UNITED ARAB EMIRATES
MINISTRY OF DEFENCE
SAFETY ENVIRONMENT AND WORTHINESS EXECUTIVE DIRECTORATE

الإمـــارات العـربيـــة المتحـــدة
وزارة الـــدفـــــاع
الإدارة التنفيذية للسلامة والبيئة والجدارة

# MILITARY SAFETY, ENVIRONMENT AND WORTHINESS EXECUTIVE DIRECTORATE

# UAEMAR UAS OPERATIONS MANUAL TEMPLATE

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## DOCUMENT CONTROL

### DOCUMENT APPROVAL

The following table identifies the persons who have prepared and approved this document.

| Edition No: | | Authorised by | Date |
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| 1.0 | Prepared by | UAE MAA UAS Section | 15/01/2024 |
| | Approved by | Brigadier General Pilot Nasser Alobaidli<br>Worthiness Director<br>United Arab Emirates Ministry of Defence | 15/01/2024 |

**DOCUMENT CHANGE RECORD**

| Edition Number | Edition Date | Status | Reason for change | Sections or pages affected |
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| 1.0 | 15/01/2024 | Approved | Initial issue | All |
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**STATUS**

The Status of the document can take two values:

**Draft:** Draft version by the UAE GHQ Armed Forces Directorate of Safety and Worthiness.

**Approved**: Approval by the UAE GHQ Armed Forces Director of Safety and Worthiness.

**EDITION**

Edition numbering will have the following format: **Edition X.Y**

The value of **X** will change after a **major** modification of the document

The value of **Y** will change after a **minor** modification of the document

**NOTE:**

1. All amended paragraphs from previous editions are indicated by the use of a ‘sidebar’ in the margin. This can be readily cross-referenced using the table at the end of the document which details each change.

**EXPLANATORY STATEMENT**

When required by Military Airworthiness Authority (MAA), in accordance with UAE Military Airworthiness Regulation for UAS (UAEMAR UAS), the Operations Manual should contain at least the information listed below, if applicable, customised for the area and type of operation.

[Insert Organisation Logo here]

[ORGANISATION]

# UAEMAR UAS OPERATIONS MANUAL

*This template has been developed to meet the United Arab Emirates Military Airworthiness Regulation (UAEMAR) Unmanned Aerial System (UAS) requirements.*

***UAS operator registry reference number***
*XXXXX*

***UAS Military Aircraft Operator Certificate (MAOC) reference number***
*XXXXX*

***[Operator Organisation]***
*Address 1*
*Address 2*
*Address 3*

***Telephone:*** xx xxxxxxx
***Facsimile:*** xx xxxxxxxx

***Email:*** *xxxx@xxxx.xxx.xx*

*Copy Number: x of xx* *Name:* _____

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## List of Issues/Amendments/Record of Revisions

*This section should set out the amendment record of the Operations Manual. The amendment record may be in the following form.*

| Issue No. | Version No. | Amendment Details | Date |
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## Distribution List

*This section should include a distribution list to ensure proper distribution of the Operations Manual and to demonstrate to MAA that all employees involved in airworthiness management have access to the relevant information. This does not mean that all employees have to be in receipt of a complete Manual but that a reasonable number of copies are distributed within the organisation so that employees may have quick and easy access to this Manual.*

*Alternately if the Operations Manual is available electronically this section should set out how the electronic version is available throughout the organisation and to individuals outside the organisation.*

| Copy No | Holder |
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## Abbreviations, Acronyms and Definitions

*This section should set out the meaning of any abbreviations, acronyms and unique terms used in the OM. UAEMAD–Acronyms & Definitions document (UAEMAD-A&D) shall apply.*

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*The template below provides section headings detailing the subject areas that should be addressed when producing the Operations Manual (OM), for the purposes of demonstrating that a UAS operation can be conducted safely. The template layouts as presented are not prescriptive, but the subject areas detailed should be included in the OM documentation as required for the particular operation(s), in order to provide the minimum required information and evidence for the Risk Assessment process (risk levels, mitigations, etc…) and specially to comply with the required safety objectives, mitigations and containment.*
*All along the document, a note is added at the end of several paragraphs to make explicit reference to the Operational Safety Objectives (OSO), according to the Specific Operations Risk Assessment (SORA, JARUS), for which compliance information is expected to be included.*
*This OM template includes headings related to:*

