AMC2 Article 11 Rules for conducting an operational risk assessment

ED Decision 2020/022/R

PREDEFINED RISK ASSESSMENT PDRA-G01 Version 1.1

EDITION December 2020

(a) Scope

This PDRA is the result of applying the methodology that is described in AMC1 Article 11 of the UAS Regulation to UAS operations that are conducted in the 'specific' category:

(1) with UA with maximum characteristic dimensions (e.g. wingspan, rotor diameter/area or maximum distance between rotors in case of multirotor) of up to 3 m and typical kinetic energy of up to 34 kJ;

(2) BVLOS of the remote pilot with visual air risk mitigation;

(3) over sparsely populated areas;

(4) less than 150 m (500 ft) above the surface overflown (or any other altitude reference defined by the Member State); and

(5) in uncontrolled airspace.

(b) PDRA characterisation and provisions

The characterisation and provisions for this PDRA are summarised in **Table PDRA-G01.1** below:

PDRA characterisation and provisions	
1. Operational characterisation (scope and limitations)	
Level of human intervention	1.1 No autonomous operations: the remote pilot should have the ability to maintain control of the UA, except in case of loss of the command and control (C2) link. 1.2 The remote pilot should operate only one UA at a time. 1.3 The remote pilot should not operate from a moving vehicle. 1.4 The remote pilot should not hand over the control of the UA to another command unit.
UA range limit	1.5 Launch/recovery: at VLOS distance from the remote pilot, if not operating from a safe prepared area. *Note: 'safe prepared area' means a controlled ground area that is suitable for the safe launch/recovery of the UA.* 1.6 In flight: 1.6.1 If no AOs are employed: the UA is not operated further than 1 km (or other distance defined by the competent authority) from the remote pilot. *Note: The remote pilot's workload should allow the remote pilot to continuously scan the airspace.* 1.6.2 If AOs are employed: the range is not limited as long as the UA is not operated further than 1 km (unless a different distance is defined by the competent authority) from the AO who is nearest to the UA.
Areas overflown	1.7 UAS operations should be conducted over sparsely populated areas.
UA limitations	1.8 Maximum characteristic dimension (e.g. wingspan, rotor diameter/area or maximum distance between rotors in case of a multirotor): 3 m 1.9 Typical kinetic energy (as defined in paragraph 2.3.1(k) of AMC1 Article 11 of the UAS Regulation: up to 34 kJ

PDRA characterisation and provisions					
Flight height limit	1.10 The maximum height of the operational volume should not be greater than 150 m (500 ft) above the overflown surface (or any other altitude reference defined by the Member State). *Note: In addition to the vertical limit of the operational volume, an air risk buffer is to be considered (see 'Air risk' under point 3 of this table).*				
Airspace	1.11 The UA should be operated: 1.11.1 in uncontrolled airspace (Class F or G) (corresponding to an air risk that can be classified as ARC-b); or 1.11.2 in a segregated area (corresponding to an air risk that can be classified as ARC-a); or 1.11.3 as otherwise established by the Member States in accordance with Article 15 (with an associated air risk that can be classified as not higher than ARC-b).				
Visibility	1.12 The UA should be operated in an area where flight visibility is more than 5 km. *Note: This flight visibility should be understood as the distance from which a UA can be visually detected by the remote crew.*				
Others	1.13 The UA should not be used to carry dangerous goods, except for dropping items in connection with agricultural, horticultural or forestry activities in which the carriage of the items does not contravene any other applicable regulations.				
2. Operational risk classification (according to the classification defined in AMC1 Article 11 of the UAS Regulation)					
Final GRC	3	**Final ARC**	ARC-b	**SAIL**	II
3. Operational mitigations					
Operational volume (see Figure 2 of AMC1 Article 11)	3.1 To determine the operational volume, the applicant should consider the position-keeping capabilities of the UAS in 4D space (latitude, longitude, height, and time). 3.2 In particular, the accuracy of the navigation solution, the flight technical error of the UAS, as well as the flight path definition error (e.g. map error) and latencies should be considered and addressed when determining the operational volume. 3.3 The remote pilot should apply emergency procedures as soon as there is an indication that the UA may exceed the limits of the operational volume.				
Ground risk	3.4 The UAS operator should establish a ground risk buffer to protect third parties on the ground outside the operational volume. 3.4.1 The minimum criterion should be the use of the '1:1 rule' (e.g. if the UA is planned to operate at a height of 150 m, the ground risk buffer should at least be 150 m). 3.5 The operational volume and the ground risk buffer should be all contained in a sparsely populated area. 3.6 The applicant should evaluate the area of operations typically by means of an on-site inspection or appraisal, and should be able to justify a lower density of people at risk.				
Air risk	3.7 The UAS operator should establish an air risk buffer to protect third parties in the air outside the operational volume. 3.8 This air risk buffer should be contained in the 'airspace class F or G' (uncontrolled airspace) over sparsely populated areas and in UAS geographical zones defined by the MSs where the probability of encounter with manned aircraft and other airspace users is not low. 3.9 The operational volume should be outside any geographical zone corresponding to a flight restriction zone, as defined by the responsible authority, unless the UAS operator has been granted an appropriate permission. 3.10 Prior to the flight, the remote pilot should assess the proximity of the planned operation to manned aircraft activity.				
Observers	3.11 If the UAS operator decides to employ one or more airspace observers (AOs), the remote pilot may operate the UA up to the distance that is specified in point 1.6.2. 3.12 The UAS operator should ensure the correct placement and number of AOs along the intended flight path. Prior to each flight, the UAS operator should verify that:				

