



CS-STAN Structural Changes & Repairs

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CS-STAN in a nutshell

- CS-STAN issue 1 was adopted on 9th July 2015 and issue 2 on 30th March 2017 and is based on,
 - lessons learnt and proposals submitted by stakeholders,
 - technological innovations from the industry and
 - principles of efficiency and proportionality.
- Part of EASA strategy to support GA



CS-STAN in a nutshell

- Standard part 21 procedures simplified to address simple changes and repairs
- 21.A.90B and 21.A.431B are introduced to address SC's & SR's



CS-STAN in a nutshell

- Why is this regulation needed?
 - support GA aircraft in EU operation, while
 - reducing the regulatory burden for the embodiment of SC's & SR's
 - some technological advancements can be introduced at a reduced cost while increasing safety
 - simplified procedure could limit illegal practices



CS-STAN in a nutshell

➤ To which products applies?

- 21.A.90B Standard Changes (SC's) are changes to type design
- 21.A.431B Standard Repairs (SR's) are repairs

Aeroplanes MTOM < 5700 kg

Rotorcraft MTOM < 3175 kg

Sailplanes, balloons and airships (as defined in [ELA1 & ELA2](#))

Follow design data included in CS's, acceptable methods, techniques and practices for carrying out and identifying standard changes including associated ICA

Are not in conflict with TC holders data

70,000 aircraft in EU!



CS-STAN in a nutshell

- To which products applies? (cont'd)
 - SC's & SR's are not meant to be used in serial production
 - SC's & SR's not included within 21.A.90B & 21.A.431B are excluded from CS-STAN and must follow standard 21.A.91 and 21.A.432A procedures.
 - SC's & SR's included in CS-STAN may contain operational limitations or restrictions



CS-STAN in a nutshell

➤ Wrap-up

- CS-STAN contains SCs and SRs which follow acceptable methods, techniques, and practices.
- SCs and SRs designed in compliance with CS-STAN are not subject to an approval process
- Release to service of aircraft modified or repaired through embodiment of SCs or SRs are provided in AMC.M.A.801
- Natural or legal person issuing the release to service becomes responsible to ensure that the SC/SR embodied fulfils the CSs.
- CS-STAN requires a minimum knowledge for its application



CS-STAN in a nutshell

➤ Where to find it

➤ CS-STAN at Initial Airworthiness folder in:

<http://www.easa.europa.eu/regulations> (CS-STAN)

➤ AMC.M.A.801 at Continuing Airworthiness folder in:

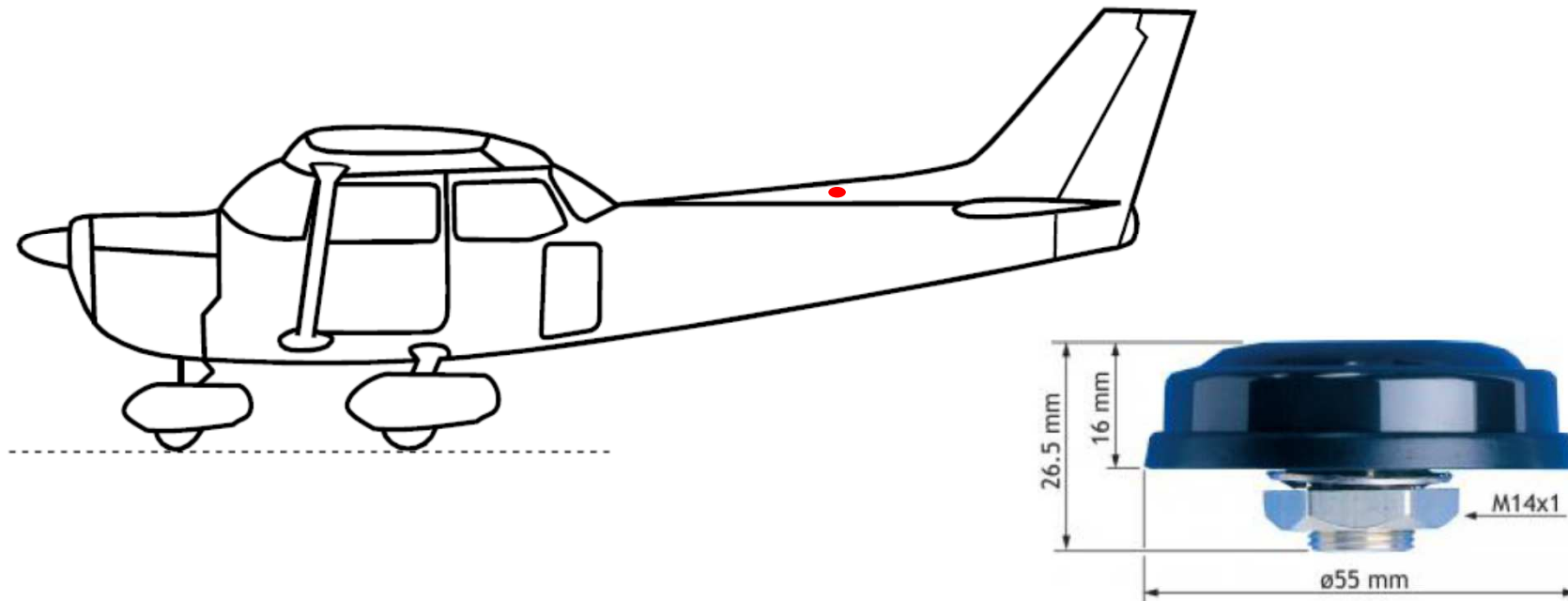
<http://www.easa.europa.eu/regulations> (Part-M, subpart H, Certificate of Release to Service)

