SECOND DRAFT

UNMANNED AIRCRAFT SYSTEMS

INTERIM POLICY FOR CIVIL UNMANNED AIRCRAFT SYSTEMS IN SOUTH AFRICA

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PART A

1. DOCUMENT LAYOUT

1.1. General

1.1.1. This Interim Policy document consists of Parts and Sections that each addresses a particular topic in related paragraphs and sub-paragraphs.

1.1.2. Part A includes this description of the layout of the document, as well as definitions of related terminology.

1.1.3. Part B includes Sections that contain policy and procedural guidance for the airworthiness and operation of unmanned aircraft systems (UAS) under the regulatory control and oversight of the South African Civil Aviation Authority (SA-CAA).

1.1.4. It is foreseen that Section 1 of Part B, General Policy Guidelines, will initially be applied for most UAS operations that are not covered by Section 2 of Part B, Guidelines for Non-Type Certified Visual Range Light UAS. Section 3 of Part B is included for those UAS applications where more detailed procedures and guidelines are required.

1.1.5. As the knowledge and experience base in UAS operations evolves and matures, this Interim Policy should be revised and refined either into a permanent UAS Policy or into regulations for inclusion in the South African Civil Aviation Regulations (CAR).

1.1.6. The Sections of Part B cover the following topics -

a. Section 1: General Policy Guidelines.

i. This Section introduces the Interim Policy and provides policy-level guidance for airworthiness and operations approvals of UAS under the regulatory control and oversight of the SA-CAA. Detailed procedures and requirements are not provided. Applicants with proven UAS, repeat applicants and applicants with relatively simple UAS will typically follow the guidance provided in this Section. The contents of this Section is based on the guidelines given in the USA FAA Interim Operational Approval Guidance 08-01. References to FAR content are included for guidance only and alternative, equivalent provisions may be used where approved by the SA-CAA.

b. Section 2: Guidelines for Non-Type Certified Visual Range Light UAS.

i. This Section provides policy-level guidance for airworthiness and operations approvals for non-type certified visual range light UAS under the regulatory control and oversight of the SA-CAA. Detailed procedures and requirements are not provided. Applicants who intend operating visual range light UAS as non-type certified aircraft within specific limitations will typically follow the guidance provided in this Section.

c. Section 3: General Procedures and Requirements for UAS.

i. This Section provides detailed procedures and requirements for airworthiness and operations of all UAS under the regulatory control and oversight of the SA-CAA. Applicants who intend to type certify a UAS, operate light UAS beyond the limitations of Section 2, or operate non-type certified UAS other than the light UAS provided for in Section 2, will typically follow the guidance provided in this Section.

d. Section 4: Annexures.

i. This Section provides for additional material related to the other Sections of the Interim Policy, such as references of source material used in the development of this Interim Policy, and where necessary, technical guidance material.

2. TERMS AND DEFINITIONS

2.1. Provisional UAS Terms and Definitions

2.1.1. Unique UAS-related terms and definitions have not been promulgated in CAR Part 1, Definitions and Abbreviations, at the time of development of this Interim Policy. Global initiatives in this regard do, however, indicate that such unique terms and definitions are required for UAS and a list of provisional terms and definitions are included here for the purpose of this Interim Policy. This provisional list is not exhaustive and will be expanded and revised by the SA-CAA as the UAS knowledge end experience base matures, until such time that acceptable terms and definitions can be included in CAR Part 1.

2.1.2. For the purpose of the provisional list of UAS terms and definitions, the following terms and definitions were derived from a UVS International (UVS) proposal to EUROCAE WG73 and ICAO, as well as from the approved definitions of the FAA Interim Operational Approval Guidance 08-01 (FAA) -

a. Air traffic control communications equipment - All equipment permitting dialog between the UAS crew and air traffic control. (UVS)

b. Airworthiness - For the UAS to be considered airworthy, both the UA and all of the other associated equipment of the UAS must be in a condition for safe operation. If any element of the system is not in

condition for safe operation, then the UA would not be considered airworthy. (FAA)

c. Automatic - The execution of a predefined process that requires UAS-c initiation. (UVS)

d. Chase aircraft - A manned aircraft flying in close proximity to an unmanned aircraft that carries, in addition to the pilot-in-command (PIC) of the aircraft, a qualified visual observer. (FAA)

e. Communication link - A digital or analogue data link to transfer voice or data between the UAS crew, air traffic control, airspace users and other data users. (UVS)

f. Control link - A data link for up-linking safety-related command instructions and down-linking UA status data from the UA to the control station(s). (UVS)

g. Control station (CS) - A facility or device(s) from which a UA is controlled for all phases of flight. There may be more than one control station as part of a UAS. (UVS)

h. Co-operative aircraft - Aircraft that have an electronic means of identification (eg a transponder) aboard and operating. (FAA)

i. Data link - A term referring to all interconnections to, from and within the UAS. It includes control, communication, and payload links. (UVS)

j. Data terminal - Independent or integrated transmitter/receiver facility permitting to up-link aircraft and payload control data to the UA, receive and display telemetry and payload data originating from the UA, and communicate with external facilities, including ATC. (UVS)

k. Down-link - Direct or indirect communication link from the unmanned aircraft. (UVS)

l. Flight termination system (FTS) - Any means and/or procedure triggered manually or automatically to initiate a pre-programmed action or a set of actions designed to terminate the flight in a safe manner. (UVS)

m. Flight time - The total time from the moment of an aircraft first moves under its own power for the purpose of taking off until the moment it comes to rest at the end of the flight. Note: Flight time normally includes taxiing, which involves the ground operation to and from the runway, as long as taxiing is carried out with the intention of flying the aircraft. (UVS)

n. Inspection - The routine performance of inspection tasks at prescribed intervals. The inspection must ensure the airworthiness of the UAS up to and including its overhaul or life limits. (FAA)

o. Launcher - A mechanical facility used to launch an UA that is not capable of conventional take off. (UVS)

p. Light unmanned aircraft (LUA) - An unmanned aircraft with a mass of less than 150 kg. (UVS)

q. Light unmanned aircraft system (LUAS) - An unmanned aircraft system comprising one or several LUA. (UVS)

r. Maintenance equipment - All equipment required to maintain the UAS in operational status. (UVS)

s. Non-co-operative aircraft - Aircraft that do not have an electronic means of identification (eg a transponder) aboard or not operating such equipment due to malfunction or deliberate action. (FAA)

t. Observer - A trained person who assists the UA pilot in the duties associated with collision avoidance. (FAA)

u. Off-airport - Any location used to launch or recover an unmanned aircraft that is not considered an airport (eg an open field). (FAA)

v. Optionally piloted aircraft (OPA) - Aircraft that may be operated by an onboard pilot or without an onboard pilot. (UVS)

w. Payload - All elements of a UA that are not necessary for flight but are carried for the purpose of fulfilling specific mission objectives. (UVS)

x. Payload link - A data link for up-linking command instructions to the UA payload and down-linking payload data, which is not critical to the safe operation of the UAS. (UVS)

y. Pilot-in-command (PIC) - The person who has final authority and responsibility for the operation and safety of flight, has been designated as PIC before or during the flight, and holds the appropriate category, class, and type rating, if appropriate, for the conduct of the flight. The responsibility and authority of the PIC as described by regulation 91.01.2 of CAR Part 91, Authority of Pilot-in-Command, apply to the unmanned aircraft PIC. The PIC position may rotate duties as necessary with equally qualified pilots. The person designated as PIC may change during flight. (CAR/FAA) *[Pilot in command (PIC) - The pilot responsible for the operation and safety of the aircraft during flight time. (UVS)]*

z. Safety pilot - A person on board a SUA who can possibly fulfill the pilot, function if required. (UVS)

aa. Scheduled maintenance (routine) - The performance of maintenance tasks at prescribed intervals. (FAA)

bb. State aircraft - An aircraft operated by a state user that is intrinsically governmental in nature. Examples of state entities are the Department of Defense and its military branches, and other local and national government agencies such as the SAPS. (FAA)

cc. Supplemental pilot - Supplemental pilots are those pilots assigned unmanned aircraft flight duties to augment the PIC. It is common for applicants to have both an “internal” and an “external” unmanned aircraft pilot. The supplemental pilot can assume either of these positions. The supplemental pilot may also assume duties of the PIC if he/she meets the required qualifications. (FAA)

dd. Support equipment - All equipment required to assure the correct functioning of the UAS. (UVS)

ee. Surrogate UA (SUA) - An OPA flown as a UA, but with a safety pilot on board. (UVS)

ff. Unmanned - No person on board capable of exercising any control over the aircraft. (UVS)

gg. Unmanned aircraft - A device used or intended to be used for flight in the air that has no onboard pilot. This includes all classes of airplanes, helicopters, airships, and translational lift aircraft that have no onboard pilot. Unmanned aircraft are understood to exclude traditional balloons. (FAA) *[Unmanned aircraft (UA) - An aircraft which is designed to operate with no person on board capable of exercising any control over the aircraft. (UVS)]*

hh. Unmanned aircraft launch & recovery element - A facility or device(s) from which a UA is launched or by which a UA is recovered. There may be more than one launch and recovery element as part of a UAS. (UVS)

ii. Unmanned aircraft system (UAS) - The combination of unmanned aircraft (UA), system elements necessary to enable the taxiing, take-off/launch, flight and recovery/landing of UA, and the elements required to accomplish its mission objectives. The system elements include:

i. - control stations;

ii. - software;

iii. - health monitoring;

iv. - communication, control & data links;

v. - data terminals;

vi. - payload(s);

vii. - launch & recovery elements;

viii. - flight termination systems;

ix. - support & maintenance equipment;

x. - power generation, distribution & supply;

xi. - air traffic control communications equipment;

xii. - handling, storage & transport equipment;

xiii. - all required documentation related to aforementioned. (UVS)

jj. Unmanned aircraft system crew (UAS-c) - All persons assigned to fulfill specific functions relative to the correct & safe operation of the UAS. (UVS)

kk. Unmanned aircraft system commander (UAS-cdr) - The person who has overall authority & responsibility for the safe operation of a UAS during a specific mission. The UAS commander may also fulfill the UAS pilot function. (UVS)

ll. Unmanned aircraft system crew member (UAS-cm) - A person assigned to perform specific duties prior to UA flight, during the operation of the UAS, and after recovery or landing of the UA. (UVS)

mm. Unmanned aircraft system operator (UAS-o) - The legal entity approved for the operation of a UAS. (UVS)

nn. Unmanned aircraft system pilot (UAS-p) - The person in direct control of the UA whilst the engine is running and reports to the UAS-cdr. The UAS-p may have direct control of more than one UA. (UVS)

oo. Unscheduled maintenance (non-routine) - The performance of maintenance tasks when electrical or mechanical irregularities occur. These irregularities are categorised as to whether or not they occur during flight time. (FAA)

pp. Up-link - Direct or indirect communication link to the unmanned aircraft. (UVS)

qq. Visual control - Method of control and collision avoidance that refers to the pilot or observer having an uninterrupted view with human eyesight of the unmanned aircraft and the airspace around it in order to avoid collision. Corrective lenses (spectacles or contact lenses) may be used by the pilot or visual observer. (UVS)

rr. Visual line-of-sight - A method of control and collision avoidance that refers to the pilot or observer directly viewing the unmanned aircraft with human eyesight. Corrective lenses (spectacles or contact lenses) may be used by the pilot or visual observer. When using other aids to vision, such as binoculars, field glasses, or telephoto television, visual observers must use caution to ensure that the UA remains within the approved visual limitation distance of the observer. Due to field of view and distortion issues, the use of such aids can be used to augment the observer's visual capability but cannot be used as the primary means of visual contact. (FAA)

ss. Visual observer - A trained person who assists the unmanned aircraft pilot in the duties associated with collision avoidance. This includes, but is not limited to, avoidance of other traffic, clouds, obstructions and terrain. (FAA)

2.2. Other Definitions

2.2.1. Accidents and Incidents

a. Regulation 1.00.1 of CAR Part 1, Definitions, defines "accident" as follows -

" *"accident" for the purposes of the definition of "accident" in section 1 of the Act, includes an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, during which –*
(a) a person is fatally or seriously injured as result of –
(i) being in the aircraft;
(ii) direct contact with any part of the aircraft, including parts which have become detached or are released from the aircraft; or
(iii) direct exposure to jet blast, rotor or propeller wake, except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to passengers and flight crew; or
(b) the aircraft sustains damage or structural failure which –
(i) adversely affects the structural strength, performance or flight characteristics of the aircraft; and
(ii) would normally require major repair or replacement of the affected component, except for engine failure or damage when the damage is limited to the engine, its cowlings or accessories, or for damage

limited to propellers, wing tips, antennae, tyres, brakes, fairings, small dents or puncture holes in the aircraft skin; or
(c) the aircraft is still missing after an official search has been terminated and the wreckage has not been located; or
(d) the aircraft is in a place where it is completely inaccessible; "

b. Regulation 1.00.1 of CAR Part 1, Definitions, defines "incident" as follows -

" *"incident" means an occurrence, other than an accident, associated with the operation of an aircraft, which affects or could affect the safety of aircraft operations;* "

2.2.2. Airspace Classification

a. South African airspace is classified in the CAR as follows -

" SA-CATS-ATS Airspace and Air Traffic Services
172.02.2 CLASSIFICATION OF AIRSPACE
1. Classes of airspace
The classes of airspace are –
(1) controlled –
(a) Class A – airspace in which only IFR flights are permitted and all such flights are –
(i) subject to air traffic control services; and
(ii) separated from each other;
(b) Class B – airspace in which IFR flights and VFR flights are permitted and all such flights are –
(i) subject to air traffic control services; and
(ii) separated from each other;
(c) Class C – airspace in which IFR flights and VFR flights are permitted and –
(i) all such flights are subject to air traffic control services;
(ii) IFR flights are separated from each other and from VFR flights; and
(iii) VFR flights are separated from IFR flights and receive traffic information in respect of all other VFR flights;
(d) Class D – airspace in which IFR flights and VFR flights are permitted and –
(i) all such flights are subject to air traffic control services;
(ii) IFR flights are separated from each other and receive traffic information in respect of VFR flights; and
(iii) VFR flights receive traffic information in respect of all other IFR flights and VFR flights;
(e) Class E – airspace in which IFR flights and VFR flights are permitted and –
(i) IFR flights are subject to air traffic control services and are separated from each other; and

(ii) all such flights receive traffic information; and
(2) uncontrolled –
(a) Class F – airspace in which IFR flights and VFR flights are permitted and –
(i) IFR flights receive an air traffic advisory service; and
(ii) all such flights receive flight information services, if requested; and
(b) Class G – airspace in which IFR flights and VFR flights are permitted and all such flights receive flight information services, if requested.
"

2.2.3. Danger Area. A danger area is an airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specific times. *(Examples of dangerous activities include volcanoes, rocket and missile launches, artillery practices, etc).* [ICAO Doc 9713, International Civil Aviation Vocabulary.]

2.2.4. Prohibited, Restricted and Special Rules Areas

a. Prohibited, Restricted and Special Rules Areas are defined in CAR Part 1 as follows -

" "prohibited area" means any area defined in Regulation 91.06.19;

"restricted area" means –
(a) any airspace as defined in regulation 91.06.20 of the Regulations;
(b) any area on an aerodrome or heliport defined as such by the aerodrome or heliport licence holder; or
(c) the area as defined in section 1 of the Civil Aviation Offences Act, 1972 (Act No. 10 of 1972);

"special rules area" means airspace other than restricted airspace where special non-standard rules are applied in order to promote safety, efficiency and orderliness outside of controlled airspace;
"

b. Prohibited and Restricted Areas are described in CAR Part 91 as follows -

"*Prohibited areas*
91.06.19 (1) The Commissioner may by notice in the AIP, AIC or NOTAM declare any area to be a prohibited area and shall, for the purposes of the prohibition contained in subregulation (2), when so declaring an area to be a prohibited area –
(a) specify a height above the ground surface of such area; or
(b) specify an altitude in respect of such area, as the Commissioner may deem expedient, in the notice in question.
(2) No person shall fly any aircraft whatsoever in the air space above a prohibited area –

(a) below the height specified in terms of subregulation (1)(a); or
(b) below the altitude specified in terms of subregulation (1)(b), as the case may be, in respect of the prohibited area in question.

Restricted areas
91.06.20 (1) The Commissioner may by notice in the AIP, AIC or NOTAM declare any area to be a restricted area and shall, when so declaring an area to be a restricted area, specify in the notice in question –
(a) the nature and extent of the restriction applicable in respect of the area in question; and
(b) the authorisation under which flights in such restricted area shall be permitted.
(2) No person shall, in contravention of a restriction contemplated in subregulation (1)(a), fly any aircraft to which the said restriction applies, in any restricted area, unless the flight in question has been permitted by virtue of an authorisation contemplated in subregulation (1)(b).
[Editorial note: Restricted areas may also be declared by persons, other than the Commissioner, in terms of Acts other than the Aviation Act of 1962. Information may be found in Volume 1 of 'Aviation Law in South Africa' under the section Miscellaneous Legislation and in the AICs.]
"

PART B

SECTION 1: GENERAL POLICY GUIDELINES

3. INTRODUCTION

(Source: Interim Operational Approval Guidance 08-01. Unmanned Aircraft Systems Operations in the U. S. National Airspace System. March 2008. FAA Unmanned Aircraft Program Office AIR-160)

3.1. Purpose

3.1.1. Since unmanned aircraft systems (UAS) can be deployed in civil applications, it is the intention of this Interim Policy to establish a harmonised approach with which civil unmanned aircraft systems are regulated by the South African Civil Aviation Authority (SA-CAA).

3.1.2. This Interim Policy provides guidance to be used to determine whether a UAS may be allowed to conduct flight operations in South African national airspace. The SA-CAA will use this guidance when evaluating each application made to the SA-CAA in terms of this Interim Policy.

3.1.3. For the purposes of this Interim Policy, UAS excludes model aircraft as defined in South African Civil Aviation Regulations (CAR) Part 1, Definitions and Abbreviations: " '*model aircraft' means a heavier-than-air aircraft of limited dimensions, with or without a propulsion device, unable to carry a human being and to be used for competition, sport or recreational purposes rather than unmanned aeronautical vehicles (UAV) developed for commercial or governmental, scientific, research or military purposes, and not exceeding the specifications as set by the Federation Aeronautique Internationale as listed in Document SA-CATS-NTCA*".

