



**DG ECHO LEAPFROG
(GA 872233)**



Deliverable B.1: Draft Standard Operating Procedures

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1 INTRODUCTION

The use of Remotely Piloted Aircraft System (RPAS) units can be effective in improving capacities for data and imagery collection to support better decision making for response in the midst of an emergency.. This is particularly vital in dangerous and life-threatening situation, when situation awareness is limited, or when operational conditions do not allow the deployment of any other system.

The particular RPAS unit can be deployed in missions dealing with fire, flood, earthquake, and tsunamis disasters. The unit can successfully deal with temporary shortcomings on situation awareness in:

- (1) assessment missions (e.g. inspection of damaged structure, mapping of affected areas as stand-alone assets or in combination with other aerial devices including satellites),
- (2) urban search and rescue operations (e.g. providing live optical/thermal video/imagery, during operations).

To support situational awareness, the particular RPAS unit is able to execute the following tasks:

- (a) provide accurate orthorectified imagery and digital surface models for rapid mapping purposes;
- (b) sharp, contrasted, undistorted photos that yield geometric precision and height data;
- (c) live HD video and thermal imagery during flight time.

2 ABBREVIATIONS AND ACRONYMS

AD – Airworthiness Directive
AOR – Area of Responsibility
ATC – Air Traffic Control
AU – Air Unit
B-VLOS – Beyond visual line of sight
CFIT – Controlled Flight Into Terrain
CTAF – Common Traffic Advisory Frequent
CRM – Crew Resource Management
FOV – Field of view
FPV – First person view
FTF – Functional Test Flight
GCS – Ground Control Station
GMT – Greenwich Mean Time
GPS – Global Positioning System
LAA – Local Airport Advisory
LO – Liaison Officer
LR – Launch and Recovery
MEL – Minimum Equipment List
METAR – Meteorological Aerodrome Report
MTOW – Maximum takeoff weight
MX – Maintenance
NM – Nautical Mile
NOTAM – Notice To Airmen
NUAF – New RPAS Acceptance Flight
OEM – Original Equipment Manufacturer
RPAS – Remotely Piloted Aircraft System
RPIC – Remote Pilot in Command
PPE – Personal Protective Equipment
RC – Remote Control
RTH – Return to Home
SIGMET – Significant Meteorological Information
SMS – Safety Management System
SOP – Standard Operating Procedure
SAR – Search and Rescue
TAF – Terminal Aerodrome Forecast
TFR – Temporary Flight Restrictions
TSO – Technical and Safety officer
UAS – Unmanned Aircraft System
VLOS – Visual line of sight
VTOL – Vertical take-off and landing
VO – Visual Observer

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3 DEFINITIONS

Aircraft – A device that is used or intended to be used for flight in the air. This includes RPASs.

Airworthiness Statement – The Airworthiness of the RPAS is self-certified by the Remote Pilot in Command through a preflight inspection prior to flight.

Caution – an operating procedure, practice, or condition, etc. if not strictly observed, may cause damage to the aircraft.

Crewmember – A person assigned to perform duty while an aircraft is operating.

Crew Resource Management (CRM) – The effective use of all available resources including human, hardware, and information resources and coordination in the use of those resources by the RPIC, Remote Pilot and Visual Observer.

Flight Cycles – an alternative measurement for small RPAS flight experience (normally measured in flight hours). A flight cycle consists of system setup, launch, and operational flight in excess of 10 minutes, recovery and system stowing.

Flight Hours – a measurement of system usage or Operator experience considered the time from power on/engine start to power down/engine shutdown.

Image – Means any capturing of sound waves, thermal, infrared, ultraviolet, visible light, or other electromagnetic waves, odor, or other conditions existing on or about real property in this state or an individual located on that property. Imagery may include data about people, organizations, events, incidents, or objects as well as metadata.

Liaison – Will liaison with the SAR coordinating personnel on behalf of the RPAS team.

Mission Area of Operations (AOR) – A defined perimeter/parameters to be determined based on the scope and type of the operation and a defined operational ceiling at or below 400 feet above the ground. The altitude of the small unmanned aircraft cannot be higher than 400 feet above the ground, unless the small unmanned aircraft is flown within a 400 foot radius of a structure and does not fly higher than 400 feet above the structure's immediate uppermost limit.

Nautical Mile – a unit of distance that is one minute of arc along the meridian or 1852 meters (6000 feet).

Night Flight – Flight of a RPAS that occurs between the hours of one half hour after sunset and one half hour before sunrise.

Note – An operating procedure, practice, or condition, etc., which is essential to emphasize.

Remote Pilot In Command – The RPIC is the person directly responsible for the operation of the RPAS.

Should – Used to express expectations and guidance that is not mandatory but expected.

Technical and Safety Officer – Is responsible for providing technical and safety support during RPAS operations.

Unmanned Aircraft System – a device used or intended to be used for flight in the air that has no onboard pilot (operator) and its associated elements related to safe operations, which may include CSs (ground, ship, or air-based), control links, support equipment, payloads, and launch/recovery equipment. It includes all remotely-piloted and autonomous aircraft, irrespective of their total take-off mass.