➤ EASA Form 123 (Part-M, subpart H, Certificate of Release to Service, page 98)



Structural Standard Changes & Repairs

- Standard Change SC004a Installation of Antennas
- Example: Installation of Antenna PROCOM 2000 GPS on a Cessna 172 (MTOM = 1110 kg)





Structural Standard Changes & Repairs

- Standard Change SC004a Installation of Antennas (cont'd)
- Upgraded technological equipment increasing safety (GPS)
- Airplane is ELA1 < 1200 kg and not complex motor-powered (ELA2<2000 kg)
- Antenna installed in non-pressurised secondary structure
- NTO from TC holder allowing installation at designated location without interfering environmental conditions and operations.
- No other antenna installed nearby
- Performance and electrical installation have been followed.
- No limitations from equipment manufacturer



Structural Standard Changes & Repairs

➤ Standard Change SC004a Installation of Antennas (cont'd)

EASA Form 123 — Standard Change/Standard Repair (SC/SR) embodiment record	^{1.} SC/SR number(s): SC001-2017
^{2.} SC/SR title & description: SC004a Installation of antenna Procom GPS2000 on Cessna 172	
^{3.} Applicability: A/C registration, S/N and Type	
^{4.} List of parts (description/Part-No/Qty): Part numbers or document reference	
^{5.} Operational limitations/affected aircraft manuals. Copies of these manuals are provided to the aircraft owner: Document xxxx, yyyy, zzzz	
^{6.} Documents used for the development and embodiment of this SC/SR: Design document, FAA AC 43.13-2B chapter 1&3, Drawings Record of compliance Electrical tests, Engineering order	

* Copies of the documents marked with an asterisk are handed to the aircraft owner.

← As recorded in aircraft logbook



Structural Standard Changes & Repairs

► Standard Change SC004a Installation of Antennas (cont'd)