3.2. Background

3.2.1. UAS operations are expected to increase in both the public and private sectors. In anticipation of this increasing activity, it has become necessary to develop guidance to be used by UAS users and the SA-CAA when making and evaluating applications respectively in terms of this Interim Policy. This guidance is not meant as a substitute for any regulatory process.

3.2.2. The introduction of UAS into non-segregated airspace will require the SA-CAA to process applications for operational approvals. These approvals are required due to the fact that unmanned aircraft (UA) are not presently compliant with various sections of the South African Civil Aviation Regulations (CAR) and, therefore, require an alternate means of compliance. Most notably, the lack of an on-board pilot requires an alternate method of complying with the requirements of regulation 91.06.7 of CAR Part 91, Right of Way *(FAA: "see-and-avoid" provisions of 14 CFR 91.113, Right-of-Way Rules: Except Water Operations)*.

3.2.3. This document is intended to provide guidance and information to SA-CAA personnel who are charged with the processing, reviewing, and approving of UAS operations, as well as to UAS users and applicants (person or organisation making applications to the SA-CAA in terms of this Interim Policy). The interim guidance presented in this document represents the culmination of best international and national practices and procedures used in prior UAS approvals, as well as input from other government agencies, industry and user stakeholders.

3.2.4. IMPORTANT: It should be noted that the material presented in this document is a recommended approach to approving typical UAS operations. However, each application needs to be assessed on its own technical merits by the SA-CAA and may require unique authorisations that are based on the specific needs or capabilities of the UAS in question. It should be further noted that due to the rapid evolution of UAS technology, this guidance material will be subject to continuous review and may be updated when appropriate by the SA-CAA.

3.2.5. NOTE: In general, and as a minimum, applicants must observe all applicable regulations of CAR Part 61, Pilot Licensing, and CAR Part 91, General Operating and Flight Rules. This document is intended to identify alternate methods of compliance with the regulations when evaluating proposed UAS operations. Note that applicable requirements will initially be determined jointly by the applicant and the SA-CAA on a case-by-case basis until such time as the knowledge base is sufficient to identify a generic set of requirements from existing and/or new regulations.

3.2.6. The CAR is available for download on the SA-CAA website: http://www.caa.co.za/.

3.3. Exemptions

3.3.1. The SA-CAA may by written notice exempt either generally, or subject to such conditions as may be specified, or for such period as may be specified, from the operation of any one or more of the provisions of this Interim Policy, provided that such exemption will not compromise aviation safety or the public interest.

3.3.2. No person may conduct operations that require a deviation from these requirements except under a written exemption issued by the SA-CAA.

4. METHODS OF AUTHORISATION AND APPLICABILITY

4.1. Applicability

4.1.1. Guidance in this Interim Policy that is of an operational nature always applies to both civil and state operators. In the areas of pilot licensing, crew licensing, pilot currency, medical certificates, and airworthiness, it is assumed that all state aircraft comply with processes and policies

established by the state entity, in a manner similar to state operated manned aircraft. If no established policies exist regarding pilot licensing, crew licensing, pilot currency, medical certificates, and airworthiness, it is recommended that the state agency/department apply the guidance outlined in this Interim Policy.

4.1.2. The procedures contained in this Interim Policy are applicable for UAS operations in the Republic of South Africa, and Flight Information Regions delegated to South Africa (if applicable).

4.1.3. In general, specific authorisation to conduct unmanned aircraft operations in national airspace outside of prohibited, restricted or special rules areas must be requested by the applicant. Airspace inside buildings or structures is not considered to be part of the national airspace and is not regulated.

4.2. Methods of Authorisation

4.2.1. For UAS other than visual range light UAS (see Section 2 of this Interim Policy), and for the purposes of this Interim Policy, the two methods of approval are either a certificate of waiver or authorisation (COA) or the issuance of a certificate of airworthiness (standard, restricted or special category) in terms of regulation 21.08.1 of CAR Part 21, Categories of Certificates of Airworthiness. Unless otherwise stated, recommended procedures and guidance in this Interim Policy, other than for light UAS, apply to both methods.

4.2.2. The applicability and process to be used in a UAS operational approval is dependent on whether the applicant is a commercial user or a state user. A state user is one that is intrinsically governmental in nature (eg DoD, local and national government departments and agencies, etc). State applicants should utilise the COA application process. Commercial applicants must apply for a certificate of airworthiness (standard, restricted or special category).

4.2.3. Regardless of the authorisation method, all UAS applications must be processed by the SA-CAA.

4.2.4. NOTE: This document and the processes prescribed do not apply to hobbyists and amateur model aircraft users when operating model aircraft for sport and recreation.

4.3. Certificate of Waiver or Authorisation (COA)

4.3.1. Applications for a COA are only accepted from state entities. An application may be referred to the SA-CAA, for determination of the status of an applicant, ie state or commercial. COAs are typically issued for a period of up to one year, but may be issued for a lesser duration if requested or deemed appropriate. COAs are not required for operations conducted wholly within a

prohibited, restricted or special rules area when operating with permission from the appropriate authority of that area.

4.3.2. National Security Considerations. When a UAS operation is declared a matter of "national security" by an appropriate authority (the declaring authority), the SA-CAA may approve an application for a COA which, under normal circumstances, might not otherwise conform to the guidelines set forth in this Interim Policy. In this case, national security itself may override risk mitigation requirements and the declaring authority must declare in the COA application acceptance of all risks associated with the UAS operations.

4.4. Certificates of Airworthiness

4.4.1. Commercial applicants are required to apply for a standard, restricted or special category certificate of airworthiness in terms of regulation 21.08.1 of CAR Part 21. Standard and restricted category certificates of airworthiness will be issued for type certified UAS, while special category certificates of airworthiness (experimental or special flight permit) will be issued to non-type certified UAS.

4.4.2. The applicant is required to submit the required data to the SA-CAA to support a determination that the UAS, including the control station(s) is designed, built, and maintained in a safe and airworthy condition. Certificates of airworthiness are typically issued for a period of up to one year.

4.4.3. Experimental certificates of airworthiness are typically issued to industry and manufacturers wishing to accomplish UAS research and development and type certification compliance testing in accordance with regulation 21.08 of CAR Part 21, Certificates of Airworthiness.

4.4.4. Special flight permits are typically issued to industry and manufacturers who do not intend to obtain type certification for a UAS, but intend to carry out a flight or a series of flights while the UAS does not conform to appropriate airworthiness design standards, as determined by the SA-CAA.

4.4.5. General Process. For commercial UAS operations, the SA-CAA is responsible for the issuance of certificates of airworthiness. A thorough review is conducted by the SA-CAA to evaluate the system's airworthiness and operational specifics and to determine mitigations required to meet acceptable standards of safety.

4.5. Alternative Methods of Compliance

4.5.1. All limitations and procedures presented in this Interim Policy are to be considered as general guidelines only.

4.5.2. Each application is evaluated on its own technical merit based on its own set of operational parameters and proposed operational profiles, mitigations, and systems.

4.5.3. As such, deviations and alternative methods of compliance may be approved by the SA-CAA and may differ from the information presented in this Interim Policy.

4.5.4. Therefore, if the applicant makes a safety case and presents sufficient data for an alternative means of compliance, then this data must be taken into consideration and evaluated for possible approval.

5. UAS AIRWORTHINESS

5.1. General

5.1.1. All UAS must be shown to be airworthy to conduct flight operations in the national airspace. Where applicable, UAS should be maintained and conform to the same airworthiness standards as are defined for similar manned aircraft. However, the SA-CAA recognizes that some of the requirements can differ from those for manned aircraft and appropriate changes can be defined.

5.1.2. In the future, UAS Maintenance Technician certification will parallel existing standards for manned aviation. As with airworthiness standards, Maintenance Technicians Requirements will be reviewed as part of the data collection process.

5.2. State Applicants

5.2.1. The applicant must provide an airworthiness statement specifying compliance with applicable airworthiness policy or criteria. Examples of acceptable policy/criteria include, but are not limited to -

a. SA CAR, USA FAR, EASA CS, and/or any other recognised civil aviation airworthiness requirements;

b. recognised military airworthiness standards, such as USA DoD MIL-HDBK 516B, Airworthiness Certification, the UK DEFSTAN 00-970 Part 9, UAV Systems, French UCAR, NATO STANAG 4671, etc; and/or

c. such other standards and criteria that the SA-CAA accepts as demonstrating an acceptable level of safety.

5.3. Commercial Applicants

5.3.1. Commercial UAS applications for certificates of airworthiness must follow the relevant SA-CAA process for reviewing and approving airworthiness applications.

5.4. Continued Airworthiness

5.4.1. Applicants for UAS operational approvals must address continued airworthiness procedures as part of their application.

5.4.2. It is highly recommended that all applicants provide the following information -

a. a Continuing Airworthiness Program;

b. a Maintenance Training Program;

c. any unique skill sets or maintenance practices relating to their UAS and/or UAS operations that may be outside the current scope and practices of manned aviation; and

d. a process to report any applicable data relating to the operation and maintenance of the UAS.

5.4.3. All information that is received from UAS operators will aid the SA-CAA in tracking the various existing UAS types and operations. This data will help expedite the regulatory process for UAS and will allow the SA-CAA to have a historical data base from which to base current and future UAS regulatory guidance.

5.4.4. Accurate recordkeeping is essential in assuring positive operational and airworthiness quality control.

6. FLIGHT OPERATIONS

6.1. General

6.1.1. The guidance presented in this Interim Policy applies only to those UAS operations affecting areas of the national airspace other than prohibited, restricted, danger or special rules areas. The SA-CAA is particularly concerned that UAS operate safely among all users of the national airspace, including non-co-operative aircraft and other airborne operations not reliably identifiable by radar (eg balloons, gliders, parachutists, etc).

6.1.2. When an operation in a danger area is to be carried out, specific authorisation for that operation shall be obtained from the SA-CAA. The SA-CAA shall evaluate each such application on a case-by-case basis and may include appropriate conditions and/or limitations in the authorisation.

6.1.3. Unless specifically authorised, UAS operations other than operations in prohibited, restricted, danger or special rules areas or Class A airspace, and UAS operations other than IFR UAS operations in Class C airspace, shall require visual observers, either airborne or ground-based.

6.1.4. While considerable work is ongoing to develop a certifiable “detect, sense, and avoid” system, no current solution exists. Compliance with the “avert

collision" aspect of regulation 91.06.7 of CAR Part 91, Right of Way *(FAA: "see-and-avoid" provisions of 14 CFR 91.113, Right-of-Way Rules: Except Water Operations)* is one of the primary issues in UAS operational approvals. As a result, alternate methods of compliance are required to accomplish the "see and avoid" function. See and avoid risk mitigation strategies are normally based on the use of visual observers or other methods of segregation.

6.1.5. Risk mitigations may also include other methods or systems that an applicant may propose for consideration. An applicant may propose any reasonable type of mitigation or system. However, the SA-CAA only approves UAS flight activities that can demonstrate that the proposed operations can be conducted at an acceptable level of safety.

6.1.6. Applicants proposing "see and avoid" strategies in lieu of visual observers need to support proposed mitigations with system safety studies which indicate the operations can be conducted safely. Acceptable system safety studies must include a hazard analysis, risk assessment, and other appropriate documentation that support an "extremely improbable" determination.

6.1.7. It is the applicant's responsibility to demonstrate that injury to persons or property along the flight path is extremely improbable.

6.1.8. UA with performance characteristics that impede normal air traffic operations may be restricted in their operations.

6.2. Approval of Areas for Operation of UAS

6.2.1. An operator of a UAS may apply to the SA-CAA for the approval of an area as an area for the operation of UAS.

6.2.2. In considering whether to approve an area for this purpose, the SA-CAA must take into account the likely effect on the safety of air navigation as a result of the operation of the UAS in or over, the area.

6.2.3. An approval granted by the SA-CAA in terms of this paragraph may be expressed to have effect for a particular period (including a period of less than 1 day), or indefinitely.

6.2.4. The SA-CAA may impose conditions on the approval in the interests of the safety of air navigation.

6.2.5. The details of an approval granted by the SA-CAA in terms of this paragraph, including any condition/s, must be published by the SA-CAA in a NOTAM.

6.2.6. The SA-CAA may revoke the approval of an area, or change the conditions that apply to such an approval, in the interests of the safety of air navigation, but must publish details of any revocation or change in a NOTAM. The SA-

CAA must also give written notice of the revocation or change to the holder of the approval.

6.3. System Considerations

6.3.1. Onboard Cameras/Sensors: Although onboard cameras and sensors that are positioned to observe targets on the ground have demonstrated some capability, their use in detecting airborne operations for the purpose of de-confliction is still quite limited. Therefore, these types of systems may not be considered as a sole mitigation in the see and avoid risk assessment. In general, current designs are not mature and have shown to be insufficient to provide the sole mitigation in the see and avoid risk assessment. Although these systems are currently immature, applicants may be allowed to propose any system solution that provides a mitigation strategy and should be evaluated as a potential solution.

6.3.2. Radar and Other Sensors: If special types of radar or other sensors are utilised to mitigate risk, the applicant must provide supporting data which demonstrates that -

a. both co-operative and non-co-operative aircraft, including targets with low radar reflectivity, such as gliders and balloons, can be consistently identified at all operational altitudes and ranges, and,

b. the proposed system can effectively de-conflict a potential collision.

6.3.3. Lost Link Procedures: In all cases, the UAS must be provided with a means of safely managing the event of a lost link. There are many acceptable approaches to satisfy this requirement. The intent is to ensure airborne operations are predictable in the event of a lost link.

6.3.4. Flight Termination System (FTS): It is highly desirable that all UAS have system redundancies and independent functionality to ensure the overall safety and predictability of the system. If a UAS is found to be lacking in system redundancies, an independent flight termination system may be required to safeguard the public.

6.4. Operational Requirements

6.4.1. Unless operating in a prohibited, restricted, danger or special rules areas UAS operations must adhere to the following requirements.

6.4.2. Observer Requirement

a. VFR UAS operations may be authorised utilising either ground-based or airborne visual observers onboard a dedicated chase aircraft. A visual observer is required to perform the see and avoid function as alternative compliance to regulation 91.06.7 of CAR Part 91, Right of

Way *(FAA: "see-and-avoid" provisions of 14 CFR 91.113, Right-of-Way Rules: Except Water Operations)*.

b. The task of the observer is to provide the pilot of the UAS with instructions to steer the UA clear of any potential collision with other traffic. Visual observer duties require the ability to maintain visual contact with the UA at all times while scanning the immediate environment for potential conflicting traffic. At no time will the visual observer permit the UA to operate outside their line-of-sight. This ensures that any required manoeuvering information can be reliably provided to the PIC.

c. The visual limitation will specify both a lateral and vertical distance and shall be regarded as a maximum distance from the observer where a determination of a conflict with another aircraft can be made. When an application is approved by the SA-CAA, the visual limitation distance becomes a directive upon the observer.

d. Generally, observers are to be positioned no greater than one nautical mile laterally and 3000 feet vertically from the UA. The use of nautical miles is based on the fact that the UA is being positioned by the pilot via control stations that typically use moving map displays that are referenced in nautical miles.

e. This distance is predicated on the observer's normal unaided vision. Corrective lenses, spectacles, and contact lenses may be used.

f. When using other aids to vision, such as binoculars, field glasses, or telephoto television, visual observers must use caution to ensure that the UA remains within the approved visual limitation distance of the observer. Due to field of view and distortion issues, the use of such aids can be used to augment the observer's visual capability but cannot be used as the primary means of visual contact.

g. Although this guidance specifies an observer distance, the small size of some UA may not allow for adequate observation at the one nautical mile limit. It should be understood that this limit is the maximum range allowed and that a practical distance may be something less, with the determination of such at the discretion of the applicant. Therefore, until an on site validation of observer distance is conducted by the SA-CAA, it will remain the responsibility of the applicant to ensure the safety of flight and adequate visual range coverage to mitigate any potential collisions. Conversely, larger UA may accommodate an observer distance greater than the one mile limit. The applicant may establish a distance greater than one mile based on a variety of factors. Increased observer distances may be proposed by the applicant and will be subject to review by the SA-CAA either by on site demonstration or other means.

h. If UAS applications are approved for nighttime operations with flight operations that will depart or arrive between sunset and sunrise, it is recommended that the ground observer(s) be in place one hour prior to that operation to ensure acclimation to the twilight/nighttime environment.

6.4.3. ATC Communications Requirements

a. The UAS pilot must have immediate radio communication with appropriate ATC facilities anytime -

i. the UA is being operated in Class A, B, C, D, E or F airspace;

ii. the UA is being operated under instrument flight rules (IFR);

iii. it is stipulated under the provisions of any issued COA or certificate of airworthiness.

b. It is preferred that communications between the UAS pilot and ATC be established through onboard radio equipment to provide a voice relay; this is required for IFR flight.

6.4.4. Inter-Communications Requirements

a. Any visual observer, sensor operator, or other person charged with providing collision avoidance for the UA must have immediate communication with the UAS pilot. If a chase aircraft is utilised, immediate communication between the chase aircraft and the UAS pilot shall be required at all times. If the UAS pilot is talking to air traffic control, monitoring of the air traffic control frequency by all UAS crew members (UAS pilots, observers, and chase pilots) is recommended for shared situational awareness. However, unless it is necessary, the UAS PIC or the supplemental pilots are the only crewmembers that will talk to Air Traffic Control.

6.4.5. Dropping Objects/Hazardous Materials

a. If the UA's intended operation includes the dropping or spraying of aircraft stores outside of prohibited, restricted, danger or special rules areas, the application must specifically address the hazard and make a clear case that injury to persons on the ground is extremely remote and operational risks have been sufficiently mitigated. A similar case must be made for hazardous materials carried aboard the UA.

6.4.6. Flight Over Populated Areas

a. Unless the SA-CAA provides otherwise, routine operations of non-type certified UAS shall not be conducted over urban or populated areas.