- *Part 0. General guidelines.*
- *Part 1. Description of the organisation.*
- *Part 2. Description of the operation (this part will be referred to as SOIU[1]).*
- *Part 3. UAS technical characteristics.*
- *Part 4. Operational procedures.*
- *Part 5. Safety.*

***Behind each section heading, the applicant may find further information presented in italics. This information may be used to put the information for checking compliance, in the correct section.***

*The applicant may need to consult with the MAA to discuss the individually appropriate document modularisation for complex organisations.*

[1] SOIU. *Statement of Operating Intent and Usage. If an operator uses more than one type of operation, each type of operation should have its own SOIU.*

# PART 0 – GENERAL GUIDELINES

## 0.1 DOCUMENT CONTROL

*Applicants should include an amendment record at the beginning of the OM to record changes and show how that the OM is controlled:*

*(a) Amendment/ Revision/ Issue Number Date Amended by Signed a, b, c or 1, 2, 3 etc. DDMMYYYY Name of the person carrying out the amendment/ revision/ issue number Signature of person carrying out the amendment/ revision/ issue number*

*(b) Any significant changes to the OM may require further assessment and approval by the MAA prior to further operations being conducted.*

## 0.2 REFERENCES

*List all references (documents, URL, manuals, appendices) mentioned in the OM: # Title Description Amendment/ Revision/ Issue Number.*

## 0.3 SAFETY STATEMENT/POLICY

*Include a statement that this OM provides compliance with the relevant requirements of Regulation UAEMAR UAS and contains instructions that are to be complied with by the personnel involved in flight operations. Please note:*

- *This statement can also refer to the organisation's safety policy, if available.*
- *The safety statement should be signed by the Accountable Manager.*
- *For high risk, large-scaled operations, a safety policy might be more reasonable.*

*The safety statement (directly, or by reference to the safety policy) is the means whereby an organisation declares its intention to maintain and, where practicable, improve safety levels in all its activities and to minimise its contribution to the risk of an accident or serious incident as far as is reasonably practicable. It reflects the management's commitment to safety, and should reflect the organisation's philosophy of safety management. The creation of a positive safety culture begins with the issuance of a clear, unequivocal direction.*

*A safety policy should:*

*(a) improve towards the highest safety standards;*
*(b) reflect organisational commitments regarding safety, and its proactive and systematic management;*
*(c) be communicated, with visible endorsement, throughout the organisation;*
*(d) include internal reporting principles, and encourage personnel to report errors related to UAS operations, incidents and hazards;*
*(e) recognise the need for all personnel to cooperate with compliance monitoring and safety investigations;*
*(f) provide appropriate human and financial resources for the implementation of the safety policy;*
*(g) apply 'just culture' principles and, in particular, not to make available or use the information on occurrences:*

*a. to attribute blame or liability to someone for reporting something which would not have been otherwise detected; or*

*b. for any purpose other than the improvement of safety;*

*(h) be endorsed by the operator accountable manager.*

# PART 1 – DESCRIPTION OF THE ORGANISATION

*This part provides section headings detailing the subject areas that should be addressed when describing the operator's organisation. For those cases in which the operator is not responsible of a specific area, the required information should also be added.*

## 1.1 OPERATOR'S ORGANISATION OVERVIEW

*Description of the UAS operator's organisation related to UAS operations. This section should include the following:*

*(a) A brief description of the organisation and its activities.*
*(b) Include the organigram and a brief description thereof:*
    *a. The organisational structure and designated individuals.*
    *b. Description of the operator's organisational structure, including an organisational chart showing the different departments, if any (e.g. flight/ground operations, operational safety, maintenance, training, etc.) and the head of each department;*
*(c) Duties and responsibilities of the management personnel (not directly involved in UAS operations):*
    *a. Accountable Manager. The accountable manager should have the authority to ensure that all activities are carried out in accordance with the requirements of the UAS Regulation. The operator can be the accountable manager.*
    *b. Other management personnel: Operations manager, maintenance manager, training manager, etc.*

## 1.2 DESIGN AND PRODUCTION ORGANISATIONS

*This section should describe the design and/or the production organisation of the UAS (manufacturer).*
*The operator may not responsible for the design and/or manufacturing of the UAS. In that case information should be provided about the organisations responsible.*

