	Means of Compliance with Light-UAS.2512 / Means of compliance with SORA M2 (high robustness) “M2 MoC high robustness”	Doc. No. : MOC Light-UAS.2512-01 Issue : 1 Date : 15 May 2024 Proposed ☒ Final ☐

SUBJECT	:	Mitigation means linked with design
REQUIREMENTS incl. Amdt.	:	Special Condition Light-UAS Medium Risk 01, point Light-UAS.2512 AMC to Article 11 of Regulation 2019/947 of 29th May 2019, SORA Annex B - M2 mitigations
ASSOCIATED IM/MoC	:	Yes☐ / No ☒
ADVISORY MATERIAL	:	N/A

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Introductory Note and Identification of Issue

This means of compliance aims at guiding applicants in showing compliance with the SC-Light UAS.2512 to satisfy requirements for a M2 mitigation means as described in Annex B to AMC1 to Article 11 of Regulation (EU) 947/2019. It is not suitable for a declarative process.

While M2 mitigations are expected to increase the level of safety of an operation, they should not be considered as an alternative to having a safe and reliable UAS design. Therefore, strict criteria apply to M2 mitigations requiring a high level of robustness, as they allow a considerable reduction of the ground risk class, leading to a significant reduction in the robustness requirement of the baseline UA/UAS.

Showing compliance with a high level of robustness is expected to require a thorough knowledge of the UAS and/or the mitigation means design and its integration. Depending on the level of integration of the means within the UAS and on the chosen means of compliance, the support of the baseline UAS manufacturer may be required.

It is known that the intentional activation of the mitigation might be combined with a termination function that ensures containment (as per step#9 of SORA). Usually, the mitigation means is then triggered by the containment function and/or the mitigation means is an integral part of the containment function. Within a design verification limited to an M2 mitigation, only the elements necessary to verify the integrity of the mitigation means would be assessed. The assessment of the containment function of the UAS would be a separate activity.

The document is organized in three chapters:

- Chapter 1: Nominal target for Special ConditionLight-UAS.2512 to meet M2 mitigation with high integrity
- Chapter 2: General Means of Compliance for Special Condition Light UAS.2512 to demonstrate M2 mitigation with high robustness
- Chapter 3: Transversal mitigation means requirements

List of acronyms

AIS	Abbreviated Injury Scale
AMC	Acceptable Means of Compliance
CAc	Claimed Critical Area
CAn	Nominal Critical Area
CMA	Common Mode Analysis
FC	Failure Condition
FHA	Functional Hazard Assessment
FTA	Fault Tree Analysis
GRr	Ground Risk Reduction
IR	Implementing Regulation
KE	Kinetic Energy
MOC	Means of Compliance
OSO	Operational Safety Objective
SAIL	Specific Assurance and Integrity Level
Scd	Surface Projected in The Crash Direction
SORA	Specific Operation Risk Assessment (ref. AMC 1 to Art. 11 of Reg. (EU) 947/2019)
UA	Unmanned Aircraft
UAS	UA System

Definitions

a) Integrator: integrator is the entity responsible for the integration of the mitigation means' components, the UA, and the testing of the entire system. For a parachute, this is specified in ASTM F3322-18.

b) Critical Area: the sum of all areas on the ground where a person standing would be expected to be impacted by the UA during or after a loss of control event (i.e. a crash), and thus the area where a fatality is expected to occur if a person were within it.

1. Nominal target for Special ConditionLight-UAS.2512 to meet M2 mitigation with high integrity

M2 mitigation means are intended to reduce the effect of ground impact after the control of the operation is lost. Consequently, all considerations of this Means of Compliance (MOC) presume that the control of the operation was lost. There should be no argument based on the probability of hitting a person, as that is already kept into account when determining the Ground Risk Class (GRC)/Specific Assurance and Integrity Level (SAIL) of the operation.

The high integrity ground risk reduction target is a reduction of two orders of magnitude of the risk, equivalent to a 99% ground risk reduction[1]. This is done either by reducing the size of the critical area (herein defined as “type 1” M2), or by reducing the probability of lethality of a UA impact leveraging e.g. energy, impulse, transfer energy dynamics, etc. (herein defined as “type 2” M2) or using a combination of both methods (“type 3” M2).