6.4.7. Flight Over Heavily Trafficked Roads or Open-air Assembly of People

a. Unless otherwise provided by the SA-CAA, non-type certified UAS operations should avoid these areas. If flight in these areas with a non-type certified UAS is required, the applicant will be required to support proposed mitigations with system safety studies that indicate the operations can be conducted safely. Acceptable system safety studies must include a hazard analysis, risk assessment, and other appropriate documentation that support an “extremely improbable” determination. Additionally, it is the applicant’s responsibility to demonstrate that injury to persons or property along the flight path is extremely improbable.

6.4.8. Day/Nighttime Operations

a. In the case of non-type certified UAS, nighttime operations may be approved by the SA-CAA if the applicant provides a safety case and sufficient mitigation to avoid collision hazards at night.

6.4.9. VFR Flights Outside Class A Airspace

a. Unless otherwise provided by the SA-CAA, VFR UAS operations shall be conducted in accordance with CAR Part 91, General Operating and Flight Rules. A minimum flight visibility of not less than three kilometres shall be maintained at all times. Cloud clearance requirements shall remain as specified in CAR Part 91, General Operating and Flight Rules. Special VFR requirements as per regulation 91.06.22 of CAR Part 91, Special VFR Weather Minima, do not apply to UAS operations and cannot be exercised.

6.4.10. Autonomous Operations

a. It is generally understood that most UAS have some level of autonomy associated with its operation. Although it is possible to have a completely manual UAS, which requires a pilot-in-the-loop, the majority of UAS are autonomous to a certain degree. Only those UAS that have the capability of pilot intervention, or pilot-on-the-loop, shall be allowed in the national airspace outside of prohibited, restricted, danger or special rules areas. UAS that are designed to be completely autonomous, with no capability of pilot intervention, are not authorised in the national airspace system at present. Although the pilot may be technically considered out-of-the-loop in a lost link scenario, this restriction does not apply to UAS operating under lost link.

6.4.11. Operations from Off-Airport Locations

a. In most cases, an off-airport location should be situated no closer than 3 km from any airport or heliport. The operational areas, including the launch and recovery zones, should be free from obstructions and reasonable efforts should be made to keep operations away from structures and heavily trafficked roads. Due to the unique attributes of off-airport locations, approval requests need to be evaluated on a case-by-case basis by the SA-CAA.

6.4.12. Other Mitigations in lieu of Observers

a. All limitations and procedures presented in this Interim Policy are to be considered as general guidelines only.

b. Each application is evaluated on its own technical merit based on its own set of operational parameters and proposed operational profiles, mitigations, and systems.

c. Alternative methods of compliance may therefore be approved by the SA-CAA. If the applicant makes a safety case and presents sufficient data for an alternative means of compliance, then this data must be taken into consideration and evaluated for possible approval.

6.5. Operating Under Instrument Flight Rules (IFR)

6.5.1. While operating on an instrument flight plan, the following must exist, be completed, or be complied with -

a. The PIC must be current on the IFR procedures for the particular UAS to be operated.

b. The aircraft's airworthiness statement includes IFR flight and all flight safety critical equipment should be approved by the SA-CAA and should be working (including pitot static and transponder checks).

c. Aviation database and charts are current and available to the UAS pilot.

d. An IFR flight plan is filed.

e. An ATC clearance has been obtained and all clearances followed.

f. Direct two-way radio communication between the UAS pilot and ATC is available. Communication relay through the UA is required.

g. In the case of non-type certified UAS operations, pre-coordination with ATC has been accomplished.

h. The UA is equipped with a certified operating mode C (mode S preferred) transponder.

i. Sense and avoid requirements are complied with in accordance with this Interim Policy.

j. ATC radar monitoring is available throughout the portion of the flight in Class A and C airspace.

6.6. Chase Aircraft Operations

6.6.1. The chase aircraft must remain at a safe distance from the UA to ensure collision avoidance should a UAS malfunction occur, but remain close enough to provide visual detection of conflicting aircraft in the path of the UA in a timely manner to advise the UAS PIC of the situation.

6.6.2. Should the UAS pilot operate the UA from the chase aircraft, the chase aircraft must remain within radio control range of the UA to maintain appropriate signal coverage for flight control or activation of the flight termination system.

6.6.3. Chase aircraft may be required to have communication with appropriate ATC facilities based on the applicant's application or mission profile.

6.6.4. Chase aircraft are not required in Class A airspace or prohibited, restricted, danger or special rules areas. Chase aircraft are also not required for IFR flights in Class C airspace.

6.6.5. Unless the SA-CAA provides otherwise, chase operations shall be conducted during daylight hours only.

6.6.6. Chase aircraft pilots must not concurrently perform either observer or UA pilot duties along with chase pilot duties.

6.6.7. Chase aircraft operating as a formation flight will immediately notify ATC if they are using a non-standard formation.

6.6.8. NOTES:

a. A standard formation is one in which a proximity of no more than one mile laterally or longitudinally and within 100 feet vertically from the flight leader is maintained by each wingman.

b. Non-standard formations are those operating under any of the following conditions -

i. when the flight leader has requested and ATC has approved other than standard formation dimensions;

ii. when operating within an authorised altitude reservation or under the provisions of a letter of agreement; and/or

iii. when the operations are conducted in airspace specifically designed for a special activity.

6.7. Airspace Considerations by Airspace Designation

6.7.1. UA operating in airspace designated as reduced vertical separation minima (RVSM) airspace must comply with regulation 91.07.31 of CAR Part 91, Reduced Vertical Separation Minima (RVSM) Operations.

6.7.2. Class A: Observers are not required in Class A. All UAS must be operated on an instrument flight plan. UAS operations approved for Class A must comply with regulation 172.02.2 of CAR Part 172 *(FAA 14 CFR 91.135, Operations in Class A Airspace)*.

6.7.3. Transponder requirement. Unless otherwise prescribed by the SA-CAA, no person may operate an aircraft within Class A airspace unless that aircraft is equipped with the applicable equipment specified in FAA 14 CFR 91.215, ATC Transponder and Altitude Reporting Equipment and Use.

6.7.4. Class B: UAS operations are currently not authorised. Class B airspace contains terminal areas with highest density of manned aircraft in the national airspace. As with all applications, the SA-CAA will consider exceptional circumstances.

6.7.5. Class C: Requests for approval of non-type certified UAS operations will be handled on a case-by-case basis and may be approved if sufficiently mitigated and a safety case has been established. Unless otherwise prescribed by the SA-CAA, UAS operations approved for Class C must comply with regulation 172.02.2 of CAR Part 172 and the relevant requirements of Subpart 5, Communication and Navigation Equipment, of CAR Part 91 *(FAA 14 CFR 91.130, Operations in Class C Airspace)*. The requirement for a transponder will not be waived.

6.7.6. Class D: Requests for approval will be handled on a case-by-case basis and may be approved if sufficiently mitigated and a safety case has been established. Unless otherwise prescribed by the SA-CAA, UAS operations approved for Class D must comply with regulation 172.02.2 of CAR Part 172 and the relevant requirements of Subpart 5, Communication and Navigation Equipment, of CAR Part 91 *(FAA 14 CFR 91.129, Operations in Class D Airspace)*.

6.7.7. Class E: Requests for approval will be handled on a case-by-case basis and may be approved if sufficiently mitigated and a safety case has been established. Unless otherwise prescribed by the SA-CAA, UAS operations approved for Class E must comply with regulation 172.02.2 of CAR Part 172 and the relevant requirements of Subpart 5, Communication and Navigation

Equipment, of CAR Part 91, or with FAA 14 CFR 91.127, Operating on or in the Vicinity of an Airport in Class E Airspace.

6.7.8. Class F: If there is an operating air traffic control tower, Class E rules may apply. Unless otherwise prescribed by the SA-CAA, UAS operations approved for Class F must comply with regulation 172.02.2 of CAR Part 172 and the relevant requirements of Subpart 5, Communication and Navigation Equipment, of CAR Part 91.

6.7.9. Class G: Unless otherwise prescribed by the SA-CAA, UAS operations approved for Class G must comply with FAA 14 CFR 91.126, Operating on or in the Vicinity of an Airport in Class G Airspace.

6.8. Oceanic Operations

6.8.1. UAS operations wholly contained within oceanic areas are handled in the same manner as those operations conducted in prohibited, restricted, danger or special rules areas, that is, no specific approval is required and observers or chase aircraft are not required.

6.9. Flight Information Region Operations

6.9.1. SA-CAA rules and policies apply in flight information regions (FIRs) where the SA-CAA (ATNS) is the air traffic service provider. The guidelines specified in this document apply to UAS operations conducted in these FIRs.

7. PERSONNEL QUALIFICATIONS

7.1. General

7.1.1. This section addresses the qualifications of UAS pilots, observers, maintainers, and other personnel as appropriate. For the purpose of this Interim Policy, a reference to a pilot licence shall mean a pilot licence issued by the SA-CAA appropriate for the type of UAS to be operated, and may be a pilot licence for manned aircraft or otherwise.

7.2. UAS Pilot Qualifications

7.2.1. The SA-CAA is focused on ensuring that UAS pilots have a common level of understanding of the CAR applicable to the airspace where the UA will operate. Pilots are responsible for a thorough pre-flight inspection of the UAS. They are accountable for controlling their aircraft to the same responsible standards as the pilot of a manned aircraft.

7.2.2. The following items apply to the pilots of all UAS -

a. One PIC must be designated at all times.

b. The PIC of an aircraft is directly responsible, and is the final authority of, the operation of that aircraft.

7.3. Pilot-in-Command (PIC)

7.3.1. The designated PIC is the pilot responsible for the UAS flight operation. The PIC may be augmented by supplemental pilots, but the PIC retains complete and overall responsibility of the flight, regardless of who may be piloting the UA. It is common for UAS to have both an “internal” and an “external” UA pilot. The PIC can assume any of these positions. The PIC duty may be rotated as necessary to fulfil operational requirements.

7.3.2. Ratings: Rating requirements for the UAS PIC depend on the type of operation conducted and fall into two categories -

a. Operations that require a pilot licence; and

b. Operations that do not require a pilot licence.

7.3.3. The requirement for the PIC to hold a pilot licence is based on various factors including the location of the planned operations, mission profile, size of the UA, and whether or not the operation is conducted within or beyond visual line of sight. Operations without a pilot licence may be allowed, permitting UA to operate below certain altitudes while controlled strictly by visual line of sight. Each application will be carefully reviewed to assess the feasibility of allowing that type of operation.

7.3.4. Operations requiring a pilot licence: The PIC should hold, at a minimum, an SA-CAA pilot licence under the following circumstances -

a. All operations approved for conduct in Class A, B, C, D and E airspace.

b. All operations conducted under IFR (appropriate SA-CAA instrument rating - manned aircraft or otherwise - recommended).

c. All operations conducted at joint use or public airfields.

d. All operations conducted beyond line of sight.

e. At any time the SA-CAA has determined the need based on the UAS’ characteristics, mission profile, or other operational parameters.

7.3.5. Operations not requiring a pilot licence: The PIC may be exempted from holding a pilot licence for operations approved and conducted solely within visual line of sight in Class F and G airspace. For the PIC to be exempt from the pilot licence requirement the following conditions must exist and the alternative compliance method described below must be followed -

a. The operation is conducted in a sparsely populated location.

b. The operation is conducted from a privately owned airfield, military installation, or off-airport location.

c. Visual range operations must be conducted no further than 1500 metres laterally from the UAS pilot and at an altitude of no more than 400 feet above ground level (AGL), unless approved otherwise by the SA-CAA.

d. Operations must be conducted during daylight hours only.

e. Operations shall be conducted no closer than 3 km from any airport or heliport.

f. Alternative Compliance Method: In lieu of a pilot licence, the PIC must have successfully completed, at a minimum, SA-CAA private pilot ground instruction, or equivalent, and have passed a relevant written examination.

7.3.6. Currency: The applicant shall provide a process that ensures that the pilots retain an appropriate level of currency in the UAS being operated. The process to retain currency should be approved by the SA-CAA.

7.3.7. Medical Certification: Unless otherwise provided by the SA-CAA, the PIC shall maintain, at a minimum, a valid SA-CAA Class 2 medical certificate issued under CAR Part 67, Medical Certification.

7.3.8. Training: In addition to the aforementioned training required for a pilot licence, UAS pilots will have additional training in all specific details of the UAS being operated including normal, abnormal, and emergency procedures. This must include manufacturer specific training (or military equivalent), demonstrated proficiency, and testing in the UAS being operated.

7.4. Supplemental Pilots

7.4.1. Supplemental pilots are those pilots assigned UA flight duty to augment the PIC. The supplemental pilot can assume the position of either an “internal” or an “external” UA pilot.

7.4.2. Ratings: No specific rating is required for supplemental pilots unless they are assuming the role of PIC. However, at a minimum, they must have successfully completed an appropriate student pilot ground school, or equivalent, and have passed a relevant written test.

7.4.3. Currency: The applicant shall provide a process that ensures that the pilots maintain an appropriate level of currency in the UAS being operated.

7.4.4. Medical Certification: Supplemental pilots shall maintain, at a minimum, a valid SA-CAA Class 2 medical certificate issued under CAR Part 67, Medical Certification. Any supplemental pilot acting as a dedicated visual observer or flying the UA on a visual basis shall also maintain a valid SA-CAA Class 2 medical certificate.

7.4.5. Training: In addition to all training required for receiving and maintaining a pilot licence, the supplemental pilot shall be additionally trained in all specific details of the UAS being operated including normal, abnormal, and emergency procedures.

7.5. Observer Qualifications

7.5.1. All observers must have an understanding of the CAR applicable to the airspace where the UA will operate. Observers are considered a crewmember of the UAS.

7.5.2. Medical Certification: All observers shall maintain, at a minimum, a valid SA-CAA Class 2 medical certificate issued under CAR Part 67, Medical Certification. Regulation 91.02.3 of CAR Part 91, Flight Crew Member Responsibilities, applies to all UAS crewmembers, including observers.

7.5.3. Training: Observers must have completed sufficient training to communicate to the pilot any instructions required to remain clear of conflicting traffic. Unless the SA-CAA determines otherwise, this training, at a minimum, shall include knowledge of the rules and responsibilities described in, for example, FAA 14 CFR 91.111, Operating Near Other Aircraft, 14 CFR 91.113, Right-of-Way Rules: Except Water Operations, and 14 CFR 91.155, Basic VFR Weather Minimums, as well as knowledge of air traffic and radio communications, including the use of approved ATC/pilot phraseology.

7.6. Other Personnel Qualifications

7.6.1. Ancillary personnel such as systems operators or mission specialists must be thoroughly familiar with, and possess operational experience of, the equipment being utilised. If the systems being utilised are for observation and detection of other aircraft for collision avoidance purposes, the personnel must be thoroughly trained on collision avoidance procedures and techniques and have direct communication with the UAS pilot, observer, and other applicable personnel on an inter-communication system.

7.7. Maintenance Personnel Qualifications

7.7.1. Ratings: Ratings will be established as more data is collected and a regulatory guideline is developed.

7.7.2. Currency: It is suggested that applicants follow applicable guidelines of CAR Part 66, Aircraft Maintenance Engineer Licensing, as appropriate, until final UAS regulatory guidelines are available.

7.7.3. Medical Certification: No medical requirements have been defined at this time.

7.7.4. Training: It is highly recommended that a Maintainer/Operator of a UAS submit a training program. This requirement will be further refined as more data is collected and a regulatory guideline is developed.

SECTION 2: GUIDELINES FOR NON-TYPE CERTIFIED VISUAL RANGE LIGHT UAS

(Source: United Kingdom Civil Aviation Authority (CAA): UK-CAA Policy for Light UAV Systems. 2004.)

8. INTRODUCTION

8.1. Background

8.1.1. Non-type certified visual range light UAS (referred to as Light UAS in this Section) are those non-type certified UAS -

a. with a maximum take-off mass below 150 kg;

b. a maximum speed not exceeding 70 knots;

c. that meet the energy criteria of paragraph 9, Light UAS Airworthiness and Operations Guidelines, of this Interim Policy;

d. that are operated within visual range of the Light UAS pilot, but not exceeding 1 km; and

e. that are operated at not more than 400 ft above ground level, unless -

i. the operations are carried out at an SA-CAA approved South African Model Aircraft Association (SAMAA) model flying site, in which case the height limitations applicable at the particular site will be observed;

ii. the operations are carried out within an area that has been approved as an area for the operation of Light UAS in terms of paragraph 8.2, Approval of Areas for Operation of Light UAS, of this Section, in which case the SA-CAA will define the maximum allowable height above ground level for the relevant Light UAS operations; or

iii. flight above 400 ft during the operations is specifically approved by the SA-CAA.

8.1.2. The routine operations of civil (state and commercial) UAS is likely to be severely restricted in the short-term until a number of significant technical problems have been resolved (eg the provision of an adequate “sense and avoid” capability). Until the solutions to such problems are available and UAS can achieve parity with manned aircraft in respect of freedom of operation, civil UAS are likely to remain segregated from manned aircraft and be confined to flight above sparsely populated areas.

8.1.3. Reviews of the UAS market have highlighted that UAS that are capable of operating under such constraints tend to be the lighter UAS, and that this trend is likely to continue for the foreseeable future.

8.1.4. These operational constraints are not unique to UAS. Pilotless aircraft in the form of "model aircraft" have been flying within these limitations for many years and have achieved an acceptable safety record. Most nations currently have provisions within their national legislation to allow model aircraft to operate with no or limited airworthiness requirements in place, provided operational constraints in terms of where and when the model aircraft is operated are enforced.

8.1.5. Furthermore, in the past these model aircraft have, on a case-by-case basis, been allowed to operate commercially in performing aerial work tasks – effectively operating as UAS.

8.1.6. With this background, the SA-CAA considers it appropriate to produce interim policy guidelines for the regulation of Light UAS based on similar principles and restrictions to those applied to model aircraft and which, if adopted, would enable a harmonised approach for the routine operation of Light UAS in South Africa.

