to Part S-7, Chapter 7, of the Supplement to the Technical Instructions contains additional guidance and information on requirements regarding operators not holding a specific approval to transport dangerous goods as cargo and for operators that have a specific approval to transport dangerous goods as cargo.

4.7 All operators should develop and implement a system that ensures they will remain current with regulatory changes and updates. The Technical Instructions contain detailed instructions necessary for the safe transport of dangerous goods by air. These instructions are issued biennially, becoming effective on 1 January of an odd-numbered year.

ATTACHMENT K. LOCATION OF AN RPA IN DISTRESS

(Supplementary to Chapter 6, 6.18 and Appendix 9)

Note. — This text has been adapted from the text in Annex 6 Part I. Although currently, ICAO RPAS SARPs have not been written with the intent that persons will be carried on board the RPA, the text has been included in order to reflect that the need to locate an RPA may be required in order to assist in any subsequent accident investigations, or in order to limit any environmental impact from any hazardous items in, or carried on board, the RPA.

GUIDANCE FOR LOCATION OF AN RPA IN DISTRESS

1. INTRODUCTION

1.1 The following material provides guidance on locating an RPA in distress. The Triggered Transmission of Flight Data Working Group (TTFDWG) reviewed forty-two accidents to determine an indication of the distance from a last-known aeroplane position to the location of an accident site. The report concluded that in approximately 95 per cent of the cases, when the aircraft position was known one minute prior to the accident, the accident site location was within a 6 NM radius of that position. (Click here to access the TTFDWG Report under the “publications” tab or go to https://www.bea.aero/en/ .)

1.2 When an RPA has an accident into water and becomes submerged, the location of the accident site within a 6 NM radius on the surface becomes more important. Starting the initial search area beyond a 6 NM radius reduces the amount of time available to search for and locate the RPA. At current estimated underwater search capabilities of 100 km^2/day, an area with a 6 NM radius could be searched in four days. Allowing for naval assets to reach the search area and conduct a search and recovery operation, it is estimated that an area of 2 300 km^2, equivalent to a radius of 14 NM, will be able to be searched before the ULD battery degrades. Starting at an area of more than 6 NM radius reduces the probability of a successful location during an initial search, whilst extending the location requirement beyond 6 NM radius reduces the time available to search with no appreciable gain in the probability of recovery.

2. CLARIFICATION OF PURPOSE OF EQUIPMENT

2.1 Information from which a position can be determined: Information from an individual system within an RPAS which either is active, or, when automatically or manually activated, can provide position information which includes a time stamp. This is a performance-based requirement which is not system-specific and may also bring operational benefits.

2.2 Emergency locator transmitter (ELT): RPA that do not carry passengers shall not be equipped with an ELT. The current generation of ELTs were designed to provide the position of impact for a survivable accident. The next generation of ELTs may have the capability to activate a transmission in flight when any of the conditions detailed in EUROCAE ED-237, Minimum Aviation System Performance Specification (MASPS) for Criteria to Detect In-Flight Aircraft Distress Events to Trigger Transmission of Flight Information are met. When an ELT sinks below the surface of water, its signal is not detectable.

2.3 Automatic deployable flight recorder (ADFR): The purpose of an ADFR is to have flight recorder data available soon after an accident, in particular for accidents over water. An RPA not carrying passengers may shall not be fitted with an ADFR that is equipped with an ELT. ELTs should only be used for communications for human survival purposes.

2.4 Underwater locator device (ULD): A ULD operating at a frequency of 8.8 kHz is attached to the airframe to locate RPA wreckage below the surface of water when an ELT signal is not possible to detect. The ULDs operating at 37.5 kHz are attached to the flight recorders and are used for locating the flight recorders under water.

3. EQUIPAGE COMPLIANCE

Reserved for future use.

ATTACHMENT L. GUIDE TO CURRENT FLIGHT RECORDER PROVISIONS

Reserved for future use