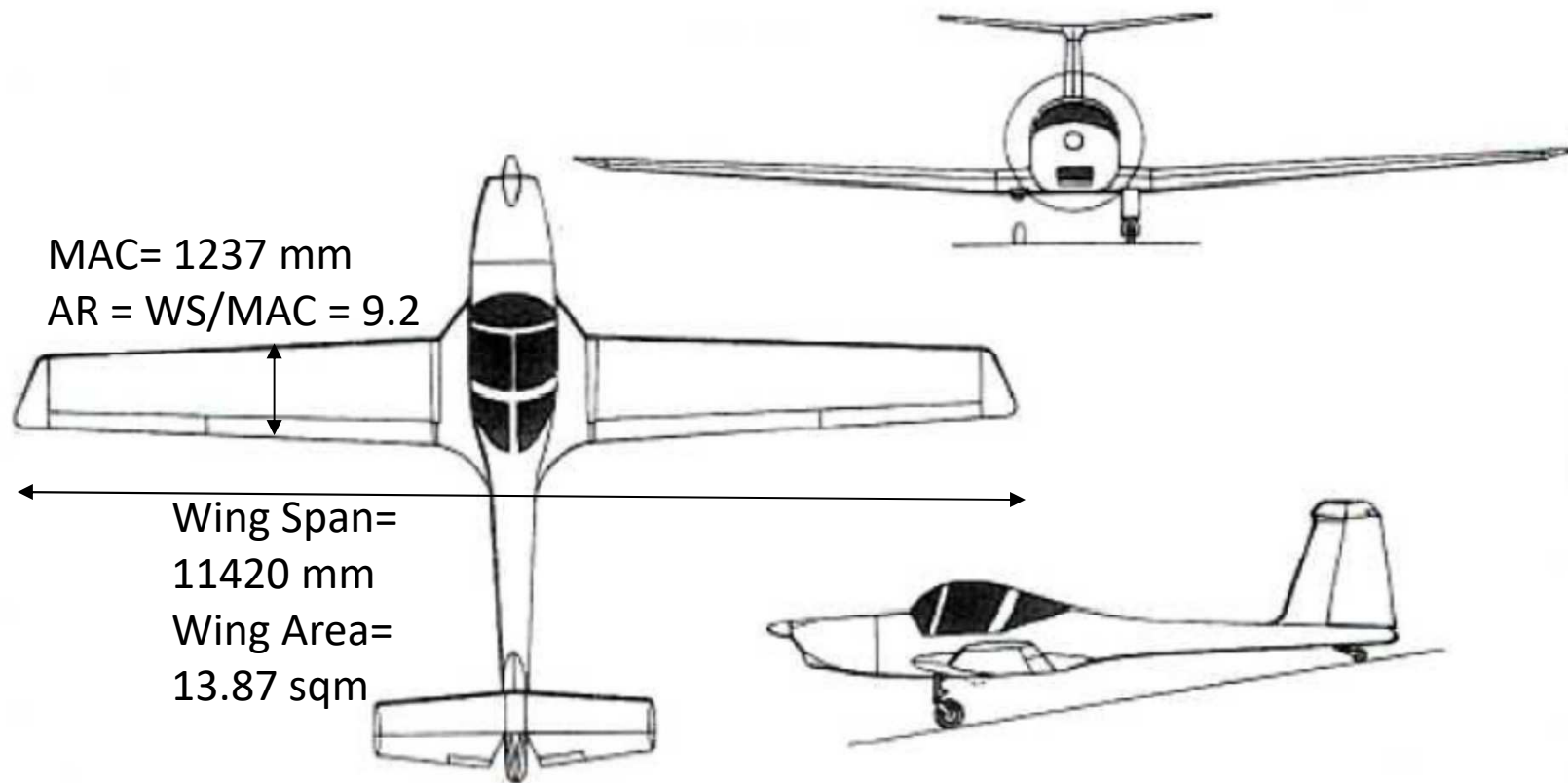
<p>^{7.} Instructions for continuing airworthiness. Copies of these manuals are provided to the aircraft owner:</p> <p>ICA xxxxx</p>	
<p>^{8.} Other information:</p> <p>N/A</p>	
<p>^{9a.} <input checked="" type="checkbox"/> This SC complies with the criteria established in 21A.90B(a) and with the relevant paragraphs of CS-STAN.</p>	
<p>^{9b.} <input type="checkbox"/> This SR complies with the criteria established in 21A.431B(a) and with the relevant paragraphs of CS-STAN.</p>	
<p>^{10.} Date of SC/SR embodiment:</p> <p>16 October 2017</p>	<p>^{11.} Identification data and signature of the person responsible for the embodiment of the SC/SR:</p> <p>Signature 1, Full name and Certificate reference</p>
<p>^{12.} Signature of the aircraft owner. This signature attests that all relevant documentation is handed over from the issuer of this form to the aircraft owner, and, therefore, the latter becomes aware of any impact or limitations on operations or additional continuing airworthiness requirements which may apply to the aircraft due to the embodiment of the change/repair.</p> <p>Signature 2</p>	

Form 123 Issue 00



Structural Standard Changes & Repairs

- Standard Change SC032a Installation of Anti-collision lights
- Example: Installation of Anti-collision lights OR5001V on an IAR-46 (VLA, MTOW = 750 kg) at wingtips.





Structural Standard Changes & Repairs

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- Example: Installation of Anti-collision lights OR5001V on an IAR-46 (VLA, MTOW = 750 kg) at wingtips.

ORION 500 LED LIGHT ASSEMBLIES

MODEL OR5001V & OR5002V LED Tail Position/Anti-Collision Lighthouse Assembly

All LED self-contained tail mounted Position/Anti-Collision system. Eliminates the need for external power supplies and reduces current draw and provides thousands of hours of operation.