8.1.7. Consideration is therefore given in this Section to allow UAS that have no greater capability than existing model aircraft to operate without obtaining airworthiness certification, subject to the UAS complying with similar limitations and conditions to those applied to model aircraft.

8.2. Approval of Areas for Operation of Light UAS

8.2.1. An operator of a Light UAS may apply to the SA-CAA for the approval of an area as an area for the operation of Light UAS.

8.2.2. In considering whether to approve an area for this purpose, the SA-CAA must take into account the likely effect on the safety of air navigation as a result of the operation of the Light UAS in or over, the area.

8.2.3. An approval granted by the SA-CAA in terms of this paragraph may be expressed to have effect for a particular period (including a period of less than one day), or indefinitely.

8.2.4. The SA-CAA may impose conditions on the approval in the interests of the safety of air navigation.

8.2.5. The details of an approval granted by the SA-CAA in terms of this paragraph, including any condition/s, must be published by the SA-CAA in a NOTAM.

8.2.6. The SA-CAA may revoke the approval of an area, or change the conditions that apply to such an approval, in the interests of the safety of air navigation, but must publish details of any revocation or change in a NOTAM. The SA-

CAA must also give written notice of the revocation or change to the holder of the approval.

8.3. Regulatory Concept

8.3.1. Historically there has been a trade-off between the level of airworthiness and operational standards of aircraft. Recreational activities tend to have minimal airworthiness standards applied and are regulated more by operational requirements which dictate where and when they may fly. The converse is true for commercial activities and public transport. The rationale for this approach stems from the level of risk and cost that people are prepared to tolerate and their level of direct involvement in the activity. However, the level of risk for third parties should remain constant and independent of the type of operation being conducted.

8.3.2. To provide a measure of “equivalence”, the regulatory concept developed here uses impact kinetic energy as a basic criterion. Impact kinetic energy is directly linked to the ability of a UAS to cause damage and injury. It provides both an absolute measure for the showing of compliance and a relative standard for identifying “equivalence” with model aircraft. Kinetic energy is also an all-encompassing criterion applicable to all aircraft types, is easy to measure and can be readily estimated during the design process. It is emphasized that there is no intent to change the regulatory environment for model aircraft in any way.

8.3.3. The proposal detailed here is concerned with the regulatory environment for UAS performing tasks other than sport and recreational. The relevance of model aircraft to the matter at issue is their safety record and how this may be read across to UAS of equivalent capability.

8.4. Exemptions

8.4.1. The SA-CAA may by written notice exempt either generally, or subject to such conditions as may be specified, or for such period as may be specified, from the operation of any one or more of the provisions of this Interim Policy, provided that such exemption will not compromise aviation safety or the public interest.

8.4.2. No person may conduct operations that require a deviation from these requirements except under a written exemption issued by the SA-CAA.

9. LIGHT UAS AIRWORTHINESS AND OPERATIONS GUIDELINES

9.1. Applicability

9.1.1. For the purposes of this Section, a Light UAS consists of a non-type certified visual range unmanned aircraft (UA) and its supporting systems in which the UA -

a. is used or is intended to be used for unmanned operation in airspace other than in buildings and structures;

b. does not have any national or foreign airworthiness certificate;

c. has a maximum take-off mass of less than 150 kg;

d. is not capable of more than 70 knots calibrated airspeed at full power in level flight; and

e. has an impact kinetic energy that does not exceed 95 kJ when assessed against both a high speed and free-fall impact scenario, and which is calculated as follows -

i. Kinetic energy = 0.5*Max. Operating Mass*(1.4 * Max. Level Speed)^2

ii. Kinetic energy resulting at impact from a free fall from a height of 400 ft. (Note that the 400 ft height limit is used here for the purposes of establishing the impact kinetic energy of the Light UAS in accordance with the current international procedure used here. This limit does not preclude the Light UAS from being operated at heights above ground level of more than 400 ft.)

9.1.2. The mass limit has been determined following a review of the worldwide UAS fleet. This showed that more than 70% of UAS employed worldwide in purely civil, research or dual-purpose operations, have a mass of less than 150 kg. A further analysis also indicates that this trend is likely to continue for the foreseeable future with 65% of those UAS types entering service, market ready or being developed, also under 150 kg. It was also noted that those UAS with weights higher than 150 kg tended to be designed for autonomous flight beyond the visual range of the operator, and were therefore outside the scope of this Section. In setting the boundary conditions for a Light UAS to operate within a restricted operational area, it therefore seems appropriate, for the purposes of this Interim Policy, to choose the 150 kg mass limit.

9.1.3. The 70 kts maximum speed limit has been applied based on a judgement of the capability of the existing model aircraft fleet, pilot workload, the ability of the pilot to retain control whilst possibly performing other operational tasks and the pilot reaction time necessary to ensure that the Light UAS does not pose a hazard to persons or property by passing through the buffer zone around the intended operating area. The imposition of this absolute speed limit at this time is seen as a prudent, precautionary position to take at this early stage of civil Light UAS operations.

9.1.4. It is generally accepted to approach the setting of UAS safety standards “equivalent” to manned aircraft by using impact kinetic energy as a defining criterion. In developing these guidelines for the regulation of Light UAS, a

similar approach is taken, with equivalence being shown against the existing model aircraft fleet.

9.1.5. Two scenarios are considered: i) in a free-fall from 400 ft, and ii) maximum impact speed (set as 1.4 x maximum operating speed for fixed wing aircraft, or the terminal velocity in the case of rotorcraft and lighter-than-air machines). These two scenarios represent the extremes of the operating envelope and compliance with the energy criteria derived from these scenarios will ensure that the ability of the Light UAS to cause damage or harm is constrained no matter what the circumstances of the crash or the characteristics of the Light UAS. In the maximum impact speed scenario, the factor of 1.4 has been added based on existing regulatory requirements for manned aircraft flutter prevention. Above this speed, it could be expected that the Light UAS would structurally fail and break-up. Note that the "free-fall" scenario is intended to address descent of the aircraft out of control, due to failures of primary structure or critical systems. Examples of such failures for a rotorcraft would be the unrecoverable loss of main rotor speed, or separation of a main rotor. For a lighter-than-air aircraft such failures could include the rupture or complete separation of the gas envelope.

9.1.6. A single kinetic energy limit is stipulated which a Light UAS must not exceed when assessed against both impact scenarios. This limit has been established following a survey of existing model aircraft. The survey concluded that setting a mass limit of 75 kg would be comparable with the majority of the existing model fleet. Note the difference here with the 150 kg limit established from the UAS survey. As the intent is to provide "equivalent" regulation with model aircraft, the 75 kg, 70 kts limitations must take precedence in setting the energy level. The UAS survey was not detailed enough to identify exact weights in many cases, and so it is unknown how many UAS may be disadvantaged through the setting of this limitation. However, the boundary has to be drawn somewhere, and this is seen as a defendable position given the level of maturity of civil UAS.

9.1.7. Combining the 70 kts maximum level speed specified above, with a mass of 75 kg, provides a kinetic energy limit of 95 kJ. A Light UAS with a maximum speed below 70 kts could have a correspondingly higher mass within the same kinetic energy limit as detailed in the following table:

Mass of Light UAS (kg)	**Maximum Achievable Speed in Level Flight (V_{max}) – kts**	**1.4 V_{max} (m/s)**	**Kinetic Energy at 1.4 V_{max} (kJ)**
60	70	50	76
70	70	50	89
75	70	50	95
80	68	49	95

90	64	46	95
110	58	42	95
130	53	38	95
150	49	36	95

9.1.8. The impact velocity arising from the "free-fall" scenario will depend upon the aerodynamic drag characteristics of the falling object and so will be specific to the particular design of Light UAS. Assuming negligible aerodynamic drag, an object dropped from 400 ft will impact the surface at 95 kts and the kinetic energy at impact will be 95 kJ if the mass of the object is 80 kg. Should the object in fact exhibit significant aerodynamic drag, (without reliance upon any onboard parachute deployment system), the impact velocity will be less and so a higher mass may be permissible. For illustrative purposes, the table below shows the relationship between the mass and cross-sectional area of a bluff-body, (with a non-dimensional drag coefficient of about 0.9), arising from the proposed 95 kJ limit.

Mass of Body (kg)	**Cross-sectional Area of Bluff Body (m^2)**	**Kinetic Energy at Impact (kJ)**
80	(Negligible drag)	95
115	0.5	95
130	1.0	95
150	1.5	95

9.1.9. Light UAS up to 80 kg. From the data presented above it can be seen that any Light UAS with a mass of less than 80 kg will meet the "free-fall" criterion whatever its drag characteristics and so it need only be considered against the maximum impact speed scenario. If the mass is 80 kg the maximum achievable level speed must not exceed 68 kts. If the mass is less that 75 kg the maximum achievable level speed must not exceed 70 kts.

9.1.10. Light UAS above 80 kg. The data presented for the "free-fall" scenario shows that if the proposed Light UAS has a mass in excess of 80 kg the constructor will have to provide a justification that the drag of the airframe, falling from a height above the surface of 400 ft, will be sufficient to prevent the impact energy exceeding 95 kJ.

9.1.11. The potential application of the "free fall" criterion is perhaps best illustrated by considering the example of an airship with a total mass of 150 kg. A 150 kg unmanned airship will be eligible under these provisions if it can be shown that -

a. the maximum achievable level speed of the airship is less than 49 kts;

b. any significant masses (with negligible drag) that might fall from it in the event of structural failure do not exceed 80 kg; and

c. the drag of the ruptured/deflated envelope is sufficient to limit the descent velocity of the complete airship falling from 400 ft, to the same extent as a bluff body of 1.5 m^2 reference area.

9.1.12. No constraint has been placed here on the amount of fuel that can be carried. However, it is believed that the energy limit imposed and practical design constraints will in effect limit the fuel capacity available.

9.1.13. The approach adopted makes no assumption on the type of Light UAS and is intended to be all encompassing so that all types of Light UAS are handled in the same way. While it is undoubtedly true that conventionally configured fixed wing Light UAS will be limited to a somewhat lower mass than the maximum 150 kg on account of their low drag, the full weight limit may be achievable by other types of Light UAS e.g. an airship, when it can be demonstrated that the impact energy is no greater than that stipulated. The kinetic energy limit has been set based on experience with model aircraft. The aim is to limit, for the time being, the capability of this category of Light UAS to that already permitted for large model aircraft. It is expected that these limits will be reviewed once several years of experience with civil Light UAS operations has been gained. The current proposal is seen as a reasonable and defendable position to take based upon existing experience with model aircraft and represents a suitably cautious approach to take at this time.

9.2. Inspection Requirements

9.2.1. Any person intending to operate, or operating a Light UAS under this Section shall, upon request, allow the SA-CAA to inspect the Light UAS to decide the applicability of these requirements.

9.2.2. The pilot or operator of a Light UAS must, upon request of the SA-CAA, furnish satisfactory evidence that the Light UAS is subject only to the provisions of these requirements.

9.3. Certification and Registration

9.3.1. A Light UAS, intended to be operated under this Section, is not required to meet the airworthiness certification standards specified for aircraft or to have a certificate of airworthiness. However, the design, construction and initial flight-testing of the Light UAS must be overseen by the SA-CAA, or by a body approved by the SA-CAA to carry out such an oversight.

9.3.2. The operator of a Light UAS is not required to meet any aeronautical knowledge requirements to operate the aircraft or to have a pilot or medical certificate. However, every operator of a Light UAS must be identified and demonstrate at least basic ability to control the aircraft.

9.3.3. A Light UAS, intended to be operated under this Section, is not required to be registered or bear markings of any type.

9.3.4. Under these provisions, a Light UAS may overfly persons directly associated with the aerial work task. To protect these personnel, who have some degree of involvement in the activity (and presumably a good knowledge of the risks involved), yet who may not have direct control of the aircraft, it is appropriate to set a safety level no less demanding than that applied by the SA-CAA to large model aircraft. For the purposes of this Interim Policy, airworthiness is controlled by inspection of the design and construction, plus "function and reliability" flight testing of significant duration to ensure against the presence of poor stability, control and performance characteristics. Oversight of these functions could be undertaken either by the SA-CAA, or by a body approved by the SA-CAA to carry out such oversight.

9.4. Maintenance Requirements

9.4.1. The operator of a Light UAS shall not operate the Light UAS unless -

a. the Light UAS is maintained in accordance with the manufacturer`s continuous airworthiness instructions that are appropriate for the Light UAS, or had been previously approved by the SA-CAA for the type of Light UAS; and

b. the Light UAS, and its elements other than the UA, are maintained in a "system worthy" condition in accordance with the manufacturer's continuous airworthiness instructions, or as previously approved by the SA-CAA for the UA and system elements.

9.5. Hazardous Operations

9.5.1. No person may operate a Light UAS in a manner that creates a hazard to persons or property.

9.5.2. No person may allow an object to be dropped from a Light UAS if such action creates a hazard to other persons or property.

9.6. Nighttime Operations

9.6.1. Requests to the SA-CAA for approval of nighttime operations with a Light UAS will be handled on a case-by-case basis and may be approved if sufficiently mitigated and a safety case has been established.

9.7. Operation Near Aircraft: Right-of-Way Rules

9.7.1. Each person operating a Light UAS shall maintain vigilance so as to see and avoid other aircraft and shall yield the right of way to all manned aircraft.

9.7.2. No person may operate a Light UAS in such a manner that the UA creates a collision hazard with respect to any other aircraft.

9.7.3. A Light UAS shall not be operated at more than 400 ft above ground level, unless -

a. the operation is carried out at an SA-CAA approved SAMAA model flying site, in which case the height limitations applicable at the particular site will be observed;

b. the operation is carried out within an area that has been approved as an area for the operation of Light UAS in terms of paragraph 8.2, Approval of Areas for Operation of Light UAS, of this Interim Policy, in which case the SA-CAA will define the maximum allowable height above ground level for the relevant UAS operation; or

c. flight above 400 ft during the particular operation is specifically approved by the SA-CAA.

9.7.4. For air traffic monitoring purposes, it is recommended that the operator of a Light UAS make use of a two-way VHF radio in compliance with CAR approval and licensing requirements.

9.8. Operations near People or Property

9.8.1. Unless a Light UAS is operated -

a. under specific SA-CAA authorisation and approval for operations near people and property, in which case the SA-CAA will define appropriate limitations;

b. at an SA-CAA approved SAMAA model flying site, in which case limitations applicable at the particular site are to be observed; or

c. within an area that has been approved as an area for the operation of Light UAS in terms of paragraph 8.2, Approval of Areas for Operation of Light UAS, of this Interim Policy, in which case the SA-CAA will define relevant limitations applicable to the approved area,

no person may operate the Light UAS such that -

i. the UA approaches within 100 metres of any congested area of a city, town, or settlement;

ii. the UA approaches within 100 metres of any person, vehicle or structure not forming part of the operation; or

iii. during take-off and landing, the UA flies within 30 metres of any person other than the Light UAS pilot and/or observer.

9.8.2. Unless approved by the SA-CAA for the purposes of the operation, a Light UAS is prohibited from operating within 100 metres of any object or installation, such as chemical or fuel storage tanks, that would result in a hazard to public health and safety in the event of damage due to any impact of the Light UAS.

9.8.3. No person may operate a Light UAS at any public flying display except with the prior permission in writing of the SA-CAA.

9.9. Operations in Certain Airspace

9.9.1. No person may operate a Light UAS within controlled airspace unless that person has prior authorisation from the ATC facility having jurisdiction over that airspace.

9.10. Operations in Prohibited, Restricted, Danger or Special Rules Areas

9.10.1. No person may operate a Light UAS in prohibited, restricted, danger or special rules areas unless that person has permission from the relevant controlling agency.

9.11. Flight Restrictions in the Proximity of Certain Areas Designated by Notice to Airmen

9.11.1. No person may operate a Light UAS in airspace designated in a Notice to Airmen (NOTAM) relating to temporary restricted airspace established for reasons of aviation safety or national security, unless authorised by the ATC facility having jurisdiction over that airspace.

9.12. Visual References with the Light UAS

9.12.1. No person may operate a Light UAS except by visual reference with the UA. When using other aids to vision, such as binoculars, field glasses, or telephoto television, visual observers must use caution to ensure that the UA remains within the approved visual limitation distance of the observer. Due to field of view and distortion issues, the use of such aids can be used to augment the observer's visual capability but cannot be used as the primary means of visual contact.

9.13. Flight Termination Systems (FTS)

9.13.1. It is highly desirable that all Light UAS have system redundancies and independent functionality to ensure the overall safety and predictability of the system. If a Light UAS is found to be lacking in system redundancies, an independent flight termination system that can be activated manually by the Light UAS PIC may be required to safeguard the public. If fitted to the UA, the pilot of a Light UAS must satisfy himself/herself that the FTS is in working order prior to the flight commencing.

SECTION 3: GENERAL PROCEDURES AND REQUIREMENTS FOR UAS

10. INTRODUCTION

10.1. Purpose

10.1.1. This Section provides guidance to -

a. designers, manufacturers and operators of civil UAS, other than the non-type certified visual range light UAS provided for in Section 2, in -

i. the design, construction and operation of UAS; and

ii. the means whereby the UAS may safely and legally be operated; and

b. SA-CAA staff on the processing of approvals for UAS design, manufacturing and operation.

10.1.2. This Section establishes requirements and procedures for -

a. regulatory administrative matters related to UAS;

b. the design of UAS, and elements of such systems;

c. the manufacturing of UAS, and elements of such systems;

d. the approval of UAS operators;

e. the maintenance of UAS;

f. the operation of UAS;

g. the training and certification/licensing of UAS crewmembers;

h. the utilisation of air traffic management and control services for the operation of UAS; and

i. UAS incident and accident handling.

10.2. Applicability

10.2.1. This Section applies to the designers, manufacturers and operators of civil UAS, in -

a. the design, development, testing and approval of UAS, and elements of such systems;

b. the manufacturing of UAS, and elements of such systems;

c. the approval of UAS operators;

d. the maintenance of UAS;

e. the operation of UAS; and

f. the training and certification/licensing of UAS crewmembers.