Visual line of sight – The maximum distance from RPIC with respect to the RPAS at which the PIC is able to see RPAS directly.

Visual Observer – Is responsible for the visual observation from the RPAS sensors while in flight, this may include camera sensors, radiation sensors etc.

Warning – an operating procedure, practice, or condition, etc., which may result in injury or death if not carefully observed or followed.

Will – Used to express an imperative command that is mandatory.

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4 ORGANIZATION

4.1 ORGANIZATION STRUCTURE

During operations the LO is responsible of coordinating the team and have a direct communication with the operation command center. The RPAS team(s) will communicate with the TL at all times regarding their operation as requested by the incident's command center.

4.2 TEAM STRUCTURE

The RPAS will be operated by a team consisting of a minimum of four (4) personnel. Each member of the team will be assigned a specific role during RPAS operations. Roles may be rotated when more than one flight will be completed during an operation as long as each member has the appropriate knowledge, experience and qualification for the corresponding role. Each member should be clearly designated with an assignment prior to any flights taking place. In addition to RPIC, at least one (1) more member of the team should have appropriate qualification and training to operate the RPAS for redundancy purposes in case of an emergency.

4.3 QUALIFICATIONS

All RPAS crews will be appropriately trained and qualified in the RPAS they operate by successfully completing a manufacturer approved training course or by completing training conducted by organization's approved Instructor Pilots. They must meet the standards required by the local civil aviation authority or by the European Aviation Safety Agency (EASA). Additionally, they must meet the proficiency events standards as stated in section TRAINING/PROFICIENCY, in order to act as a team member.

4.4 TEAM MEMBER DUTIES

4.4.1 Remote Pilot in Command (RPIC)

The RPIC will function as the operator of the RPAS. The RPIC will be ultimately responsible for the operation and solely responsible for input of commands/piloting of the RPAS during flight. The RPIC will also be responsible for GCS assembly, pre-flight preparation, post flight procedures and GCS disassembly/storage. RPIC may only fly the aircraft if reasonably satisfied that the flight can safely be executed. The RPIC can release supplemental crew members from their duties or ground the RPAS at any time due to lack of airworthiness. Additionally, RPIC is responsible for conducting a flight safety risk assessment.

4.4.2 Visual Observer (VO)

The VO is responsible for controlling the external on-board non-flying related equipment such as optical camera sensors, thermal imagers or any other measurement instrument used to perform surveillance. VO will mainly maintain a visual observation of the RPASs main surveillance camera sensors while it is in flight and will also advice RPIC to perform maneuvers at his discretion such that VO can focus on a point of interest. To accomplish this effectively, the observer will be in close proximity to the RPIC to ensure instant relaying of information.

4.4.3 Technical and Safety Officer (TSO)

The TSO is responsible for any technical aspects regarding the equipment as well as ensuring safety of the equipment. TSO along with RPIC will complete all ground operations regarding the GCS assembly, pre-flight preparations, post flight procedures and GCS disassembly/storage. During flight, the TSO officer will ensure that the operations area remains secured and both RPIC and VO are not interrupted. TSO is responsible for performing risk assessments for new areas or types of operations, collecting safety data, investigating accidents, as well as developing and administering safety training to RPAS crews.

4.4.4 Team Leader / Liaison Officer (LO) / Logistics

The LO will be an AU supervisor or designee whose function is to provide a conduit for information and request from the coordination center to the RPAS team. As the LO may not be physically located with the other RPAS team members, communications will be paramount. Any request from the coordination center for the RPAS to perform a specific function will be communicated to the RPIC via the LO. The LO will be responsible for all aviation related communications required by FARs. Additionally, the LO will appoint the VO, TSO and RPIC at his discretion as long as the personnel has the appropriate qualification for the corresponding position. The LO is responsible for taking any necessary actions required prior any flight in order to grant an official approval for any flight (if its required).

5 SAFETY

5.1 GENERAL SAFETY POLICY

Occurrences are unplanned safety related events, including accidents and incidents that could impact safety. A hazard is something that has the potential to cause harm. The systematic identification and control of all major hazards is foundational to safety. It is the duty of every crewmember to contribute to the goal of continued safe operations. This contribution comes in many forms and includes always operating in the safest manner practicable and never taking unnecessary risks. Any safety hazard, whether procedural, operational, or maintenance related must be identified as soon as possible after, if not before, an incident occurs. Any suggestions in the interest of safety should be made to the team LO. If any member observes, or has knowledge of an unsafe or dangerous act committed by another member, the RPAS coordinator is to be notified immediately so that corrective action may be taken.