Model OR500 Specifications

Model Numbers	Part Number	Voltage	LED Color	Anti-Collision LED Color	Operational Voltage	Input Current	Flash Rate	Weight	Approvals	Lenses
OR5001V	01-0771774V01	12 VDC	Aviation White	Aviation White	9-14 VDC	0.20 Amp (Position) 0.72 Amp Avg (ACL)	45 ± 5 FPM	0.28 lbs (132gm)	FAA TSO/ETSO-C96a Class II & III TSO/ETSO-C30c Type III	Clear Hard-coated Polycarbonate (Field Replaceable)
OR5002V	01-0771774V02	28 VDC			22-32 VDC	0.10 Amp (Position) 0.36 Amp Avg (ACL)		0.29 lbs (132gm)	FAA TSO/ETSO-C96a Class II & III TSO/ETSO-C30c Type III	



Structural Standard Changes & Repairs

➤ Standard Change SC032a Installation of Anti-collision lights

- The equipment is authorised in accordance with ETSO-C96a or later amendments, or equivalent;
- The anti-collision light is located in a distance to other systems appropriate for the aircraft and the anti-collision light;
- The anti-collision light is compatible with the connected equipment and is suitable for the environmental conditions to be expected during normal operation;
- Impact on weight and balance needs to be considered;
- Instructions and tests defined by the equipment manufacturer have been followed and recorded; and
- Any modification of electrical wiring is performed in accordance with acceptable practices such as the aircraft maintenance manual or Chapter 11 of FAA Advisory Circular AC 43.13-1B.
- **3.1 Anti-collision lights installed on wing tips and/or vertical tail tip**
- Anti-collision lights may be installed if their total weight, including reinforcements, is equal or lower than a certified anti-collision lights installation on a similar aircraft. Similarity shall be assessed following the guidelines given by AC 23.629-1B, Chapter 1, paragraph 1c. The location of the anti-collision lights shall be similar to the location on equivalent aircraft. This assessment shall be recorded within EASA Form 123. **Next slide**
- Anti-collision lights installation shall not alter torsional stiffness.



Structural Standard Changes & Repairs

► Standard Change SC032a Installation of Anti-collision lights

equivalent
airplanes
comparison



MODEL IAR-46
MTOW 750 kg
Wing Span 11.42 m
Wing Area 13.87 sqm
MAC 1.214 m
AR 9.4
Length 7.85 m
Height 2.15 m
VNE 150 KIAS
W/S 54.1 kg/sqm

construction T- tail
Low trapezoidal Wing
single engine

DIAMOND HK36 TTC
930 kg
16.33 m (included winglet)
15.3 sqm
0.937 m
17.4
7.28 m
1.78 m
141 KIAS
60.8 kg/sqm

T- tail
Low trapezoidal Wing
single engine

DIAMOND DA20 C1
800 kg
10.87 m
11.6 sqm
1.067 m
10.2
7.17 m
2.19 m
164 KIAS
69 kg/sqm

T- tail
Low trapezoidal Wing
single engine



Structural Standard Changes & Repairs

➤ Standard Change SC032a Installation of Anti-collision lights

- Anti-collision lights total weight, including reinforcements, is equal or lower than a certified anti-collision lights installation on a similar aircraft.
- The location of the anti-collision lights shall be similar to the location on equivalent aircraft.
- AC 23.629-1B, Chapter 1, paragraph 1c
 - Airplanes are similar in weight
 - Airplanes have similar speed range
 - Airplanes are geometrically similar
 - Airplanes are similar in mass and stiffness distribution
 - Airplanes have similar control systems and architecture

