

**Assessment Specifications
for
Remotely Piloted Aircraft
Systems, Version 2**

AS-RPAS2

Version 2

10 July 2020

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AS-RPAS2

REMOTELY PILOTED AIRCRAFT SYSTEMS, VERSION 2

AIRWORTHINESS CODE

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PREAMBLE*AS-RPAS Version 2**Effective: 10/7/2020*

Following the vast (technological) developments in the manufacturing of drones, the previous AS-RPAS1 issued 1 December 2014 needed revision. The version 2 improvements have been based on the experience gained by performing the RPAS technical assessments over the past six years and the improved manufacturing of RPAS. The improvements enable assessments meeting the state-of-the-art of RPAS manufacturing, reducing assessment time and cost, while maintaining the required safety level. This version takes into account and recognises, among others, the implications of opening an RPAS upfront for visual inspection, and anticipates on the operation centric approach as detailed in the upcoming EU-regulations. To improve the use of the AS-RPAS2, the respective AMC's have been added just after the requirements.

The following is a list of paragraphs affected by this version.

Subpart A

- RPA.G.0 through RPA.G.7 Amended
- RPA.G.8 Deleted (covered by RPA.G.6)
- RPA.G.9 Amended
- RPA.G.10 Deleted (covered by RPA.G.17)
- RPA.G.11 through RPA.G.12 Amended
- RPA.G.13 AMC1 added
- RPA.G.14 Amended and AMC added
- RPA.G.15 Amended
- RPA.G.16 Deleted and moved to RPA.G.19
- RPA.G.17 Amended
- RPA.G.18 through RPA.G.19 Created

Subpart B

- RPA.S.1 Amended
- RPA.S.2 Amended and AMC1 added
- RPA.S.3 Amended and AMC1 and AMC2 added
- RPA.S.4 through RPA.S.7 Amended

Subpart C

- RPA.C.2 Amended and AMC1 and AMC2 added
- RPA.C.4 Amended and AMC1 added
- RPA.C.5 Deleted
- RPA.C.6 Amended

Subpart D

- RPA.E.1 Amended and AMC1 and AMC2 added
- RPA.E.2 through RPA.E.5 Deleted and moved to RPA.E.1
- RPA.E.6 Amended
- RPA.E.7 Deleted and moved to RPA.E.1
- RPA.E.8 Amended and AMC1 added
- RPA.E.9 Deleted and moved to RPA.E.8

Subpart E

- RPA.EQ.1 Amended and AMC1 added
- RPA.EQ.2 Deleted
- RPA.EQ.3 Created (former DL.5)

Subpart F

- RPA.A.1 Amended

Subpart G

- RPA.H.1 Deleted (covered by RPA.C.4)
- RPA.H.2 Deleted (covered by RPA.S.5)

Subpart H

- RPA.EM.1 Deleted (covered by RPA.G.11)
- RPA.CE.1 Amended
- RPA.CE.2 Deleted (covered by RPA.G.19)
- RPA.CE.3 Amended and AMC1 added
- RPA.CE.4 Amended
- RPA.CE.6 Amended
- RPA.TE.3 AMC1 deleted

Subpart I

- RPS.1 Amended
- RPS.2 Deleted
- RPS.3 Created and AMC1 added

Subpart J

- DL.2 Amended and AMC1 added
- DL.3 AMC1 and AMC2 added
- DL.4 AMC1 added
- DL.5 Deleted and moved to RPA.EQ.3
- DL.6 Deleted and moved to RPS.1

SUBPART A – GENERAL

RPA.G.0 Introduction

Though the assessment is applicable for RPAS up to a MTOM of 150 kg it is written with practical experience in CAA-NL, EuroUSC and NLR mainly with RPAS with a MTOM between 0 and 25 kg. So additional or other assessment items may be expected for a s-BvL for an RPAS with a MTOM between 25 and 150 kg.

RPA.G.1 Applicability

This assessment is applicable to RPAS:

- (a) Operated within the restrictions of the national legislation (ROABL);
- (b) Flown in Visual Line of Sight (VLOS) or Extended Visual Line of Sight (E-VLOS), when specifically addressed;
- (c) Flown in visual meteorological conditions (VMC) within the daylight period;
- (d) Flown over unpopulated area's;
- (e) Where the intended operation for which the technical assessment is requested, is in accordance with the limitations stated in the RPAS documentation.

RPA.G.2 Mass

The maximum take-off mass of the aircraft shall be documented and verified during flight.

