

comment 1 comment by: *Wingcopter GmbH*

Section 7.12.6.1 is rather a requirement while 7.12.6.2 might be considered an MoC.

response **EASA acknowledges that the clauses of the standard F3298 utilized by the MoC provide sometimes generic / non-prescriptive indications on how to comply. This MoC is not provided for pure declarative purposes. Being utilized in the frame of design verification projects, the applicant and EASA will have the opportunity to agree on more prescriptive criteria and / or pass / fail conditions as considered appropriate. EASA in cooperation with industry may publish in the future more prescriptive criteria to comply with the requirement (similar approach as for CS23 amendment 5 where less prescriptive AMC based on ASTM standards are provided in alternative to more prescriptive AMC based on previous versions of CS23 and their AMC). However EASA does not agree with the specific message of this comment (that 7.12.6.1 would be a new requirement).**

comment 2 comment by: *Wingcopter GmbH*

Section 15 contain some general high level guidance on verification which is not wrong, but no particular MoC to this paragraph. Additionally, I cannot see how 15.4 fits in here. It might be a prerequisite for successful product development, but by no means related to the compliance demonstration to this SC-LUAS paragraph.

response **Identification of the intended functions of the system is also a prerequisite for successful endurance/durability/operation of the lift/thrust/power system.**

comment 3 comment by: *Wingcopter GmbH*

Same here, example and quote from the standard:  
 16.9.1 Propeller Strength and Endurance Propellers shall be shown to have satisfactory endurance as well as stresses that do not exceed values shown to be safe for continuous operation in accordance with the applicable requirements of Section 14, Documentation.

This is rather a refined or new requirement than a method to demonstrate compliance to it. It does not answer how to show compliance and deliver evidence.

response **See response to comment no. 1**

	Entire document	2	<p>General comment: according to the compliance matrix established by EASA linking the design related OSOs and the SC Light UAS, Light UAS.2405 and 2410 requirements are linked to OSO #4, which has a Low level of robustness for SAILs III and IV. The low assurance criterion for this OSO is the one provided in section 9 of Annex E to AMC1 to the article 11: « The applicant declares that the required level of integrity has been achieved » and « Supporting evidence may or may not be available ». On the other hand these MoCs state that they are expected to be demonstrated within the frame of SAIL IV DVR, through compliance demonstration to the relevant SC Light-UAS paragraphs. Does EASA intend to ask and review evidence for compliance (or directly, compliance documents) to these MoCs? This would not seem consistent with the current integrity level of the OSO in our opinion. However, if EASA does not intend to review the evidence of compliance to these MoCs, we see a risk that the level of compliance and efforts made to demonstrate compliance will vary greatly from one applicant to another. It could indeed be difficult for the applicants to appreciate what is expected from them because the standards sometimes use evasive and undefined terms (such as significant change, minimal failure, satisfactory, adequate).</p> <p>More generally, the activities required by these ASTM standards are closer to certification processes and do not seem compatible with a low level of robustness. It would be a good idea to clarify this apparent inconsistency in order for the applicants to better understand what is expected from them.</p>	NA
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response Please consider that at the moment in which we act within a DVR or TC project, the context is by definition not declarative. EASA, within SAIL IV DVR, will still consider the SORA indications and, where the integrity of the OSO that could be linked with the requirement is low, will keep its level of involvement low and, where the MoC agreed for application is considered sufficiently comprehensive, may simply accept a declaration on the MoC (still reserving to ask evidence where for any reason this would be needed). This may not be the

case for this MoC for the reasons pointed in the answer to comment 1. Additionally, the matrix of compliance should be improved (as a matter of fact, there are requirements like 2500 that are not even traced)

comment

5

comment by: *DGAC FR*

	Introductory note	1	It is stated that "the selection of some sections of ASTM F3298 to substantiate full compliance with Light UAS 2405". Isn't UAS 2410 meant instead of UAS 2405?	

response

Yes, will be corrected.

comment

6

comment by: *DGAC FR*

	2	2	Reference error in title "Means of Compliance with Special Condition Light-UAS.2405". Should be "means of compliance with Special Condition Light-UAS.2410"	Refer to 2410 instead of 2405

response

Yes, will be corrected.

comment

7

comment by: *DGAC FR*

	Reference	Page	Comment	Resolution
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DGAC FR	2, reference to ASTM section 7.12.6	2	Section 7.12.6.2 of ASTM makes references to 'significant changes'. How are significant changes defined?	NA
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response Usually criteria for “significant changes” are the following:

- the general configuration or the principles of construction are not retained;
- the assumptions used for design verification of the Light-UAS to be changed do not remain valid

comment

8

comment by: DGAC FR

	2, reference to ASTM section 15.2	2	Section 15.2.2.3(4) of ASTM recommends at least 40 FTH for the UAS, while 25 FTH are required. Are the 40 FTH deemed required for all UAS?	NA

response

25 h of flight time are for the complete system (aircraft + ground station and other equipment) whereas 40 h flight time are for the unmanned aircraft (ground station and other equipment is not required)

comment

9

comment by: DGAC FR

	2, reference to ASTM section 15.4	2	Section 15.4.3.2 of ASTM lists (E)TSO MPS as possible means of compliance. This leads to several questions: 1. Would reference to an outdated TSO MPS be accepted? 2. If ETSOA is used as means of compliance, it would only cover the ETSO-functions. What about the non-ETSOA functions (cf. 21.A.606(d))?	NA

response

1. Suitability of the chosen TSO minimum performance standard needs to be demonstrated. Reference to outdated TSO MPS would need to be justified.
2. Non-ETSO functions should be addressed per 21.A.606(d) and AMC 21.A.606(d)

comment

10

comment by: DGAC FR

	2, reference to ASTM section 16.3	2	Section 16.3.3 ASTM: "should be shown capable of minimal failure"; is "minimal failure" quantitatively defined?	NA

response

Pass/fail criteria need to be defined in the test planes prepared by the applicant.

comment

11

comment by: DGAC FR

	2, reference to ASTM section 16.4	2	"Propellers shall be shown to have satisfactory endurance [...]": how is "satisfactory" defined?	NA

response

Pass/fail criteria need to be defined in the test planes prepared by the applicant.

comment

12

comment by: THALES

7.12.6 Powerplant and Rotor/Vertical Lift System Compatibility. This § is only applicable to VTO. Question: Do we need to consider this requirement for fixed wing UAS (Endurance)? It seems that no equivalent endurance requirement is proposed for fixed wings UAV.

response	No, only VTOL designs are considered. It's not seen as necessary for fixed wing configurations.	
comment	13	comment by: <i>DE-LBA</i>
	LBA has no comments.	
response	Noted.	
comment	14	comment by: <i>Drone Alliance Europe</i>
	All references to the ASTM standard made throughout the proposed MoC, including the Introductory Note, should include the relevant version: F3298-19.	
response	Agreed.	
comment	15	comment by: <i>Drone Alliance Europe</i>
	Given that ASTM F3298-19 utilizes terminology specific to the FAA, it is essential that EASA either adapts the relevant terms or, at a minimum, clarifies their significance and use / applicability / interpretation within the EASA framework. This will prevent any potential misinterpretations by DVR applicants not familiar with the FAA terminology	
response	Terminology used in ASTM F3298-19 is not FAA specific and refers to "nation's CAA" instead.	
comment	16	comment by: <i>Drone Alliance Europe</i>
	At page 2, Recall of ASTM F3298-19 Par. 7.12.6 Powerplant and Rotor/vertical Lift system compatibility. Only 7.12.6.2 should be applicable (required 100h flight test) 7.12.6.1 already to be fulfilled in MoC L-UAS.2405.	
response	7.12.6.1 is referring to "the range of operating conditions and flight envelope" which should be taken into account for 7.12.6.2	
comment	17	comment by: <i>Drone Alliance Europe</i>

Recall of ASTM F3298-19 Par. 7.12.6 Powerplant and Rotor/vertical Lift system compatibility. Sub Par. 7.12.6.2 requires 100h flight testing to demonstrate compatibility of the Lift system compatibility. The 100 FH required are not in accordance with ASTM F3298-19 scope defined in par. 1.4: "This specification is intended to support UAS operations. It is assumed that the risk of UAS will vary based on concept of operations, environment, and other variables. The fact that there are no human beings onboard the UAS may reduce or eliminate some hazards and risks. However, at the discretion of the CAA, this specification may be applied to other UAS operations"

Since the Standard is "operation based" then the definition of a minimum flight hours may not be compatible with the operations for which the UAS is intended. Therefore, Specify in the recall of ATSM F3298-19 Par. 7.12.6.2 that the amount of flight hours required to verify the compliance must be defined in the DVR, according to the CONOPS for which the UAS is intended to.

