Overview regarding the certification of a new military jet aircraft for school and training

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Section 4 – Materials and Structures

Abstract: *The requirements for designing a new Romanian school and training military jet, IAR 99 NG, are in line with the EMAR - European Military Airworthiness Requirement. The Approval Regulation for the new school and training military jet is EMACC - European Military Airworthiness Certification Criteria. In addition to the basic regulation, the main categories of norms used for designing, manufacturing and testing are as follows: AIR, MIL, NA, EN and SR EN etc. For each system used on the new school and training military jet, Standard Defense 00-970 and NATO STANAG regulates the requirement to perform tests on a functional model. In order to be tested, each modeled system, must accurately reproduce the original system.*

Key Words: *requirements, regulations, military, jet, school, training*

1. FOREWORD [1]

Achieving economic performance in building and operating a new aircraft involves analyzing general requirements, including regulatory requirements, in relation to modern technologies and adapting technical solutions according to these requirements. Under these conditions, the level of demonstration by trial is diminished and costs can be reduced.

Currently, the European legislation is dynamic, with objectives for the implementation of the requirements adopted, completion and standardization of procedures, building consensus on national military regulations and achieving the perspective of integration into a civilian and military single regulation with specific parts, differentiated by the criteria currently adopted for civil aviation. In the context of legislation in the field the conformity analysis allows the correlation with the requirements of the Military Aeronautical Authority, the correct approach to compliance for the new school and training military jet.

The harmonization of airworthiness regulations is a European strategic decision to improve cooperation, strengthen the technological competitiveness and the industrial base and improve cohesion between the airworthiness regulations, military and civilian-military commonwealth of European Union.

The objectives and benefits anticipated through the European strategy are as follows:

- Improving the safety of military aviation;
- Improving military-military and civil-military cooperation;
- Reducing time and costs for developing a new aircraft;
- Increasing competitiveness;
- Introducing a common approach to maintenance and repair of the aircraft;
- Recognition among the various military airworthiness authorities;
- Creating perspectives for outsourcing maintenance and repairs;
- Improvement of weapons systems;
- Recognition by civil aviation authorities;
- Increase interoperability in joint air operations.

In the framework of the MAWA (Military Airworthiness Authorities), the representatives of the Member States will promote a common set of harmonized European Airworthiness Requirements (EMAR), Acceptable Means of Compliance (AMC) and Guidance Material (GM).

These will be included in national airworthiness regulations by all states. MAWA does not have the authority to impose airworthiness regulations on Member States. The international relations of MAWA and the way of collaboration/cooperation mode are presented in Fig. 1.

Concluding the writing and approval of the Military Regulations is characterized by a legislative dynamic with a view to ratification of documents at the level of EU Member States, harmonization at European level and adoption of the final regulations.