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5.2 SAFETY REGULATIONS

In regards to safety, RPAS crewmembers are responsible for the following:

1. Understand applicable regulatory requirements, standards and organizational safety policies and procedures.
2. RPAS RPICs are responsible to ensure that during take-off or landing, RPAS must not be flown within thirty (30) meters (98 feet) of any person.
3. An appropriately equipped first aid kit will be carried with the RPAS at all times.
4. A fire extinguisher should be presented in the deployment area.
5. RPAS crewmembers would be required to wear minimal Personal Protective Equipment (PPE) during flight operations. This equipment should include class II safety vests, hard hats, and eye protection at a minimum. Certain missions will require the use of work/hiking boots and cut resistant gloves.
6. The RPAS operators must adhere to aviation rules (e.g. CASA, FAA, CAA, EASA) for the area being overflown.
7. The RPAS ground station, launch and recovery site to be located at a reasonable distance from the survey area
8. Except as required by the mission, all RPAS crewmembers will ensure that no persons are in the vicinity of the RPAS during operations to avoid flying over non-hostile persons or vehicles.
9. Comply with the RPAS operator manual, warning, limitations, placards, and/or checklists at all times unless an emergency dictates otherwise.
10. The RPAS remote control device must have the ability to convert to manual control of the RPAS during the flight.
11. RPAS RPICs are authorized to evaluate and accept or decline any mission or portion of it, if at their discretion there is lack of airworthiness.
12. ALL RPAS PERSONNEL ARE AUTHORIZED AT ANY TIME TO TAKE ANY NECESSARY ACTION TO CORRECT A HAZARD if beyond any reasonable doubt, any delay will result in an accident or an injury. The RPAS TL will be notified immediately in such situations.
13. Hazards requiring immediate attention will be brought to the attention of the RPAS TL, verbally, without delay.
14. RPIC must not perform duties for more than one RPAS at a time and are prohibited from flying any mission without having completed three RPAS flight events within the preceding ninety (90) days.
15. Every hazard and/or occurrence will be investigated, with the results and corrective action taken communicated to all crewmembers. The investigation will be conducted by the TSO or any other member of the organization who has the technical skill necessary to do it. The services of an independent subject matter expert may be necessary in some cases to assure a thorough and complete investigation.
16. RPIC will operate the aircraft at all times with the safety of the public as the primary goal while making all efforts to accomplish the specific mission at hand.
17. RPIC will be familiarized with all available information concerning the deployment including, but not limited to, the weather conditions, hazards, description of the incident, deployment goals, etc.
18. RPIC and TSO will ensure that the location for take-off and emergency landing is adequate for a safe deployment and that the take-off/landing area is clearly marked and identifiable. At least one emergency landing area should be identified per deployment.
19. Will ensure that they are aware of their surroundings in the event that an emergency landing is necessary. This includes the ability to recover the RPAS.

5.3 SAFETY TRAINING

All crewmembers shall receive training in the following subjects prior to operating the RPAS:

1. Organization commitment to safety
2. Organization policy

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3. RPAS crewmember's role in safety
4. Emergency safety procedures

All members shall review the organization safety policy and procedures on an annual basis and that review shall be noted in their training history.

5.4 MEDICAL FACTORS

1. Aircrew readiness is an important part of safety. RPIC and VO will only deploy the RPAS when rested (8 hours of uninterrupted sleep) and emotionally prepared for the tasks at hand.
2. Physical illness, exhaustion, emotional problems, etc., seriously impair judgment, memory and alertness. The safest rule is not to act as a RPIC or VO when suffering from any of the above. Crewmembers are expected to "stand down" when these problems could reasonably be expected to affect their ability to perform flight duties.
3. A self-assessment of physical condition shall be made by all members during pre-flight activities.
4. Performance can be seriously hampered by prescription and over-the-counter drugs. The LO must be advised anytime such drugs are being taken. If it is determined that the medication being taken could hamper the RPIC or VO, that member shall be prohibited from the deployment or exercise.
5. No crewmember shall act as a RPIC or VO when under the influence of alcohol. This requirement should be understood as follows:
 - i. The blood alcohol concentration (BAC) should not exceed 0.02%, which is 0.2 grams of alcohol per liter of blood, whilst performing duties related to operating a RPAS, including flight preparation.
 - ii. The breath alcohol concentration (BrAC) should not exceed 90 micrograms of alcohol per liter of breath, whilst performing duties related to operating an aircraft, including flight preparation.
 - iii. Alcohol should not be consumed within eight (8) hours of performing duties related to operating a RPAS, including flight preparation. However, it should be noted that eight (8) hours 'from bottle to throttle' does not guarantee that the individual's BAC/BrAC will be below the above-mentioned limits. It is, therefore, recommended to abstain for longer than 8 hours, as appropriate, in order to take into account the quantity of alcohol consumed.
 - iv. Alcohol should not be consumed whilst performing duties related to operating a RPAS, including flight preparation.

6 NORMAL OPERATIONS

6.1 OPERATIONS AREA

The operation area selected by the RPAS crewmembers shall be located within a secure perimeter, whenever possible. The area should be evaluated for adequate space and clearances in order to safely assemble, launch, and recover the RPAS. Attention should be given to overhead obstacles and obstructions that may pose a risk to the RPAS during operation. The site selected and utilized by the RPAS crewmembers will be restricted and access granted to personnel for operational purposes only. If it is required, crewmembers may tape off a no entry zone for all others to not enter.

6.2 PRE-FLIGHT PROCEDURES

6.2.1 RPAS and Control Station assembly

The RPAS and Control station will be assembled on site by RPAS crewmembers as described in Section TEAM MEMBER DUTIES. Assembly of RPAS, Control Station and any other support equipment required for the flight, should be done according to manufacturer's operation manual and/or checklists.