AMC 1: Verify that the mass of the aircraft including batteries and/or fuel and default payload is not more than the MTOM as specified in the Flight Manual. Verify that the MTOM in the FM is equal or less than the MTOM specified by the manufacturer in its technical specification.
AMC 2: A 5% margin with a maximum of 500 gram is allowed between actual and documented MTOM.

RPA.G.3 Dimensions

The maximum characteristic dimensions of the aircraft shall be documented and verified and a 3-view image shall be available.

RPA.G.4 Centre of gravity

The centre of gravity verification method shall be documented and the position shall be verified.

RPA.G.5 Emergency descent

The RPA shall be capable to descent during emergencies with a minimum vertical speed of 2.7m/s or shall have an in-flight kill switch.

AMC 1: If the RPA does not meet one of the two requirements above the maximum operating altitude shall be limited to ensure the RPA can descent to 20m within 36 seconds.

AMC 2: When a kill switch is present its functionality is described in the documentation and a functional ground test is performed.

RPA.G.6 Minimum manoeuvrability

The aircraft shall be capable to take off, fly at cruise speed and land safely within the documented operational limitations.

RPA.G.7 Water resistance

Flight in any kind of precipitation is prohibited unless the rainy conditions are specified in the Flight Manual by the manufacturer. In which case the RPAS (including RPS) shall be able to withstand water spray up to that specified level.

AMC 1: When the aircraft is stated to be capable to operate in rain, snow or highly damp (fog) conditions, the manufacturer shall provide test results or certificate to proof that the RPAS is compliant to the appropriate international protection rating (IP-rating).

RPA.G.8 (reserved)

RPA.G.9 Manufacturer notifications

The actual hardware and software versions shall be documented and verified.

AMC 1: Only flight software that is on the aircraft or which the operator can use to control the aircraft is documented. Flight software consists of all software that controls the aircraft or can influence the flight.

RPA.G.10 (reserved)**RPA.G.11 System cooling**

The design of the RPAS and its components shall be such that the RPAS (including the RPS) shall not be subject to overheating.

RPA.G.12 Line colours

Fuel, oil and air lines shall be marked or documented in a diagram.

RPA.G.13 Stationary motor/engine conditions

The aircraft shall hold its position on the ground while motor/engine is running at idle.

AMC 1: Brakes may be used to comply to this requirement.

RPA.G.14 Identification plate

A fireproof identification plate containing at least the aircraft registration and operator or owner contact details shall be secured to the aircraft in an accessible position.

AMC 1: For 'fireproof' refer to EASA AMC 25.1181.

RPA.G.15 System check

All flight systems shall be functioning as indicated in the documentation

AMC 1: The functioning of all systems required for safe flight will be verified against the documentation. Verification includes a check that other systems shall not negatively influence systems required for safe flight. This verification may be included in the flight test under RPA.EQ.1 if this cannot be performed during a ground check.

RPA.G.16 (reserved)**RPA.G.17 Emergency scenarios**

The following emergency scenarios shall be documented in the flight manual and assessed: Control Failure, Fatal Error, Engine Loss, Loss of Engine Power, Low Battery Voltage, Loss of GNSS Signal, Radio Link Failure, RPAS Communication Failure, Pilot Incapacitation.

RPA.G.18 National registration

The national registration mark shall be indicated on the outside of the RPA, be easily readable and the characters may not confuse the reader.

RPA.G.19 Documentation and markings

The RPAS shall have documentation. As a minimum this documentation must include:

- Indication of the intended operation for which the technical assessment is requested. This shall be in accordance with the limitations stated in the RPAS documentation.
- The maximum theoretical endurance.
- The maximum theoretical range in most adverse conditions (i.e. tailwind).
- The maximum operational (data link) range.
- The maximum operational wind speed and crosswind limits.
- The RPAS serial number.
- A description of all switches and operator accessible functions on the RPS.
- If a failsafe switch is present, it shall be marked red.
- A description of the maintenance items as advised by the component manufacturer.
- When no fuel or battery indication on the RPS is available, a safe maximum flight time and means of monitoring shall be described.
- Specification of the remote pilot station including displayed information, control modes and means of control.
- A description of the accepted payloads and/or restrictions.
- A description of the following contingencies: control failure due to failure of servo, fatal autopilot error, engine loss, loss of engine power, low battery voltage, loss of GPS signal, radio control link failure, RPS communication failure, pilot incapacitation.

SUBPART B – STRUCTURE

RPA.S.1 Propeller marking

For RPAS with a MTOM of more than 25kg, all propellers and/or rotors shall be marked so that their discs are conspicuous under visual daylight conditions.

