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Minimum System Requirements for RPAS (On behalf of SDC Subgroup 1.2)

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SGT 1.2: Minimum safety requirements and Systems certification

- Establish minimum requirements for RPAS systems and equipment
- Define testing methodologies to check the fulfilment of the above minimum requirements for RPAS



- Definition of minimum requirements for:
 - Communication systems with ATC
 - ADS-B equipment
 - Forward-oriented vision device
 - Safe flight termination system
 - Lights to guarantee the RPAS visibility
 - Means to know the position of the RPAS while flying
 - Equipment to guarantee that the RPAS operates within the specified flight volume

For each system, requirements have been defined for low, medium and high risk operations

- Determination of testing methodologies at H robustness level for:
 - HMI
 - Lights
 - Parachutes
- Next, some of examples of the minimum systems requirements developed are detailed

- **Vision device forward-oriented**

- This system will be used to increase the situational awareness of the pilot in case of an emergency. Not as a part of a Detect&Avoid system.

- Requirements based on the risk of the operation and taking into account the minimum requirements specified in: DO-362 for the task “Make decisions for appropriate site for off-airport emergency landings”

- Requirements for low risk operations:

- Refresh rate at least 3 frames per second

- Latency less than 2 seconds

- Resolution at least 640x480 pixels

- Images in colour

- FOV of at least 80° in the horizontal axis and 10° in the vertical one

- **Vision device forward-oriented**

- Requirements for medium risk operations:

- Refresh rate at least 3 frames per second
- Latency less than 500 milliseconds
- Resolution at least 640x480 pixels
- Images in colour
- FOV of at least 80° in the horizontal axis and 10° in the vertical one

- Requirements for high risk operations:

- Refresh rate at least 3 frames per second
- Latency less than 250 milliseconds
- Resolution at least 1280x720 pixels for 16:9 screens and 960x720 pixels for 3:4 screens
- Images in colour
- FOV of at least 120° in the horizontal axis and 15° in the vertical one
- Screen prepared for the operational environment where the GCS is located and fulfilling the standard ISO 9241-303 (Ergonomics - Visual Interfaces)

- **Lights to guarantee the RPAS visibility**

- Requirements for low risk operations:

- The aircraft shall have enough lights to ensure its visibility in 500 meters from any direction.
 - In case of VLOS flights and an operational distance of less than 250 meters, it has to be ensured the visibility in at least the same distance as the operational declared distance
 - Lights have to fulfilled SERA 3215 with the only exception of aircrafts with less than 3 meters wingspan. For aircrafts with less than 3 meters wingspan, only anti-collision lights are necessary.
 - The colours for the anti-collision lights are the ones established in ICAO Annex 14 for mobile obstacles, flashing between 60-90 times per minute.
 - It is allowed to use these lights in attenuated o fixed-mode if the aircraft is within 500meters from the pilot and/or observers.
 - If the aircraft is flying below 50 feet or completely blocked by surroundings obstacles, it will be allowed to only have flights that cover the upper side of the aircraft.

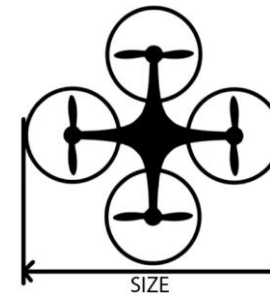
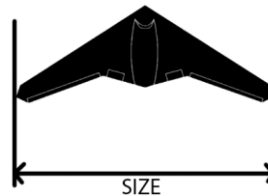
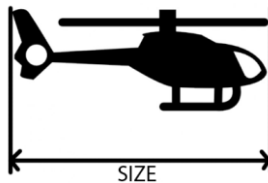
- **Lights to guarantee the RPAS visibility**

- Requirements for medium and high risk operations:

- Same as low risk operations, but in case the aircraft has less than 3 meters of wing span

- Minimum 40 cd of light power.

- If the aircraft is flying below 50 feet or completely blocked by surroundings obstacles, it will be allowed to be attenuate the lights that are used to illuminate the lower part of the aircraft.



Means to know the position of the RPAS while flying

Low risk (SAIL I & II)		Medium risk (SAIL III)		High risk (SAIL IV, V & VI)	
VLOS	BVLOS	VLOS	BVLOS	VLOS	BVLOS
Height measurement system with error less than 20 meters	GNSS equipment with error less than 5m, 95% of the time (alternatively coverage of at least 12 satellites available at the same time)	GNSS equipment with error less than 5m, 95% of the time (alternatively coverage of at least 12 satellites available at the same time)	GNSS equipment with error less than 4m, 95% of the time (alternatively coverage of at least 12 satellites available at the same time)	GNSS equipment with error less than 4m, 95% of the time (alternatively coverage of at least 12 satellites available at the same time)	GNSS equipment augmented with INS with error less than 4m, 95% of the time (alternatively coverage of at least 12 satellites available at the same time)

- Spanish working groups are on the way to ensure adequate adaptation between regulation and technologies, ensuring appropriate safety requirements
- SGT1.2 has already defined minimum requirements for a first set of RPAS systems
- All this information has been published as AMC by AESA (Appendix O of AESA Guidance Material for RPAS) in September 2018



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