response

The amount of FHs will be defined in the frame of the DVR project.

comment

18

comment by: Drone Alliance Europe

Recall of ASTM F3298-19 Par. 15.1 General

ASTM F3298-19 cover all the systems of an UAS, not only lift/thrust/power system. Therefore, Specify in the recall the applicability of the ASTM F3298-19 only to lift/thrust/power systems with reference to 15.1.3.4 (verification of systems functions)

response

Already addressed in 2. of Means of Compliance with Light-UAS.2410

comment

19

comment by: Drone Alliance Europe

Recall of ASTM F3298-19 Par. 15.2 Methods of verification. Both sub par. 15.2.1 and 15.2.2 refers to "each ready-to-fly UAS", this paragraph is then applicable to "acceptance flight" of each UAS before release to fly (intended as after manufacturing a new UAS) Only Sub Par. 12.2.2.3 (3) defines that the compliance is not intended for each individual aircraft but it's for design type and specific configuration. Therefore, Specify in the recall the applicability of the ASTM F3298-19 Par. 15.2 only in regard to the frame of SAIL IV DVR with EASA or SAIL III with NAA (when applicable) and not for "each ready-to-fly UAS".

response

Applicability of the MoC is for DVRs, which are required for SAIL IV, but still possible for SAIL III; For SAIL III, declarations to NAA will be based on OSOs and not on the basis of SC Light UAS..

comment

20

comment by: Drone Alliance Europe

Recall of ASTM F3298-19 Par. 15.2 Methods of verification. Sub Par. 12.2.2.3 (3) defines 25 FH to demonstrate the correct performance of all the systems, and Sub Par. 12.2.2.3 (4) defines a minimum of 40FH:

Since the MoC L-UAS.2410 is intended only for Lift/Thrust/Power Systems,

Since the Standard is "operation based" according to ASTM F3298-19 scope defined in par. 1.4: "This specification is intended to support UAS operations. It is assumed that the risk of UAS will vary based on concept of operations, environment, and other variables. The fact that there are no human beings onboard the UAS may reduce or eliminate some hazards and risks. However, at the discretion of the CAA, this specification may be applied to other UAS operations"

then the definition of a minimum flight hours may not be compatible with the operations for which the UAS is intended. Therefore, Specify in the recall of ATSM F3298-19 Par. 12.2.2.3 that the amount of flight hours required to verify the compliance must be defined in the DVR, according to the CONOPS for which the UAS is intended to.

response

See response to comment 19.

comment

21

comment by: *Drone Alliance Europe*

Recall of ASTM F3298-19 Par. 16.3 Propulsion System, SubPar. 16.3.1 "The engine(s) thrust shall be verified by either the manufacturer's published thrust to RPM numbers or by actual measurements."

According to the propulsion system (Electric motors, internal combustion engines etc. , constant speed propeller, constant pitch propeller etc.) the outcome of the thrust can have a different relation than to RPM. Therefore, Specify in the recall of ASTM F3298-19 SubPar. 16.3.1 that the thrust measurement need to be related with the significant property of the specific lift/thrust/power system.

response

If the manufacturer's published thrust to RPM numbers are not suitable, actual measurements have to be carried out.

comment

22

comment by: *Drone Alliance Europe*

Recall of ASTM F3298-19 Par. 16.4 Propeller and 16.9.1 Vertical Lift Propeller.

Both paragraphs covers the propeller requirements in terms of strength and endurance, with different functions of the propeller (push/pull or Vertical lift). Specify in the recall of ASTM F3298-19 that Par 16.4 and 16.9.1 are alternative depending on the propeller functions. Both are applicable in case of tilting propellers/motors for the different functions, since Par. 16.4 does not specify the applicability on "push/pull" function.

response

As you stated correctly, applicability is depending on the design and therefore applicability should be addressed in the DVR.



comment 23

comment by: UAVDACH

The MoC should provide clear and concise requirements on how to show compliance; the current draft provides more guidance than means of compliance. In particular, pass/fail criteria (as mandated by the Guidelines on Design verification for UAS operated in the 'specific' category, Issue 2) are missing.	Revise all sections. Provide pass/fail criteria.	Requested
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response

Pass/fail criteria need to be defined in the test planes prepared by the applicant.