10.3. Classification

10.3.1. For the purposes of all Sections of this Interim Policy, a basic and simplistic UAS classification has been selected as follows -

a. Large UAS. A large UAS is one that consists of the unmanned aircraft (UA) and all necessary UAS elements, and means any of the following -

i. an unmanned airship with an envelope capacity greater than 100 cubic metres;

ii. an unmanned powered parachute with a take-off/launch mass greater than 150 kilograms;

iii. an unmanned fixed wing aircraft, powered or unpowered, with a take-off/launch mass greater than 150 kilograms;

iv. an unmanned helicopter/rotorcraft with a take-off/launch mass greater than 150 kilograms; or

v. any other unmanned powered lift device with a take-off/launch mass greater than 150 kilograms.

b. Light UAS. A light UAS is one that consists of the UA and all necessary UAS elements, and means any of the following -

i. an unmanned airship with an envelope capacity of not more than 100 cubic metres;

ii. an unmanned powered parachute with a take-off/launch mass of not more than 150 kilograms;

iii. an unmanned fixed wing aircraft, powered or unpowered, with a take-off/launch mass of not more than 150 kilograms;

iv. an unmanned helicopter/rotorcraft with a take-off/launch mass of not more than 150 kilograms; or

v. any other unmanned powered lift device with a take-off/launch mass of not more than 150 kilograms; and

vi. light UAS as provided for in Section 2 of Part B, Guidelines for Non-Type Certified Visual Range Light UAS.

10.4. Utilisation

10.4.1. For the purposes of this Interim Policy, the utilisation of UAS will be limited to the following -

a. UAS used for commercial aerial services and/or aerial work, other than passenger carrying;

b. UAS used for non-commercial, civil aerial services and/or aerial work, other than passenger carrying; and

c. UAS specifically designed or modified for research, experimental, testing or scientific purposes.

10.5. International Operations

10.5.1. A South African UAS may only be operated outside the Republic's borders if the appropriate authority with jurisdiction over the relevant airspace has given prior permission for the UAS to be operated in such airspace.

11. SECURITY

11.1. General

11.1.1. UAS security is that characteristic or condition that implies protection against unauthorised access, loss or manipulation of the UAS, usually in connection with unlawful attempts of exploitation of possible weaknesses of the system. During the design phase of a UAS, a threat analysis, and the vulnerabilities identified as a result, will determine the general security measures that would need to be applied to the UAS. In addition, to ensure secure missions, it may also be necessary to carry out a threat analysis for each mission undertaken by the UAS.

11.1.2. As there are similar concerns in respect of flight safety and airworthiness design aspects, the boundary between security and safety often becomes blurred as the applied security measures may also benefit the safety of the UAS. This is in particular valid for information security. Safety, security and accrediting aspects should therefore be treated together during the design phase. The primary UAS security issues include, but are not limited to, the following -

a. physical security;

b. communication links;

c. data networks;

d. software; and

e. malicious intentions for the use of UAS.

11.2. Personnel

11.2.1. Where intended UAS operations have the potential to impact on national security, the SA-CAA may recommend that the personnel associated with the specific UAS operations be subjected to an appropriate security clearance procedure.

12. INSURANCE

12.1.1. While insurance is not a safety issue, it is highly desirable that operators of UAS hold adequate levels of insurance in order to meet possible legal liabilities in the event of an accident, irrespective of the purposes for which the UAS is used. Guidance regarding the minimum levels of third party accident and war risk insurance for UAS operating in South Africa should be obtained from the SA-CAA, the national Air Service Licensing Council (aerial service operations), and/or appropriate insurance professionals. Further details and guidelines may in future be incorporated in this Interim Policy as experience in this field develops.

13. PROCEDURES

13.1. General

13.1.1. The purpose of this Interim Policy is not to replicate the SA-CAA procedures that already exist, but to provide a typical, general set of guideline procedures that may be followed for applications made to the SA-CAA in connection with this Interim Policy.

13.1.2. It remains the prerogative of the SA-CAA to prescribe any specific or additional procedures that may be appropriate to UAS. Thus, prior to making an application, it is the responsibility of each applicant to consult the SA-CAA to verify the exact procedures required for the particular application.

13.2. Application for a Licence, Certificate or Approval

13.2.1. An application for the issuing of a licence, certificate or approval –

a. must be made to the SA-CAA on the appropriate form;

b. must be accompanied by the information required in respect of the application; and

c. when applicable, must be accompanied by the prescribed fee.

13.3. Applicable Requirements

13.3.1. For the purpose of this Interim Policy, determining the Applicable Requirements appropriate to -

a. a first application for a particular licence, certificate or approval; or

b. a repeat application for a particular licence, certificate or approval,

will normally be accomplished through a process of consultation between the applicant and the SA-CAA. It is the responsibility of the applicant to identify and propose appropriate Applicable Requirements for evaluation and approval by the SA-CAA. Alternatively, in the absence of relevant regulations, SA-CAA may prescribe interim guidance material based on this Interim Policy and/or any other appropriate local or international legislation, standards and guidance material.

13.3.2. When an applicant for a licence, certificate or approval is responsible for proposing Applicable Requirements, the applicant may utilise any recognised national or international legislation, regulations, compliance requirements and/or industry standards for this purpose. Such material can be used independently or may be combined in a suitable manner to form a set of Applicable Requirements appropriate for the particular application.

13.3.3. In selecting the reference material and developing the applicable requirements, the applicant is advised to regularly consult with the SA-CAA to ensure the minimum delay in the subsequent evaluation and approval of the Applicable Requirements.

13.4. Issuing of a Licence, Certificate or Approval

13.4.1. An application for a licence, certificate or approval in terms of this Interim Policy shall be granted and the licence, certificate or approval issued by the SA-CAA if -

a. the applicant complies with the appropriate requirements associated with the application;

b. the UAS complies with the relevant airworthiness and operational requirements as approved and prescribed by the SA-CAA;

c. in the case of a non-compliance with an airworthiness and/or operational requirement, mitigating factors providing an equivalent level of safety acceptable to the SA-CAA and, where appropriate, comparable to levels of safety of equivalent manned aircraft, have been demonstrated to the SA-CAA by the applicant;

d. the UAS does not exhibit features or characteristics that makes the UAS unsafe for its intended operation; and

e. the applicant undertakes in writing to comply with the provisions of this Interim Policy, and/or any other appropriate provisions prescribed by the SA-CAA.

13.4.2. The licence, certificate or approval must be issued in writing in a format as may be determined by the SA-CAA and shall include –

a. information identifying the applicant, or in the case of a UAS, information identifying the UAS, and specifically the UA or UAs, as applicable;

b. the conditions and limitations that will apply to the granting of the licence, certificate or approval;

c. the period of validity of the licence, certificate or approval; and

d. any other information, conditions or limitations prescribed by the SA-CAA.

13.5. Privileges of the Holder of a Licence, Certificate or Approval

13.5.1. The holder of a licence, certificate or approval will be entitled to conduct such activities as are granted by the licence, certificate or approval, subject to the conditions and limitations prescribed for the licence, certificate or approval by the SA-CAA.

13.6. Duties of the Holder of a Licence, Certificate or Approval

13.6.1. The holder of a licence, certificate or approval shall -

a. conduct the activities granted by the licence, certificate or approval in compliance with the provisions of the licence, certificate or approval;

b. comply with any other requirement which the SA-CAA may prescribe; and

c. report to the SA-CAA any incident, occurrence, failure, malfunction or defect that may affect the continued validity of the licence, certificate or approval.

13.7. Transferability

13.7.1. No licence, certificate or approval issued in terms of this Interim Policy shall be transferable.

13.7.2. A change in ownership of the holder of a licence, certificate or approval shall require a re-application to the SA-CAA for the issuing of the licence, certificate or approval to the new owner.

13.8. Amendment of a Licence, Certificate or Approval

13.8.1. No person other than a person authorised by the SA-CAA shall amend or change a licence, certificate or approval issued in terms of this Interim Policy.

13.9. Falsification of Applications, Reports or Records

13.9.1. No person shall make or cause to be made –

a. any fraudulent or intentionally false statement on any application for a licence, certificate or approval in terms of this Interim Policy;

b. any fraudulent or intentionally false entry in any record or report that is required to be kept, made, or used to show compliance with any requirement for the issuance, or the exercise of the privileges of any licence, certificate or approval issued in terms of this Interim Policy;

c. any reproduction for a fraudulent purpose of any licence, certificate or approval issued in terms of this Interim Policy; or

d. any alteration of any licence, certificate or approval issued in terms of this Interim Policy.

13.9.2. The committing of an act prohibited under this paragraph is a basis for suspending, or revoking, any licence, certificate or approval issued in terms of this Interim Policy, and which is associated with the prohibited act.

13.10. Safety Inspections, Audits and Tests

13.10.1. An applicant for the issuing of any licence, certificate or approval in terms of this Interim Policy shall permit a person authorised by the SA-CAA to carry out such safety inspections, audits and tests that may be necessary to verify the validity of any application made in terms of this Interim Policy.

13.10.2. The holder of any licence, certificate or approval issued in terms of this Interim Policy, shall permit a person authorised by the SA-CAA to carry out such safety inspections, audits and tests, including safety inspections and audits of its partners or subcontractors, that may be necessary to determine continued compliance with the provisions of this Interim Policy and the privileges granted by the licence, certificate or approval.

13.11. Suspension and Cancellation of Licence, Certificates or Approvals, and Appeal

13.11.1. A person authorised by the SA-CAA may suspend for a period not exceeding 30 days, any licence, certificate or approval issued in terms of this Interim Policy, if –

a. after a safety inspection, audit and/or test carried out in terms of this Interim Policy, it is evident that the holder of the licence, certificate or

approval, does not comply with the provisions of this Interim Policy and the privileges granted by the licence, certificate or approval, and such holder fails to take action to remedy such non-compliance within 30 days after receiving notice in writing from the person authorised by the SA-CAA to do so; or

b. the person authorised by the SA-CAA is prevented by the holder of the licence, certificate or approval, or its partners or subcontractors, to carry out a safety inspection and/or audit in terms of this Interim Policy; or

c. the suspension is necessary in the interests of aviation safety.

13.11.2. Subsequent to the suspension of a licence, certificate or approval, standard SA-CAA procedures shall be followed to -

a. report the suspension;

b. appeal the suspension;

c. adjudicate the suspension;

d. confirm, vary or set aside the suspension; and

e. in the case of confirmation of the suspension, cancel the licence, certificate or approval.

13.12. Register of Licences, Certificates and Approvals

13.12.1. The SA-CAA shall maintain a register of all licence, certificates and approvals issued in terms of this Interim Policy.

14. EXEMPTIONS

14.1. Exemptions from the Provisions of this Interim Policy

14.1.1. The SA-CAA may by written notice exempt -

a. the applicant for the issuing of a licence, certificate or approval in terms of this Interim Policy; or

b. the holder of a licence, certificate or approval issued in terms of this Interim Policy,

either generally or subject to such conditions as may be specified, or for such period as may be specified, from the operation of any one or more of the provisions of this Interim Policy, provided that such exemption will not compromise aviation safety or the public interest.

15. UAS AIRWORTHINESS

15.1. General

15.1.1. All UAS must be shown to be airworthy to conduct flight operations in the national airspace. Where applicable, UAS should be maintained and conform to the same airworthiness standards as are defined for similar manned aircraft. However, the SA-CAA recognizes that some of the requirements can differ from those for manned aircraft and appropriate changes can be defined.

15.1.2. For the purposes of this Interim Policy, a UAS typically consists of one or more UA and all necessary elements, subsystems and functions, including but not limited to, a control station, a communications/datalink system, support equipment and/or infrastructure, a maintenance system, and operating personnel (crewmembers and support personnel).

15.1.3. Although the intention of this Interim Policy is to evaluate and approve the airworthiness of a UAS as a whole, the SA-CAA recognises that the airworthiness of elements of unmanned aircraft systems and equipment could be evaluated and approved individually where such elements are to be produced in series for use in different types of UAS.

15.1.4. A basic requirement for operations without restrictions in non-segregated airspace is a UAS issued with a standard category certificate of airworthiness. The issuance of the standard category certificate of airworthiness is made on condition that the UAS design has been type certified to comply with appropriate Applicable Requirements for airworthiness, the Type Certification Basis.

15.1.5. For a UAS issued with a restricted or special category certificate of airworthiness, the SA-CAA may, if required, prescribe such conditions and limitations to the operation of the UAS as would be appropriate to ensure safe air navigation.

15.1.6. When type certification for a UAS is required, the SA-CAA may prescribe such airworthiness requirements as it may deem acceptable for the issuing of a type certificate for the UAS. Such airworthiness requirements may be based on the South African Civil Aviation Regulations (CAR) or on any other airworthiness requirements.

15.2. Airworthiness Approval Process

15.2.1. Unless the SA-CAA determines otherwise, the following procedures and requirements will typically form part of the airworthiness approval process.

15.2.2. The primary steps in the airworthiness approval process include -

a. selection of the relevant approach (conventional/safety target) *[SA-CAA and applicant]*;

b. application for UAS design approval *[applicant applies to SA-CAA]*;

c. designation of Applicable Airworthiness Requirements for the design of the UAS *[proposed by the applicant, approved by the SA-CAA]*;

d. design, development and testing of the UAS using recognised aeronautical practices and/or best engineering practices, including aspects such as -

i. compliance with the Applicable Airworthiness Requirements;

ii. engineering design and analyses of primary designs and of design changes;

iii. mass and balance of the UA;

iv. configuration management;

v. UAS documentation, including instructions for operation and continuous airworthiness;

vi. declarations of design and performance;

vii. inspections and tests;

viii. ground tests; and

ix. flight test approvals and flight tests

[executed by applicant and overseen by SA-CAA];

e. when an experimental certificate of airworthiness is to be issued, application for registration of the prototype UA or UAs *[applicant applies to SA-CAA]*;

f. application for an experimental certificate of airworthiness for the prototype UA, when applicable *[applicant applies to SA-CAA]*;

g. application for approval of UAS test programme *[applicant applies to SA-CAA]*;

h. verification and oversight of execution of UAS test programme, as required and prescribed in UAS test programme *[applicant executes test programme, SA-CAA oversees test programme]*;

i. approval of final UAS design and required documentation (granting of type certificate, when applicable) *[SA-CAA]*;

j. for series production, application for manufacturing approval *[applicant applies to SA-CAA]*;

k. when a standard or restricted certificate of airworthiness is to be issued for a production UA, application for registration of such a UA *[applicant applies to SA-CAA]*;

l. when a standard or restricted certificate of airworthiness is to be issued for a production UA, application for such a standard or restricted certificate of airworthiness, as applicable *[applicant applies to SA-CAA]*; and

m. issuing of a standard or restricted certificate of airworthiness, as applicable, for the relevant production UA *[SA-CAA issues to applicant]*.

15.3. Airworthiness Approval Approach

15.3.1. One of two possible approaches for the evaluation and approval of the airworthiness of a UAS may be followed by the SA-CAA, while a third, emerging approach has recently been proposed in the EU military aviation environment as a means to introduce new technologies more rapidly into service.

15.3.2. The Conventional (Civil) Airworthiness Certification Approach

a. The Conventional approach for the civil certification of manned aircraft is to apply defined airworthiness requirements (usually prescribed in civil aviation regulations), based on a long history of experience, to the design of an aircraft. Recognition of compliance with those requirements is given by the granting of a type certificate for the approved design, and the issuing of certificates of airworthiness to individual aircraft. The certification specifications, sometimes supplemented by special conditions, address all aspects of the design that may affect the airworthiness of the aircraft. Generally, it is a common philosophy of these airworthiness requirements that, as far as is practicable, they avoid any presumption of the purposes for which the aircraft will be used in service. In applying this approach to UAS, appropriate existing airworthiness requirements may be used and/or adapted, or new airworthiness requirements may be developed and approved.

15.3.3. The Safety Target Approach

a. The Safety Target approach requires the setting of an overall safety objective for the aircraft within the context of a defined mission and operating environment. The Safety Target methodology is a top-down approach that focuses on safety critical issues that could affect achievement of the safety target, and allows potential hazards to be addressed by a combination of design and operational requirements. For example, uncertainties regarding the airworthiness of an aircraft

may be addressed by restricting operations to airspace from which third parties are excluded. The Safety Target approach facilitates concentrating on the key risks and is not constrained by the need to compile, and comply with, a comprehensive code of airworthiness requirements covering all aspects of the design for missions that are not envisaged.

15.3.4. The Hybrid Certification Approach

a. In 2007, the final report for the European Consortium for Advanced Training in Aerospace (ECATA) Multi-National Team Project No. 2 (MTP2), "Investigation into Harmonisation of Military Aviation Regulation across the EU – what outcome should Industry aim for?", identified the "hybrid certification approach" as an alternative approach to introduce innovative technologies into service. When innovative systems are developed that are based on new technological principles, there is usually insufficient experience of practical implementation to develop appropriate airworthiness standards. A safety target approach, based on systematic hazard identification and risk reduction, is usually used to introduce such systems without going through the process of acquiring experience to develop airworthiness standards. However, in many cases, the new or innovative technologies are limited to specific areas of a typical aircraft system, whereas the remainder of the aircraft could still comply with existing airworthiness standards.

b. By merging, through a process of sound engineering judgement, the Conventional Airworthiness Certification Approach with the Safety Target Approach, a "Hybrid Certification Approach" results that can be used to accelerate new or innovative technologies into service. The Conventional approach is adopted for all system elements that would comply with existing or modified airworthiness requirements and standards. To ensure an adequate overall level of safety, the remaining system elements, including the new or innovative technologies, are to be assessed by using the Safety Target approach.

c. Where significant benefits can be demonstrated, the SA-CAA may consider the use of this approach for the purposes of this Interim Policy.

15.3.5. In order to apply the most suitable airworthiness approval approach to a UAS project, the developer of the UAS is encouraged to consult with the SA-CAA as early as possible in the design stage to establish and agree on the approach to be followed for the particular project.