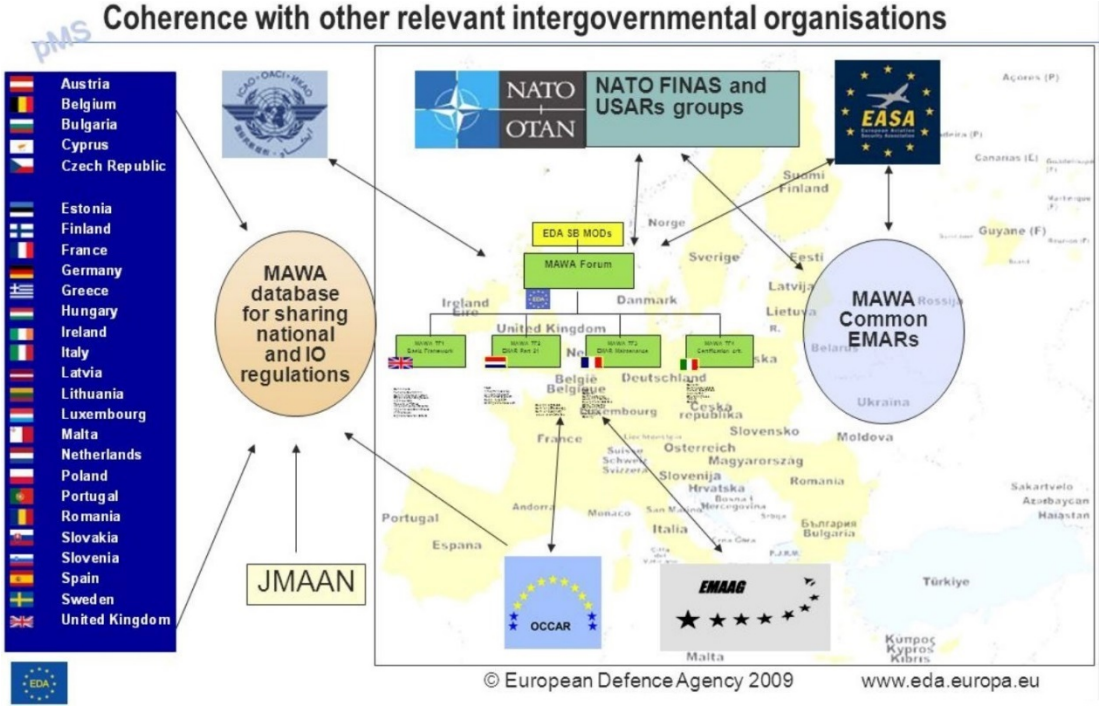

Fig. 1 – The international relations of MAWA and the way of collaboration/cooperation mode [2]

The EU Member States also use the American US Defense Department guidelines MIL category, mainly where products or services have to be recognized / certified globally. The European legislation follows a harmonization with these regulations with a view to mutual recognition of certification documents under similar requirements. The product compatibility

within NATO helps speed up this process. The position of the EU states towards the main security systems is presented in Fig. 2.

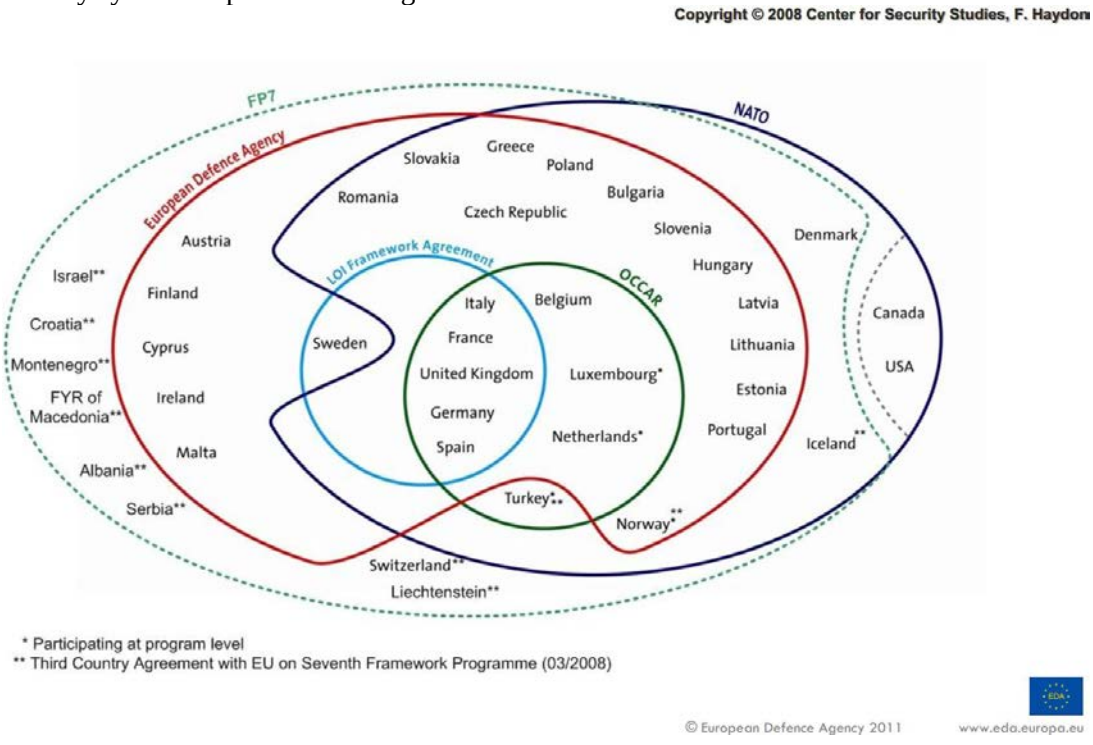

Fig. 2 – Environment of global cooperation [3]

2. ANALYSIS OF EUROPEAN LEGISLATION AND REGULATIONS IN THE FIELD

EDSTAR (European Standards Reference System) developed under the aegis of the EDA (European Defense Agency) documents integrated into the strategy for the implementation of harmonized regulations and its implementation under the name of EMAR (European Military Airworthiness Requirements) [9, 10, 11, 12, 13, 14, 15, 16].

The Defense ministers from the EU states have declared political support for this move (November 2009).