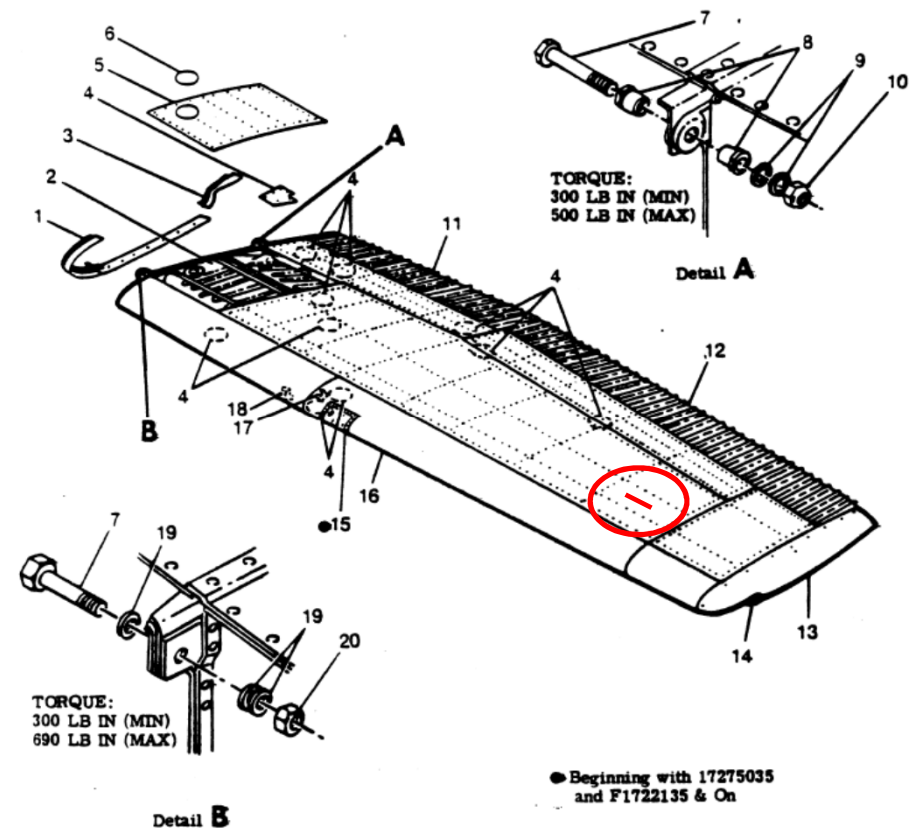


Structural Standard Changes & Repairs

- Standard Repair SR801a Aircraft Repair per FAA AC 43.13-1B
- Cracked upper skin at IAR-46 wing.

Limitations

- Be familiar with applicable ARs to determine that repair data developed from AC 43.13-1B is appropriate for the product.
- Not applicable to metallic structure on products whose certification basis or an applicable AD includes damage tolerance based requirements.
- Where suitable TC holder approved repair data exists, this should be used before a SR is considered.
- This SR data is not applicable to critical parts, as defined in the manufacturers' data.





Structural Standard Changes & Repairs

- Standard Repair SR801a Aircraft Repair per FAA AC 43.13-1B (cont'd)
- No SRM
- Note: where there is any doubt as to whether following AC 43.13-1B will result in compliance with the applicable requirements, instead of applying this SR, a repair design approval in accordance with Part-21 should be obtained. Particular attention should be paid to repair designs where there is a risk of adversely affecting fatigue or aeroelastic characteristics and the recommendations of AC 43-13-1b should be followed.



Structural Standard Changes & Repairs

► Standard Repair SR801a Aircraft Repair per FAA AC 43.13-1B (cont'd)