15.4. Certificates of Airworthiness

15.4.1. For the purposes of this Interim Policy, and subject to compliance with the relevant Applicable Requirements being shown by the applicant, the following certificates of airworthiness may be issued by the SA-CAA in accordance with regulation 21.08 of CAR Part 21, Certificates of Airworthiness, in respect of UAS -

a. standard and restricted category certificates of airworthiness will be issued for type certified UAS, while special category certificates of airworthiness (experimental or special flight permit) will be issued to non-type certified UAS;

b. experimental certificates of airworthiness are typically issued to industry and manufacturers wishing to accomplish UAS research and development and type certification compliance testing; and

c. special flight permits are typically issued to industry and manufacturers who do not intend to obtain type certification for a UAS, but intend to carry out a flight or a series of flights while the UAS does not conform to appropriate airworthiness design standards, as determined by the SA-CAA.

15.5. Registration

15.5.1. The owner/operator of a UA for which a standard, restricted or special category certificate of airworthiness is to be issued, must hold a certificate of registration for that UA, issued by the SA-CAA.

15.5.2. Except where, for reasons acceptable to the SA-CAA, the application of registration markings is not possible or practical (eg limited physical dimensions, modular replacements, etc), registration markings shall be applied to each UA for which a registration has been issued, in compliance with requirements as prescribed by the SA-CAA. Where registration markings cannot be applied to a UA, this shall be recorded on the certificate of registration by the SA-CAA.

15.5.3. Unless exempted by the SA-CAA, each UA shall have affixed to it a durable identification plate inscribed with appropriate marks to identify ownership and identity of the particular aircraft.

15.6. Engineering Organisation Approvals

15.6.1. Each UAS which is to be issued with a standard or restricted certificate of airworthiness must be -

a. designed by the holder of an appropriate design organisation approval issued by the SA-CAA in terms of Part 147 of the CAR of 1997, as amended;

b. manufactured by the holder of an appropriate manufacturing organisation approval issued by the SA-CAA in terms of Part 148 of the CAR of 1997, as amended; and

c. maintained by the operator in accordance with the operator's maintenance schedule, as approved by the SA-CAA, or by the holder of an appropriate aircraft maintenance organisation approval issued by the SA-CAA in terms of Part 145 of the CAR of 1997, as amended.

15.6.2. For all other UAS, it remains the prerogative of the SA-CAA to require the design, manufacturing and maintenance of such UAS to be accomplished by organisations with appropriate engineering organisation approvals.

15.7. Technical Issues, Design Criteria and Equipment Requirements

15.7.1. Proven fail-safe principles should be applied to the design of UAS as far as is practicable. Human factors, and the potential effects of human errors, should be considered in the design of a UAS and associated risks should be minimised as far as is practicable.

15.7.2. Critical System Design Criteria. Unless otherwise determined by the SA-CAA, the following are considered critical system design criteria for UAS:

a. Sense and Avoid/Collision Avoidance System Criteria. In its interim policy, "UAS Interim Operational Approval Guidance 08-01", the FAA rules as follows:

"While considerable work is ongoing to develop a certifiable "detect, sense, and avoid" system, no current solution exists. Compliance with the "see and avoid" aspect of 14 CFR 91.113, Right-of-Way Rules: Except Water Operations, becomes one of the primary issues in UAS operational approvals. As a result, alternate methods of compliance are required to accomplish the "see and avoid" function. See and avoid risk mitigation strategies are normally based on the use of visual observers or other methods of segregation. Risk mitigations may also include other methods or systems that an applicant may propose for consideration. An applicant may propose any reasonable type of mitigation or system, however, the FAA approves UAS flight activities that can demonstrate that the proposed operations can be conducted at an acceptable level of safety.

Applicants proposing "see and avoid" strategies in lieu of visual observers, need to support proposed mitigations with system safety studies which indicate the operations can be conducted safely. Acceptable system safety studies must include a hazard analysis, risk assessment, and other appropriate documentation that support an "extremely improbable" determination. "

For the purposes of this Interim Policy, the SA-CAA will substantially follow the FAA approach and strongly recommends that any parties developing sense and avoid technology for use on UAS in non-segregated airspace, should establish a process of regular discussion and review of their research and development activity with the SA-CAA at an early stage in the development programme.

b. Software. Safety critical UAS software should be verified and validated to a level of safety acceptable to the SA-CAA. It is recommended that the applicant use an appropriate standard for this purpose. Such standards may be industry standards such as RTCA DO-178B and equivalent, or standards developed by, or for, the applicant, in which case the standards will be subject to approval by the SA-CAA.

c. Flight Management System. The flight management system includes UAS controls, sensors, computers and actuation parts necessary to control the UA. It is highly desirable that the flight management system has system redundancies and independent functionality to ensure the overall safety and predictability of the system.

d. Electrical System. The electrical system should have sufficient power and endurance to ensure safe operations. Consideration should be given to the ability to shed non-essential load in the event of a power generation failure. Similar considerations apply to the remote control station.

15.7.3. Communications System

a. Where non-standard radio frequencies are to be used, approval must be obtained from the appropriate national authorities.

b. The UAS pilot must have immediate radio communication with appropriate ATC facilities anytime -

i. the UA is being operated in Class A, B, C, D, E or F airspace;

ii. the UA is being operated under instrument flight rules (IFR);

iii. it is stipulated under the provisions of the applicable certificate of airworthiness.

c. It is preferred that communications between the UAS pilot and ATC be established through onboard radio equipment to provide a voice relay; this is required for IFR flight.

15.7.4. General Requirements

a. Any visual observer, sensor operator, or other person charged with providing collision avoidance for the UA must have immediate communication with the UAS pilot. If a chase aircraft is being utilised, immediate communication between the chase aircraft and the UAS pilot shall be required at all times.

b. Data Link. Uplinks/downlinks are sensitive to electromagnetic interference (EMI) and should be adequately protected from this hazard. In all cases, the UAS must be provided with a means of managing the situation in the event of a lost link. There are many acceptable approaches to satisfy this requirement. The intent is to ensure airborne operations are predictable in the event of a lost link.

c. Navigation System. The UAS navigation system should meet the required navigation performance standards of the flight rules and the specific requirements for the airspace in which the operations are to be conducted.

d. Propulsion System. It is highly desirable that the propulsion system have system redundancies to ensure the overall safety and reliability of the system.

e. Remote Control Station. It is highly desirable that the remote control station, particularly those control stations that are also airborne, have system redundancies to ensure the overall safety and reliability of the UAS. Note that failures in the ground station can be repaired in a short period if spares are readily available and the design allows for modular replacement.

f. UA Airframe Structure. The UA structure should be designed to withstand the maximum expected operational loads as determined by the intended operational flight envelope of the UA, and as approved by the SA-CAA.

g. Flight Termination System. It is highly desirable that all UAS have system redundancies and independent functionality to ensure the overall safety and predictability of the system. If a UAS is found to be lacking in system redundancies, an independent flight termination system may be required to safeguard the public.

15.7.5. Equipment Requirements. In the process of establishing and proposing the Applicable Airworthiness Requirements for a UAS to the SA-CAA, the applicant will identify the relevant equipment and instrument capabilities that would be required in order for the UAS to comply with the applicable requirements for safe flight in the airspace where it is intended to operate the UAS. In reviewing and approving the Applicable Airworthiness Requirements for the UAS, the SA-CAA will confirm or revise the equipment and instrument capabilities proposed by the applicant.

15.7.6. Environmental Protection. From an environmental protection point of view there is very little difference between a manned and an unmanned aircraft. The essential requirements for environmental protection as prescribed, for example, by CAR Part 34 and CAR 36 make no distinction between manned or unmanned aircraft. Thus, in principle the normal environmental protection requirements are applicable. However, as UA are likely to operate from small or dedicated airports or launching sites that may be located much closer to noise sensitive areas it may be necessary to develop noise certification requirements for UA. This would also be the case if the normal operation of a UA would include sustained low level flight.

15.8. Continued Airworthiness

15.8.1. Each UAS must be maintained in accordance with -

a. instructions for continuous airworthiness prescribed by the manufacturer;

b. standard maintenance and inspection procedures applicable to manned aircraft, where appropriate; and

c. such continued airworthiness criteria and requirements as may be prescribed by the SA-CAA.

15.8.2. For purposes of UAS airworthiness, the UA and all flight safety related support equipment (eg the remote control station) should be considered as elements of the UAS and must be maintained to the same level of airworthiness as the UA.

15.8.3. For each UAS that is to be type certified, appropriate instructions for continuous airworthiness must be developed by the applicant and must be approved by the SA-CAA.

15.8.4. The instructions for continuous airworthiness should cover aspects such as -

i. maintenance schedules;

ii. mandatory maintenance;

iii. periodic and other inspections;

iv. mandatory periodical inspections;

v. release to service;

vi. repairs and modifications;

vii. approval of the design of major repairs and major modifications;

viii. approval of major repairs and major modifications incorporated into the UAS; and

ix. configuration management.

15.8.5. The UAS manufacturer should provide UA and/or UAS specific training as required.

16. OPERATIONAL REQUIREMENTS: OPERATOR APPROVAL

16.1. General

16.1.1. No person may conduct operations with UAS that require a deviation from the requirements of this Section except under a written exemption issued by the SA-CAA.

16.1.2. No UAS which is intended to be used for commercial aerial services and/or aerial work, other than passenger carrying, shall be operated unless the operator is the holder of an appropriate Operator Approval, issued in terms of this Section.

16.2. Operator Approval Process

16.2.1. Unless the SA-CAA determines otherwise, the following procedures and requirements will typically form part of the Operator Approval process.

16.2.2. The primary steps in the Operator Approval process include -

a. application for Operator Approval *[applicant applies to SA-CAA]*;

b. establishing of Applicable Operator Requirements, including security requirements, if applicable *[proposed by the applicant, approved by the SA-CAA]*;

c. administrative preparation and development of procedures to show compliance with the approved Applicable Operator Requirements *[executed by applicant and overseen by SA-CAA];*

d. inspection and evaluation of operator's organisation and procedures *[SA-CAA]*; and

e. approval of operator by granting of Operator Approval *[SA-CAA]*.

16.3. Lease Agreements

16.3.1. No operator who is subject to the provisions of this Interim Policy shall enter into a lease agreement with any other operator -

a. without the written approval of the SA-CAA; and

b. unless such lease agreement, including security provisions, if applicable, has been approved in writing by the SA-CAA.

16.4. Subchartering

16.4.1. When an Approved Operator is engaged in emergency operations, or when an operator is faced with an immediate, urgent and unforeseen need for a specific UAS and/or UAS crew, such operator may subcharter the appropriate UAS and/or UAS crew from any other Approved Operator, including security clearances, if applicable, provided that -

a. the subcharter period does not exceed such period as the SA-CAA may prescribe; and

b. both operators inform the SA-CAA, within 24 hours, of such subcharter.

16.5. Routes and Areas of Operation

16.5.1. For operations other than emergency operations, the operator of a UAS shall ensure that such operations are only conducted along such routes, or within such areas, for which -

a. appropriate ground facilities and services are provided for the planned operations;

b. appropriate maps and charts are available;

c. approval, if required, has been obtained for the planned operations from the appropriate authorities concerned; and

d. provision has been made to accommodate emergency situations.

16.6. Establishment of Procedures

16.6.1. The operator of a UAS shall -

a. establish written procedures and instructions for ground personnel and crewmembers;

b. establish a checklist system to be used by ground personnel and crewmembers for all phases of operation under normal and emergency conditions, to ensure that the operating procedures are complied with; and

c. ensure that crewmembers do not perform any activities during critical phases of flight, other than those required for the safe operation of the aircraft.

16.7. Operational Control and Supervision

16.7.1. The operator of a UAS shall -

a. exercise operational control; and

b. establish and maintain a method for supervision of flight operations acceptable to the SA-CAA.

16.8. Competence of Operations Personnel

16.8.1. The operator of a UAS shall ensure that all personnel assigned to, or directly involved in, ground and flight operations -

a. are properly instructed, competent and qualified;

b. have demonstrated their abilities in their particular duties;

c. are aware of their responsibilities, and the relationship of such responsibilities to the operation as a whole;

d. are competent to perform the duties assigned to them; and

e. hold appropriate and valid licences and/or certificates, and ratings.

16.8.2. The operator shall also ensure that all personnel competencies, licences, certifications and ratings are recorded in personal training files for the personnel.

16.9. Use of Airspace and Air Traffic Management Services

16.9.1. The operator of a UAS shall ensure that airspace and air traffic management services are used in compliance with the provisions of this Interim Policy, or as directed by the SA-CAA.

16.10. Minimum Flight Altitudes

16.10.1. The operator of a UAS shall establish minimum flight altitudes, and the methods to determine such minimum flight altitudes, for all routes and areas over which flights are to be conducted, to provide the required terrain clearance, taking into account all relevant operating limitations and prescribed minimum altitudes.

16.11. Fuel Policy

16.11.1. The operator of a UAS shall establish a fuel policy for the purpose of flight planning, and in-flight re-planning, to ensure that every flight carries sufficient fuel for the planned operation, including reserve fuel to cover deviations from the planned operation.

16.12. Noise Abatement Procedures

16.12.1. Where practicable, or as directed by the SA-CAA, the operator of a UAS shall establish operating procedures for noise abatement.

16.13. Incidents and Defects

16.13.1. The operator of a UAS shall establish adequate inspection, reporting and actioning procedures to ensure that defective equipment are reported and actioned prior to each operation.

16.13.2. The operator of a UAS shall establish adequate reporting and actioning procedures to ensure that all incidents, including the exceeding of limitations that may occur during an operation, are reported and actioned immediately after each operation.

16.14. Composition of Operational Crew

16.14.1. The minimum number and composition of the operational crew shall not be less than the minimum number and composition specified for the UAS.

16.14.2. The operator of a UAS shall allocate adequate numbers of additional operational crewmembers when it is required for a particular operation (for example, long endurance flights).

16.14.3. The operator shall ensure that the operational crewmembers -

a. are competent to perform the duties assigned to them; and

b. hold appropriate and valid licences and/or certificates, and ratings.

16.14.4. For each operation, the operator shall designate one pilot among the operational crewmembers as PIC. The PIC may delegate the conduct of the flight to another suitably qualified pilot.

16.15. In-flight Relief of Operational Crewmembers

16.15.1. The operator of a UAS that is to be used for long endurance operations, shall establish procedures to provide for the in-flight relief of operational crewmembers.

16.15.2. An operational crewmember may be relieved of his or her duties by another operational crewmember suitably competent and qualified.

16.16. Ground Personnel and Operational Crewmember Emergency Duties

16.16.1. An operator of a UAS shall establish procedures and assign functions to ground personnel and operational crewmembers that are to be performed in an emergency.

16.16.2. The emergency procedures and functions shall be such as to ensure that any reasonably anticipated emergency can be adequately dealt with, and shall take into consideration the possible incapacitation of individual ground personnel members and/or operational crewmembers.

16.17. Flight Time and Duty Periods

16.17.1. The operator of a UAS shall -

a. establish a documented system for the regulation of flight time and duty periods, for each operational crewmember; and

b. ensure that each operational crewmember complies with the provisions of the system.

16.18. Ground Personnel and Operational Crewmember Training

16.18.1. The operator of a UAS shall establish and maintain ground, flight, recurrent and familiarisation training programmes for ground personnel and operational crewmembers in his or her permanent and part-time employ.

16.18.2. The training programmes shall be adequate and appropriate for the type/s of UAS operated by the operator, and the operator shall develop the syllabi and content of the training programmes.

16.18.3. Training shall be in accordance with the requirements of this Interim Policy, and/or such requirements as prescribed by the SA-CAA.

16.19. Operations Manual

16.19.1. The operator of a UAS shall compile an operations manual that -

a. contains all information required in terms of this Interim Policy; and

b. sets out the manner in which the operator will conduct operations.

16.19.2. Each Approved Operator shall submit the operations manual, and future amendments to the operations manual, to the SA-CAA for approval. Other operators of UAS shall, on request, make their operations manuals available to the SA-CAA for inspection.

16.19.3. The operator of a UAS shall at all times ensure that operations are carried out in accordance with the operations manual.

16.20. UAS Operating Manuals

16.20.1. The operator of a UAS shall compile, and make available, UAS operating manuals for use by ground personnel and operational crewmembers.

16.20.2. The operating manuals shall contain -

a. the normal and emergency procedures relating to the UAS;

b. details of the UAS systems;

c. the checklists to be used by the ground personnel and operational crewmembers; and

d. the UAS flight manual/s.

16.20.3. The UAS operating manuals shall be included in the operations manual of the operator.

16.21. Procedural Flight Plan

16.21.1. The operator of a UAS shall ensure that, where practical, a procedural flight plan is completed for each flight undertaken with the UAS.

16.21.2. The procedural flight plan, and instructions for its use, shall be contained in the operator's operations manual.

16.21.3. For purposes of recordkeeping and traceability, the procedural flight plan shall be retained by the operator for a period of at least 90 days after the planned flight, whether the flight took place or not. A new procedural flight plan shall be compiled for each flight.

16.22. Logbooks

16.22.1. The operator of a UAS shall maintain logbooks for each UA that forms part of the UAS, and, where appropriate, for elements such as engines and propellers.

16.23. Flight Time and Duty Period Records

16.23.1. The operator of a UAS shall maintain current flight time and duty period records of all operational crewmembers.

16.24. Ground Personnel and Operational Crewmember Training Records

16.24.1. The operator of a UAS shall maintain the records of all training and proficiency checks undertaken by the ground personnel and operational crewmembers. Such records shall include certified copies of certificates indicating the successful completion of such training and proficiency checks.

16.24.2. The operator shall retain the training records of a ground personnel or crew member for the duration of that member’s association with the operator, and for a period of three years subsequent to the ending of the member’s association with the operator.

16.25. Maintenance

16.25.1. The operator of a UAS shall not operate the UAS unless the UAS is maintained in accordance with the continuous airworthiness instructions for the UAS.

16.26. UAS Maintenance Schedule

16.26.1. The operator of a UAS shall ensure that the UAS is maintained in accordance with a UAS maintenance schedule established by the operator.

16.26.2. The UAS maintenance schedule shall contain details, including frequency, of all maintenance required to be carried out on the UAS.

16.26.3. The UAS maintenance schedule shall include a reliability programme if the operator and/or the SA-CAA determine that such a reliability programme is required.