*(a) The design and manufacturing procedures used for the production of the UAS should be developed to a standard considered adequate by the MAA. This is applicable, but not limited, to the following processes:*
    *a. the specification of materials;*
    *b. the suitability and durability of materials used;*
    *c. the design process;*
    *d. the processes necessary to allow for repeatability in manufacturing, and conformity within acceptable tolerances;*
    *e. configuration control;*
    *f. the verification of incoming products, parts, materials, and equipment;*
    *g. identification and traceability;*
    *h. inspections & testing;*
    *i. the control and calibration of tools;*
    *j. handling and storage;*
    *k. the control of non-conforming items;*
    *l. control of changes;*
    *m. development of the maintenance instructions;*

*n. preparation of the repair instructions.*

## 1.3 MAINTENANCE OF THE UAS

*All maintenance instructions required to keep the UAS in a safe condition should be available, performed and tracked. This section should identify:*

*(a) The reference to the manuals/documents containing the UAS maintenance instructions;*
*(b) The structure of the maintenance organisation;*
*(c) Reference to the maintenance programme where the Scheduled maintenance of the UAS is organised;*

*The maintenance log system where the maintenance activities conducted on the UAS are recorded. The objective is to record all the maintenance performed on the UAS, and why it is performed (rectification of defects or malfunctions, modifications, scheduled maintenance, releases, etc.).*

## 1.4 UAS CONFIGURATION MANAGEMENT

*This section should describe how the operator controls the UAS configuration and manages changes thereof.*

## 1.5 ORGANISATION PERSONNEL

*This section should describe:*

*(a) the responsibilities and duties of personnel, including all the positions and people involved in the UAS operation:*
  *a. remote pilots/crew*
  *b. support personnel (e.g. visual observers (VOs), launch crew, and recovery crew, payload operator, ground assistant, maintenance technician, etc.);*
  *c. any other personnel relevant for the correct functioning of the operator's organisation e.g. safety manager, compliance monitoring manager, head of training, etc.).*
*(b) Name the personnel and their competences in terms of qualification, knowledge and experience. (initial qualifications; experience in operating UAS; experience in the particular operation; training and checking; compliance with the applicable regulations and guidance to crew members concerning health, fitness for duty and fatigue;).*

### 1.5.1 REMOTE PILOTS/CREW

*(a) Names of the remote pilots (including the composition of the flight team according to the nature of the operation, its complexity, the type of UAS, etc.);*
*(b) A record the competences of the remote pilot/flight team to ensure that they are appropriately fit, capable and able to conduct the planned operations, is established and kept up to date;*
*(c) Any other detail of the operator's policy on crew health requirements.*

### 1.5.2 VISUAL OBSERVERS AND ASSISTANTS (IF APPLICABLE)

### 1.5.3 MAINTENANCE PERSONNEL (IF APPLICABLE)

*(a) List of maintenance staff. This list should be kept up to date.*
*(b) A record of all the relevant qualifications, experience and/or training completed by the maintenance staff should be available and kept up to date.*

### 1.5.4 SAFETY MANAGER (SM) (IF APPLICABLE)

*(a) Name of the nominated Safety Manager.*
*(b) Records of the Safety Manager relevant qualifications, experience and/or training should be available and kept up to date.*
*(c) The safety manager should:*

*a. facilitate hazard identification, risk analysis, and risk management;*
*b. monitor the implementation of risk mitigation measures;*
*c. provide periodic reports on safety performance;*
*d. ensure maintenance of the safety management documentation;*
*e. ensure that there is safety management training available and that it meets acceptable standards;*
*f. provide all the personnel involved with advice on safety matters; and*
*g. ensure the initiation and follow-up of internal occurrence investigations.*

### 1.5.5 COMPLIANCE MONITORING MANAGER (CM) (IF APPLICABLE)

*The primary objective of the compliance monitoring function is to independently monitor the adequacy and effectiveness of the UAS Operator's organisation and its associated procedures in the execution of the safe operation and to remain in compliance with the UAEMAR UAS.*

*(a) Name of the nominated Compliance Monitoring Manager (CM).*
*(b) Records of the CM relevant qualifications, experience and/or training should be available and kept up to date.*
*(c) The following should be taken into account:*
*a. The CM should be designated by the Accountable Manager.*
*b. The tasks of the CM may be performed by the Safety Manager.*
*c. An external organisation may be contracted to perform compliance monitoring functions. In such cases, that organisation should designate the CM.*
*d. The CM should:*
*i. Conduct audits and surveillance activities to independently monitor the compliance with, and adequacy of the organisation procedures with regards to the applicable airworthiness requirements.*
*ii. Report to the person responsible for the corrective actions for the closure of the findings identified during the surveillance activities/audits;*
*iii. Report directly to the Accountable Manager on the result of the audits and status of the findings;*