<u>Type 1 – Critical area reduction</u>

To obtain the ground risk reduction (GRr) by a reduction of the critical area, the following should be demonstrated:

- Determine the correct column for the UA in the ground risk table according to SORA step#2, utilizing the maximum UA dimension and typical kinetic energy as per published EASA AMC to article 11 or IR 2019/947.
- The following table[2] shows the nominal critical area that should be considered associated to that column (CAn):

Maximum characteristic dimension (m)		≤1	≤3	≤8	≤20	≤40
Nominal critical area (m^2)	0.8	6.5	65	650	6500	65000

Table 1 - Nominal critical areas

  E.g. for an UA of 4 m, CAn = 650 m^2.

- To achieve the necessary reduction the claimed critical area (CA_c) needs to be less than or equal to the nominal critical area of the second column to the left of the nominal critical area (CA_n).

[1] As specified by the EASA AMC1 for Regulation (EU) 2019/947.

[2] This table is a complement to the SORA step#2 table and assigns reference sizes of the assumed nominal critical area (basically the area of the ground impact)

For example, for a UAS with a characteristic dimension of 4m (nominal critical area 650m²), the applicant should show a Critical Area less than or equal to 6.5m².

- The quantitative objective can be expressed as $\frac{CA_C}{CA_n} \leq 0{,}01$.

  Where :
  CA_n is the Critical area before mitigation, and
  CA_C is the Critical area claimed after mitigation.

The simple re-assessment of the critical area based on either the shape of the UA (e.g. multirotor which might be claimed to have a pure ballistic trajectory) or operational constraints (e.g. the remote pilot shall not accelerate the UA beyond a certain speed during the operation, but no technical means is provided to prevent such acceleration), or both, does not qualify for assessment under this MoC.

If instead of using the table provided above, the applicant calculated the critical area of its UA in Step#2[3] with a methodology acceptable by the competent authority, then the nominal critical area to be used as reference in Table 1 for this MoC should be the one associated to the iGRC column used in Step#2 (i.e. if the calculated critical area is 40m2, the nominal critical area considered before the mitigation should be 65m2).

Type 2 – Lethality reduction

This approach aims at obtaining the necessary ground risk reduction (GRr) of at least 99% by means of a reduction of lethality only. "Lethality" is defined as the probability of causing a fatal injury (fatality[4]) by the UA upon impacting a person, having applied M2. The quantitative objective can be expressed as $P_{(fatality|collision,M2)} = lethality \leq 0.01$.
In practice, due to the high number of involved variables, it is difficult to determine the lethality of an impact through simple pass/fail criteria. However, the applicant should demonstrate that the impact and post-impact dynamics of the UAS, after the activation of the mitigation means, when applicable, are such to make the UA compliant with the lethality objective.

Type 3 – Mixed approach

This approach aims at obtaining a ground risk reduction (GRr) of approximately 99% by means of both methods (reduction of critical area and reduction of lethality).

The following relation applies:

$$Lethality \times \frac{CA_c}{CA_n} \leq 0.01$$

[3] Fill in the pre-registration form and access the Critical Area Assessment Tool at the Innovative Air Mobility Hub.
[4] It is considered not appropriate to distinguish between a fatality and injury levels which could be considered not acceptable.

For example, if the probability of having a fatality as a consequence of an impact is 10%

$$lethality = 0.1$$

If the critical area is reduced to 10% of the nominal critical area

$$\frac{CA_c}{CA_n} = 0.1$$

then the product of these factors corresponds to a ground risk reduction of 99%

$$lethality \times \frac{CA_c}{CA_n} = 0.01$$

2. General Means of Compliance for Special Condition Light UAS.2512 to demonstrate M2 mitigation with high robustness

Any compliance claimed to a high level of robustness should demonstrate the following:

1. The mitigation means reduces the effect of ground impact by two orders of magnitude.
2. The mitigation means works with sufficient reliability in the event of a loss of control (see §3.1).
3. The mitigation means does not increase risk of the operation.
4. The mitigation means is activated automatically.

The applicant needs to demonstrate and document that their design satisfies these claims. This is achieved by establishing documentation of appropriate design and its review, testing, analysis, simulation, inspection, and, as appropriate, by evidence of operational experience that support the claims. More detailed guidance is provided hereafter.