PDRA characterisation and provisions	
	3.12.1 visibility and the planned distance of the AO are within acceptable limits that are defined in the operations manual (OM); 3.12.2 there are no potential terrain obstructions for each AO; 3.11.3 that there are no gaps between the zones that are covered by each of the AOs. 3.12.4 communication with each AO is established and effective; and 3.12.5 if means are used by the AOs to determine the position of the UA, those means are functioning and effective. *Note: Instead of an AO, the remote pilot may perform the visual scan of the airspace, provided that the workload allows the remote pilot to perform their duties.*
4. UAS operator and UAS operations provisions	
UAS operator and UAS operations	4.1 In addition to the responsibilities that are defined in point UAS.SPEC.050 of the Annex to the UAS Regulation and the provisions for UAS operators in previous points of this AMC, the UAS operator should: 4.1.1 develop an operations manual (OM) (for the template, refer to AMC1 UAS.SPEC.030(3)(e) and to the complementary information in GM1 UAS.SPEC.030(3)(e)); 4.1.2 develop an emergency response plan (ERP) (see point 7 of GM1 UAS.SPEC.030(3)(e)); 4.1.3 validate the operational procedures against standards that are recognised by the competent authority and/or in accordance with a means of compliance acceptable to that authority; 4.1.4 ensure the adequacy of the contingency and emergency procedures and prove them through any of the following: (a) dedicated flight tests; or (b) simulations, provided that the representativeness of the simulation means is proven for the intended purpose with positive results; or (c) any other means acceptable to the competent authority; and 4.1.5 have a policy that defines how the remote pilot and all other personnel in charge of duties essential to the UAS operation can declare themselves fit to operate before conducting any operation.
UAS maintenance	4.2 The UAS maintenance instructions that are defined by the UAS operator should be included in the OM and should cover at least the UAS manufacturer's instructions and requirements, when applicable. 4.3 The maintenance staff should follow the UAS maintenance instructions when performing maintenance.
External services	4.4 The UAS operator should ensure that the level of performance for any externally provided service that is necessary for the safety of the flight is adequate for the intended operation. The UAS operator should declare that this level of performance is adequately achieved. 4.5 The UAS operator should define and allocate the roles and responsibilities between the UAS operator and the external service provider(s), if applicable.
5. Provisions for the personnel in charge of duties essential to the UAS operation	
	As per Appendix A to AMC2 Article 11 *The personnel in charge of duties essential to the UAS operation*
6. Technical provisions	
General	6.1 The UAS should be equipped with means to monitor the critical parameters of a safe flight, in particular the: 6.1.1 UA position, height or altitude, ground speed or airspeed, attitude and trajectory;

PDRA characterisation and provisions	
	6.1.2 UAS energy status (fuel, battery charge, etc.); and 6.1.3 status of critical functions and systems; as a minimum, for services based on RF signals (e.g. C2 Link, GNSS, etc.), means should be provided to monitor the adequate performance and trigger an alert if the level becomes too low. 6.2 The UA should have the performance capability to descend safely from its operating altitude to a 'safe altitude' in less than 1 minute, or have a descent rate of at least 2.5 m/s (500 fpm).
Human-machine interface (HMI)	6.3 The UAS information and control interfaces should be clearly and succinctly presented and should not confuse, cause unreasonable fatigue, or contribute to causing any disturbance to the personnel in charge of duties essential to the UAS operation in such a way that could adversely affect the safety of the operation. 6.4 If an electronic means is used to support AOs in their role of maintaining awareness of the position of the unmanned aircraft, its HMI should: 6.4.1 be sufficiently easy to understand to allow the AOs to determine the position of the UA during the operation; and 6.4.2 not degrade the AOs' ability to: 6.4.2.1 perform unaided visual scanning of the airspace where the UA is operating for any potential collision hazard; and 6.4.2.2 maintain effective communication with the remote pilot at all times. 6.5 The UAS operator should conduct a UAS evaluation that considers and addresses human factors to determine whether the HMI is appropriate for the operation.
C2 links and communication	6.6 The UAS should comply with the applicable requirements for radio equipment and use of the RF spectrum. 6.7 Protection mechanisms against interference should be used, especially if unlicensed bands (e.g. ISM) are used for the C2 link (mechanisms such as FHSS, technology or frequency de-confliction by procedure). 6.8 Communication between the remote pilot and the AO(s) should allow the remote pilot to manoeuvre the UA with sufficient time to avoid any risk of collision with manned aircraft, in accordance with point UAS.SPEC.060(3)(b) of the UAS Regulation.
Tactical mitigation	6.9 The UAS design should be adequate to ensure that the time required between a command given by the remote pilot and the UA executing it does not exceed 5 seconds. 6.10 Where an electronic means is used to assist the remote pilot and/or AOs in being aware of the UA position in relation to potential 'airspace intruders', the information is provided with a latency and an update rate for intruder data (e.g. position, speed, altitude, track) that support the decision criteria.
Containment	6.11 To ensure a safe recovery from a technical issue that involves the UAS or an external system supporting the operation, the UAS operator should ensure that: 6.11.1 no probable failure of the UAS or of any external system supporting the operation should lead to operation outside the operational volume; and 6.11.2 it is reasonably expected that a fatality will not occur due to any probable failure of the UAS or of any external system supporting the operation. 6.12 The vertical extension of the operational volume should be 150 m above the surface (or any other altitude reference defined by the Member State). *Note: The term 'probable' should be understood in its qualitative interpretation, i.e. 'anticipated to occur one or more times during the entire system/operational life of an item'.* 6.13 A design and installation appraisal should be made available and should cover at least: 6.13.1 the design and installation features (independence, separation, and redundancy); and 6.13.2 the particular risks (e.g. hail, ice, snow, electromagnetic interference, etc.) relevant to the ConOps.

PDRA characterisation and provisions	
	6.14 The following additional provisions should apply if the adjacent area includes an assembly of people or if the adjacent airspace is classified as ARC-d (in accordance with AMC1 Article 11 of the UAS Regulation): 6.14.1 The UAS should be designed to standards that are considered adequate by the competent authority and/or in accordance with a means of compliance that is acceptable to that authority such that: 6.14.1.1. the probability of the UA leaving the operational volume should be less than 10^{-4}/FH; and 6.14.1.2 no single failure of the UAS or of any external system supporting the operation should lead to operation outside the ground risk buffer. *Note: The term 'failure' should be understood as an occurrence that affects the operation of a component, part, or element in such a way that it can no longer function as intended. Errors may cause failures but are not considered to be failures. Some structural or mechanical failures may be excluded from this criterion if it can be shown that these mechanical parts were designed according to aviation industry best practices.* 6.14.2 SW and AEH whose development error(s) could directly lead to operations outside the ground risk buffer should be developed according to an industry standard or methodology that are recognised as adequate by the competent authority. *Note 1: The proposed additional safety provisions cover both the integrity and assurance levels.* *Note 2: The proposed additional safety provisions do not imply a systematic need to develop the SW and AEH according to an industry standard or methodology that are recognised as adequate by the competent authority. For instance, if the UA design includes an independent engine shutdown function that systematically prevents the UA from exiting the ground risk buffer due to single failures or a SW/AEH error of the flight controls, the intent of the provisions of point 6.14.1 above could be considered to be met.* 6.15 Compliance with the provisions of points 6.14.1 and 6.14.2 above should be substantiated by analysis and/or test data with supporting evidence.

Table PDRA-G01.2 — Main limitations and provisions for PDRA-G01

Appendix A to AMC2 Article 11 The personnel in charge of duties essential to the UAS operation

ED Decision 2020/022/R

The following are provisions applicable to UAS operators in relation to ensuring the proficiency, competency and clear duty assignment to the personnel in charge of duties essential to the UAS operation. UAS operators may decide to expand these requirements as applicable to its operation.