### 1.5.6 HEAD OF TRAINING (HT) (IF APPLICABLE)

## 1.6 TRAINING POLICY FOR PERSONNEL INVOLVED IN OPERATIONS

*This section should describe or make reference to the training policy of the Operator's organisation for all personnel involved in operations. It should identify the training programme that the*

*organisation uses to develop and maintain the necessary competence (ie: initial training, maintenance of currency, flight simulation training, etc).*

# PART 2 – DESCRIPTION OF THE OPERATION

## 2.1 STATEMENT OF OPERATING INTENT AND USAGE, SOIU.

*The template below provides section headings detailing the subject areas that should be addressed when producing the SOIU[2], for the purposes of demonstrating that a UAS operation can be conducted safely. Please provide information for every single operation. If there is more than one type of operation, you should provide individual SOIUs for each one (e.g. one SOIU for surveillance missions and another SOIU for load deployment).*
*If you use the same UAS and/or procedures for several operations (within different SOIUs), you can describe these elements in a general chapter outside of the specific SOIU.*
*For each operation, please describe the following:*

### 2.1.1 TYPE OF OPERATIONS

*Describe the general nature of the activities performed and the associated risks.*

*(a) The applicant should describe what types of operations (e.g. cargo; intelligence, surveillance, reconnaissance; close air support; communications relay surveying, etc.) the UAS operator intends to carry out. The description should contain all the information needed to obtain a general understanding of how, where and under which limitations or conditions the operations shall be performed. For example, VLOS, BVLOS, operating heights, horizontal distances, weather conditions, the applicable flight performance envelope, times of operations (day and/or night) and any limitations for operating within the applicable class(es) of airspace, etc.*
*(b) Relevant charts/diagrams, and any other information helpful to visualise and understand the intended operation(s) should be included in this section*
(c) *The applicant should describe the level of involvement (LoI) of the crew and any automated or autonomous systems during each phase of the flight.*

### 2.1.2 OPERATIONAL ENVIRONMENT

*This section is essential for getting an impression of where the operation will take place. The geographical area and operational environment for the intended operation(s) are presented. The reader should get a detailed impression of each operating environment of a single operation applied for (for generic authorisations please ask the MAA prior to application).*

*(a) In general terms, describe the characteristics of the area to be overflown, its topography, obstacles, population density, the environmental conditions (i.e. the climate and electromagnetic environment) and the type of airspace to be used (e.g. a segregated area, fully integrated).*
*(b) The operational volume, including the ground and air risk buffers, needs to be clearly defined. Relevant charts/diagrams (incl. detailed visualisation and calculation basis of the flight geography, contingency volume and ground risk buffer), and any other information helpful to visualise and understand the intended operation(s) should be included in this section (e.g. Google Earth / Google Maps / QGIS).*

[2] SOIU is considered equivalent to ConOps used in EASA regulations.

# PART 3 – UAS TECHNICAL INFORMATION

*The aim of this section is to collect technical information about the UAS and its supporting systems sufficient to develop the Risk Assessment and address the required robustness levels of the mitigations and the OSOs.*
*Therefore, this section should include descriptive information enough to develop the risk assessment mentioned in UAEMAR UAS. A description of the detection, warning and alerting due to any malfunction, failure or combination thereof, which would lead to a hazard should also be available (see paragraph 3.4.1).*
*The list below is suggested guidance for items which may be relevant for this assessment, but the items may differ, depending on the UAS.*
*If there is more than one specific type of UAS used, an individual chapter for each UAS-type may be necessary under this section.*

## 3.1 AIRFRAME

*This section should include the following:*

*(a) Description of the physical characteristics of the UAS (mass, centre-of-mass, dimensions, etc.), including photos, diagrams and schematics, if appropriate to support the description of the UAS.*
   - *a. Dimensions: for fixed-wing UA, the wingspan, fuselage length, body diameter etc.; for a rotorcraft, the length, width and height, propeller diameter, etc.;*
   - *b. Mass: all the relevant masses such as the empty mass, MTOM, etc.; and*
   - *c. Centre of gravity: the centre of gravity and limits if necessary.*

*(b) Materials: the main materials used and where they are used in the UAS, highlighting in particular any new materials (new metal alloys or composites) or combinations of materials (composites 'tailored' to designs).*