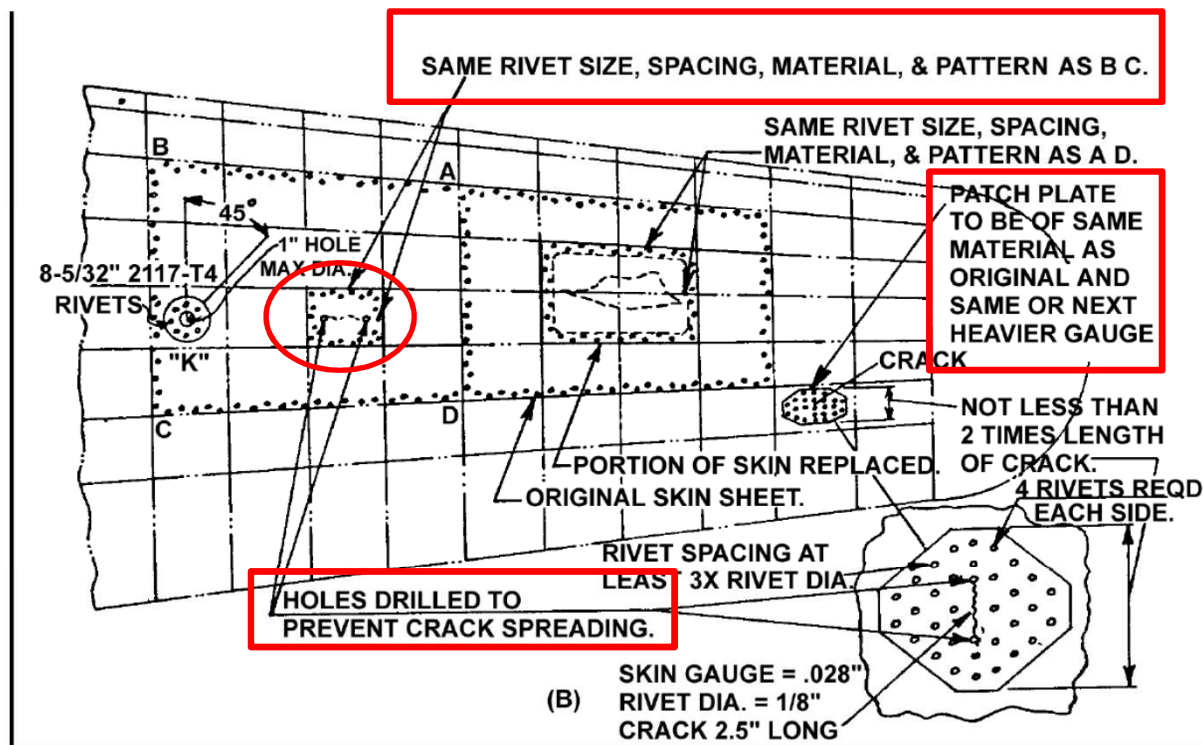


FIGURE 4-16. Typical repairs of stressed sheet metal coverings. (Refer to tables 4-9, 4-10, and 4-11 to calculate number of rivets to be used.)

AC 43.13-1B

4-59. REPAIRING CRACKED MEMBERS. Acceptable methods of repairing various types of cracks in structural elements are shown in figures 4-21 through 4-24. The following general procedures apply in repairing such defects.

a. **Drill small holes** $\frac{3}{32}$ inch (or $\frac{1}{8}$ inch) at the extreme ends of the cracks to minimize the possibility of their spreading further.

b. **Add reinforcement** to carry the stresses across the damaged portion and to stiffen the joints. (See figures 4-14 through 4-17.) The condition causing cracks to develop at a particular point is stress concentration at that point in conjunction with repetition of stress, such as produced by vibration of the structure. The stress concentration may be due to the design or to defects such as nicks, scratches, tool marks, and initial stresses or cracks from forming or heat-treating operations. It should be noted, that an increase in sheet thickness alone is usually beneficial but does not necessarily remedy the conditions leading to cracking.



Structural Standard Changes & Repairs

- Standard Repair SR804a Use of Alternative Adhesive for repairs of wood and wooden mixed structures
- Enable the use of an alternative adhesive/bonding system instead of initially approved conventional wood glue systems.
- Not intended to substitute the repair design and provided by the TC holder, however, it gives the possibility to use alternative adhesives.
- Applicable to ELA1 Sailplanes or powered sailplanes (< 1200 kg)
- Working conditions and wood conditions shall keep the conditions described by the TC holder (e.g. temperature, humidity, etc.).
- Application and restrictions given in the adhesive manufacturer specifications are mandatory.



Structural Standard Changes & Repairs

➤ Standard Repair SR804a Use of Alternative Adhesive for repairs of wood and wooden mixed structures (cont'd)

➤ LIMITATIONS

- No simultaneous application of different adhesive types
- Any adhesive complying with EN 301-I-90-GF-1,5-M or equivalent standard can be used as released by the manufacturer.
- For Epoxy resin based adhesives not compliant with EN 301-I-90-GF-1,5-M:
 - Not applicable for bonding of spars; main structure beam; root ribs
 - Bonded areas operating temperature limited to 50°C (e.g. bonded areas must be coloured white or not allowed in hot areas as engine compartment)
 - Adhesive must be qualified by the bond manufacturer as suitable for structural wood bonding



Structural Standard Changes & Repairs

➤ Standard Repair SR804a Use of Alternative Adhesive for repairs of wood and wooden mixed structures (cont'd)

➤ LIMITATIONS (cont'd)

- For Epoxy resin based adhesives not compliant with EN 301-I-90-GF-1,5-M (cont'd):

- Quality and strength bonding tests for different mixtures shall be carried out

- The person responsible for the design and execution of the repair must be familiar enough with the use the adhesive. Experience and knowledge handling adhesives can make a huge difference in the final bonding performance



Structural Standard Changes & Repairs

- Standard Repair SR804a Use of Alternative Adhesive for repairs of wood and wooden mixed structures (cont'd)
- **LIMITATIONS (cont'd)**
 - **Surface preparation** (Sand, ensure wood is dry, adequate solvent,...)
 - **Epoxy adhesive** (storage, mixture viscosity required and mix ratio of epoxy resin and hardener, respect of mixing time and consistency with application time, pot-life and curing temperature,...)
- The adhesive used and conditions shall be recorded in EASA Form 123 (adhesive type, manufacturer, charge, curing temperature)



CS-STAN development

➤ Current Performance

➤ Safety Impact

- Methods, techniques and practices are proven safe by experience
- The legal person embodying the change ensures that their design/repair follows the CSs
- Encouragement to modernise aircraft embodying safety features enhancing operations safety

