ITALIAN MINISTRY OF DEFENCE Secretariat General for Defence - National Armaments Directorate AIR ARMAMENTS DIRECTORATE



The Benefits of Harmonising Airworthiness Certification Eriteria o Achieve Recognition of Certificatio (ENACC, UASS STANAGS)

Lt.Col. GArn Alessio GRASSO Italian MoD - DAA Vice Technical Direction Alessio.grasso@am.difesa.it +39 06 4986 6812

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- UNCLASSIFIED -





- To provide examples of successful harmonisation activities in the field of airworthiness
- To "Socialize" these products that some of you may not be aware of





Harmonisation processes in the field of military airworthiness

Case Studies

✓ EMACC

✓ STANAG 4761, 4702, 4703





The Concept of Harmonisation in the field of Airworthiness of Military Aircrafts









CIVIL WORLD



The operational environment and the mission profiles are limited and almost always the same

Airworthiness is regulated by law e.g. CS 25 / FAR 25















Potential advantage not only for Authorities but also for Aerospace Industry











In the field of military airworthiness, a lot of resources are being spent in harmonisation initiatives within EU (EDA), NATO and US Services

! SHARE EXPERIENCE AND HARMONIZE ! (trying to avoid redundances when feasible)

Potential advantage not only for Authorities but also for Aerospace Industry



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THE EXAMPLE OF EMACC

(European Military Airworthiness Certification Criteria)





THE EXAMPLE OF EMACC



EUROPEAN DEFENCE AGENCY	
EUROPEAN MILITARY AIRWORTHINESS	
CERTIFICATION CRITERIA (EMACC)	

Edition Number	1.3
Edition Date	09/12/2011
Status	Working Draft



MILITARY AIRWORTHINESS AUTHORITIES FORUM Under MAWA, a specific Task Force (TF4) is established to produce harmonised European Military Airworthiness Certification Criteria (EMACC).

EMACC is an European handbook detailing technical military airworthiness certification criteria, intended to be used to tailor the airworthiness basis for Military Type Certification activity.





EMAAC is NOT intended to be a Certification Specification containing the specific quantitative REQUIREMENTs to which the product is to be certified.

□ EMACC provides

- 1. a complete set of airworthiness criteria to be considered (like an airworthiness checklist)
- 2. a complete sources list of state of the art rules and standards applicable to each criterion
- 3. an expanded text harmonized among previous standards to help in the tailoring process of defining quantitative airworthiness requirements



THE EXAMPLE OF EMACC







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Approach in two steps

- Starting point: MIL-HDBK-516B Change 1
- DOORs database with existing 516B criteria, US DoD/Mil and FAA crossreferences

STEP 1

- Adding cross-references to European and NATO documents where equivalence is deemed possible:
 - Def Stan 00-970
 - STANAGs
 - EASA CSs







STEP 2: Harmonisation among different standards





THE EXAMPLE OF EMACC



5.4. DAMAGE TOLERANCE AND DURABILITY (FATIGUE).

FRAMEWORK

INFORMATION

SOURCES

HARMONISED

CRITERIA

5.4.1 Verify that all safety-of-flight (SOF) structure, including dynamic components, have adequate safe life or damage tolerance capability (depending on certification authority).for the required service life.

US Cross References		European Cross References			
Comm'l Doc:					
DoD/MIL Doc:	JSSG-2006: A.3.12 Damage Tolerance, pg 398	Def-Stan 00-970 Reference:	00-970 3.2.3 00-970 Part 1 Sec 3 3.2.2		
	Tolerance, pg 400 (for compliance development)		00-970 Part 1 Sec 3 3.2.3 00-970 Part 1 Sec 3 3.2.8 00-970 Part 1 Sec 3 3 2 9		
			00-970 Part 1 Sec 3 3.2.10 00-970 Part 1 Sec 3 3.2.11		
			00-970 Part 1 Sec 3 3.2.12 00-970 Part 1 Sec 3 3.2.13		
		STANAG Reference:	4671 305 4671 570		
			4671 572 4671 573 4671 575		
FAA Doc:	14CFR reference: 23.571, 23.572, 23.573; 25.571; 27.571; 29.571.	EASA CS Reference:	CS 23.571 CS 23.572 CS 23.573 CS 23.575 CS 25.571 CS 27.571 CS 29.571		
Harmonised Text:	Harmonised Text: Text: The airframe structure and associated components, whose failure would be catastrophic, must be shown by analysis supported by test evidence and, if availat service experience, to meet the fatigue requirements of a damage tolerant or, if no applicable a safe life design methodology over the design service life of the aircraf The fatigue evaluation must include the requirements of subparagraph (1), (2), and (3) and also must include a determination of the probable locations and modes of damage caused by fatigue, considering environmental effects, intrinsic/discrete fla or accidental damage				

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- EMACC will be ready by the beginning of 2013
- > EMACC Custodian Support activity for next years
- Refinement based upon changes within information sources
- Potential future TF4 opportunity: Harmonisation with US process (MIL HDBK 516B team)