A.1 Training and qualifications for the personnel in charge of duties essential to the UAS operation

A.1.1 The UAS operator should ensure that all the personnel in charge of duties essential to the UAS operation (i.e. any people involved in the operation) are provided with competency-based theoretical and practical training specific to their duties that consists of the following elements:

A.1.1.2 The basic competencies from the competency framework that are necessary for staff to be adequate for the operation, to ensure safe flight, are as follows:

A.1.1.2.1 the UAS regulation,

A.1.1.2.2 UAS airspace operating principles,

A.1.1.2.3 airmanship and aviation safety,

A.1.1.2.4 human performance limitations,

A.1.1.2.5 meteorology,

A.1.1.2.6 navigation/charts,

A.1.1.2.7 UA knowledge,

A.1.1.2.8 operating procedures,

A.1.1.2.9 assignment of tasks to the crew,

A.1.1.2.10 establishment of step-by-step communications, and

A.1.1.2.11 coordination and handover.

A.1.1.3 Familiarisation with the 'specific' category of operations

A.1.1.3.1 The training programme should be documented (at least the training syllabus should be available).

A.1.1.3.2 Evidence of training should be presented for inspection upon request from the competent authority or authorised representative.

A.2. AOs

A.2.1 The AO's main responsibilities should be to:

A.2.1.1 maintain a thorough visual scan of the airspace that is surrounding the UA, to identify any risk of collision with manned aircraft;

A.2.1.2 maintain awareness of the position of the UA through direct visual observation or through assistance provided by an electronic means; and

A.2.1.3 alert the remote pilot if a hazard is detected and assist in avoiding or minimising the potential negative effects.

A.3 Remote pilot

A.3.1 The remote pilot has the authority to cancel or delay any or all flight operations under the following conditions:

A.3.1.1 the safety of persons is threatened; or

A.3.1.2 property on the ground is threatened; or

A.3.1.3 other airspace users are in jeopardy; or

A.3.1.4 there is a violation of the terms of this authorisation.

A.3.2 If VOs are used, then the remote pilot should ensure that the necessary VOs are available and correctly placed, and that the communications with them can be adequately performed.

A.3.3 The remote pilot should ensure that the UA remains clear of clouds, and that the ability of the remote pilot, or one of the VOs, to perform unaided visual scanning of the airspace where the unmanned aircraft is operating for any potential collision hazard is not hampered by clouds.

A.4. Multi-crew cooperation (MCC)

A.4.1 In applications where MCC might be required, the UAS operator should:

A.4.1.1 include procedures to ensure coordination between the remote crew members with robust and effective communication channels. Those procedures should cover as a minimum:

A.4.1.1.1 the assignment of tasks to the remote crew members; and

A.4.1.1.2 the establishment of step-by-step communication; and

A.4.1.2 ensure that the training of the remote crew covers MCC.

A.5. The remote crew is fit to operate

A.5.1 The UAS operator should have a policy defining how the remote crew can declare themselves fit to operate before conducting any operation.

A.5.2 The remote crew shall declare that they are fit to operate before conducting any operation based on the policy defined by the UAS operator.

A.6. Maintenance staff

A.6.1 Any staff member authorised by the UAS operator to perform maintenance activities should have been duly trained regarding the documented maintenance procedures.

A.6.2 Evidence of training should be presented for inspection upon request from the competent authority or authorised representative.

A.6.3 The UAS operator may declare that the maintenance team has received training regarding the documented maintenance procedures; however, evidence of this training shall be made available upon request from the competent authority or authorised representative.

AMC3 Article 11 Rules for conducting an operational risk assessment

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PREDEFINED RISK ASSESSMENT PDRA-G02 Version 1.0

EDITION December 2020

(a) Scope

This PDRA is the result of applying the methodology that is described in AMC1 Article 11 of the UAS Regulation to UAS operations that are conducted in the 'specific' category:

(1) with UA with maximum characteristic dimensions (e.g. wingspan, rotor diameter/area or maximum distance between rotors in case of multirotor) of up to 3 m and typical kinetic energy of up to 34 kJ;

(2) BVLOS of the remote pilot;

(3) over sparsely populated areas;

(4) in airspace that is reserved for the operation: either a danger area or a restricted area appropriate for UAS operations.

(b) PDRA characterisation and provisions

The characterisation and provisions for this PDRA are summarised in Table PDRA-G02.1 below:

PDRA characterisation and provisions					
1. Operational characterisation (scope and limitations)					
Level of human intervention	1.1 No autonomous operations: the remote pilot should have the ability to maintain control of the UA, except in case of loss of the command and control (C2) link. 1.2 The remote pilot should operate only one UA at a time.				
UA range limit	1.3 Launch/recovery: at VLOS distance from the remote pilot, if not operating from a safe prepared area. *Note: 'safe prepared area' means a controlled ground area that is suitable for the safe launch/recovery of the UA.* 1.4 In flight: The range limit should be within the C2 link coverage that ensures the safe conduct of the flight.				
Areas overflown	1.5 UAS operations should be conducted over sparsely populated areas.				
UA limitations	1.6 Maximum characteristic dimension (e.g. wingspan, rotor diameter/area or maximum distance between rotors in case of a multirotor): 3 m 1.7 Typical kinetic energy (as defined in paragraph 2.3.1(k) of AMC1 Article 11 of the UAS Regulation: up to 34 kJ				
Flight height limit	1.8 The maximum height of the operation volume is limited by the size of the reserved airspace. *Note: In addition to the vertical limit of the operational volume, an air risk buffer is to be considered (see 'Air risk' under point 3 of this table).*				
Airspace	1.9 Operations should only be conducted in airspace that is reserved for the operation (corresponding to an air risk that can be classified as ARC-a). *Note: 'Reserved airspace' means here either a danger area or a restricted area that is designated for UAS operations.*				
Visibility	1.10 If take-off and landing are conducted in VLOS of the remote pilot, visibility should be sufficient to ensure that no people are in danger during the take-off/landing phase. The remote pilot should abort the take-off or landing in case people on the ground are in danger.				
Others	1.11 The UA should not be used to drop material or carry dangerous goods, except for dropping items in connection with agricultural, horticultural or forestry activities in which the carriage of the items does not contravene any other applicable regulations.				
2. Operational risk classification (according to the classification defined in AMC1 Article 11 of the UAS Regulation)					
Final GRC	**3**	**Final ARC**	**ARC-a**	**SAIL**	**II**
3. Operational mitigations					
Operational volume (see Figure 2 of AMC1 Article 11)	3.1 To determine the operational volume, the UAS operator should consider the position-keeping capabilities of the UAS in 4D space (latitude, longitude, height, and time). 3.2 In particular, the accuracy of the navigation solution, the flight technical error of the UAS, as well as the flight path definition error (e.g. map error) and latencies should be considered and addressed when determining the operational volume. 3.3 The remote pilot should apply the emergency procedures as soon as there is an indication that the UA may exceed the limits of the operational volume.				
Ground risk	3.4 The UAS operator should establish a ground risk buffer to protect third parties on the ground outside the operational volume. 3.4.1 The minimum criterion should be the use of the '1:1 rule' (e.g. if the UA is planned to operate at a height of 150 m, the ground risk buffer should at least be 150 m). 3.5 The operational volume and the ground risk buffer should be all contained in a sparsely populated area.				