16.26.4. Unless the SA-CAA directs otherwise, the UAS maintenance schedule and subsequent amendments thereof shall be approved by the SA-CAA.

17. OPERATIONAL REQUIREMENTS: FLIGHT PROCEDURES

17.1. General

17.1.1. The guidance presented in this Interim Policy applies only to those UAS operations affecting areas of the national airspace other than prohibited, restricted, danger or special rules areas. The SA-CAA is particularly concerned that UAS operate safely among all users of the national airspace, including non-co-operative aircraft and other airborne operations not reliably identifiable by radar (eg balloons, gliders, parachutists, etc).

17.1.2. Unless specifically authorised, UAS operations in other than prohibited, restricted, danger or special rules areas, or Class A airspace, shall require visual observers, either airborne or ground-based. Visual observers shall also not be required for IFR flights in Class C airspace.

17.1.3. While considerable work is ongoing to develop a certifiable “detect, sense, and avoid” system, no current solution exists. Compliance with the “avert collision” aspect of regulation 91.06.7 of CAR Part 91, Right of Way *(FAA: “see-and-avoid” provisions of 14 CFR 91.113, Right-of-Way Rules: Except Water Operations)* is one of the primary issues in UAS operational approvals. As a result, alternate methods of compliance are required to accomplish the “see and avoid” function. See and avoid risk mitigation strategies are normally based on the use of visual observers or other methods of segregation.

17.1.4. Risk mitigations may also include other methods or systems that an applicant may propose for consideration. An applicant may propose any reasonable type of mitigation or system. However, the SA-CAA only approves UAS flight

activities that can demonstrate that the proposed operations can be conducted at an acceptable level of safety.

17.1.5. Applicants proposing “see and avoid” strategies in lieu of visual observers need to support proposed mitigations with system safety studies which indicate the operations can be conducted safely. Acceptable system safety studies must include a hazard analysis, risk assessment, and other appropriate documentation that support an “extremely improbable” determination.

17.1.6. It is the applicant’s responsibility to demonstrate that injury to persons or property along the flight path is extremely improbable. UA with performance characteristics that impede normal air traffic operations may be restricted in their operations.

17.2. Approval of Areas for Operation of UAS

17.2.1. An operator of a UAS may apply to the SA-CAA for the approval of an area as an area for the operation of UAS.

17.2.2. In considering whether to approve an area for this purpose, the SA-CAA must take into account the likely effect on the safety of air navigation as a result of the operation of the UAS in or over, the area.

17.2.3. An approval granted by the SA-CAA in terms of this paragraph may be expressed to have effect for a particular period (including a period of less than 1 day), or indefinitely.

17.2.4. The SA-CAA may impose conditions on the approval in the interests of the safety of air navigation.

17.2.5. The details of an approval granted by the SA-CAA in terms of this paragraph, including any condition/s, must be published by the SA-CAA in a NOTAM.

17.2.6. The SA-CAA may revoke the approval of an area, or change the conditions that apply to such an approval, in the interests of the safety of air navigation, but must publish details of any revocation or change in a NOTAM. The SA-CAA must also give written notice of the revocation or change to the holder of the approval.

17.3. Operations Approval

17.3.1. Subject to review, the SA-CAA may approve UAS for operations in accordance with -

a. the procedures and special conditions established in an approved operator's Operator Approval;

b. such procedures and special conditions that the SA-CAA may have approved under the certificate of airworthiness issued for the UAS; or

c. such procedures and special conditions as may require special approval by the SA-CAA on a case-by-case basis.

17.3.2. The review will generally include, but will not be limited to, UAS airworthiness, ground personnel and operational crewmember competencies and qualifications, flight planning, weather minima, installed equipment and maintenance procedures.

17.3.3. In addition to operations approval by the SA-CAA, and prior to the commencement of a UAS operation, the operator of the UAS should also determine what minimum procedures will apply for UAS operations at the specific sites from, at and to which the particular operation will be carried out. Such procedures should also be co-ordinated with, and authorised by, the appropriate air traffic services authorities. The minimum procedures should be established by the SA-CAA and/or the air traffic services authorities, and should include procedures for UAS ground operations, flight plan filing, integration of UAVs into the local traffic pattern and UAS take-off and landing, as well as local airspace restrictions, noise abatement, right-of-way rules, communications requirements, and UAS emergency procedures. Designated “safe areas” must also be established for emergency UAS holding and flight termination.

17.4. Prohibited Operations

17.4.1. No UAS shall be used for operations that have not been approved under -

a. an Operator Approval;

b. a Certificate of Airworthiness; and/or

c. a special approval by the SA-CAA on a case-by-case basis.

17.5. Safety Procedures

17.5.1. No person shall operate a UAS in a careless or reckless manner that would endanger life or property.

17.5.2. No person will operate a UAS if his or her physical or psychological condition might be detrimental to safety.

17.5.3. Consumption of alcoholic beverages is prohibited 8 hours prior to conducting UAS operations and no person will operate any UAS equipment or UAS support equipment under conditions where his or her blood alcohol concentration is at or over 0.02 grammes of alcohol per 100 milliliters of blood. *(CAR Parts 65.01.12, 67.00.9 and 91.02.3)*

17.5.4. The operator of a UAS must ensure that all necessary and reasonable measures and precautions are taken to minimise the risk of a safety hazard for the UAS crew, the UAS and associated equipment, and people and property that are directly exposed to such a risk as a result of the UAS operations.

17.5.5. When applicable, only qualified explosive ordnance detonation personnel will dispose of a rocket-assisted take-off booster and/or any explosive components that have misfired.

17.6. Crew Endurance

17.6.1. The operator of a UAS shall not cause, or permit, any operational crewmember to perform his or her duties if such operator knows, or has been made aware, that such crewmember -

a. will exceed the maximum flight times and duty periods prescribed for the particular UAS, while on duty; or

b. is suffering from or, having regard to the circumstances of the operation to be undertaken, is likely to suffer from, fatigue which may endanger the safety of the operation.

17.7. Meteorological Conditions

17.7.1. Weather minimums for UAS flight should be determined by the equipment and capabilities of each specific UAS system, the qualifications of the supervising controller and the class of airspace in which the flight is conducted.

17.7.2. Icing Conditions. Appropriate precautionary measures must be taken when a UAS is to be flown in conditions where icing may occur.

17.7.3. Visibility. For UAS operating under VFR procedures for take-off/launch and recovery, visibility requirements shall normally be as defined for the type of airspace in regulation 91.06.21 of CAR Part 91, but in all cases with a cloud ceiling of at least 600 feet and visibility of at least 1500 metres. Where a UAS is equipped with an internal automatic precision landing aid and external observers are utilised, specific weather minimums should be established for the particular UAS or UAS type, as appropriate, to enable an external observer to visually verify the UAS flight path and alert the UAS controllers of an unsatisfactory landing approach in sufficient time to execute a missed approach.

17.8. Noise Abatement

17.8.1. Unless otherwise authorised by the SA-CAA, the operator of a UAS should comply with applicable local noise abatement procedures at the take-off/launch and recovery sites, consistent with safe operation of the UAS.

17.9. UAS Operating Manual

17.9.1. UAS flights in controlled airspace should only be conducted if an approved UAS Operating Manual, or approved flight reference material appropriate to the UAS being operated, is immediately available to the UAS PIC.

17.10. UAS Flight Testing

17.10.1. UAS flight testing and certification flights should normally be conducted outside controlled airspace. However, such flights within visual line of sight of the UAS PIC may be carried out in controlled airspace in an approved operating area, in accordance with an approval issued by the SA-CAA, and subject to clearance by ATC.

17.11. UAS Flight Notification

17.11.1. Where operations with a UAS issued with a restricted or special category certificate of airworthiness are to be conducted in airspace shared with manned aircraft, the SA-CAA may require flight notification in the form of a NOTAM, or in accordance with the normal procedures for IFR flight, as appropriate. The flight plan should indicate that the aircraft is unmanned and provide as much detail as possible concerning the nature of the flight.

17.11.2. The UAS may not enter controlled airspace without approval of ATC, and flight procedures in controlled airspace will be as directed by ATC.

17.12. Chase Aircraft Operations

17.12.1. When a chase aircraft is used during a UAS operation, chase aircraft pilots must not concurrently perform either observer or UAS PIC duties along with chase pilot duties.

17.12.2. Observers onboard a chase aircraft must keep visual contact with the UAS at all times.

17.12.3. The chase aircraft should be operated to within such range from the UAS as is consistent with the safety of the chase aircraft.

17.13. Collision Avoidance/Sense-and-Avoid

17.13.1. Unless the PIC of a UAS is provided with sufficient visual cues to enable the acquisition and avoidance of other air traffic, UAS flights in controlled airspace will be treated as IFR flights, subject to ATC control.

17.13.2. While considerable work is ongoing to develop a certifiable “detect, sense, and avoid” system, no current solution exists. Compliance with the “avert collision” aspect of regulation 91.06.7 of CAR Part 91, Right of Way *(FAA: “see-and-avoid” provisions of 14 CFR 91.113, Right-of-Way Rules: Except Water Operations)* is one of the primary issues in UAS operational approvals.

As a result, alternate methods of compliance are required to accomplish the "see and avoid" function. See and avoid risk mitigation strategies are normally based on the use of visual observers or other methods of segregation.

17.13.3. Risk mitigations may also include other methods or systems that an applicant may propose for consideration. An applicant may propose any reasonable type of mitigation or system. However, the SA-CAA only approves UAS flight activities that can demonstrate that the proposed operations can be conducted at an acceptable level of safety.

17.13.4. Applicants proposing "see and avoid" strategies in lieu of visual observers need to support proposed mitigations with system safety studies which indicate the operations can be conducted safely. Acceptable system safety studies must include a hazard analysis, risk assessment, and other appropriate documentation that support an "extremely improbable" determination.

17.13.5. It is the applicant's responsibility to demonstrate that injury to persons or property along the flight path is extremely improbable. UA with performance characteristics that impede normal air traffic operations may be restricted in their operations.

17.13.6. Communications Requirements. Any visual observer, radar monitor, or sensor operator charged with providing collision avoidance duties for the UAS must have direct communication with the UAS PIC.

17.14. Operation of Equipment

17.14.1. Equipment Requirements. In the process of establishing and proposing the Applicable Airworthiness Requirements for a UAS to the SA-CAA, the applicant will identify the relevant equipment and instrument capabilities that would be required in order for the UAS to comply with the applicable requirements for safe flight in the airspace where it is intended to operate the UAS. In reviewing and approving the Applicable Airworthiness Requirements for the UAS, the SA-CAA will confirm or revise the equipment and instrument capabilities proposed by the applicant.

17.14.2. Flight Termination Systems (FTS). It is highly desirable that all UAS have system redundancies and independent functionality to ensure the overall safety and predictability of the system. If a UAS is found to be lacking in system redundancies, an independent flight termination system that can be activated manually by the UAS PIC may be required to safeguard the public. If fitted to the UA, the pilot of a UAS must satisfy himself/herself that the FTS is in working order prior to the flight commencing.

17.15. Take-off and Landing

17.15.1. When a UAS is operated at an aerodrome normally used by manned aircraft, take-off and landing should be in accordance with normal procedures and the UA should follow ATC instructions, unless otherwise authorised.

17.15.2. For a UA that is manually controlled during take-off by the PIC, VFR procedures, local airfield pattern regulations, and VFR weather minimums for the class of airspace will apply. After take-off, the PIC should maneuver the UA as required to maintain visual contact. During take-off and during evolution from manual to autonomous control, the UA must be monitored by the PIC to verify the UA status and compliance with navigational and flight path clearances. The PIC is responsible during this phase for collision avoidance, but should maneuver the UA as directed by ATC when IFR procedures are applied.

17.15.3. For a UA that is manually controlled during landing by the PIC, VFR procedures, local airfield pattern regulations, and VFR weather minimums for the class of airspace, will apply. The UA should be flown according to ATC instructions, with traffic separation provided by ATC, to a pre-designated recovery point, entering a holding pattern until visual sight of the UA is acquired by the PIC. At this point, the PIC assumes responsibility for traffic separation and collision avoidance. The PIC should monitor the recovery evolution to manual control to verify UA performance and compliance with navigational and flight path clearances.

17.15.4. For UA equipped with automatic take off and landing systems, the PIC should monitor the UA status and compliance with ATC clearances, making flight path corrections as required and/or directed by ATC.

17.16. Lost Link Emergency Procedures

17.16.1. The UA flight plan should include information and procedures regarding pre-planned emergency flight profiles in the event that positive data link control of the UA is lost. Dependent on system capabilities, these profiles could include -

a. autonomous transit of the UA to a pre-designated holding point area followed after a suitable period where communications cannot be restored by an autonomous recovery, flight termination or other suitable action; or

b. autonomous transit of the UA to a pre-designated recovery area followed by activation of a flight termination system (FTS).

17.16.2. Specific abort and flight termination procedures should be developed by the operator of the UAS, and should be briefed to ATC as required. As a minimum, information regarding pre-programmed loss-of-link flight profile (including termination actions should the control link not be re-established),

flight termination capabilities, and UAS performance under termination conditions, should be briefed.

17.16.3. Lost Link. The UA must be provided with a means of managing the situation in the event of a lost link. The intent is to ensure airborne operations are predictable in the event of a lost link.

17.16.4. The data link should be continuously and automatically checked and a real time warning should be displayed to the UAS crew in case of failure. In case of loss of data link other than intermittent loss of signal or during programmed periods of outage, *[SSR 7700 code]* should be squawked both automatically and manually by the PIC and emergency recovery procedures should be executed. The parameters that determine acceptable intermittent loss of signal and total loss will be established by the manufacturer. A UA which has lost total control data link and is conducting an autonomous pre-programmed flight profile to termination or recovery will be handled by ATC as an aircraft in an emergency state.

17.16.5. In the event of communications failure between the PIC and ATC, the UA should squawk *[SSR code 7600 (mode 3A)]* and attempt to establish alternate communications. Pending re-establishment of communications with ATC, the UA will be controlled in accordance with last acknowledged instructions, or should be commanded to orbit in its current position. If communications with ATC are not re-established, the UA flight should be aborted.

17.17. Visual Line-of-Sight Operations (Controlled Airspace)

17.17.1. Mission Briefing. The following information should be included in any requests for flight authorisation and in flight plans, when applicable. When UA take-off and landing is to be accomplished by the PIC under visual conditions, the PIC should ensure appropriate ATC personnel are informed in writing on the specific evolution of control to be conducted and are aware of the specific UA operating procedures required. In addition to the information required for the flight plan, written procedures for UA taxiing, take-off, separation, local traffic pattern restrictions, controller hand-over, departure, abort, recovery, and flight termination should be included in the briefing.

17.17.2. Communication Requirements. Communication requirements for UA visual line-of-sight operations are as required for the class of airspace in which the flight will occur. When the PIC is not co-located with the take-off/launch system, the crewmembers at the take-off/launch system and recovery control station, as well as at the primary remote control station, must have established communications with the PIC prior to commencement of flight.

17.18. Operations Beyond Visual Line-of-Sight (Controlled Airspace)

17.18.1. Mission Briefing. The following information should be included in any requests for flight authorisation and in flight plans, when applicable.

17.18.2. Performance Requirements. Any performance requirements or limitations unique to the UA should be provided in writing to the ATC unit as appropriate prior to the flight. The PIC should not request any clearance (eg SID, precision approach, altitude, holding pattern) that the UA is not capable of executing within its approved flight envelope.

17.18.3. Abort Procedures. Specific abort and flight termination procedures should be developed by the UAS operator, and should be provided in writing to ATC as required. As a minimum, information regarding pre-programmed loss-of-link flight profile (including terminal actions should the control link not be re-established), flight termination capabilities, and UAS performance under termination conditions, should be included.

17.18.4. Direct Communications Required. Communications between the PIC and the controlling ATC unit should be as required for the class of airspace in which operations occur. The UAS remote control station should utilise a communications architecture that interfaces with existing ATC communications equipment and procedures, so that the fact that the PIC is not onboard the UA is transparent to ATC personnel. Prior to each flight, a direct contingency telephone number for ATC must be made available to the PIC.

17.18.5. Chase Aircraft Requirements. Chase aircraft are not required for UA operating in controlled airspace when operated in accordance with approved IFR flight plans and in accordance with the procedures outlined in this Interim Policy. When a chase aircraft is utilised during flights under IFR procedures, the chase aircraft must be incorporated into the IFR flight plan. In such a case, the flight will be classified as a formation flight, and will have the same right-of-way status as aircraft engaged in towing. For the purpose of collision avoidance, a chase aircraft should not be utilised in conjunction with UA IFR flight operations when VFR conditions cannot be maintained.

17.19. Flight Procedures: Pre-flight

17.19.1. Prior to commencing a flight, UAS crewmembers will acquaint themselves with the UAS operation, procedures, and rules. The following should be addressed -

a. Planning. Crewmembers will evaluate UAS performance, mission/sensor equipment capabilities and limitations, departure airfield/airport, flight plan, flight route, lost link route, relevant route data, weather conditions, NOTAMs, requirements for, and availability of special use, airspace and/or controlled airspace requirements.

b. Fuel Requirements. The UAS must carry sufficient fuel at take-off for the planned operation, including reserve fuel to cover deviations from the planned operation.

c. Flight Weather Planning. Crewmembers will obtain departure airfield/airport, en-route, destination airfield/airport, and alternate airfield/airport (if required) weather information before take-off. The following weather requirements apply -

i. Flight into icing conditions. A UA will not be flown into known or forecast severe or moderate icing conditions intentionally. If a flight is to be made into known or forecast light icing conditions, the UA should be equipped with adequate operational de-icing or anti-icing equipment.

ii. Flight into turbulence. A UA will not be intentionally flown into known or forecast extreme turbulence or into known severe turbulence. A UA will not be intentionally flown into forecast severe turbulence unless clearance procedures have been established and -

(1) weather information is based on area forecasts;

(2) flights will be made in areas where encountering severe turbulence is unlikely;

(3) flights are for essential training or essential operations or missions only; and

(4) flights are terminated, or depart the turbulence, if severe turbulence is encountered.

iii. Flight into thunderstorms. A UA will not be intentionally flown into thunderstorms.

iv. Destination weather. Destination airfield/airport weather must be forecast to be equal to visual flight rules (VFR) minimums at estimated time of arrival (ETA) and for a period of one hour after ETA. When there are intermittent weather conditions, predominant weather will apply.