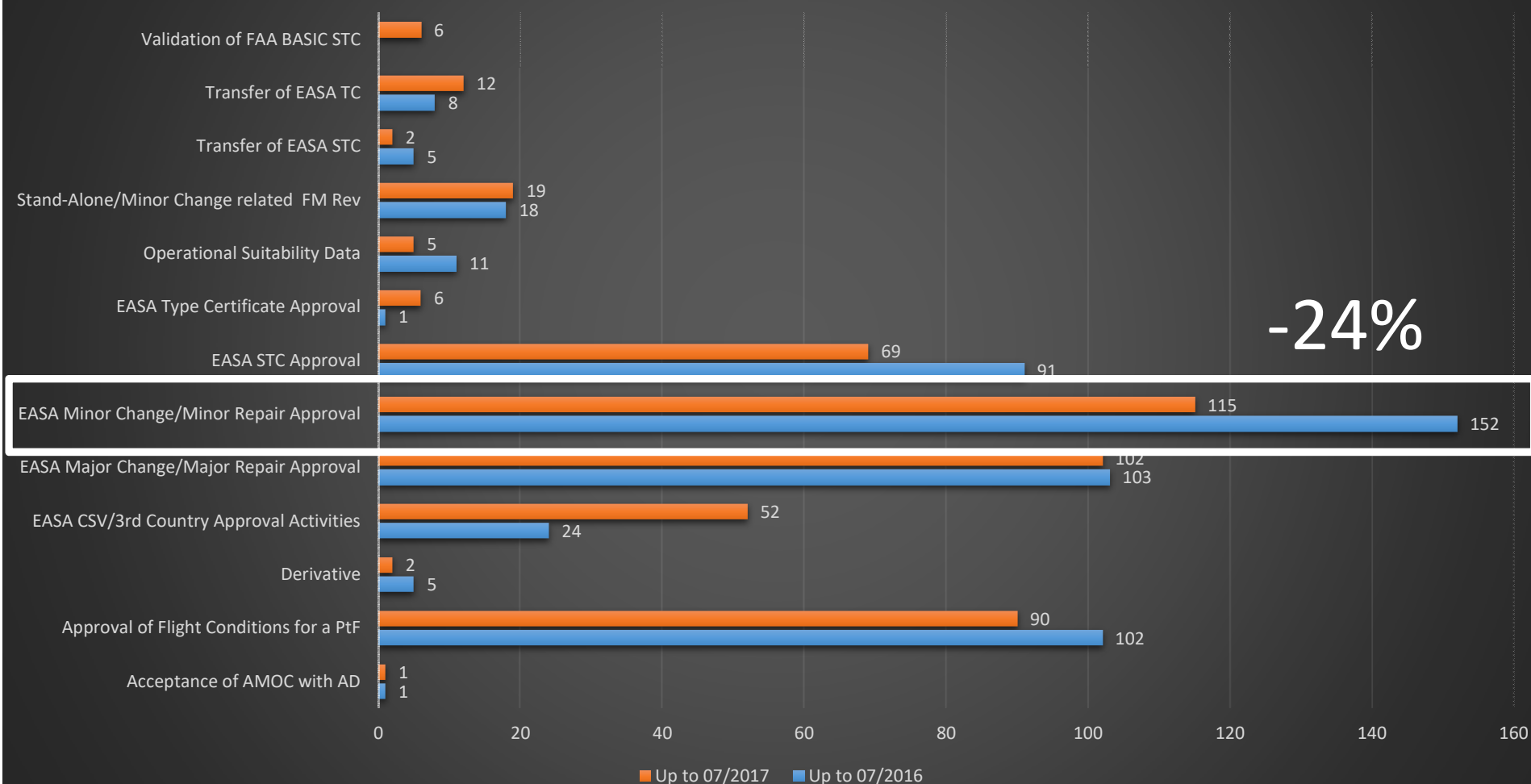
➤ Economic Impact

- 70,000 aircraft could benefit
- DOAs and EASA might lose requests at the expense of GA promotion and its positive impact in industry
- DOAs and EASA resources employed in higher technical value Changes/Repairs