The design verification application documentation for an M2 mitigation should include the description of the mitigation means and how it reduces the effect of ground impact. When the mitigation means require activation, its automatic functioning should also be described.
More detailed guidance on the compliance demonstration and on aspects that should be addressed in the application are provided hereafter.

2.1 Provide a description of the mitigation and the involved systems

The description of the mitigation means should include at least the following elements:

1. Description of the elements and the functional principle of the mitigation means, highlighting also the mitigation type according to chapter 1 of this document.
   a. To enable the Agency to familiarize initially with the design and to understand its functions, a high level description should be established and include drawings, images and/or graphs.
2. Description of the functional architecture of the mitigation means.
   a. If applicable, this document should identify the mitigation means' supporting functions and the chain of events that would lead to the activation of the mitigation means.
   b. The description should include and highlight all UAS's functions necessary for the operation of the means.
   c. The functional architecture should clarify the interfaces between the UAS and the mitigation means.
3. If applicable, a description of the installation of the mitigation means on the UAS.
   a. It should include, but may not limited to, system architecture, mechanical links, dedicated structural elements if any.

4. If applicable, the required operational procedures for the utilization and maintenance of the mitigation means.
5. Information and instructions linked to the operation of the mitigation means.
    a. The means’ characteristics that may have an impact on the safety of the flight.
    b. Emergency, abnormal and/or maintenance procedures requiring specific knowledge by the operator and/or the remote crew.

Guidance:

The level of detail in the content of such description should be limited to the information that will contribute to the substantiation of the hazard assessment in the following chapters.

2.2 Description of the principle on which the mitigation means is based

Integrity requirement:
High level of integrity, criterion #1: “*(a) Effects of impact dynamics and post impact hazards are significantly reduced to a level where it can reasonably be assumed that a fatality will not occur.”*

Type 1 means – Critical area reduction
The applicant should demonstrate by analysis or test that the claimed critical area (CA_c) is less than or equal to the nominal critical area of the second column to the left of the nominal critical area (CA_n). The demonstration will depend on the impact dynamics (gliding, spiral, ballistic descent…) and should take into account and identify the operational limitations beyond which the above reduction target is not achieved (e.g. maximum wind, maximum operating altitude, maximum speed, etc.).

1. For *parachutes or systems that will drift in the wind, the maximum wind to be considered as operational limitation is the one which, excluding gusts, would still allow achievement of target critical area.*
2. For *non-drift systems, such as impact, glide or ballistic mitigations, the maximum wind to be considered as operational limitation is the one which, excluding gusts, would still allow achievement of target critical area analysis or testing, considering maximum operating altitude and maximum commanded speed. If there are probable failure conditions which would lead to operations outside of the maximum altitude or commanded speed, the system should be tested under those conditions.*

Type 2 means – Lethality reduction
Demonstration of sufficient impact severity reduction should be achieved by showing that a fatality is not expected to occur.

Determining the lethality of a UAS can be particularly challenging because of the number of parameters to keep into account. While some studies have been conducted, there is no simple metric for

determining the lethality of an impact between a small aircraft and a person[5], unless conservative hypotheses are introduced. Some conservative values (e.g., for the UA kinetic energy) are given in Table 2 below. If the UA impact dynamic does not meet the proposed simplified values, it should be tested in an appropriate facility. A test plan should be previously agreed with EASA. All demonstrations should be representative of an impact with a person on ground and keep into the account the effects of protruding objects or sharp edges resulting from that configuration (e.g. antennas, protruding rigid payload(s), sharp edges created by payload bay doors, etc.).
In the absence of established injury metrics for measuring the consequences of the impact of a light UAS with a person, the use of automotive injury metrics as well as associated testing standards, methods, and facilities, should be acceptable[6,7]. The applicant may consider using ASTM F3389M-21 "Test for Safety of UAS Impact" when developing a test plan.

The lethality reduction should be demonstrated by using one of the following criteria:

MoC	Injury criterion	Substantiation Method
H1	UA must not cause injury to a human being that is equivalent to or greater than the severity of injury caused by a transfer of 11 Joules (25 lb*ft) of kinetic energy upon impact from a rigid object.[8] The probability of laceration / cutting injury should be minimized.	Analyze results of ASSURE Task A14 final report for criteria and associated thresholds. A test plan should be established, following the most appropriate testing method in ASTM F3389M-21. **Laceration/cutting injury criteria:** to be agreed with the Agency. Human skin surrogate could be used.
H2	Maximum impact KE: 80 Joule The probability of laceration / cutting injury should be minimized.	**Maximum impact KE:** calculated as per this chapter. **Laceration/cutting injury criteria:** to be agreed with the Agency. Human skin surrogate could be used.