Derived from CS23 Ed 1 ratified Ed 2 non ratifiable is the last version Added specific sections for UASs (eg Data Link, Ground Station) Ed 3 will start ratification in fall 2013 Included a lot of experience from various NATO Nations **STANAG 4671 (Ed2)** Fixed Wing UAS from 150 to 20,000 kg

Cross walk exercise with MIL-HDBK-516 Identified gaps not covered by a CS23 derived STANAG (eg in the Vehicle Control Functions field) A lot of effort is being dedicated to harmonize safety requirements for Edition 3 => above a weight breakpoint safety will be increased of an order of magnitude

Derived from CS27

Added specific <u>sections</u> for UASs (eg Data Link, Ground Station), taken from STANAG 4671 Included a lot of experience from various NATO Nations Ed 1 started ratification this year

STANAG 4702 (Ed1)

Rotary Wing UAS from 150 to 3750 kg

THE EXAMPLE OF STANAGS

AIMs

the amount of certification evidences required should be as **LIGHT** as possible

USAR-LIGHT must be **RIGOROUS** and **COMPLETE**

in addressing those design attributes which may endanger safety

> being **FLEXIBLE** and not prescriptive, in order not to limit the Manufacturers design solutions

A set of Airworthiness Codes doesn't exist for any type of aircraft < 150 kg

A single complete set of Airworthiness Codes cannot be flexible enough to consider all the variety of configurations in this UAS category

A complete set of airworthiness codes would result to be excessively prescriptive to this UAS category Manufacturers.

Nevertheless a minimum set of basic Airworthiness Codes could help both the Applicant and the Authority in performing UAS certification activities

AIMs

as **light** as possible

rigorous and complete in addressing all design attributes

flexible and not prescriptive

1) What are the minimum requirements required by law to be fulfilled in order to recognize a type design as airworthy?

In EU Civil Aviation the minimum Essential Requirements for Airworthiness are established by **Regulation (EC) N°216/2008** (Annex 1) of the European Parliament and of the Council

OCCAR-JMAG (BE+DE+FR+IT+SP+UK) agreed among themselves and with ASD (the association of EU Aerospace Industries) a military version of the Essential Requirements adopted then by **MAWA** as the basis of their regulatory framework.

2) How to demonstrate compliance with the Essential Requirements for Airworthiness?

For UAS<150 kg the best proposed solution is a *hybrid approach* in which compliance with Essential Requirements is demonstrated through detailed arguments made of the following:

- a clear definition of the design usage spectrum
- a minimum set of airworthiness codes
- verification of the design criteria by the Authority
- process evidences (e.g. Safety Management System)

MANDATORY AIRWORTHINESS ESSENTIAL REQUIREMENTS	DETAILED ARGUMENTS	MEANS OF EVIDENCE
ER.1Product integrityER.1.1Structures and materialsER.1.2PropulsionER.1.3Systems and equipmentsER.1.4ForContinuedairworthiness	Compliance with the Essential Requirements may be shown by the Applicant through these detailed arguments or by any other argument which meets the intent behind them with comparable level of safety to be agreed with the Certifying	Acceptable type of evidence to be presented to the Authority
ER.2 <u>Airworthiness aspects of</u> product operation	Authority, wherever a "should" statement appears	
ER.3 Organisations	FLEXIBILITY= Few "must" statements Many "should" statements	

3) Can some requirements be relaxed for very Light UAS?

official medical studies: any vehicle under **25 ft-lb**

PhD dissertation: any vehicle under **49 ft-lb** (Very Low Energy threshold that cannot cause fatalities)

... Lethality Threshold of 66J

NEW STANAG 4xxx

STANAG 4xxx

Rotary Wing UAS < 150 kg

A new team has been established to develop a new STANAG, similar in structure to the 4703, applicable to rotary wing UAS< 150kg START IN SPRING 2013

CONCLUSIONS (1/2)

- MILITARY AIRWORTHINESS HARMONISATION IS NOW A NEED
 UNDER THE WILL OF NATIONS
- DUPLICATION OF EFFORT MUST BE AVOIDED (LACK OF NATIONAL SPECIALISTIC RESOURCES)
- THERE ARE BENEFITS IN USING A COMMON APPROACH IN THE AIRWORTHINESS
 - TO PROVIDE MILITARY AIRCRAFTS CAPABLE OF PERFORMING THEIR MISSION SAFELY
 - THE POTENTIAL SAVINGS IN TIME, COST AND EFFORT FOR BOTH AUTHORITHIES AND INDUSTRY.
- USE THE SUCCESS OF THE EARLY STAGES TO ENABLE
 STRONGER HARMONISATION

CONCLUSIONS (2/2)

- EU EFFORTS TO DEVELOP EMACC SHOULD BE HARMONIZED WITH US PROCESS OF REVISION OF THE MIL-HDBK-516, POSSIBLY SHARING BACKGROUND EXPERIENCES AND KNOW-HOW
- RELEVANT NATIONS AROUND THIS TABLE ARE RECOMMENDED TO CONSIDER NEW STANAGS 4702 AND 4703 FOR CONSIDERATION AND RATIFICATION

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The benefits of harmonising In the field of airworthiness

Any question?

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