PDRA characterisation and provisions	
	3.6 The applicant should evaluate the area of operations typically by means of an on-site inspection or appraisal, and should be able to justify a lower density of people at risk.
Air risk	3.7 The operational volume should be entirely contained in the reserved airspace. 3.8 The operational volume should be outside any geographical zone corresponding to a flight restriction zone, as defined by the responsible authority, unless the UAS operator has been granted an appropriate permission.
Observers	N/A
4. UAS operator and UAS operations provisions	
UAS operator and UAS operations	4.1 In addition to the responsibilities that are defined in point UAS.SPEC.050 of the Annex to the UAS Regulation and the provisions for UAS operators in previous points of this AMC, the UAS operator should: 4.1.1 develop an operations manual (OM) (for the template, refer to AMC1 UAS.SPEC.030(3)(e) and to the complementary information in GM1 UAS.SPEC.030(3)(e)); 4.1.2 develop an emergency response plan (ERP) (see point 7 of GM1 UAS.SPEC.030(3)(e)); 4.1.3 validate the operational procedures against standards that are recognised by the competent authority and/or in accordance with a means of compliance acceptable to that authority; 4.1.4 ensure the adequacy of the contingency and emergency procedures and prove it through any of the following: (a) dedicated flight tests; or (b) simulations, provided that the representativeness of the simulation means is proven for the intended purpose with positive results; or (c) any other means acceptable to the competent authority; and 4.1.5 have a policy that defines how the remote pilot and all other personnel in charge of duties essential to the UAS operation can declare themselves fit to operate before conducting any operation. 4.1.6 as part of the procedures that are contained in the OM (point 4.1.1 above), include the description of the following: (a) The method and means of communication with the authority or entity responsible for the management of the airspace during the entire period of the reserved or restricted airspace being active, as mandated by the authorisation. *Note: The communication method should be published in the notice to airmen (NOTAM), which activates the reserved airspace to also allow coordination with manned aircraft.* (b) The member(s) of personnel in charge of duties essential to the UAS operation, who are responsible for establishing that communication.
UAS maintenance	4.2 The UAS maintenance instructions that are defined by the UAS operator should be included in the OM and should cover at least the UAS manufacturer's instructions and requirements, when applicable. 4.3 The maintenance staff should follow the UAS maintenance instructions when performing maintenance.
External services	4.4 The UAS operator should ensure that the level of performance for any externally provided service that is necessary for the safety of the flight is adequate for the intended operation. The UAS operator should declare that this level of performance is adequately achieved. 4.5 The UAS operator should define and allocate the roles and responsibilities between the UAS operator and the external service provider(s), if applicable.

5. Provisions for the personnel in charge of duties essential to the UAS operation	
	As per Appendix A to AMC2 Article 11 *The personnel in charge of duties essential to the UAS operation*
6. Technical provisions	
General	6.1 The UAS should be equipped with means to monitor the critical parameters of a safe flight, in particular the: 6.1.1 UA position, height or altitude, ground speed or airspeed, attitude, and trajectory; 6.1.2 UAS energy status (fuel, battery charge, etc.); and 6.1.3 status of critical functions and systems; as a minimum, for services based on RF signals (e.g. C2 Link, GNSS, etc.), means should be provided to monitor the adequate performance and trigger an alert if the performancelevel becomes too low.
Human-machine interface (HMI)	6.3 The UAS information and control interfaces should be clearly and succinctly presented and should not confuse, cause unreasonable fatigue, or contribute to causing any disturbance to the personnel in charge of duties essential to the UAS operation in such a way that could adversely affect the safety of the operation. 6.4 The UAS operator should conduct a UAS evaluation that considers and addresses human factors to determine whether the HMI is appropriate for the operation.
C2 links and communication	6.5 The UAS should comply with the applicable requirements for radio equipment and use of the RF spectrum. 6.6 Protection mechanisms against interference should be used, especially if unlicensed bands (e.g. ISM) are used for the C2 link (mechanisms such as FHSS, technology or frequency deconfliction by procedure). 6.7 The UAS operator should ensure that reliable and continuous means of two-way communication for the purpose that is indicated in point 4.1.6(a) above are available.
Tactical mitigation	N/A
Containment	6.8 To ensure a safe recovery from a technical issue that involves the UAS or an external system supporting the operation, the UAS operator should ensure that: 6.8.1 no probable failure of the UAS or of any external system supporting the operation should lead to operation outside the operational volume; and 6.8.2 it is reasonably expected that a fatality will not occur due to any probable failure of the UAS or of any external system supporting the operation. *Note: The term 'probable' should be understood in its qualitative interpretation, i.e. 'anticipated to occur one or more times during the entire system/operational life of an item'.* 6.9 A design and installation appraisal should be made available and should cover at least: 6.9.1 the design and installation features (independence, separation, and redundancy); and 6.9.2 the particular risks (e.g. hail, ice, snow, electromagnetic interference, etc.) relevant to the ConOps. 6.10 The following additional provisions should apply if the adjacent area includes an assembly of people or if the adjacent airspace is classified as ARC-d (in accordance with AMC1 Article 11 of the UAS Regulation). 6.10.1 The UAS should be designed to standards that are considered adequate by the competent authority and/or in accordance with a means of compliance that is acceptable to that authority such that: 6.10.1.1. the probability of the UA leaving the operational volume should be less than 10^{-4}/FH; and 6.10.1.2 no single failure of the UAS or of any external system supporting the operation should lead to operation outside the ground risk buffer.

	Note: The term 'failure' should be understood as an occurrence that affects the operation of a component, part, or element in such a way that it can no longer function as intended. Errors may cause failures but are not considered to be failures. Some structural or mechanical failures may be excluded from the criterion if it can be shown that these mechanical parts were designed according to aviation industry best practices. 6.10.2 SW and AEH whose development error(s) could directly lead to operations outside the ground risk buffer should be developed according to an industry standard or methodology that are recognised as adequate by the competent authority. *Note 1: The proposed additional safety provisions cover both the integrity and assurance levels.* *Note 2: The proposed additional safety provisions do not imply a systematic need to develop the SW and AEH according to an industry standard or methodology that are recognised as adequate by the competent authority. For instance, if the UA design includes an independent engine shutdown function that systematically prevents the UA from exiting the ground risk buffer due to single failures or an SW/AEH error of the flight controls, the intent of the provisions of point 6.10.1 above could be considered to be met.* 6.11 Compliance with the provisions of points 6.10.1 and 6.10.2 above should be substantiated by analysis and/or test data with supporting evidence.