6.2.2 Pre-Flight Inspections

RPIC and TSO are both responsible for a thorough preflight inspection of the RPAS. Before and after each deployment (whether a mission or training), the RPIC and TSO shall conduct a thorough inspection of the RPAS in accordance with the instructions contained in the manufacturer's operation's manual. Besides the manufacturer's written pre-flight inspection procedure, RPIC and TSO should ensure that the following are included in the pre-flight inspection:

1. RPAS components.
2. Airframe structure (including undercarriage), all flight control surfaces, and linkages.

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3. Registration markings.
4. Servomotors, including attachment points.
5. Propulsion system, including power plants, propellers, rotors, ducted fans, etc.
6. Energy supply – confirm all systems (e.g., RPAS and control unit) have an adequate energy supply for the intended operation and are functioning properly.
7. Avionics, including control link transceiver, communication/navigation equipment, and antennas.
8. Compass (calibrate RPAS compass before any flight).
9. Display panel, if used (confirm functioning properly).
10. Ground support equipment, including takeoff and landing systems (check for proper operation).
11. Equipment used for crewmember's communication.
12. Control link functionality established between the aircraft and the flight control surfaces.
13. Onboard navigation and communication data links.
14. Flight termination system operable, if installed.
15. No items are attached to the RPAS prior to flight that are not required for safe operation or to complete the mission goal.

Any issues found that will put in jeopardy the safe operation of the RPAS shall be documented and resolved immediately prior to flight. Any physical equipment that cannot be resolved on-site, and which have an impact on safety or the mission, will override the deployment.

6.2.3 Weather Brief

Weather shall be obtained by the RPIC for the local area of operation to include METAR and TAF from the closest airport reporting weather conditions. Review of NOTAMs and TFRs are required prior to launch. Additional weather information should be obtained from the National Oceanic Atmospheric Administration (NOAA), or another source or cell phone application to review the following:

1. Weather radar.
2. Ceiling/visibility.
3. Wind/temperatures.
4. Turbulence.
5. SIGMET.
6. NOTAMs.
7. TFRs.
8. Icing conditions.

6.2.4 Pre-Flight Briefing

Crewmembers must participate in the pre-flight briefing, led by the RPIC prior to RPAS launch, which includes, but is not limited to:

1. Review of the mission's aims and objectives.
2. Review of current and forecasted weather conditions.
3. Review of current NOTAMs and TFRs that have been issued for the proposed flight area.
4. Identification of mission limitations and safety issues.

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5. Review of proposed Mission AOR - flight area, including maximum ceiling and floor.
6. Review of communication procedures between RPIC, VO, LO and other personnel used to support the mission. Including verifying cell phone numbers used to communicate with ATC in the event of a fly-away or other flight emergency.
7. Review of emergency/contingency procedures including aircraft system failure, flight termination, divert, and lost link procedures. At least one emergency landing area should be identified per deployment.
8. Execution of a pre-flight check utilizing the approved checklist.

The RPIC will be responsible to ensure that the above steps have been accomplished prior to flight.

6.3 FLIGHT

Flight begins when take-off procedure starts, and finishes immediately after landing procedure is terminated. RPIC will not begin any take-off procedure under any circumstances before getting an approval to do so from the LO. If the airspace at the mission's site is controlled or an approval is required to perform a RPAS flight; the LO is responsible of taking any necessary actions to grant an official approval regarding any flight. The flight may be fully autonomous, partially autonomous or fully manually controlled. During any kind of flight, RPIC is solely responsible and has final authority over the flight, including:

1. The RPAS is operated in accordance within manufacturer specifications, guidelines, limitations and restrictions.
2. Ensuring that flight will comply with all limitations, restrictions and requirements as stated by the corresponding aviation authority.
3. Ensuring the aircraft is not operated carelessly or recklessly nor carrying hazardous materials.
4. When operating at night, the RPAS will have active visual strobe lights operational to allow for the identification of the RPAS in the air.
5. Ensuring that the aircraft poses no threat to any person or property in the event of a loss of control for any reason.

6.4 POST-FLIGHT PROCEDURES

6.4.1 Flight debriefing

After changeover or landing, crewmembers must participate in the post-flight debriefing, led by the RPIC, which includes, but is not limited to:

1. Discussing whether aims and objectives of the mission have been accomplished.
2. Retain information regarding flight by performing a flight review.
3. Evaluate the performance of the team and identify possible knowledge gaps or emerging issues.
4. Execution of a post-flight check utilizing the approved checklist.

6.4.2 RPAS and Control Station disassembly

The RPAS and Control station will be disassembled by RPAS crewmembers as described in Section TEAM MEMBER DUTIES. Disassembly of RPAS, Control Station and any other support equipment, should be done according to manufacturer's operation manual and/or checklists. Before disassembly, RPIC along with TSO should perform a brief inspection to the RPAS in order to identify possible faults, defects or malfunctions that may occurred during the mission.

6.5 DOCUMENTATION

The RPIC is responsible for completion pre-flight and post-flight documentation for each flight. After each flight or end of a duty cycle, the RPIC or his/her designate will complete a flight log documenting the RPAS's operations. All flight logs should include the following information:

1. RPIC, VO, TSO and LO full names.
2. Flight number.
3. Date (in format DD/MM/YYYY).
4. Take-off GMT Time (in format HH:MM).