The Regulations Structure of EASA - European Aviation and Safety Agency. is summarized in Fig. 3.

The Basic Civilian Regulation also includes enforcement rules for additional areas such as airport operations, air traffic management, airline licensing staff.

Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and amending Regulations (EC) No 2111/2005, (EC) No 1008/2008, (EU) No 996/2010, (EU) No 376/2014 and Directives 2014/30/EU and 2014/53/EU of the European Parliament and of the Council, and repealing Regulations (EC) No 552/2004 and (EC) No 216/2008 of the European Parliament and of the Council and Council Regulation (EEC) No 3922/91 [5]:

12/01/2016 Commission Regulation (EU) 2016/5

01/07/2015 Commission Regulation (EU) 2015/1039

27/01/2014 Commission Regulation (EU) No 69/2014
08/01/2013 Commission Regulation (EU) No 7/2013
03/08/2012 Commission Regulation (EU) No 748/2012 AMENDED
30/11/2009 Commission Regulation (EC) No 1194/2009 REPEALED
27/10/2008 Commission Regulation (EC) No 1057/2008 REPEALED
28/03/2008 Commission Regulation (EC) No 287/2008 REPEALED
30/03/2007 Commission Regulation (EC) No 375/2007 REPEALED
28/03/2007 Commission Regulation (EC) No 335/2007 REPEALED
08/05/2006 Commission Regulation (EC) No 706/2006 REPEALED
07/03/2005 Commission Regulation (EC) No 381/2005 REPEALED
24/09/2003 Commission Regulation (EC) No 1702/2003 AMENDED REPEALED.

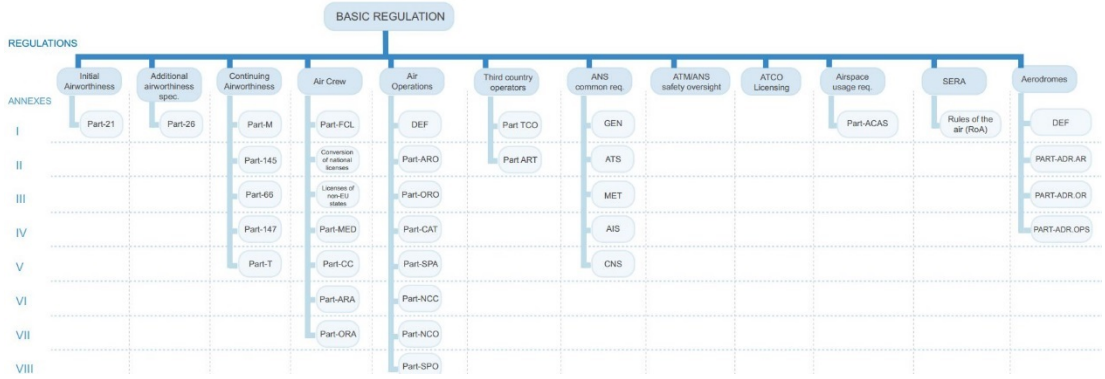

Fig. 3 – EASA regulations structure [4]

Following this model in the process of harmonizing national military regulations, the representatives of the Member States will promote a common set of harmonized European Airworthiness (EMAR), Acceptable Compliance (AMC) standards within the MAWA (Military Airworthiness Authorities) and guidance material (GM).

These will be included in national airworthiness regulations by all states, as shown in Fig. 4.

MAWA does not have the authority to impose airworthiness regulations on EU Member States. The international relations of MAWA and the way of collaboration are presented in Fig. 5. EMACC: In parallel with the development of EMAR 21, the MAWA Forum aims to develop the European Military Certification Criteria (EMACC), which will define harmonized criteria for the certification of military aircraft.

EMAR European Military Airworthiness Requirements [9, 10, 11, 12, 13, 14, 15, 16]:

• EMAR M: establishes the measures to be taken to ensure airworthiness, including maintenance. It shall also specify the conditions to be met by the persons or organizations involved in continuing airworthiness management [15].

• EMAR 145: establishes the requirements to be met by an enterprise to obtain the authorization or to prolong an aircraft and component maintenance license [16].

• EMAR 66: establishes education and training requirements for the aircraft maintenance personnel.

• EMAR 147: establishes the requirements to be met by companies operating aircraft.

Concluding the drafting and approval of the Military Regulations is characterized by a legislative dynamic with a view to ratification of documents at the level of EU Member States, harmonization at European level and adoption of the final regulations.