Table 2 - Thresholds for lethality assessment

The impact kinetic energy (KE) should be calculated according to this formula:

$$KE = \frac{TOM}{2}\left({V_z}^2 + {V_{wind}}^2\right)$$

Where

- TOM is the UA take-off mass.

[5] Frontiers | When Physics Meets Biology: Low and High-Velocity Penetration, Blunt Impact, and Blast Injuries to the Brain (frontiersin.org)
[6] UAS Ground Collision Severity Evaluation (A4) - Assure (assureuas.org)
[7] UAS Ground Collision Severity Evaluation Phase II (A14_A11L.UAS.7) - Assure (assureuas.org)
[8] ASSURE - Task A14: UAS Ground Collision Severity Evaluation - Final Report

- V_z is the terminal velocity of the UA after the activation of the M2 means, or the expected impact velocity in the most severe and probable scenario, if the means do not require activation.
- V_{wind} is the maximum wind speed to be considered as operational limitation i.e. the one which, excluding gusts, would still allow achievement of target kinetic energy.

For example, using the H1 approach, the applicant may propose a plan including the elements listed below.

Injury criterion	**Substantiation method**
Maximum peak head acceleration: 198 Gs The probability of laceration / cutting injury is minimized.	**Max. peak head acceleration:** method D of ASTM F3389M-219 **Laceration/cutting injury criteria:** to be agreed with the Agency.
Head Injury Criterion (HIC) ≤ 600. The probability of laceration / cutting injury is minimized.	**Max. peak head acceleration:** method D of ASTM F3389M-21. **Laceration/cutting injury criteria:** to be agreed with the Agency.

Table 3 - Example criteria for 'type 2' mitigations

[9] Method D provides the option to use a parachute recovery system

Type 3 means – Mixed approach

Reduction of both critical area and lethality. To claim this type of mitigation means, it should be determined approximately which percentage of the global reduction of risk can be respectively apportioned to the reduction of critical area and which to the reduction of lethality. The applicant may refer to the injury/energy criteria identified in the MoC for M2 medium integrity and complement them with a demonstration of crash area reduction.

MoC	Injury criterion	Critical area reduction	Substantiation Methods
Mi1	Demonstrate that an impact with a person in the most critical condition results at most in 30% probability of AIS3+ injuries;[10]	Critical Area of the UA is less than or equal to the nominal critical area of the column to the left of the nominal critical area as per SORA Step#2 (ref. Table 1).	**Injury criterion**: calculated as per this chapter. Compliance with M2 medium could be accepted if duly substantiated. **Critical area:** see considerations for Type 1 mitigations.
Mi2	Maximum impact KE: 175 Joules Or Maximum transferred KE: 80 Joules	Critical Area of the UA is less than or equal to the nominal critical area of the column to the left of the nominal critical area as per SORA Step#2 (ref. Table 1).	**Injury criterion:** calculated as per this chapter. Compliance with MOC for 'M2 medium' could be accepted if duly substantiated. **Critical area:** see considerations for Type 1 mitigations.

Table 4 - Mixed approach criteria

For example, using the Mi1 approach, the applicant may propose a plan including the elements listed below.

Injury criterion	Substantiation method
Maximum peak head acceleration: 237 Gs The probability of laceration / cutting injury is minimized.	**Max. peak head acceleration:** method D of ASTM F3389M-21[11] **Laceration/cutting injury criteria:** to be agreed with the Agency.
Head Injury Criterion (HIC) ≤ 1170. The probability of laceration / cutting injury is minimized.	**Max. peak head acceleration:** method D of ASTM F3389M-21. **Laceration/cutting injury criteria:** to be agreed with the Agency.

Table 5 - Example criteria for 'type 2' mitigations

Independently of the type of M2 mitigation, the applicant should first agree the plan for compliance activities with the Agency, and after the execution of these, compile all calculations, test evidence and

[10] AIS 2005: A contemporary injury scale https://doi.org/10.1016/j.injury.2006.07.009

[11] Method D provides the option to use a parachute recovery system

other possible evidence into the report, showing that the mitigation means achieves the necessary performance target.