RPA.S.2 Airframe

The airframe structure shall be able to withstand normal flight loads without permanent deformation in an assisted mode (if available). Strength calculations and/or static load test for RPAS with a MTOM >25kg must be available.

AMC 1: Normal flight loads will be tested by means of a test flight with a normal flight profile according to the flight manual at MTOM.

RPA.S.3 Fasteners

All flight critical bolts, screws, nuts, pins, or other removable fasteners whose loss could jeopardize the safe operation of the RPAS, shall incorporate a locking means, e.g. a self-tightening prop.

AMC 1: A non-friction locking device is used in addition to the self-locking device, or
AMC 2: The nut is tightened to the specified torque and its position is marked with sealing varnish.

RPA.S.4 Cracks

The aircraft shall not fly with visible cracks in any flight critical structure.

RPA.S.5 Vibration and oscillation

The aircraft shall be free of excessive vibrations and (pilot induced) oscillation under any operational speed and power condition.

RPA.S.6 Doors and panels

All doors, hatches and panels shall be properly secured and withstanding in-flight vibration.

RPA.S.7 Propeller blade clearance

During operation the propeller blade clearance should be sufficient from structures and/or components.

SUBPART C – CONTROL

RPA.C.1 Flight phase transition

It shall be possible to make a smooth transition from one flight condition to another without exceptional pilot skills.

RPA.C.2 Control response

Control system forces and free play may not inhibit smooth and direct response to control system input. All controls of the RPAS shall be free from excessive deflection.

AMC 1: The verification includes:

- 1) Excessive free play and/or friction on all actuators and control surfaces that could inhibit smooth and direct response;

- 2) The maximum deflection of all flight controls.

RPA.C.3 (reserved)

RPA.C.4 Stability control

The aircraft shall be able to maintain a stable flight at MTOM for the intended flight operation.

AMC 1: The verification includes a test flight, in most manual mode, in which the aircraft shall maintain a stable flight for at least 1 second when the pilot let's go of the controls (throttle may be an exception). A fully manual mode without stability augmentation is excluded for helicopter configurations.

RPA.C.5 (reserved)

At any moment during an automatic flight, the pilot shall be able to deviate the aircraft as necessary from a flight trajectory.

RPA.C.6 Pilot intervention**SUBPART D – ELECTRONICS****RPA.E.1 Primary electronics**

All electrical and electronic parts and all electrical wiring shall be:

- a) Suitable for their purpose,
- b) Properly mounted, and
- c) Able to withstand in-flight vibrations.

AMC 1:

Confidence that electrical and electronic parts and electrical wiring are compliant can be obtained by visual inspection combined with functional (flight) testing. For a visual inspection of the parts and wiring it will generally be necessary to open the aircraft. This can be difficult and potentially has drawbacks with respect to warranty, permanent damage and reduced reliability.

Where a number of visual inspections of RPAs of a specific manufacturer and a specific type and model in the scope of earlier RPAS assessments have demonstrated compliance, credit can be claimed for these earlier assessments, removing the need to open the aircraft. A prerequisite for such credit is that these earlier assessments not only demonstrated compliance, but also consistency of the components used, the design and the workmanship. This credit for previous assessments can be extended to other models of the same manufacturer if manufacturing consistency was proven in these previous assessments without any findings, and if a documented argument is provided to support this credit, and functional (flight) testing with the subjected model does not reject this. For areas of the aircraft where access is impractical, the visual inspection can be supplemented by documented substantiation with signed manufacturer statements.

AMC 2:

The assessment of electrical and electronic parts and electrical wiring must be driven by the

suitability of the system for the intended operational use.

The assessment includes verification that:

- 1) Cables are connected according to the diagram;
- 2) Colour coding is according to the diagram;
- 3) The wires are suitable for their purpose;
- 4) Parts and wiring are properly mounted including minimum slack in wiring;
- 5) Wiring is not routed over sharp edges;
- 6) Soldering connections are in a proper condition; and
- 7) Connectors are adequately secured.

RPA.E.2 (reserved)**RPA.E.3** (reserved)**RPA.E.4** (reserved)**RPA.E.5** (reserved)**RPA.E.6 Location sensor**

A location sensor shall be on board and send its location to the ground station with a maximum inaccuracy of 10 m.

RPA.E.7 (reserved)**RPA.E.8 Power supply**

Batteries shall be properly mounted and a monitoring system shall be available and suitable for the intended flight operations.

AMC 1: Properly battery mounting in such a way that the battery cannot move during flight is verified.