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5. Take-off Local Time (in format HH:MM).
6. Brief description of the mission.
7. RPAS type, make and model.
8. RPAS registration
9. Location.
10. Weather (cloudy, clear skies, scattered clouds, etc.).
11. Wind speed (approximate, e.g. 4G7knts, 4 knots Gusting 7 Knots based on Beaufort scale).
12. M/T Type (Mission or Training. written down as M or T).
13. Flight duration.
14. Flight altitude.
15. Notes (optional).
16. Significant concerns regarding safety or maintenance issues should be noted in the log and also reported in detail to the LO.

7 EMERGENCY PROCEDURES

7.1 FLIGHT EMERGENCY PROCEDURES

Emergency Procedures stated in the manufacturer's operations manual shall be complied for all RPAS operations. In the event of an emergency involving the safety of persons or property, the RPIC may deviate from the procedures of this directive relating to aircraft, equipment, and weather minimums to the extent required to meet the emergency. In case of any emergency situation the RPIC will inform crewmembers as soon as possible and emergency procedures, duties and responsibilities will take place as discussed and assigned by the RPIC in the pre-flight debriefing.

7.1.1 Loss Link

An interruption or loss of command-and-control link contact with the RPAS such that the RPIC can no longer manage the aircraft's flight and as a result of the control loss the RPAS is not operating in a predictable or planned manner.

1. **Loss of RPAS Flight Control:** The RPAS lost link procedures shall be initiated which shall automatically cause the RPAS to climb to a predefined altitude, safe from any obstacles, and return to and land at the launch or emergency site. If positive control of the RPAS cannot be maintained and the RPAS is leaving the operation area or the RPAS poses a risk to life and/or property, the RPIC will issue an Engine Kill command if available.
2. **Loss of GPS Signal:** If the RPAS loses GPS signal during autonomous operations, the RPIC must immediately command the RPAS into manual mode and land as soon as practical. If positive control of the RPAS cannot be maintained and the RPAS departs the operation area or the RPAS poses a risk to life and/or property, the RPIC will issue an Engine Kill command if available.
3. **Fly-away:** If all the above procedures failed to be executed for any reason and the RPAS is flying uncontrolled beyond its controlled area, then it is considered as fly-away. The RPIC will immediately take a note of the last known position of the RPAS and inform the LO for the event. The LO will immediately communicate and report the fly-away to the local ATC, local aviation authority and command center. It is recommended that the RPAS is equipped with external GPS tracker, independent from RPASs systems, in order to track the aircraft's position in case of fly-away.

7.1.2 Loss of Visual Contact

Losing visual contact with the RPAS should be avoided except if it is required for mission purposes. However, if visual contact with the RPAS is lost during the flight, whether intentionally or unintentionally, the RPIC will make sure that the RPAS is fully under control at all times by monitoring all instruments and make sure that he/she is aware of any obstacles, property and/or people around the area. He/she will make sure to systematically check through the camera feed and flight instruments in order to understand the state, position and condition of the RPAS at all times. If the RPIC for any reason at any time, is not satisfied flying B-VLOS, then shall command the aircraft into a hover mode and shall try to re-establish visual contact. If visual contact cannot be re-established within a reasonable amount of time determined by the RPIC, then lost link procedures shall be executed.

7.1.3 Loss of RPAS Power

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1. **Fixed wing RPAS:** In case of an engine failure, the RPIC will ensure the following procedure is followed:
 - i. Immediately command the RPAS to manual mode.
 - ii. If the RPAS is suffering from stall, then perform necessary maneuvers to recover the RPAS.
 - iii. If the predefined emergency site is not available or cannot be reached, then quickly identify the most suitable site for performing an emergency landing.
 - iv. Perform emergency landing.
2. **Rotorcraft RPAS:** In case of an engine failure, the RPAS will not be able to maintain flight. Crewmembers will immediately attempt to locate the RPAS, assess the scene for injuries, and render first aid as necessary. It is recommended if applicable, that the RPAS is equipped with parachute. In this case the parachute must be deployed immediately.

7.1.4 Flight Termination

The intentional and deliberate process of performing CFIT. Flight termination must be executed in the event that all other contingencies have been exhausted, and further flight of the aircraft cannot be safely achieved, or other potential hazards exist that require immediate discontinuation of flight.

7.1.5 Collision, Crash and Damaged Aircraft

Where a collision or crash occurs priority shall be given to reduce any further damage or injuries to persons or property. Attempts shall be made to shut down propulsion system via the transmitter as soon as possible, all batteries shall be disconnected and the scene preserved.

During an incident/accident, efforts will be prioritized as follows:

1. Minimizing risk to life.
2. Provide first aid to the injured.
3. Protect property.

The RPAS shall be immediately inspected for potential damaged battery and/or fuel leakage to monitor and restrict any possibility of fire. The RPAS will be deemed unserviceable pending inspection by the TSO. Public shall be restricted access to area until deemed safe.