comment 24

comment by: UAVDACH

The ASTM Standard F3298-19 is a certification specification (see 15.1.3.4) and could be used as an alternative to SC.Light UAS with more details and additional requirements to comply with, but it does not provide testable means of compliance with pass/fail criteria.	Do not use ASTM F3298-19 as MoC at all.	Requested
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response

See response to comment 1.

comment 25

comment by: UAVDACH

<p>The ASTM Standard assumes the following:</p> <ul style="list-style-type: none"> <li>- extremely improbable <math>\leq 1E-6/FH</math></li> <li>- extremely remote probability <math>\leq 1E-5/FH</math></li> <li>- remote probability <math>\leq 1E-4/FH</math></li> <li>- improbable <math>\leq 1E-2/FH</math></li> <li>- probable <math>\leq</math> has a reasonable likelihood of occurring, or can be envisioned to occur (7.2.2.1. (1))</li> </ul>	The MoC should either explicitly provide a translation or acknowledge these definitions.	Requested
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response The MoC does not recall clauses of the standard where these definitions are utilized.

comment 26

comment by: UAVDACH

2	The ASTM Standard is intended for lightweight UAS with a gross weight of less than 25kg (4.1+4.2.1); weight limit may be exceeded (1.3)	The MoC should either explicitly state that the weight limit is accepted to be exceeded and provide a rationale.	Requested
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response Accepted to be exceeded as this MoC does not refer to aspects of the standard which are obviously applicable only for limited MTOM. EASA reserves anyway to accept or reject this MoC for UAS with MTOM > 25 Kg.

comment 27

comment by: UAVDACH

2	In 7.12.6: use of unquantified terms "satisfactory manner", "satisfactory operation"; MoC should provide clear pass/fail criteria	Provide pass/fail criteria or do not use ASTM F3298-19 as MoC at all.	Requested
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response Pass/fail criteria need to be defined in the test planes prepared by the applicant.

comment 28

comment by: UAVDACH

2	15.1.3.3 states that F3298-19 should not be used if a development assurance process is required. This may be in contradiction with MOC 2510-1, section 2 (c)	Analyse and remove contradiction.	Recommended;
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response

The use of 15.1.3.3. does not imply that DA will not have to comply with the MoC to LUAS 2510.

comment

29

comment by: UAVDACH

2	15.2 does not provide means of compliance for testing but a superficial description of an approach to testing; there are no specific instructions and pass(fail criteria for Lift/ Thrust/ Power System Endurance and Durability show of compliance	Do not use ASTM F3298-19 as MoC at all.	Requested
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response

It is up to the applicant to propose other means of compliance that EASA might accept after positive feedback from public consultation.

comment

30

comment by: UAVDACH

2	According to 15.4.2.1 the applicant (?) determines and documents whether a function is to be verified under the SPECIFICATION(!) or by OTHER MEANS (cf. 15.4.2.2). Means of compliance are not defined. Instead 15.4. describes a process for function centric (functional) design and verification.	Do not use ASTM F3298-19 as MoC at all.	Requested
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response

See response to comments 23 and 29.

comment

31

comment by: UAVDACH

2	In 15.5.1.2 (1) The applicant (?) defines a series of verification methods and pass/fail criteria - it must be the aim of the MoC to provide these	Do not use ASTM F3298-19 as MoC at all.	Requested
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response

No, that's a task of the applicant.

comment

32

comment by: UAVDACH

2	In 16.3 only paragraph 16.3.5.1 qualifies as MoC	Refer to 16.3.5.1 instead of 16.3	Recommended;
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response

16.3.1 to 16.3.4 define important aspects for the compliance demonstration to SC Light-UAS.2410 and cannot be ignored.

comment

33

comment by: UAVDACH

2	In 16.4.1 reference is made to section 14 (Documentation) which is not in the scope of the MoC.	Add section 14 to scope of MoC or specify how to treat the reference ("References to Section 14 in ASTM F3298-12 shall be considered as referring to ...")	Recommended;
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response

Accepted.

comment

34

comment by: UAVDACH

2	Section 16.4 does not define any means of compliance to show that propellers "have satisfactory endurance as well as stresses that do not exceed values shown to be safe for continuous operation in accordance with the applicable requirements [in the documentation]"	Provide pass/fail criteria or do not use ASTM F3298-19 as MoC at all.	Requested
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response