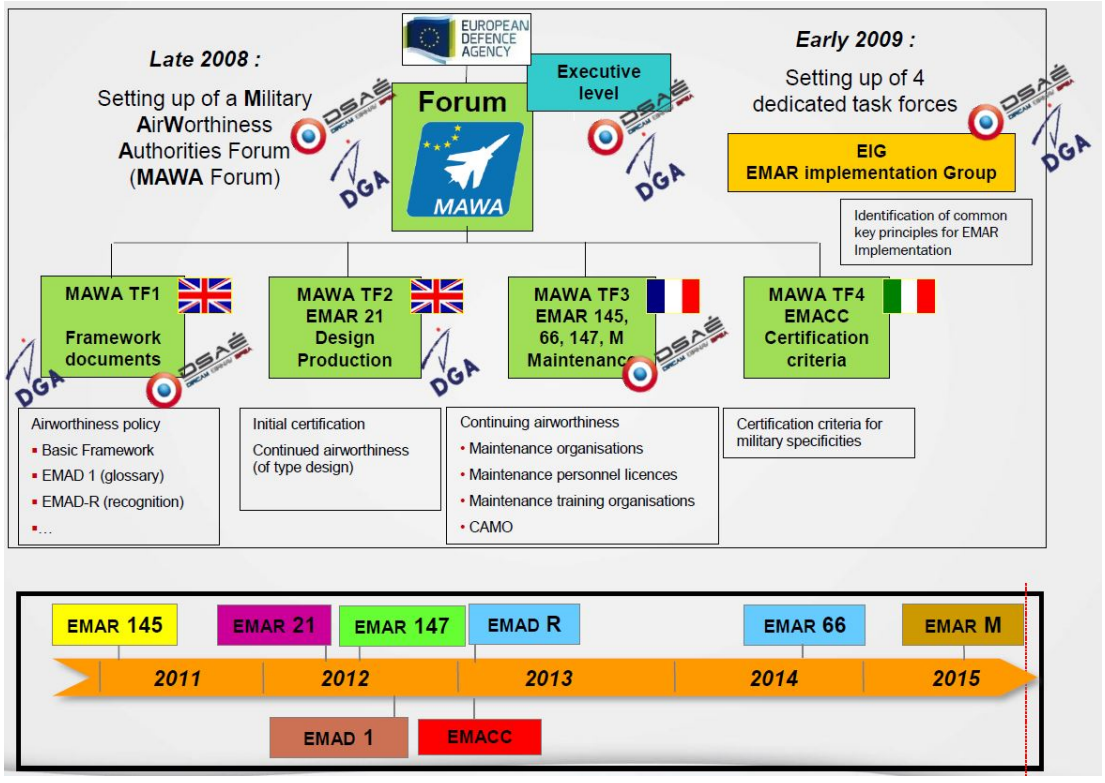

Fig. 4 – European harmonization with EDA and MAWA [6]

At the EU Member State level, American US Department of Defense guidelines are also used, MIL indicative, mainly where products or services have to be recognized / certified globally.

European legislation follows a harmonization with these regulations with a view to mutual recognition of certification documents under similar requirements. Product compatibility within NATO helps speed up this process.

In the field of quality management, the rules agreed in the European community are Quality management systems for the aerospace industry:

- EN 9100 for design, development, production and installation companies;
- EN 9110 for companies operating in the maintenance sector;
- EN 9120 for distributors.

The ISO 9100 standard promotes the adoption of a "process" approach in the development, implementation and improvement of a quality management system.

Based on ISO 9100 and derived standards, INCAS has developed a quality assurance system based on a general quality management manual, accompanied by specific application procedures for a particular type of activity and project phase.

The process initiated by MAWA is based on proposals for standards following the civil regulation model to reduce the effort of harmonization between a set of military regulations and a set of civilian regulations.

In the medium term, it is expected to unify airworthiness regulations for all types of aircraft (military and civilian). At present, the harmonization of specific regulations that will have a limited regime is anticipated.

For the other categories of regulations (maintenance, repair, schooling etc.), the harmonization process started in recent years is in the implementation phase.

The efforts to achieve unique European-level regulations in the field of military aviation are part of the security strategy and involve all areas of defense.

Increasing the share in the delivery of equipment to NATO, with the development of the operating infrastructure, are arguments based on common interests of boosting the integration processes.

MAWA has been involved in harmonizing national regulations between the Member States in order to bring the requirements of the proposed unitary framework closer.