CS-STAN development

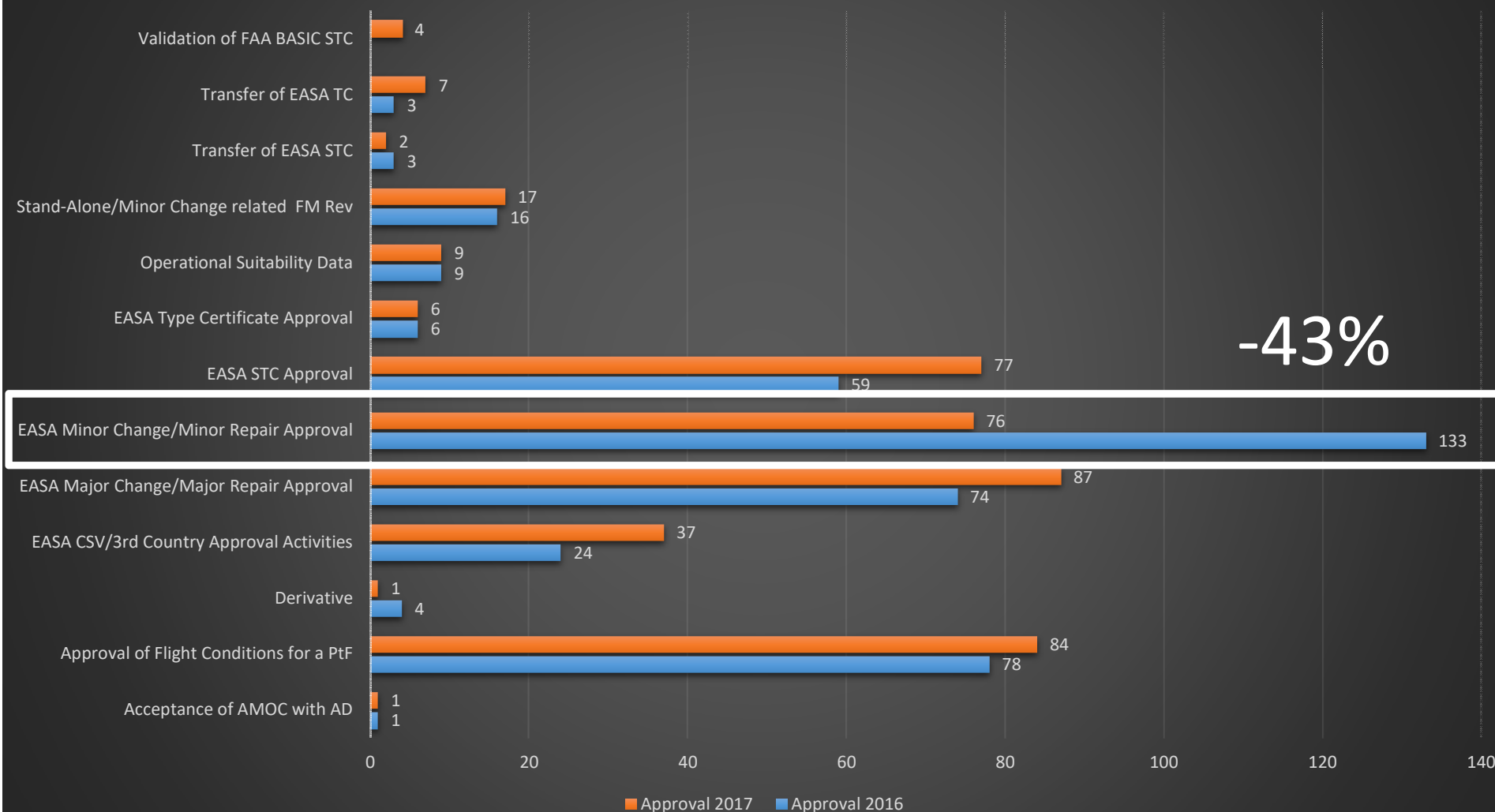
Applications received (GA Dpt figures)





CS-STAN development

Approvals (GA Dpt figures)





CS-STAN development

➤ Future and management of new proposals

➤ Future

- Substantial increase of SCs & SRs between CS-STAN phase 1 and phase 2 (July 2015 and March 2017)
- List of SCs & SRs to be expanded depending on stakeholders feedback

➤ New proposals

- Stakeholders invited to send mature proposals to the Agency



CS-STAN development

➤ New proposals?





Conclusions

- Powerful tool to GA industry and operators
- Specific part 21 process tailor made to address SCs & SRs, increasing efficiency through reduction of administrative burden and smart use of resources
- Encouraging future improving CS-STAN:
 - increasing the SCs & SRs covered and
 - lessening limitations and restrictions through gained experience



EASA

European Aviation Safety Agency

Thank you for your attention!

Any questions....?

Your safety is our mission.

An agency of the European Union