Pass/fail criteria need to be defined in the test planes prepared by the applicant.

comment

35

comment by: UAVDACH

2	In 16.4.1: use of unquantified term "satisfactory endurance"; MoC should provide clear pass/fail criteria	Provide pass/fail criteria or do not use ASTM F3298-19 as MoC at all.	Requested
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response

See response to comment 34.

comment

36

comment by: UAVDACH

2	Section 16.9.1 does not define any means of compliance to show that propellers "have satisfactory endurance as well as stresses that do not exceed values shown to be safe for continuous operation in accordance with the applicable requirements [in the documentation]" except for 16.9.1.2 (2)	Provide pass/fail criteria or do not use ASTM F3298-19 as MoC at all.	Requested
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response

See response to comment 34.

comment

37

comment by: UAVDACH

2	In 16.9.1: use of unquantified terms "satisfactory endurance", "enough clearance", "same balance", "very close"; MoC should provide clear pass/fail criteria	Provide pass/fail criteria or do not use ASTM F3298-19 as MoC at all.	Requested
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response See response to comment 34.

comment 38 comment by: FOCA (Switzerland)  
Thank you very much for the opportunity to comment. We have no remarks to add to this document.

response Noted.

comment 39 comment by: DELAIR  
"When all sections are complied with, Light UAS.2410 can be considered fully covered."

This document might not fully cover the fixed wing drones.  
Should the fixed wing drone show compliance only to the sections listed in the document and directly related to this type of drones without any other consideration so that the Light UAS 2410 is considered fully covered?

response ASTM F3298 is not limited to VTOL only. It addresses fixed wing too. Also MoC with Light-UAS.2410 is general, independent from the actual UAS configuration.

comment 40 comment by: DELAIR  
It is preferable not to refer and quote from closed documentation, especially for proposals. This will add a high cost on all the involved stakeholders who will be obliged to buy every document referred to, just to be able to access or read the sections used, which in turn could also limit the number of participants and feedback received.

response Noted.

comment 41 comment by: JEDA  
The MoC should provide clear and concise requirements on how to show compliance; the current draft provides more guidance than means of compliance. In particular, pass/fail criteria

(as mandated by the Guidelines on Design verification for UAS operated in the 'specific' category, Issue 2) are missing.

response

Pass/fail criteria need to be defined in the test planes prepared by the applicant.

comment

42

comment by: JEDA

The ASTM Standard F3298-19 is a certification specification (see 15.1.3.4) and could be used as an alternative to SC.Light UAS with more details and additional requirements to comply with, but it does not provide testable means of compliance with pass/fail criteria. Is AST F3298-19 useful for a MoC?

response

See response to comment 1.

comment

43

comment by: JEDA

In 7.12.6: use of unquantified terms "satisfactory manner", "satisfactory operation"; MoC should provide clear pass/fail criteria

response

See response to comment 41.

comment

44

comment by: JEDA

15.1.3.3 states that ASTM F3298-19 should not be used if a development assurance process is required. This may be in contradiction with MOC 2510-1, section 2 (c)

response

See response to comment 28.

comment

45

comment by: JEDA

According to 15.4.2.1 the applicant determines and documents whether a function is to be verified under the Specifications or by other means ?? (cf. 15.4.2.2). Means of compliance are not defined. Instead 15.4. describes a process for function centric (functional) design and verification.

response

See response to comment 30.

comment 46 comment by: JEDA

In 15.5.1.2 (1) The applicant defines a series of verification methods and pass/fail criteria - it must be the aim of the MoC to provide these

response See response to comment 41.

comment 47 comment by: JEDA

In 16.4.1 reference is made to section 14 (Documentation) which is not in the scope of the MoC.

response Yes, will be added.

comment 48 comment by: JEDA

Section 16.4 does not define any means of compliance to show that propellers "have satisfactory endurance as well as stresses that do not exceed values shown to be safe for continuous operation in accordance with the applicable requirements [in the documentaton]"

response It is up to the applicant to propose suitable tests and pass/fail criteria.

comment 49 comment by: JEDA

In 16.4.1: use of unquantified term "satisfactory endurance"; MoC should provide clear pass/fail criteria

response See response to comment 41.

comment 50 comment by: JEDA

In 16.9.1: use of unquantified terms "satisfactory endurance", "enough clearance", "same balance", "very close"; MoC should provide clear pass/fail criteria

response See response to comment 41.