*(c) Load limits: the capability of the airframe structure to withstand expected flight load limits.*

*(d) Sub-systems: any sub-systems such as a hydraulic system, environmental control system, parachute, brakes, etc.*

## 3.2 UA PERFORMANCE CHARACTERISTICS

*This section should include the following:*

*(a) the performance of the UAS within the proposed flight envelope, specifically addressing at least the following items:*
   - *a. Performance: the*
     - *i. maximum altitude;*
     - *ii. maximum endurance;*
     - *iii. maximum range;*
     - *iv. maximum rate of climb;*
     - *v. maximum rate of descent;*
     - *vi. maximum bank angle; and*
     - *vii. turn rate limits.*
   - *b. Airspeeds: the*
     - *i. slowest speed attainable;*
     - *ii. stall speed (if applicable);*

iii. *nominal cruise speed;*
iv. *max cruise speed; and*
v. *never-exceed airspeed.*

*(b) Any performance limitations due to environmental and meteorological conditions, specifically addressing the following items:*

a. *wind speed limitations (headwind, crosswind, gusts);*
b. *turbulence restrictions;*
c. *rain, hail, snow, ash resistance or sensitivities;*
d. *the minimum visibility conditions, if applicable;*
e. *outside air temperature (OAT) limits; and*
f. *in-flight icing:*
    i. *whether the proposed operating environment includes operations in icing conditions;*
    ii. *whether the system has an icing detection capability, and if so, what indications, if any, the system provides to the remote pilot, and/or how the system responds; and*
    iii. *any icing protection capability of the UAS, including any test data that demonstrates the performance of the icing protection system.*

### 3.3 PROPULSION SYSTEM

*This section should include the following:*

*(a) A description of the propulsion system and its ability to provide reliable and sufficient power to take off, climb, and maintain flight at the expected mission altitudes.*

*(b) Fuel-powered propulsion systems*

a. *The type (manufacturer organisation and model) of engine that is used;*
b. *Number of engines installed;*
c. *The type and the capacity of fuel that is used;*
d. *How the engine performance is monitored;*
e. *The status indicators, alerts (such as warning, caution and advisory), messages that are provided to the remote pilot;*
f. *Identification of the most critical propulsion-related failure modes/conditions and their impact on the operation of the system;*
g. *How the UAS responds, and the safeguards that are in place, to mitigate the risk of a loss of engine power;*
h. *The in-flight restart capabilities of the engine, if applicable, and if so, a description of the manual and/or automatic features of this capability;*
i. *The fuel system and how it allows for adequate control of the fuel delivery to the engine, and provides for aircrew determination of the fuel remaining. This includes a system level diagram showing the location of the system in the UAS and the fuel flow path; and*
j. *How the fuel system is designed in terms of safety (fire detection and extinguishing, reduction of risk in case of impact, leak prevention, etc.).*

*(c) Electric-powered propulsion systems*

a. *A high-level description of the electrical distribution architecture, including items such as regulators, switches, buses, and converters, as necessary;*
b. *The type of motor that is used;*
c. *The number of motors that are installed;*

d. *The maximum continuous power output of the motor in watts;*
e. *The maximum peak power output of the motor in watts;*
f. *The current range of the motor in amps;*
g. *Whether the propulsion system has a separate electrical source, and if not, how the power is managed with respect to the other systems of the UAS;*
h. *A description of the electrical system and how it distributes adequate power to meet the requirements of the receiving systems. This should include a system level diagram showing the electrical power distribution throughout the UAS;*
i. *How power is generated on board the UAS (for example, generators, alternators, batteries).*
j. *If a limited life power source such as batteries is used, the useful life of the power source during normal and emergency conditions, and how this was determined;*
k. *How information on the battery status and the remaining battery capacity is provided to the remote pilot or the watchdog system;*
l. *If available, a description of the source(s) of backup power for use in the event of a loss of the primary power source. This should include:*
    i. *the systems that are powered during backup power operation;*
    ii. *a description of any automatic or manual load shedding; and*
    iii. *how much operational time the backup power source provides, including the assumptions used to make this determination;*
m. *How the performance of the propulsion system is monitored;*
n. *The status indicators and alert (such as warning, caution and advisory) messages that are provided to the remote pilot;*
o. *A description of the most critical propulsion-related failure modes/conditions and their impact on system operation;*
p. *How the UAS responds, and the safeguards that are in place to mitigate the risk of a propulsion system loss (low battery charge, failed signal input from the RPS, motor controller failure…)*
q. *If the motor has in-flight reset capabilities, a description of the manual and/or automatic features of this capability.*