Table PDRA-G02.1 — Main limitations and provisions for PDRA-G02

AMC4 Article 11 Rules for conducting an operational risk assessment

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PREDEFINED RISK ASSESSMENT PDRA-S01 Version 1.0

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(a) Scope

This PDRA addresses the same type of operations that are covered by the standard scenario STS-01 (Appendix 1 to the Annex to the UAS Regulation); however, it provides the UAS operator with the flexibility to use UAS that do not need to be marked as Class C5.

This PDRA addresses UAS operations that are conducted:

(1) with UA with maximum characteristic dimensions (e.g. wingspan, rotor diameter/area or maximum distance between rotors in case of multirotor) of up to 3 m and MTOM of up to 25 kg;

(2) in VLOS of the remote pilot;

(3) over a controlled ground area that might be located in a populated area;

(4) not higher than 120 m above the surface overflown (except when close to obstacles); and

(5) in controlled or uncontrolled airspace, provided that there is a low probability of encountering manned aircraft.

(b) PDRA characterisation and provisions

The characterisation and provisions for this PDRA are summarised in **Table PDRA-S01.1** below:

PDRA characterisation and provisions					
1. Operational characterisation (scope and limitations)					
Level of human intervention	1.1 No autonomous operations: the remote pilot should have the ability to maintain control of the UA, except in case of loss of the command and control (C2) link. 1.2 The remote pilot should operate only one UA at a time. 1.3 The remote pilot should not operate from a moving vehicle. 1.4 The remote pilot should not hand over the control of the UA to another command unit.				
UA range limit	1.5 VLOS distance from the remote pilot at all times.				
Areas overflown	1.6 UAS operations should be conducted over a controlled ground area. 1.7 For the operation of a tethered UA, the area should have a radius equal to the tether length plus 5 m and should be centred on the point of the surface of the Earth where the tether is fixed.				
UA limitations	1.8 The UA should have an MTOM of less than 25 kg, including payload. 1.9 The UA should have a maximum characteristic dimension (e.g. wingspan, rotor diameter/area or maximum distance between rotors in case of multirotor) of less than 3 m.				
Flight height limit	1.10 The remote pilot should maintain the UA within 120 m from the closest point of the surface of the Earth. The measurement of the distances should be adapted according to the geographical characteristics of the terrain, such as plains, hills, and mountains. 1.11 When flying a UA within a horizontal distance of 50 m from an artificial obstacle that is taller than 105 m, the maximum height of the UAS operation may be increased up to 15 m above the height of the obstacle, at the request of the entity responsible for the obstacle. 1.12 The maximum height of the operational volume should not exceed by 30 m the maximum height that is allowed by points 1.10 and 1.11 above.				
Airspace	1.13 The UA should be operated: 1.13.1 in uncontrolled airspace (Class F or G), unless different limitations are provided for by the Member States for their UAS geographical zones in areas where the probability of encountering manned aircraft is not low; or 1.13.2 in controlled airspace after coordination and flight authorisation in accordance with the published procedures for the area of operation, to ensure a low probability of encountering manned aircraft. *Note: An airspace with an air risk that is classified as not higher than ARC-b can be considered having a low probability of encountering manned aircraft.*				
Visibility	1.14 The flight visibility should allow the remote pilot to conduct the entire flight in VLOS.				
Others	1.15 The UA should not be used to carry dangerous goods, except for dropping items in connection with agricultural, horticultural or forestry activities in which the carriage of the items does not contravene any other applicable regulations.				
2. Operational risk classification (according to the classification defined in AMC1 Article 11 of the UAS Regulation)					
Final GRC	**3**	**Final ARC**	**ARC-b**	**SAIL**	**II**
3. Operational mitigations					
Operational volume (see Figure 2 of AMC1 Article 11)	3.1 The UAS operator should define the operational volume for the intended operation, including: 3.1.1 the flight geography; and 3.1.2 the contingency volume, with its external limit(s) at least 10 m beyond the limit(s) of the flight geography if the operation is conducted with untethered UA. 3.2 To determine the operational volume, the UAS operator should consider the position-keeping capabilities of the UAS in 4D space (latitude, longitude, height, and time).				

PDRA characterisation and provisions

3.3 In particular, the accuracy of the navigation solution, the flight technical error of the UAS, as well as the flight path definition error (e.g. map error) and latencies should be considered and addressed when determining the operational volume.
3.4 The remote pilot should apply emergency procedures as soon as there is an indication that the UA may exceed the limits of the operational volume, as per point 5.1.4(d) below.

Ground risk

3.5 The UAS operator should establish a ground risk buffer to protect third parties on the ground outside the operational volume.
3.6 For the operation of untethered UA, the ground risk buffer should cover a distance beyond the external limit(s) of the contingency area. That distance should be at least as defined below:

Maximum height above ground	Minimum distance to be covered by the ground risk buffer for untethered UA	
	with an MTOM of up to 10 kg	with an MTOM of more than 10 kg
30 m	10 m	20 m
60 m	15 m	30 m
90 m	20 m	45 m
120 m	25 m	60 m

3.7 For the operation of tethered UA, the ground risk buffer is considered in point 1.7 above.

Air risk

3.8 The operational volume should be outside any geographical zone corresponding to a flight restriction zone of a protected aerodrome or of any other type, as defined by the responsible authority, unless the UAS operator has been granted an appropriate permission.
3.9 Prior to the flight, the UAS operator should assess the proximity of the planned operation to manned aircraft activity.

Observers

Airspace observers (AOs): N/A.
UA observers: refer to point 5.1.4(b) below.