RPA.E.9 (reserved)

SUBPART E – EQUIPMENT, SYSTEMS, AND INSTALLATIONS

RPA.EQ.1 Adverse effects

All documented modes and functions of operation shall not adversely affect the safety of the RPAS, the RPAS crew, and third parties. Demonstrate the suitability for the intended flight operations.

AMC 1: All documented modes and functions of operation (such as “waypoint navigation”, “assisted mode” and “manual mode”) will be

verified during ground and flight test to perform as documented and in a safe manner.

RPA.EQ.2 (reserved)

RPA.EQ.3 Electromagnetic susceptibility

For RPAS intended for operation in the vicinity of EM radiating sources such as high tension cables or transmitting antennas, EMI verification (testing) shall be performed to ensure safe flight.

SUBPART F – AEROPLANE

RPA.A.1 Minimum speed

The specified minimum operating speed of the aircraft shall be demonstrated. The verification may be performed under RPA.C.4.

SUBPART G – HELICOPTER

RPA.H.1 (reserved)

RPA.H.2 (reserved)

SUBPART H – POWERPLANT

ELECTRICAL MOTOR

RPA.EM.1 (reserved)

COMBUSTION ENGINE

RPA.CE.1 Exhaust

Exhaust shall be firmly mounted and free of any obstructions. Hot exhaust parts may not cause any danger to the RPA.

RPA.CE.2 (reserved)

RPA.CE.3 Fuel system

The fuel system shall be leak free and qualified for the used fuel type and pressure. In case of alternative fuels (i.e. hydrogen) the manufacturer shall provide the additional checks to be performed for safe operation.

AMC 1: Verification includes:

- 1) Suitability for the used fuel type and pressure;
- 2) No fuel leaks in the system under pressure during the operational test on the ground.

RPA.CE.4 Location engine start-up battery

Engine start-up shall not interfere with the proper operation of the RPAS including data link and/or control receiver.

RPA.CE.5 Engine start safe mode

Engine start on the ground shall be inhibited when data link is unavailable.

RPA.CE.6 Fuel level

A fuel level check shall be possible on the aircraft and the actual fuel level or fuel quantity used shall be transmitted to the RPS or a safe engine run time shall be described in the flight manual and monitored by the pilot during flight.

TURBINE ENGINE

RPA.TE.1 Fuel System

The fuel system shall be leak free and qualified for the used fuel type and pressure.

AMC 1: Verification includes:

- 1) Suitability for the used fuel type and pressure;
- 2) No fuel leaks in the system under pressure during the operational test on the ground.

RPA.TE.2 (reserved)

RPA.TE.3 Air intake

Air intake of the engine shall be sufficient to operate at all possible flight conditions.

RPA.TE.4 Engine start safe mode

Engine start on the ground shall be inhibited when data link is unavailable.

RPA.TE.5 (reserved)

RPA.TE.6 Fuel level

A fuel level check shall be possible on the aircraft and the actual fuel level shall be transmitted to the RPS.

SUBPART I – REMOTE PILOT STATION

RPS.1 RPA Status information

The following information shall be displayed on the Remote Pilot Station and verified during flight:

- (a) Aircraft altitude (AGL or AMSL);
- (b) Aircraft position or horizontal distance to remote pilot or equivalent information that ensures that the aircraft shall stay within the maximum distance;
- (c) Aircraft ground speed;
- (d) Remaining Level of fuel and/or actual battery voltage and/or capacity remaining or consumed;
- (e) Aircraft GPS satellite fix indication;
- (f) Radio link status indication.

RPS.2 (reserved)

RPS.3 Crew interface

The suitability of the RPS will be assessed according to the environmental conditions to be expected under the desired operation.

AMC 1: The check will included the readability of the information presented on the RPS under the expected lighting conditions.

SUBPART J – DATA LINK

DL.1 Frequency

Used data link frequency and transmitting power shall be approved by the radio communications agency.

DL.2 Range

Communication range shall be sufficient to have a permanent connection with the aircraft at the maximum range for the desired operation.

AMC 1: Fully functioning communication is verified during a distance communication test of 1.2 times the operational range as specified under RPA.G.19.

DL.3 Flight control

Flight control shall not be affected by payload operations.

AMC 1: This requirement shall only be checked for payloads which do not comply with the documentation.

AMC 2: Communication with controls is verified not to be effected by payload data link operations.

DL.4 Safe mode

When data link is lost or in other contingencies, the aircraft shall follow a predefined procedure to ensure a safe end of flight within the required area restrictions.

AMC 1: The predefined procedure for loss of data link is checked in flight when this is a non-destructive test. The other contingencies are checked by means of documentation (refer to RPA.G.19).

DL.5 (reserved)

DL.6 (reserved)