*(d) Other propulsion systems.*

*A description of these systems to a level of detail equivalent to the fuel and electrical propulsions sections above.*

### 3.4 FLIGHT CONTROL SURFACES AND ACTUATORS

*This section should include the following:*

*(a) A description of the design and operation of the flight control surfaces and servos/actuators, including a diagram showing the location of the control surfaces and the servos/actuators;*
*(b) A description of any potential failure modes and the corresponding mitigations;*
*(c) How the system responds to a servo/actuator failure; and*
*(d) How the remote-pilot or watchdog system is alerted of a servo/actuator malfunction.*

### 3.5 SENSORS

*This section should describe the non-payload sensor equipment on board the UAS and its role.*

## 3.6 PAYLOADS

*This section should describe the payload equipment on board the UAS, including all the payload configurations that significantly change the weight and balance, electrical loads, or flight dynamics.*

## 3.7 UAS CONTROL SEGMENT

*An overall system architecture diagram of the avionics architecture, including the location of all air data sensors, antennas, radios, and navigation equipment. A description of any redundant systems, if available.*

### 3.7.1 NAVIGATION

*(a) How the UAS determines its location;*
*(b) How the UAS navigates to its intended destination;*
*(c) How the remote pilot responds to instructions from:*
- *a. air traffic control;*
- *b. UAS observers or VOs (if applicable); and*
- *c. other crew members (if applicable);*

*(d) The procedures to test the altimeter navigation system (position, altitude);*
*(e) How the system identifies and responds to a loss of the primary means of navigation;*
*(f) A description of any backup means of navigation; and*
*(g) How the system responds to a loss of the secondary means of navigation, if available.*

### 3.7.2 AUTOPILOT

*(a) How the autopilot system was developed, and the industry or regulatory standards that were used in the development process.*
*(b) The procedures used to install the autopilot and how its correct installation is verified, with references to any documents or procedures provided by the manufacturer's organisation and/or developed by the UAS operator's organisation.*
*(d) The type of testing and validation that was performed (software-in-the-loop (SITL) and hardware-in-the-loop (HITL) simulations), when available.*

### 3.7.3 FLIGHT CONTROL SYSTEM

*(a) If there are any auxiliary controls, how the flight control computer interfaces with the auxiliary controls, and how they are protected against unintended activation.*
*(b) A description of the flight control computer interfaces required to determine the flight status and to issue appropriate commands.*
*(c) A description of the flight modes (i.e. manual, artificial-stability, automatic, autonomous).*
*(d) The operating system on which the flight controls are based.*
*(e) How the control surfaces (if any) respond to commands from the flight control computer/autopilot.*
*(f) Describe if the UAS flight control system incorporates automatic protection of the flight envelope to prevent the remote pilot from making any single input under normal operating conditions that would cause the UAS to exceed its flight envelope or prevent it from recovering in a timely fashion.*

a. *Automatic protection of the flight envelope is intended to prevent the remote pilot from operating the UAS outside its flight envelope. If the operator demonstrates that the remote-pilot is not in the loop, this is not applicable;*
b. *A UAS implementing such an automatic protection function will ensure that the UA is operated within an acceptable flight envelope margin even in the case of incorrect remote-pilot control inputs (human errors).*

### 3.7.4 REMOTE PILOT STATION (RPS)

*(a) A description or a diagram of the RPS configuration, including screen captures of the control station displays.*
*(b) How accurately the remote pilot can determine the attitude, altitude (or height) and position of the UAS.*
*(c) The accuracy of the transmission of critical parameters to other airspace users/air traffic control (ATC).*
*(d) The critical commands that are safeguarded from inadvertent activation and how that is achieved (for example, is there a two-step process to command 'switch the engine off'). The critical commands that should be safeguarded are those which an inadvertent activation could lead to an undesirable outcome (for example, accidentally hitting the 'kill engine' control in flight).*
*(e) Any other programmes that run concurrently on the ground control computer, and if there are any, the precautionary measures that are used to ensure that flight-critical processing will not be adversely affected.*
*(f) The provisions that are made against an RPS display or interface lock-up.*
*(g) The alerts (such as warning, caution and advisory) that the system provides to the remote pilot (e.g. low fuel or battery level, failure of critical systems, or operation out of control).*
*(h) A description of the means to provide power to the RPS, and redundancies, if any.*
*(i) The UAS information and control interfaces are clearly and succinctly presented and do not confuse, cause unreasonable fatigue, or contribute to remote crew errors that could adversely affect the safety of the operation.*