7.1.6 Incident/Accident notification and investigation

All in flight accidents and incidents involving fatalities, injuries, property damage, and lost link shall be reported to the LO immediately for appropriate assistance with guidance. The LO must immediately report to the local aviation authority any operation that results in at least serious injury, loss of consciousness, or property damage. The TSO will perform an initial investigation of the incident/accident and conduct an investigation report. Follow-up investigation may be conducted by the appropriate organization, department and/or external investigator.

The investigation performed by the TSO should include the following:

1. Type of emergency.
2. Detailed description of the accident/incident. This should include:
 - i. Location.
 - ii. Date and time.
 - iii. Registration number of RPAS
 - iv. RPIC full name and contact details.
 - v. Weather conditions.
 - vi. Summary of the safety measures taken pre-flight.
 - vii. Summary of emergency actions decided pre-flight.
 - viii. Circumstances leading to the incident/accident.
 - ix. Property damaged and extent of damage.

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- x. Number of person(s) injured and extent of injuries.
3. RPIC response description.
4. Crewmembers response description.
5. Post incident/accident actions.
6. Conclusions and findings.

7.2 NON-FLIGHT EMERGENCY PROCEDURES

Any non-flight related emergencies will be addressed according to health and safety regulations of the corresponding organization. Crewmembers must be aware of the health and safety regulations protocol of the corresponding organization.

8 EQUIPMENT

Taking into consideration the strenuous conditions of deployments in disaster scenario, resilience and autonomy of RPAS units are crucial. The equipment should be capable of executing missions in challenging environments. In general, the RPAS should be able to operate within the range of temperatures from -25°C to 40°C with high level of humidity (IP3 to 4) in medium to strong wind disturbance (up to 40 Km/h) and the continuity of operations should be guaranteed by redundancy, that is, when the autonomy of an aircraft requires it to land another one should take-off.

8.1 HARDWARE

8.1.1 Hardware redundancy

Continuity of operations should be guaranteed by redundancy, that is, when the autonomy of an aircraft requires it to land another one should take-off and so on. During emergency operations all the equipment must be available to perform as expected, therefore, it is important to have back-up equipment at all times in case that any equipment is not functioning as expected. It is mandatory that any crucial equipment required to perform any operation, will have at least one (1) identical back up for redundancy purposes.

8.1.2 RPAS platform and payloads capabilities

The RPAS platform itself and any other supplementary equipment required for any operation, including payloads, must satisfy a minimum set of requirements. Specifically, the RPAS platform and payloads should be capable of at least:

1. Providing high-definition imagery.
2. Have a flight time of at least thirty (30) minutes.
3. Have payload capacity of at least two (2) kilograms.
4. Providing infrared imagery for operations during night.
5. Provide a minimum transmission distance of at least two (2) kilometers.
6. Be deployed within thirty (30) minutes from the arrival at the operational site.
7. Operate in temperatures from -25°C to 40°C.
8. Operate in medium to strong winds (up to 40 Km/h).

8.2 SOFTWARE

During any emergency operation, specific software should be used for mission planning, data post processing, flight management and any other flight related activity. Software must be user-friendly and easy to operate by non-technical experts. It is required that any software used can operate offline without the necessity of Internet access. This pre-requests that any maps and charts are already been loaded into the software by default or the user is able to download them in advance before the operation. Mission planning software should give the operator a wide range of mission planning alternatives and be able to execute a mission plan autonomously, including auto-take off and auto-land. Furthermore, the mission planning software should be able to capture imagery on demand, and correlate the imagery with the exact GPS coordinates of the RPAS on a GIS for data post processing purposes.

8.3 MAINTENANCE

8.3.1 Functional test flight

A FTF is an operational “check out” of an entire system after the system has undergone maintenance of a primary component. Any RPAS that has undergone maintenance or alterations that affect the RPAS operation or flight characteristics, e.g. replacement of a flight critical component, will undergo a FTF prior to conducting further operations. These FTFs are considered high risk activities and will only be conducted by a RPIC with a TSO. The

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functional test flight will be conducted in such a manner so as not to pose an undue hazard to persons and property. This requires the flight to be performed over a designated test area and must remain at least 500 feet from people, structures and/or vehicles.

8.3.2 Software

Any software related with the RPAS equipment such as RPAS firmware, GCS firmware, payloads firmware or any other supplementary software used during any operation, should be checked in a weekly basis to ensure that are functioning properly and are up to date.

8.4 NEW RPAS ACCEPTANCE FLIGHT

A New RPAS Acceptance Flight is for newly acquired RPAS from an Original Equipment Manufacturer (OEM). This flight is to ensure the newly acquired RPAS works as designed and procedures designed for that system are suitable for the operational environment. The flight should be conducted over a designated test area and must remain at least 500 feet from people, structures and/or vehicles. These flights are considered high risk activities and should be conducted by senior qualified personnel or professionals and completed in accordance with the new RPAS Acceptance Checklist.

8.5 STORAGE AND TRANSPORTATION

The RPAS and all related equipment will be stored and available for missions on demand. Equipment should be pre-packed for easy and immediate access at any time and stored in secured places. The RPAS and its related support equipment will be packed in a way providing convenient transportation for national and international missions. In addition, equipment should be packed in a suitable casing that has the appropriate size to fit as a luggage in any airliner. Equipment should be packed in special casing that provides at least the minimum protection against water spraying, vibrations and dust according to international protection standards (i.e., aforementioned IP ratings).