4. UAS operator and UAS operations provisions

UAS operator and UAS operations

4.1 In addition to the responsibilities that are defined in point UAS.SPEC.050 of the Annex to the UAS Regulation, and the provisions for UAS operators in previous points of this AMC, the UAS operator should:

4.1.1 develop an operations manual (OM) (for the template, refer to AMC1 UAS.SPEC.030(3)(e) and to the complementary information in GM1 UAS.SPEC.030(3)(e));

4.1.2 define the operational volume and ground risk buffer for the intended operation, as per points 3.1 to 3.6 above, and include them in the OM;

4.1.3 ensure the adequacy of the contingency and emergency procedures and prove it through any of the following:

(a) dedicated flight tests; or

(b) simulations, provided that the representativeness of the simulation means is proven for the intended purpose with positive results; or

(c) any other means acceptable to the competent authority;

4.1.4 develop an effective emergency response plan (ERP) that is suitable for the intended operation (see GM1 UAS.SPEC.030(3)(e));

4.1.5 upload updated information into the geo-awareness function, if such system is installed on the UAS, when required by the UAS geographical zone for the intended location of the operation;

4.1.6 ensure that before starting the operation, the controlled ground area is in place, effective, and compliant with the minimum distance that is defined in points 3.1 and

PDRA characterisation and provisions	
	3.5 above and, when required, coordination with the appropriate authorities has been established; 4.1.7 ensure that before starting the operation, all persons that are present in the controlled ground area: (a) have been informed of the risks of the operation; (b) have been briefed on or trained in, as appropriate, the safety precautions and measures that the UAS operator has established for their protection; and (c) have explicitly agreed to participate in the operation; and 4.1.8 ensure that the UAS that is used in the intended operation complies with the technical provisions of point 6 below. 4.2 A UAS operation under this PDRA should be conducted: 4.2.1 keeping the UA in VLOS of the remote pilot at all times; 4.2.2 in accordance with the OM that is referred to in point 4.1.1 above; 4.2.3 over a controlled ground area that comprises the area of the operational volume that is indicated in point 3.1 above and the ground risk buffer that is indicated in point 3.5 above, both projected on the surface of the Earth; 4.2.4 at a ground speed of less than 5 m/s in case of untethered UA; 4.2.5 by a remote pilot that complies with point 5.1 below; and 4.2.6 with a UA that complies with point 6 below.
UAS maintenance	4.3 The UAS maintenance instructions that are defined by the UAS operator should be included in the OM and should cover at least the UAS manufacturer's instructions and requirements, when applicable. 4.4 The maintenance staff should follow the UAS maintenance instructions when performing maintenance.
External services	4.5 The UAS operator should ensure that the level of performance for any externally provided service that is necessary for the safety of the flight is adequate for the intended operation. The UAS operator should declare that this level of performance is adequately achieved. 4.6 The UAS operator should define and allocate the roles and responsibilities between the UAS operator and the external service provider(s), if applicable.
5. Provisions for the personnel in charge of duties essential to the UAS operation	
Remote pilot	5.1 In addition to complying with the requirements of point UAS.SPEC.060 of the Annex to the UAS Regulation and with the provisions for remote pilots in previous points of this AMC, a remote pilot who is engaged in operations under this PDRA should: 5.1.1 hold a certificate of remote-pilot theoretical knowledge, in accordance with Attachment A to Chapter I of Appendix 1 to the Annex to the UAS Regulation, which is issued by the competent authority or by an entity that is designated by the competent authority of a Member State; 5.1.2 hold an accreditation of completion of a practical-skill training course for this PDRA, in accordance with Attachment A to Chapter I of Appendix 1 to the Annex to the UAS Regulation, which is issued by: (a) an entity that has declared compliance with the requirements of Appendix 3 to the Annex to the UAS Regulation and is recognised by the competent authority of a Member State; or (b) a UAS operator that has declared to the competent authority of the Member State of registration compliance with this PDRA and with the requirements of Appendix 3 to the Annex to the UAS Regulation; 5.1.3 before starting the UAS operation, verify that the means to terminate the flight of the UA as well as the remote identification system are operational; and 5.1.4 during the flight: (a) keep the UA in VLOS and maintain a thorough visual scan of the airspace that is surrounding the UA to avoid any risk of collision with manned aircraft; the remote

PDRA characterisation and provisions	
	pilot should discontinue the flight if the operation poses a risk to other aircraft, people, animals, environment or property; (b) for the purpose of point (a) above, be possibly assisted by a UA observer; clear and effective communication should be established between the remote pilot and the UA observer; (c) use the contingency procedures that are defined by the UAS operator for abnormal situations, including situations where the remote pilot has an indication that the UA may exceed the limits of the flight geography; and (d) use the emergency procedures that are defined by the UAS operator for emergencies, including triggering the means to terminate the flight when the remote pilot has an indication that the UA may exceed the limits of the operational volume; the means to terminate the flight should be triggered at least 10 m before the UA reaches the limits of the operational volume.
6. Technical provisions	
UAS	6.1 A UAS that is to be used in operations under this PDRA should comply with the requirements of Part 16 of the Annex to Regulation (EU) 2019/945[1], except that the UAS does not need to: 6.1.1 bear a Class C3 UAS or Class C5 UAS identification on itself; 6.1.2 be exclusively powered by electricity, if the UAS operator ensures that the environmental impact that is caused by the use of non-electric UAS is minimised; 6.1.3 include a notice that is published by EASA and provides the applicable limitations and obligations, as required by the UAS Regulation; and 6.1.4 include the manufacturer's instructions for the UAS if it is privately built; however, information on its operation and maintenance, as well as on the training of the remote pilot, should be included in the OM. *Note 1: The UAS can comply with point (9) of Part 4 of the Annex to Regulation (EU) 2019/945 by using an add-on that complies with Part 6 of the Annex to said Regulation.* *Note 2: If the UA does not have a physical serial number that is compliant with standard ANSI/CTA-2063-A 'Small Unmanned Aerial Systems Serial Numbers' and/or does not have an integrated system of direct remote identification, it can comply with point (9) of Part 4 of the Annex to Regulation (EU) 2019/945 by using an add-on that complies with Part 6 of the Annex to said Regulation.* *Note 3: If the UAS is privately built, there may be no identification on the UA of its MTOM. In that case, the operator should ensure that the MTOM of the UA, in the configuration of the UA before take-off, does not exceed 25 kg.*

Table PDRA-S01.1 — Main limitations and provisions for PDRA-S01

AMC5 Article 11 Rules for conducting an operational risk assessment

ED Decision 2020/022/R

PREDEFINED RISK ASSESSMENT PDRA-S02 Version 1.0

EDITION December 2020

(a) Scope

This PDRA addresses the same type of operations that are covered by the standard scenario STS-02 (Appendix 1 to the Annex to the UAS Regulation); however, it provides the UAS operator with the flexibility to use UAS that do not need to be marked as Class C6.

[1] Commission Delegated Regulation (EU) 2019/945 of 12 March 2019 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems (OJ L 152, 11.6.2019, p. 1) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R0945).

This PDRA addresses UAS operations that are conducted:

(1) with UA with maximum characteristic dimensions (e.g. wingspan, rotor diameter/area or maximum distance between rotors in case of multirotor) of up to 3 m and MTOM of up to 25 kg;

(2) at a distance of up to 2 km from the remote pilot if airspace observers (AOs) are employed; otherwise at a distance of up to 1 km;

(3) over a controlled ground area that is entirely located in a sparsely populated area;

(4) not higher than 120 m above the surface overflown (except when close to obstacles); and

(5) in controlled or uncontrolled airspace, provided that there is a low probability of encountering manned aircraft.