### 3.7.5 DETECT AND AVOID (DAA) SYSTEM

*(a) Aircraft conflict avoidance*
a. *A description of the system/equipment that is installed for collaborative conflict avoidance (e.g. SSR, TCAS, ADS-B, FLARM, etc.).*
b. *If the equipment is qualified, details of the detailed qualification to the respective standard.*

*(b) Non-collaborative conflict avoidance.*
*A description of the equipment that is installed (e.g. vision-based, PSR data, LIDAR, etc.).*

*(c) Obstacle conflict avoidance.*
*A description of the system/equipment that is installed, if any, for obstacle collision avoidance.*

*(d) Avoidance of adverse weather conditions.*
*A description of the system/equipment that is installed, if any, for the avoidance of adverse weather conditions.*

*(e) Standard. If equipment is qualified, a list of the respective standards.*

*(f) A description of any interface between the conflict avoidance system and the flight control computer.*
*(g) A description of the principles that govern the installed DAA system*
*(h) A description of the role of the remote pilot or any other remote crew in the DAA system.*
*(i) A description of the known limitations of the DAA system.*

### 3.8 COMMAND AND CONTROL (C2) LINK SEGMENT

*Provide the C2-Link related information in the following.*

*(a) The main parameters associated with the performance of the Link include, but are not limited to the following:*
- *a. the transaction expiration time;*
- *b. the availability;*
- *c. the continuity; and*
- *d. the integrity.*

*(b) The standard(s) with which the system is compliant.*
*(c) A detailed diagram that shows the system architecture of the C2 link, including informational or data flows and the performance of the subsystem, and values for the data rates and latencies, if known.*
*(d) A description of the control link(s) connecting the UAS to the RPS and any other ground systems or infrastructures, if applicable, specifically addressing the following items:*
- *a. The spectrum that will be used for the control link and how the use of this spectrum has been coordinated. If approval of the spectrum is not required, the regulation that was used to authorise the frequency.*
- *b. The type of signal processing and/or link security (i.e. encryption) that is employed.*
- *c. The datalink margin in terms of the overall link bandwidth at the maximum anticipated distance from the RPS, and how it was determined.*
- *d. If there is a radio signal strength and/or health indicator or similar display to the remote pilot, how the signal strength and health values were determined, and the threshold values that represent a critically degraded signal.*
- *e. If the system employs redundant and/or independent control links, how different the design is, and the likely common failure modes.*
- *f. For satellite links, an estimate of the latencies associated with using the satellite link for aircraft control and for air traffic control communications.*
- *g. The design characteristics that prevent or mitigate the loss of the datalink due to the following:*
  - *i. RF or other interference;*
  - *ii. flight beyond the communications range;*
  - *iii. antenna masking (during turns and/or at high attitude angles);*
  - *iv. a loss of functionality of the RPS;*
  - *v. a loss of functionality of the UA; and*
  - *vi. atmospheric attenuation, including precipitation.*

#### 3.8.1 C2 LINK DEGRADATION

*A description of the system functions in case of a C2 link degradation:*

*(a) Whether the C2 link degradation status is available and in what form (e.g. degraded, critical, automatic messages).*
*(b) How the status of the C2 link degradation is announced to the remote pilot (e.g. visual, haptic, or sound). A description of the associated contingency procedures.*
*(c) Other.*

### 3.8.2 C2 LINK LOSS

*(a) The conditions that could lead to a loss of the C2 link.*
*(b) The measures in case of a loss of the C2 link.*
*(c) A description of the clear and distinct aural and visual alerts to the remote pilot for any case of a lost link.*
*(d) A description of the established lost link strategy presented in the UAS operating manual, taking into account the emergency recovery capability.*
*(e) A description of how the geo-awareness or geo-fencing system is used in this case, if available.*
*(f) The lost link strategy, and, if incorporated, the re-acquisition process in order to try to re-establish the link in a reasonably short time.*

## 3.9 OTHER GROUND SUPPORT EQUIPMENT (GSE) SEGMENT

*(a) A description of all the support equipment that is used on the ground, such as launch or recovery systems, generators, and power supplies.*
*(b) A description of the standard equipment available, and the backup or emergency equipment.*
*(c) A description of how the UAS is transported on the ground.*