9 TRAINING/PROFICIENCY

Considering that RPAS operations in disaster situations create heavy stress on operators it is of paramount importance that team members of the RPAS unit be trained and certified for disaster management operations.

9.1 NATIONAL TRAINING

All team members need to undertake emergency management training from their respective home country or organization in order to be able to take appropriate measures in confronting disasters for national or international deployments.

9.2 GENERAL DRONE TRAINING

9.2.1 Flight instructors and training schools

Individuals certified by any official civil aviation authority as flight instructors, may develop RPAS training courses, provide training, and evaluate trainee performance.

Any organization certified by any official civil aviation authority as a RPAS training school, may organize RPAS training courses that will be conducted by at least one (1) flight instructor.

9.2.2 Pilot certifications

RPIC must have completed sufficient training according to local aviation authority's rules by a certified flight instructor under a certified training school, or any other aviation/aeronautical official authority and held a RPAS official pilot license. This training, at a minimum, shall include knowledge of basic VFR Weather Minimums; knowledge of air traffic and radio communications, including the use of approved ATC/pilot phraseology; and knowledge of aeronautical fundamentals such as air law, basic flight dynamics, charts and aviation weather, navigation etc.

9.2.3 Pilots initial training and examination within the organization

Further to the official pilot training and certification, any new member in the RPAS team will undertake an initial training and an examination within the organization. This training must include an overview of health and safety regulations of the organization, specific type rating of the RPAS used within the organization along with any relevant equipment necessary to perform any operation. In conjunction with fulfilling all training requirements for UAV team member duties, the new member must also become familiar with all procedures and regulations within this document.

In addition, before any member is able to act as RPIC within the organization, he/she must complete at least twenty (20) hours of flight training during the RPAS type rating and show proficiency on the flight training exercises and the airframe. This must be accomplished to show their ability and knowledge of the specific RPAS used within the organization.

The whole training within the organization will be organized and executed by a senior pilot with at least one hundred (100) flight hours registered on their logbook. If for any reason, within the organization there is no pilot with at least one hundred (100) flight hours, then, the organization may use an external collaborator that fulfills this requirement. At the end of the initial training, any new member will undertake a written examination covering the whole subjects of the initial training. Anyone who fails to successfully complete the initial training and/or examination will be disqualified from the RPAS flight crew.

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9.2.4 TSO and VO training

The VO must undertake any necessary training regarding the equipment that he/she will be responsible during any flight. This equipment includes any hardware and software that are used to collect, analyze and evaluate the data during and after any flight. This training must only be performed by expert personnel.

The TSO must undertake professional training in all the available equipment, hardware and software, to be able to identify any technical issue and be able to find a technical solution. This training must only be performed by approved, certified engineers and/or software developers, depending on the equipment used. The TSO must also be familiar with health and safety regulations within the organization.

9.2.5 Recurrent Training

All pilots within the unit shall maintain proficiency in their RPIC abilities. Members who do not have any documented training or flight time within a span of ninety (90) days will have to show proficiency before being a RPIC during a deployment or exercise.

Recurrent training is not limited to actual RPIC skills but includes knowledge of all pertinent RPAS/aviation matters.

Failure to prove proficiency can result in removal from RPAS responsibilities.

9.3 RPAS MODULE TRAINING

RPAS module training is necessary for all team members in order to obtain the necessary knowledge, tools and skill-set to make informed decisions on RPAS international deployments for emergency response. This training aims to keep the team up to date with the latest technologies and strategies available for emergency response operations using RPAS. This course should be conducted by experts and should have the following structure:

1. Introduction
 - a. RPAS in emergency management
 - b. RPAS-based mission classification
 - c. Knowledge sharing from real deployments in various emergency situations
2. Emergency-related RPAS mission tasking
 - a. Software tools for mission planning and tasking
 - b. GIS-based data collection, management, processing, protection
3. RPAS Module
 - a. Basic mission set
 - b. Minimum requirements and specifications (self-sufficiency)
 - c. Plan of action, execution and replanning
 - d. Data collection, processing and sharing
4. Exercises
 - a. Demonstrating plan of action
 - b. Setting, executing and aborting flights
 - c. Live video sharing
 - d. Real-time mapping and object detection
 - e. Night operations using drone illuminations and thermal sensors

9.4 UCPM TRAINING

The EU Civil Protection Mechanism runs an active and comprehensive training programme, offering experts from all over Europe a deeper knowledge of the requirements of European civil protection missions. The training helps experts improve their coordination and assessment skills in disaster response.

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The programme offers a wide range of courses from basic training to high-level sessions for future mission leaders. Special courses are also available aiming to prepare for specific aspects of missions such as security training or assessments. As a minimum requirement, the LO should participate to at least 3 of these courses, including the Assessment Mission Course, and continuously refresh knowledge gained. In addition, the TSO should participate in at least 2 of these training courses and exercises, including the Technical Expert Course and continuously refresh knowledge gained.