(b) PDRA characterisation and provisions

The characterisation and provisions for this PDRA are summarised in **Table PDRA-S02.1** below:

PDRA characterisation and provisions	
1. Operational characterisation (scope and limitations)	
Level of human intervention	1.1 No autonomous operations: the remote pilot should maintain control of the UA, except in case of loss of the command and control (C2) link. 1.2 The remote pilot should operate only one UA at a time. 1.3 The remote pilot should not operate from a moving vehicle. 1.4 The remote pilot should not hand over the control of the UA to another command unit.
UA range limit	1.5 UAS operations should be conducted: 1.5.1 keeping the UA in sight of the remote pilot during the launch and recovery of the UA, unless the recovery of the UA is the result of an emergency flight termination; 1.5.2 if no airspace observer (AO) is employed in the operation, with the UA no further than 1 km from the remote pilot; and 1.5.3 if one or more AOs are employed in the operation, with the UA no further than 2 km from the remote pilot.
Areas overflown	1.6 UAS operations should be conducted over a controlled ground area.
UA limitations	1.7 The UA should have an MTOM of less than 25 kg, including payload. 1.8 The UA should have maximum characteristic dimensions (e.g. wingspan, rotor diameter/area or maximum distance between rotors in case of multirotor) of less than 3 m. 1.9 The UA should have a maximum ground speed in level flight of not more than 50 m/s.
Flight height limit	1.10 The remote pilot should maintain the UA within 120 m from the closest point of the surface of the Earth. The measurement of the distances should be adapted according to the geographical characteristics of the terrain, such as plains, hills, and mountains. 1.11 When flying a UA within a horizontal distance of 50 m from an artificial obstacle that is taller than 105 m, the maximum height of the UAS operation may be increased up to 15 m above the height of the obstacle at the request of the entity responsible for the obstacle. 1.12 The maximum height of the operational volume should not exceed by 30 m the maximum height that is allowed by points 1.10 and 1.11 above.
Airspace	1.13 The UA should be operated: 1.13.1 in uncontrolled airspace (Class F or G), unless different limitations are provided for by the Member States for their UAS geographical zones in areas where the probability of encountering manned aircraft is not low; or

PDRA characterisation and provisions					
	1.13.2 in controlled airspace after coordination and flight authorisation in accordance with the published procedures for the area of operation, to ensure a low probability of encountering manned aircraft. *Note: An airspace with an air risk that is classified as not higher than ARC-b can be considered having a low probability of encountering manned aircraft.*				
Visibility	1.14 The UA operation should be conducted in an area where the flight visibility is more than 5 km.				
Others	1.15 The UA should not be used to carry dangerous goods, except for dropping items in connection with agricultural, horticultural or forestry activities in which the carriage of the items does not contravene any other applicable regulations.				
2. Operational risk classification (according to the classification defined in AMC1 Article 11 of the UAS Regulation)					
Final GRC	**3**	**Final ARC**	**ARC-b**	**SAIL**	**II**
3. Operational mitigations					
Operational volume (see Figure PDRA-G01.1 of AMC2 Article 11)	3.1 The UAS operator should define the operational volume for the intended operation, including the flight geography and the contingency volume. 3.2 To determine the operational volume, the UAS operator should consider the position-keeping capabilities of the UAS in 4D space (latitude, longitude, height, and time). 3.3 In particular, the accuracy of the navigation solution, the flight technical error of the UAS, as well as the flight path definition error (e.g. map error) and latencies should be considered and addressed when determining the operational volume. 3.4 The remote pilot should apply emergency procedures as soon as there is an indication that the UA may exceed the limits of the operational volume, as per point 5.1.4(h) below.				
Ground risk	3.5 The UAS operator should establish a ground risk buffer to protect third parties on the ground outside the operational volume. 3.6 The ground risk buffer should cover a distance that is at least equal to the distance specified by the UAS manufacturer's instructions, considering the operational conditions within the limitations specified by the UAS manufacturer.				
Air risk	3.7 The operational volume should be outside any geographical zone corresponding to a flight restriction zone of a protected aerodrome or of any other type, as defined by the responsible authority, unless the UAS operator has been granted an appropriate permission. 3.8 Prior to the flight, the UAS operator should assess the proximity of the planned operation to manned aircraft activity.				
Observers	3.9 If the UAS operator decides to employ one or more airspace observers (AOs), the UA may be operated at a distance from the remote pilot greater than that referred to in point 1.5.2 above. 3.10 In relation to AOs, the UAS operator should comply with the provisions of point 4.1.8 below. 3.11. AOs should comply with the provisions of point 5.2 below.				
4. UAS operator and UAS operations provisions					
UAS operator and UAS operations	4.1 In addition to the responsibilities that are defined in point UAS.SPEC.050 of the Annex to the UAS Regulation, the UAS operator should: 4.1.1 develop an operations manual (OM) (for the template, refer to AMC1 UAS.SPEC.030(3)(e) and to the complementary information in GM1 UAS.SPEC.030(3)(e)); 4.1.2 define the operational volume and ground risk buffer for the intended operation, as per points 3.1 to 3.6 above, and include them in the OM;				

PDRA characterisation and provisions
4.1.3 ensure the adequacy of the contingency and emergency procedures and prove it through any of the following: (a) dedicated flight tests; or (b) simulations, provided that the representativeness of the simulation means is proven for the intended purpose with positive results; or (c) any other means acceptable to the competent authority; 4.1.4 develop an effective emergency response plan (ERP) that is suitable for the intended operation (see GM1 UAS.SPEC.030(3)(e)); 4.1.5 upload updated information into the geo-awareness function, if such system is installed on the UAS, when required by the UAS geographical zone for the intended location of the operation; 4.1.6 ensure that before starting the operation, the controlled ground area is in place, effective, and compliant with the minimum distance that is defined in points 3.1 to 3.6 above as well as that, when required, coordination with the appropriate authorities has been established; 4.1.7 ensure that before starting the operation, all persons that are present in the controlled ground area: (a) have been informed of the risks of the operation; (b) have been briefed on or trained in, as appropriate, the safety precautions and measures that the UAS operator has established for their protection; and (c) have explicitly agreed to participate in the operation; and 4.1.8 before starting the operation, and if airspace observers (AOs) are employed: (a) ensure the correct placement and number of AOs along the intended flight path; (b) verify that: (i) visibility and the planned distance of the AO are within acceptable limits as defined in the OM; (ii) there are no potential terrain obstructions for each AO; (iii) there are no gaps between the zones that are covered by each of the AOs; (iv) the communication with each AO is established and effective; and (v) if means are used by the AOs to determine the position of the UA, those means are functioning and effective; and (c) ensure that the AOs have been briefed on the planned flight path of the UA and on the associated timing; and 4.1.9 ensure that the UAS that is used in the intended operation complies with the technical provisions of point 6 below. 4.2 A UAS operation under this PDRA should be conducted: 4.2.1 keeping the UA in sight of the remote pilot during the launch and recovery of the UA, unless the recovery of the UA is the result of an emergency flight termination; 4.2.2 in accordance with the OM that is referred to in point 4.1.1 above; 4.2.3 over a controlled ground area that comprises the area of the operational volume that is indicated in point 3.1 above and the ground risk buffer that is indicated in point 3.5 above, both projected on the surface of the Earth; 4.2.4 by a remote pilot that complies with point 5.1 below; and 4.2.5 with a UA that complies with point 6 below and is operated with: (a) an active system to prevent the UA from exceeding the limits of the flight geography; and (b) an active and updated system of direct remote identification. 4.3 If no AO is employed in the operation, the operation should be conducted with the UA flying no further from the remote pilot than the distance that is indicated in point 1.2.2 above and following a preprogrammed trajectory when the UA is not in VLOS of the remote pilot.