17.20. Flight Procedures: Departure

17.20.1. Take-off minimums are cloud ceilings of at least 600 feet and visibility of at least 1500 metres, or as directed by the SA-CAA.

17.20.2. Rocket-assisted take-off procedures. Rocket-assisted take-off launches, for those systems incorporating such capabilities, will be conducted in accordance with the appropriate UAS operating manuals and local operating

procedures. Appropriate firefighting equipment (such as fire extinguishers) will be on hand and in proper operational condition.

17.21. Flight Procedures: En-route

17.21.1. Communications. UAS crewmembers must establish and maintain two-way radio communications with appropriate air traffic control units.

17.21.2. Minimum safe en-route altitude. When required, minimum safe en-route altitudes will be maintained in accordance with standard air navigation procedures, as directed by ATC, and/or in accordance with specific instructions issued by the SA-CAA.

17.22. Flight Procedures: Arrival

17.22.1. Traffic patterns. Depending upon the traffic pattern airspeed of the UA involved, the UA will be flown at the published traffic pattern altitude as established by the airfield of intended landing. Exceptions will be as directed by ATC.

17.22.2. Landing. No UA will be flown below the designated minimum safe altitude established for that UA by the local operating procedures for the airfield of intended landing, or as directed by ATC, unless the UA is in a position from which a safe approach to the runway or landing area can be made.

17.22.3. Closing flight plans. If a flight plan was required for the operation, the UAS crewmembers will ensure that the flight plan is closed when the flight terminates.

17.23. Flight Procedures: Use of Airports, Heliports, and other Operating Sites.

17.23.1. An operator of a UA shall obtain approval from the SA-CAA to operate a UA from, or to, airports and heliports normally used for manned aircraft. In addition, approval may also need to be obtained from the airport or heliport operator or manager to conduct operations from such airport or heliport.

17.23.2. A UAS operating site which has been specifically established for the operation of UAS, shall be approved by the SA-CAA.

17.23.3. Operation of a UAS from, or to, any other intended operating site shall be approved by the SA-CAA on a case-by-case basis.

17.23.4. In the event of emergency conditions necessitating landing at other than approved landing facilities, such an emergency landing shall in all cases be considered to be an incident that shall be reported to the SA-CAA in accordance with the requirements of this Interim Policy.

18. PERSONNEL QUALIFICATIONS

18.1. General

18.1.1. UAS ground personnel and crewmember training requirements are essential to the establishment of effective UAS operations. A defined set of training requirements must continue to be refined on the basis of continued experience from ongoing UAS operations. The training guidelines presented here are examples of training systems used elsewhere and may be used as guidelines for training and qualifying UAS ground personnel and crewmembers towards certification and/or licensing by the SA-CAA.

18.1.2. Where an organisation (UAS operating, UAS training, or otherwise) intends to conduct UAS personnel training programmes and unless the SA-CAA provides otherwise, such programmes should be approved by the SA-CAA.

18.2. Training and Operations Criteria

18.2.1. Some of the difficulties currently encountered in establishing a set of acceptable UAS training and operations criteria result from the wide variety of UAS sizes and types with widely differing technology architecture envisioned for production, and from the diversity of UAS operations. Some UAS training criteria may apply to all UAS and some may be unique to certain types and classes of UAS.

18.2.2. Future UAS training and operational provisions should eventually accommodate virtually all classes and types of UAS. The data collected and experience gained in future civil UAS operations will also provide the SA-CAA, and the aerospace industry, with the expertise necessary to adequately determine the best method of controlling and integrating UAS operations with existing manned aircraft operations and procedures.

18.3. Medical Standards

18.3.1. Unless otherwise provided for and/or exempted by the SA-CAA, the medical requirements for UAS PIC crew members will be as prescribed in CAR Part 67, Medical Certification, for a Class 2 certification.

18.4. Ground Training

18.4.1. UAS pilots should have completed thorough ground instruction equivalent to that undertaken by aircrew of comparable manned aircraft. The depth of knowledge required will depend on the operating environment. The following topics, which are not exhaustive, should be covered -

a. aerodynamics, including effects of controls;

b. UAS systems;

c. performance;

d. navigation;

e. meteorology;

f. airspace;

g. rules of the air;

h. radio telephony procedures; and

i. emergency procedures management.

18.4.2. Ground instruction should be delivered by personnel with appropriate experience and/or qualifications in the relevant topics.

18.5. Flight Training

18.5.1. UAS pilots should have undertaken thorough practical training in the control of a UA in flight, which may consist of a proportion of simulated flight training. The training should enable the pilot to demonstrate that he/she can control a specific UA throughout its design parameters and potential operating conditions, including dealing correctly with emergencies and system malfunction.

18.5.2. All instruction should be conducted by personnel who are acceptable to the SA-CAA as being qualified to conduct UAS flight training.

18.6. Proficiency/Currency Requirements

18.6.1. The currency/proficiency of UAS pilots should be maintained by regular practice, which may be computer based. Additionally, all UAS pilots should be subject to periodic theoretical and practical examination. These requirements should be addressed in the operations manual.

18.7. Pilot Qualification

18.7.1. Since UAS vary so widely and missions envisioned are so diverse, co-ordination between the UAS manufacturer and the SA-CAA to build a consensus as to the appropriate level of training, should be exercised. UAS that operate in an IFR environment will require a high level of training or experience, while operation and use of a UAS in remote areas and Class G airspace, where it has been determined by the SA-CAA as posing no threat to public safety or property, may require only a minimal level of training.

18.8. Initial Certification

18.8.1. UAS pilots should be required to demonstrate satisfactory knowledge of ground and flight operations via oral/written examinations and initial flight checks.

18.9. Maintenance Personnel

18.9.1. The training required for maintenance personnel will vary according to the complexity of the UAS. The SA-CAA requires that a person intending to operate a UAS ensures that persons required to perform maintenance on the UAS are trained to the same standards required for maintenance personnel of similar or equivalent types of manned aircraft.

18.10. Crewmembers

18.10.1. The following list, which is not exhaustive, contains examples of the skills that may be required for the operation of an UAS.

18.10.2. Flight crews. A UAS operator should establish, in writing, formal UAS flight crewmember qualification and selection programmes. Such programmes should contain qualification and selection criteria and evaluation requirements acceptable to the SA-CAA. UAS instructor pilots and safety personnel should aid the operator in the selection process.

18.10.3. PIC. The PIC is responsible for controlling and monitoring the actual flight of the UA from a remote control station, a portable control station, a chase aircraft, or similar device. This is normally done through the use of a monitor and not by direct visual contact with the UA.

18.10.4. External Pilot. The external pilot is the UAS crewmember responsible for the take-off and landing of the UAS, for those UAS systems requiring specifically designated crewmembers for take-off and landing (ie, those systems not incorporating an automatic takeoff and/or landing capability).

18.10.5. Operation/Mission Commander. The UAS operator will designate an appropriately qualified crewmember as the operation/mission commander. The operation/mission commander is responsible for control over all flight operations from pre-operation planning and execution of the operation, to post-operation debriefing.

18.10.6. Payload Operator. The payload operator is responsible for operation of the payload onboard the UA, where such payload requires operation by a crewmember.

18.10.7. Radar/Sensor Observer. The radar/sensor observer/operator must be thoroughly familiar with and possess operational experience with the equipment being utilised for observation and detection of other aircraft for collision avoidance purposes.

18.10.8. Visual Observer Responsibilities. In general, UAS should yield the right of way to any manned aircraft. The task of the observer is to provide the pilot of the UAS with instructions to steer the UA clear of any potential collision with other traffic. Visual observer duties require continuous visual contact with the UA at all times. At no time will the visual observer permit the UA to operate

outside his visual line-of-sight to ensure that any required maneuvering information can be reliably provided to the UAS pilot. When using aids to vision, such as binoculars, field glasses, or telephoto television, visual observers must use caution to ensure that the UA remains within visual line-of-sight range, should the vision aid become unavailable.

18.10.9. Instructor Pilot. The instructor pilot will train and evaluate UAS pilots in accordance with the appropriate training requirements.

18.10.10. UAS Test Pilots. A UAS should be test flown by a qualified UAS test pilot only. A UAS test pilot must be qualified and current on the UAS to be test flown, or on a UAS of similar design and capabilities.

AIRSPACE AND AIR TRAFFIC MANAGEMENT

19.1. General

19.1.1. In general and unless the SA-CAA determines otherwise, UAS should, when operating in controlled airspace, be operated in accordance with the rules governing the flights of manned aircraft as specified by the appropriate air traffic services authority in that airspace. The UA should be able to comply with air traffic control regulations and equipment requirements applicable to the class of airspace within which they are intended to be operated.

19.1.2. Routine operations of UAS in the national airspace must not increase the risk to other airspace users and should not deny the airspace to them. Any “one-off” unusual UAS operation that require de-confliction with, coordination with, and notification to, other airspace users should be notified in the same way as for manned aircraft.

19.1.3. From the air traffic controller’s perspective, the provision of an air traffic service to a UA must be transparent. This includes all stages of the flight from pre-notification to landing. There should be no difference in radio communication, landline communications or transponder data procedures, nor should the air traffic controller have to apply different rules or different criteria.

19.1.4. The PIC will be required to comply with any ATC instruction or a request for information made by an air traffic service unit in the same way and within the same timeframe that the pilot of a manned aircraft would. These instructions may take a variety of forms and, for example, may be to follow another aircraft or to confirm that another aircraft is in sight.

19.2. Procedures and Authorisations

19.2.1. The procedures and authorisations in this section apply specifically to UAS operations within controlled airspace.

19.2.2. These procedures also apply specifically to those UAS that can be monitored and controlled in real-time from a remote control station. It is not the intention of these procedures to preclude operation of an UAS in an "autonomous" or programmed flight mode, provided that the UA performance and designated air traffic control communication circuits are continuously monitored by the UAS operating crew, and that the UAS crew are capable of immediately taking active control of the UA.

19.3. UAS Flight Notification

19.3.1. Where operations with a UAS issued with a restricted or special category certificate of airworthiness are to be conducted in airspace shared with manned aircraft, the SA-CAA may require flight notification in the form of a NOTAM, or in accordance with the normal procedures for IFR flight, as appropriate. The flight plan should indicate that the aircraft is unmanned and provide as much detail as possible concerning the nature of the flight.

19.3.2. The UA may not enter controlled airspace without approval of ATC. The UA flight procedures, when operating within controlled airspace, will be as directed by ATC.

19.3.3. When the operation of an UAS does not involve flight higher than 400 ft above ground level, or within close proximity to an aerodrome, the operator may exercise discretion in lodging flight notification. Where there is doubt, the operator should seek guidance from the SA-CAA.

19.4. Emergency Procedures

19.4.1. The UAS flight plan should include information and procedures regarding pre-planned emergency flight profiles in the event that positive data link control of the UA is lost. Dependent on system capabilities, these profiles could include -

a. autonomous transit of the UA to a pre-designated holding area followed by an autonomous recovery; or

b. autonomous transit of the UA to a pre-designated recovery area followed by activation of a flight termination system (FTS).

19.4.2. Specific abort and flight termination procedures should be developed by the operator of the UAS, and should be briefed to ATC as required. As a minimum, information regarding pre-programmed loss-of-link flight profile (including termination actions should the control link not be re-established), flight termination capabilities, and UAS performance under termination conditions, should be briefed.

19.4.3. In case of loss of data link other than intermittent loss of signal or during programmed periods of outage, *[SSR 7700 code]* should be squawked both automatically and manually by the PIC and emergency recovery procedures

should be executed. The parameters that determine acceptable intermittent loss of signal and total loss will be established by the manufacturer. A UA which has lost total control data link and is conducting an autonomous pre-programmed flight profile to termination or recovery will be handled by ATC as an aircraft in an emergency state.

19.4.4. In the event of communications failure between the PIC and ATC, the UA should squawk *[SSR code 7600 (mode 3A)]* and attempt to establish alternate communications. Pending re-establishment of communications with ATC, the UA will be controlled in accordance with last acknowledged instructions, or should be commanded to orbit in its current position. If communications with ATC are not re-established, the UA flight should be aborted.

19.5. Co-ordination/Authorisation with Air Traffic Services

19.5.1. Prior to the commencement of UAS operations, the UAS crew should establish Local Operating Procedures for UAS operations with the appropriate air traffic services provider. Specific procedures should be established for UA ground operations, flight plan filing procedures, integration of UA into local traffic pattern, UA take-off and landing procedures, local airspace restrictions, noise abatement procedures, right-of-way rules, communications requirements, and UA emergency procedures. Designated “safe areas” will be established for emergency UA holding and flight termination.

19.6. Interfacing with Air Traffic Services

19.6.1. UAS operating within radar controlled airspace should be equipped with a SSR transponder capable of operating in modes 3 A and C. The PIC should have the capability to change the SSR code and squawk identification when required.

19.6.2. Flight Deviations. All requests for flight deviations should be made by established procedures to the appropriate air traffic services authorities.

19.6.3. Communications. The PIC should initiate and maintain two way communications with the appropriate ATC units for the duration of any flight.

19.6.4. Position Reporting. A UA operating in controlled airspace should be continuously monitored for adherence to the approved flight plan by the PIC. The PIC should make all position and other required reports to the appropriate ATC unit.

19.6.5. Tracking. Where radar coverage is provided, ATC will continuously monitor the flight path of the UA if it is fitted with a transponder. Outside of radar coverage, the SA-CAA may require the fitment of additional equipment to facilitate tracking of the UA and separation from other aircraft. ADS or similar equipment may be suitable for this purpose.

19.6.6. UA Identification. Unless the SA-CAA determines otherwise, each UA flight should have some means of informing ATC that the flight is unmanned. It is recommended that all UA call signs should include the word 'UNMANNED'.

20. ACCIDENTS AND INCIDENTS

20.1. Notification of Accidents

20.1.1. When a UA is involved in an accident within the Republic, the operator of the UAS shall, as soon as possible, notify

a. the SA-CAA;

b. if applicable, the air traffic service unit associated with the flight at the time of the accident;

c. if the public is involved in, or affected by, the accident, or could disturb the accident scene, the nearest police station; and

d. if the accident is on an aerodrome, the aerodrome manager,

of such accident.

20.2. Notification of Incidents

20.2.1. When an UA is involved in an incident, other than an air traffic service incident, within the Republic, the operator of the UAS shall, as soon as possible, notify –

a. the SA-CAA;

b. if applicable, the air traffic service unit associated with the flight at the time of the incident;

c. if the public is involved in, or affected by, the incident, or could disturb the incident scene, the nearest police station; and

d. if the incident is on an aerodrome, the aerodrome manager,

of such incident.

20.3. Notification of Air Traffic Service Incidents

20.3.1. When a UA is involved in an air traffic service incident within the Republic, the operator of the UAS shall, as soon as possible, notify the air traffic service unit associated with the flight at the time of the incident, of such incident.

20.4. Notification of Accidents and Incidents Outside the Republic

20.4.1. When a South African registered UA is involved in an accident or incident outside the Republic, the operator of the UAS shall, as soon as possible, notify –

a. the appropriate authority in the State or territory where the accident or incident occurred, directly or through any air traffic service unit; and

b. the SA-CAA,

of such accident or incident.

SECTION 4: ANNEXURES

21. ANNEXURE A: REFERENCES

a. Australian Civil Aviation Safety Authority (CASA): Civil Aviation Safety Regulations of 1998, Part 101, Unmanned Aircraft and Rocket Operations. Issued December, 2004.

b. Australian Civil Aviation Safety Authority (CASA): AC 101-1(0). Unmanned Aircraft and Rockets Unmanned Aerial Vehicle (UAV) Operations, Design Specification, Maintenance and Training of Human Resources. 2002.

c. European EASA: Advance Notice of Proposed Amendment (NPA) No 16/2005, Policy for Unmanned Aerial Vehicle (UAV) Certification. 2005.

d. Japan UAV Association: Safety Standards for Commercial-Use Unmanned Rotary-Wing Aircraft in Uninhabited Areas. 2005.

e. SA ATNS Draft: Aerial Vehicle Operations in the RSA – Guidance. 2002.

f. SA-CAA: SA CAR (2007) -

i. Part 12, Aviation Accidents and Incidents;

ii. Part 24, Airworthiness Standards: Non-Type Certificated Aircraft;

iii. Part 47, Registration and Marking;

iv. Part 94, Operation of Non-Type Certificated Aircraft; and

v. Part 172, Airspace and Air Traffic Services.

g. *NOTE: The material listed here was used as source material in the development of this Interim Policy and is listed as such.* SA-MAA/SAAF: Draft SA Military Aviation Regulations -

i. Part 21, Certification Procedures for Airborne Aviation Hardware (2003);

ii. Part 24, Approval Procedures and Airworthiness Requirements for Non-Type Certified Light Airborne Hardware (2004);

iii. Part 94, Operation of Non-Type Certified Light Airborne Hardware (2005); and

iv. Part 124, Operators of Non-Type Certified Light Airborne Hardware (2005).

h. Swedish Armed Forces Headquarters: Enclosure 1 to HKV. Swedish Armed Forces' UAV System Vision for Operation in Non-segregated Airspace. 2004.

i. United Kingdom Civil Aviation Authority (CAA): CAP 722, Unmanned Aerial Vehicle Operations in UK Airspace - Guidance. 2004.

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k. USA Army (Aviation): Army Regulation 95–23. Unmanned Aerial Vehicle Flight Regulations. 2004.

l. USA FAA: AFS-400 UAS Policy 05-01. USA FAA: AFS-400 UAS Policy 05-01. Unmanned Aircraft Systems Operations in the U.S. National Airspace System - Interim Operational Approval Guidance. 2005. NOTE: *At the time the 1st draft of the SA Interim Policy was developed, the 2008 update did not exist.*

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n. ECATA MTP2 Team. Investigation into Harmonisation of Military Aviation Regulation across the EU – what outcome should Industry aim for? Final Report. ECATA France. 2007.