10 SELF-SUFFICIENCY

Article 12 of Implementing Decision 2014/762/EU applies to each module in the voluntary pool. For the particular RPAS unit these rules will apply proportionately. Specifically, the RPAS unit will:

- (a) include in the module the necessary staff, equipment and consumables for the RPAS task execution;
- (b) make the necessary arrangements on the site of operations for the operating aspects;

For all other elements of self-sufficiency in Article 12 pre-arrangements should be made with a technical assistance and support team in order to comply with the requirements.

11 COLLECTED DATA POLICY

11.1 DURING TRAINING AND NON-OPERATIONAL FLIGHTS

During any flight that is considered as training or non-emergency, the RPAS RPICs and VOs will ensure the protection of private individuals' civil rights and reasonable expectations of privacy before deploying the RPAS. The GDPR EU (2016/679), regulates the privacy of citizens and the protection of personal data within EU state members. Therefore, every attempt will be made to avoid flying RPAS in the vicinity of people, private properties and/or residences. In the event that a private property or member of the public is inadvertently captured on still or video imagery, then these frames will be removed from the recorded media, or, depending on the importance of the material captured to the nature of the survey being conducted, the sensitive parts of captured frames will be pixelated or made invisible using an appropriate video/software technique. To comply with the data protection regulations, the subsequent should be followed:

1. Before making any imagery public, the resolution of images that contain sensitive information will be reduced. The solutions used regarding privacy and ethical sensitivities may include blurring and/or down sampling the data.
2. Any of imagery will not be released to the media without the permission of the organization.
3. Any data collected using RPAS shall not be retained for more than one hundred eighty (180) days unless deemed absolutely necessary. Any data collected must be secured and safeguarded.
4. The data will be collected and analyzed in a manner that is impartial to avoid discrimination. Informed consent should be secured insofar as the situation allows. As far as possible, data collection and analysis should highlight the needs and aspirations of vulnerable and marginalized groups.
5. The need(s) will be carefully determined before identifying an appropriate data collection platform. It is important to ensure that the data collected are necessary and proportionate given the need(s) of the mission.
6. Where appropriate and feasible, reasonable measures must be taken to establish informed consent for data collection by RPAS.
7. Before deployment, a plan must be established regarding the management of the data that will be collected. This will include who will be responsible for the data, where the data will be stored, and whether it is interoperable with other systems and existing platforms. The overarching priority should be to mitigate risk for the individual.
8. A plan for storing, sharing and discarding the data collected must be established, ensuring the security of storage and transmission of data.
9. Before deployment, a risk assessment will be conducted covering the data that will be collected and the tools that will be used.
10. The RPAS will not be operated near or over military installations (military bases, airstrips, ships, etc.), intelligence and security-related installations, or over critical infrastructure.
11. Before collecting, sharing or storing data that is particularly sensitive, an assessment should be conducted to mitigate the risk and benefit. This can include religious and military sites and other information that may be considered military, intelligence, and may also include other information according to the local context and the type of response, such as religious and critical infrastructure, pictures of the deceased, communication records or personal data.

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11.2 DURING AN EMERGENCY OPERATION

During an emergency operation, depending on EU Member State local laws, GDPR may not be applied. The Article 23 of the GDPR creates the right for Member States to introduce derogations to data protection law in certain situations. Article 23 states the following:

1. Union or Member State law to which the data controller or processor is subject may restrict by way of a legislative measure the scope of the obligations and rights provided for in Articles 12 to 22 and Article 34, as well as Article 5 in so far as its provisions correspond to the rights and obligations provided for in Articles 12 to 22, when such a restriction respects the essence of the fundamental rights and freedoms and is a necessary and proportionate measure in a democratic society to safeguard:
 - (a) national security;
 - (b) defence;
 - (c) public security;
 - (d) the prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, including the safeguarding against and the prevention of threats to public security;
 - (e) other important objectives of general public interest of the Union or of a Member State, in particular an important economic or financial interest of the Union or of a Member State, including monetary, budgetary and taxation matters, public health and social security;
 - (f) the protection of judicial independence and judicial proceedings;
 - (g) the prevention, investigation, detection and prosecution of breaches of ethics for regulated professions;
 - (h) a monitoring, inspection or regulatory function connected, even occasionally, to the exercise of official authority in the cases referred to in points (a) to (e) and (g);
 - (i) the protection of the data subject or the rights and freedoms of others;
 - (j) the enforcement of civil law claims.
2. In particular, any legislative measure referred to in paragraph 1 shall contain specific provisions at least, where relevant, as to:
 - (a) the purposes of the processing or categories of processing;
 - (b) the categories of personal data;
 - (c) the scope of the restrictions introduced;
 - (d) the safeguards to prevent abuse or unlawful access or transfer;
 - (e) the specification of the controller or categories of controllers;
 - (f) the storage periods and the applicable safeguards taking into account the nature, scope and purposes of the processing or categories of processing;
 - (g) the risks to the rights and freedoms of data subjects; and
 - (h) the right of data subjects to be informed about the restriction, unless that may be prejudicial to the purpose of the restriction.

12 DEPLOYMENT STRATEGY

1. CECIS Request for RPAS support
2. Per organization call-out procedure
3. Per organization deployment priorities

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