PDRA characterisation and provisions	
	4.4 If one or more AOs are employed in the operation, the following conditions should be complied with: 4.4.1 the AO(s) should be positioned so as to adequately cover the operational volume and the surrounding airspace, having the minimum flight visibility that is indicated in point 1.10 above; 4.4.2 the UA should be operated no further than 1 km from the AO who is nearest to the UA; 4.4.3 the distance between any AO and the remote pilot should not be more than 1 km; and 4.4.4 robust and effective means are available for communication between the remote pilot and the AO(s).
UAS maintenance	4.5 The UAS maintenance instructions that are defined by the UAS operator should be included in the OM and should cover at least the UAS manufacturer's instructions and requirements, when applicable. 4.6 The maintenance staff should follow the UAS maintenance instructions when performing maintenance.
External services	4.7 The UAS operator should ensure that the level of performance for any externally provided service that is necessary for the safety of the flight is adequate for the intended operation. The UAS operator should declare that this level of performance is adequately achieved. 4.8 The UAS operator should define and allocate the roles and responsibilities between the UAS operator and the external service provider(s), if applicable.
5. Provisions for the personnel in charge of duties essential to the UAS operation	
Remote pilot	5.1 In addition to complying with the requirements of point UAS.SPEC.060 of the Annex to the UAS Regulation and with the provisions for remote pilots in previous points of this AMC, a remote pilot who is engaged in operations under this PDRA should: 5.1.1 hold a certificate of remote-pilot theoretical knowledge, in accordance with Attachment A to Chapter II of Appendix 1 to the Annex to the UAS Regulation, which is issued by the competent authority or by an entity that is designated by the competent authority of a Member State; 5.1.2 hold an accreditation of completion of a practical-skill training course for this PDRA, in accordance with Attachment A to Chapter II of Appendix 1 to the Annex to the UAS Regulation, which is issued by: (a) an entity that has declared compliance with the requirements of Appendix 3 to the Annex to the UAS Regulation and is recognised by the competent authority of a Member State; or (b) a UAS operator that has declared to the competent authority of the Member State of registration compliance with this PDRA and with the requirements of Appendix 3 to the Annex to the UAS Regulation; 5.1.3 before starting the UAS operation: (a) set the programmable flight volume of the UA to keep it within the flight geography; and (b) verify that the means to terminate the flight as well as the programmable flight volume functionality of the UA are operational; and 5.1.4 during the flight: (a) unless supported by visual observers (VOs), maintain a thorough visual scan of the airspace that is surrounding the UA to avoid any risk of collision with manned aircraft; the remote pilot should discontinue the flight if the operation poses a risk to other aircraft, people, animals, environment or property; (b) maintain control of the UA, except in case of loss of the command and control link; (c) operate only one UA at a time; (d) not operate the UA from a moving vehicle;

PDRA characterisation and provisions	
	(e) not hand over the control of the UA to another control unit; (f) inform the AO(s), when employed, in a timely manner of any deviations of the UA from the intended flight path, and of the associated timing; (g) use the contingency procedures that are defined by the UAS operator for abnormal situations, including situations where the remote pilot has an indication that the UA may exceed the limits of the flight geography; and (h) use the emergency procedures that are defined by the UAS operator for emergencies, including triggering the means to terminate the flight when the remote pilot has an indication that the UA may exceed the limits of the operational volume.
Airspace observer (AO)	5.2 The AO's main responsibilities are laid down in point A.2 of Appendix A to AMC2 Article 11 *The personnel in charge of duties essential to the UAS operation*.
6. Technical provisions	
UAS	6.1 A UAS that is to be used in operations under this PDRA should comply with the requirements of Part 17 of the Annex to Regulation (EU) 2019/945, except that the UAS does not need to: 6.1.1 bear a Class C3 or Class C6 UAS identification on itself; 6.1.2 be exclusively powered by electricity, if the UAS operator ensures that the environmental impact that is caused by the use of non-electric UAS is minimised; 6.1.3 include a notice that is published by EASA and provides the applicable limitations and obligations, as required by the UAS Regulation; and 6.1.4 include the manufacturer's instructions for the UAS if it is privately built; however, information on its operation and maintenance, as well as on the training of the remote pilot, should be included in the OM. *Note 1: The UAS can comply with point (9) of Part 4 of the Annex to Regulation (EU) 2019/945 by using an add-on that complies with Part 6 of the Annex to said Regulation.* *Note 2: If the UA does not have a physical serial number that is compliant with standard ANSI/CTA-2063-A 'Small Unmanned Aerial Systems Serial Numbers' and/or does not have an integrated system of direct remote identification, it can comply with point (9) of Part 4 of the Annex to Regulation (EU) 2019/945 by using an add-on that complies with Part 6 of the Annex to said Regulation.* *Note 3: If the UAS is privately built, there may be no identification on the UA of its MTOM. In that case, the operator should ensure that the MTOM of the UA, in the configuration of the UA before take-off, does not exceed 25 kg.*

Table PDRA-S02.1 — Main limitations and provisions for PDRA-S02

Article 12 - Authorising operations in the 'specific' category

Regulation (EU) 2019/947

1. The competent authority shall evaluate the risk assessment and the robustness of the mitigating measures that the UAS operator proposes to keep the UAS operation safe in all phases of flight.
2. The competent authority shall grant an operational authorisation when the evaluation concludes that:
   (a) the operational safety objectives take account of the risks of the operation;
   (b) the combination of mitigation measures concerning the operational conditions to perform the operations, the competence of the personnel involved and the technical