Eventually, the applicant should establish any operational limitation associated with the safe operation of the mitigation. The limitations will be added in the UAS flight manual (UFM) or UAS flight manual supplement as appropriate.

3. Transversal mitigation means requirements

This chapter aims at clarifying some aspects of the mitigation means' additional technical requirement, as well as providing some means to show compliance. The applicant is reminded that it is possible to agree with EASA on different ways to comply.

3.1 Reliability in the event of a loss of control

Integrity requirement:
Medium level of integrity, criterion #1(b): "*When applicable, in case of malfunctions, failures or any combinations thereof [of the UAS] that may lead to a crash, the UAS contains all the elements required for the activation of the mitigation".*

This implies that the mitigation means should still work when a malfunction resulting in a loss of control of the drone occurs. This criterion does not apply to mitigation means based on UAS "intrinsic" characteristics like frangibility. The mitigation means should be effective independently of failures or malfunctions. However, if the effectiveness of such means depends on any UA's function (e.g. speed limitation), the malfunctions, failures or combinations thereof of such UAS function should be assessed.

For mitigation means that are not based on intrinsic UAS characteristics, shared components (e.g. sensors, electronic components, etc.) should be analysed. No single failure of the UAS, supporting equipment or external system supporting the operation should lead to a Loss of control of the operation and prevent the proper functioning of the mitigation means. For example, if an add-on mitigation means require an integration with the UA systems (e.g. adding switches/relays to the power lines to turn off electric motors), these should be able to operate even in case of a UA malfunction. The higher the integration of the mitigation means in the UAS, the higher is the likelihood that the UAS designer will need to be involved in showing compliance.

The applicant may show compliance through the following activities:

1) List all probable malfunctions that may cause the crash of the UA. For example:
    a) One motor shut down or one motor runaway for a VTOL UA (i.e. multicopter), etc.
    b) Flight control actuator runaway or total loss of thrust for a fixed wing UA, etc.
2) Justify how the mitigation means can be successfully activated in each of these situations.
3) The applicant should show that the mitigation means achieves a reliability of at least 99% after activation. Alternatively, the reliability can be shown to be of at least 95% if a pre-flight check can ensure the correct functioning of all parts of the mitigation means. The applicant may show compliance keeping the following into consideration:
    a) The evaluation may be done by calculation, safety assessment, component testing, flight testing, operational experience or a combination of the above.

b) Tests may be substituted by operational experience where the mitigation means has been in operation with the same configuration and with the same UAS as planned to be demonstrated for, and evidence is available. The use of operational experience requires the knowledge of the UAS configuration (hardware and software) as well as the operational conditions (procedures, weather, etc.) when relevant.

c) If Safety assessment is used to assess the robustness of the mitigation system, then the applicant should apply the same process as per Light-UAS.2510. The applicant should show that there is no single failure leading to the loss of the M2 effectiveness and a crash of the UA. Inadvertent and erroneous activation are discussed in chapter 3.2.

d) In exceptional cases in which no flight test is possible, for example if the UAS is a large, prototype for experimental purposes, alternatives could be proposed to EASA.

In summary, for medium and high-risk operations, the applicant should conduct an analysis as per Eurocae ED-280 extended to all the functions, systems and equipment that support the mitigation means. Among other analyses, the applicant may use FHA, FTA, CMA as per ARP 4761A/ED-135. Finally, a design and installation appraisal as per ASTM F3309/F3309M-18 should be conducted. The applicant should highlight the sufficient independence of the mitigation means with respect to the UAS.

Guidance

The SAIL level referred to in this chapter is the SAIL of the operation, after applying an M2 mitigation with a high level of robustness. The analysis should aim at demonstrating that no single failure can lead to both the crash of the UA and the failure or improper functioning of the mitigation means. If the mitigation means are intrinsic (require no activation) no single failure or probable FC should lead the UAS to violate the hypothesis/limitations. Failures or improper system behaviour during tests should be reported to EASA, analysed and the root cause identified. Failed tests shall not be repeated without having performed an appropriate analysis of the causes and, where necessary, before appropriate design changes have been made.

Depending on the technical mitigation used, there may be cases in which additional flight tests might be appropriate. A sufficiently reliable function is the responsibility of designers who therefore should perform additional flight tests as they see fit. This should be agreed with EASA. The compliance evidence to be presented should include at least record of one of the successful activation tests in flight.