## 3.10 CONTINGENCY / EMERGENCY RELATED SUBSYSTEMS

*(a) A description of the subsystems involved in contingency and emergency procedures that are not already included in other paragraphs of part 3 (e.g. flight termination system or FTS, automatic recovery system or ARS, etc…). These systems may be used to perform containment functions for:*
    *a. avoidance of specific area(s) or volume(s); or*
    *b. confinement in a given area or volume.*
*(a) The system information and, if applicable, supporting evidence that demonstrates the reliability of the containment system.*

# PART 4 –OPERATIONAL PROCEDURES

## 4.1 NORMAL OPERATING PROCEDURES

*This section should describe the normal operating procedures in place for the intended operations, including at least:*

*(a) Pre-flight preparations and checklists, covering:*
*(b) launch and recovery procedures;*
*(c) in-flight procedures, including those to ensure that the unmanned aircraft remains within the flight geography;*
*(d) post-flight procedures, including the inspections to verify the condition of the UAS;*

## 4.2 CONTINGENCY AND EMERGENCY PROCEDURES

*This section should describe the contingency procedures in place for any malfunction or abnormal operation, as well as the emergency procedures:*

*(a) contingency procedures should include at least:*

- *a. procedures to cope with the unmanned aircraft leaving the designated 'flight geography';*
- *b. procedures to cope with persons who are not involved entering the controlled ground area;*
- *c. procedures to cope with adverse operating conditions;*
- *d. procedures to cope with the deterioration of external systems supporting the operation;*
- *e. if airspace observers are employed, the phraseology to be used;*
- *f. conflict avoidance procedures with other airspace users;*

*(b) emergency procedures to cope with emergency situations should include at least:*

- *a. procedures to avoid, or at least minimise, harm to third parties in the air or on the ground;*
- *b. procedures to cope with the unmanned aircraft leaving the 'operational' volume;*
- *c. procedures for the emergency recovery of the unmanned aircraft; y.*

## 4.3 OCCURRENCE REPORTING PROCEDURES

*UAS, like all aircraft, are subject to accident investigations and occurrence reporting schemes. Describe the system on how the organisation collects and investigates occurrences. Mandatory or voluntary reporting to the MAA should be carried out:*

*(a) reporting procedures in case of:*

- *a. damage to property;*
- *b. a collision with another aircraft; or*
- *c. a serious or fatal injury (third parties and own personnel); and*

*(b) documentation and data logging procedures: describe how records and information are stored and made available, if required, to the accident investigation body, competent authority, and other government entities (e.g. police) as applicable.*

## 4.4 EMERGENCY RESPONSE PLAN (ERP)

*The applicant should:*

*(a) define a response plan for use in the event of a loss of control of the operation;*
*(b) describe the procedures to limit the escalating effects of a crash; and*
*(c) describe the procedures for use in the event of a loss of containment.*

# PART 5 –SAFETY

## 5.1 UAS FUNCTIONAL FAILURES

*(a) Include the reference to the Risk Assessment (whenever the operation is not intended to fly in a Standard Scenario or under an existing predefined risk assessment, PDRA).*

*(b) Include the list of all possible UAS functional failures (and possible combinations) deriving into a fatality, together with a design and installation appraisal that covers at least:*

a. *the design and installation features used to mitigate the risk (independence, separation, and redundancy); and*
b. *the particular risks (e.g. hail, ice, snow, electromagnetic interference, etc.) relevant to the type of operation.*

*Note: all this information requested in (b) may already be included as part of the Risk Assessment provided in (a).*

*(c) Explain how can be reasonably expected that a fatality will not occur due to any probable failure of the UAS.*

## 5.2 EXTERNAL SYSTEMS

*External systems should be understood as systems that do not belong to the UAS design but which are required for the operation.*

*(a) For these systems:*
   a. *identify the external systems supporting the operation;*
   b. *describe the deterioration modes of these external systems which would prevent the operator maintaining a safe operation of the UAS (e.g. complete loss of GNSS, drift of the GNSS, latency issues, etc.);*
   c. *describe the means put in place to detect the deterioration modes, and*
   d. *describe the procedure(s) in place once a deterioration mode is detected (e.g. activation of the emergency recovery capability, switch to manual control, etc.).*

*(b) Explain how can be reasonably expected that a fatality will not occur due to a deterioration of any external system.*