Operational experience may be used in support of testing and/or to reduce the number of tests upon agreement with EASA. The criteria should be the same as for testing. The UAS configuration should be the same. For example, the parachute attachment points to the UA structure are not changed; the materials and construction are the same when a frangible structure is claimed.

The design differences contributing to its aerodynamic behaviour should also be negligible. For example, weight for the shock loads on a parachute’s risers; mass distribution and/or parachute attachment point’s location if the attitude at impact of the UA is relevant for the claim.

3.2 Additional risk for third parties

Integrity requirement:
Medium level of robustness, criterion #1: ***(c)*** *When applicable, any failure or malfunction of the proposed mitigation itself (e.g. inadvertent activation) does not adversely affect the safety of the operation.*

The applicant should provide evidence that the probability of unintended activation of the mitigation is sufficiently low to not negatively affect the expected loss of control rate for an operation beyond acceptable levels. This is a SAIL-dependent requirement, as the risk of adverse safety effect must become smaller with rising SAIL.

To comply with requirement (c) the probability of inadvertent activation of the means should be commensurate with the Safety Objective of the UAS.

1) SAIL I operation: the safety objective for inadvertent activation is assumed met without further evidence being required.
2) SAIL II operations: inadvertent activations should not be experienced during testing.
3) SAIL III and higher: inadvertent and erroneous activations should be considered as part of the system safety assessment as required by OSO#05 or Light-UAS.2510. Within the frame of a M2 mitigation design verification exercise, those MOCs should be interpreted as processes with a limited scope. Depending on the level of integration of the mitigation means, the analysis could be limited to the systems needed for its functioning.

In the cases in which a malfunction of the means would render the mitigation ineffective, the probability of erroneous activation should be demonstrated to be commensurate to the allowable loss of control probability of the unmitigated risk. This can be achieved by applying to such failure condition, the same process prescribed in the MOC relative to the “non-mitigated SAIL” i.e. the SAIL that would be achieved if the mitigation was not present. Erroneous activation should be understood as any system behaviour that is different than intended, like partial or untimely activation. For example, if the erroneous activation of a parachute in flight without the shut-down of the engine(s), would lead to the entanglement of the parachute leading to a non-mitigated impact, such event should be shown to happen with a probability commensurate with the risk of a non-mitigated operation. This is justified by the fact that, if the ground risk class associated with a given SAIL (e.g. SAIL IV with an allowable LOC probability < 10^{-4}/FH) was reduced by 2 points by the mitigation means, leading to the operation be classified as a lower SAIL (e.g. SAIL II, with an allowable LOC probability < 10^{-2}/FH), then the cases in which the mitigation means are not effective should be treated as if the operation was not mitigated. This is consistent with the fact that the mitigation means should not create additional danger to people on the ground. For example, also the use of pyrotechnics/rockets to slow down the descent could introduce an unacceptable danger to the people on ground.

Eventually, the post-crash dynamic of the mitigation means should be considered. For example, if a parachute is used and it is not (partially) released upon touchdown, the UA may be dragged on the ground by the wind, causing damages and possibly fatalities.

Explanatory note

Inadvertent activation means that the mitigation is activated when not required. This could be caused by pilot error, an equipment failure or a development error, including the mitigation means activation logic.

Unintended activations could undermine the hypothesis at the basis of a SORA according to which, a UAS that conforms to the OSOs should achieve a given reliability depending on the SAIL. If a UAS design is reliable enough to fly operations up to a given SAIL, the introduction of the mitigation means should not decrease the operational safety performance. For example, if a UAS is designed to support operations having no more loss of control of operation events than one every 1000 hours (SAIL III), a parachute that is erroneously activated every 100 hours would lead to have ten times more loss of control events leading to crashes than expected from the UAS operation.

3.3 Automatic activation

Integrity requirement:
High level of robustness, criterion #1: (a) “*When applicable, the activation of the mitigation is automated*”.

This requirement does not apply to ‘intrinsic’ mitigations. The applicant should demonstrate that at least under all the crash cases identified in point 1 of chapter 3.1, the mitigation means can be activated without the remote pilot intervention. If a manual activation system is present, it should comply with all the provisions listed in this Means of Compliance, with particular emphasis on unintended activations.