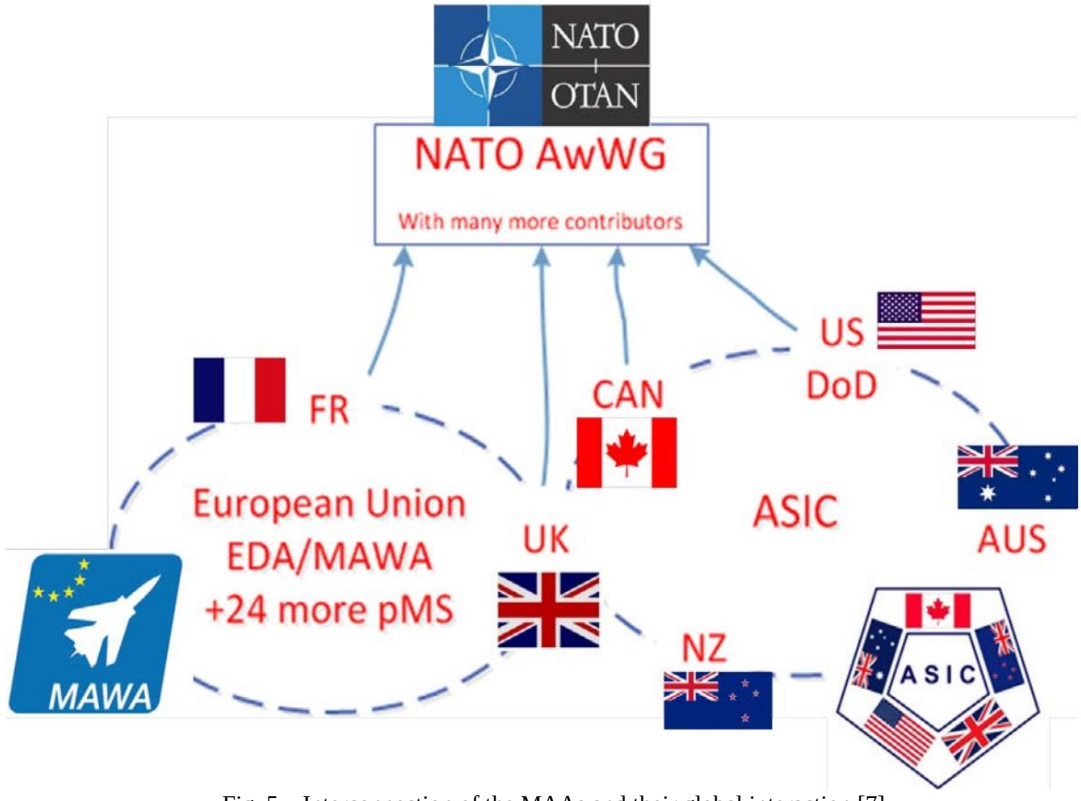

Fig. 5 – Interconnection of the MAAs and their global interaction [7]

3. CONCLUSIONS

After the National Military Airworthiness Authority (NMAA) establishes the aircraft airworthiness requirements for the development of the new school and training military aircraft, IAR 99 NG, are delivered to the design company and to the production company. Their negotiations will determine the agreed airworthiness requirements for the aircraft which could be based upon civil standards, defence standards or a combination of these.

The outcome will be an agreed Certification Basis according to which the company must design the aircraft. During the design and development phase, if the company is not already an approved organisation, the NMAA will start the process to provide the company with a Design Organisation Approval. This approval is based upon an investigation and audit of the company to ensure that their processes, procedures and systems can be relied upon to design (and maintain the design) of the aircraft or sub-systems that they are responsible for.

Depending upon the contractual arrangements it may be necessary for the NMAA to grant an approval for more than one company involved in the programme.

Towards the end of the design and development phase, the NMAA will be required to review and evaluate evidence from the company that the design meets the airworthiness requirements within the Certification Basis. Once sufficient evidence is provided by the company, the NMAA may provide the company with a Permit to Fly that will enable the company to fly a development aircraft within certain limits decided by the NMAA.

The test flying by the company will provide further evidence to substantiate that their product conforms with the Certification Basis until such time as when the NMAA declares and verifies that the aircraft is in compliance. The NMAA will then issue a Military Type Certificate for the aircraft to the company who becomes the Military Type Certificate Holder.

Prior to production and manufacture of the final product the company must also receive a Production Organisation Approval issued by the NMAA. This is once again based upon an investigation and audit of the company's processes, procedures and systems. After being granted a Production Organisation Approval the company is permitted to produce the aircraft.

This is not the end of the involvement of the NMAA as each individual aircraft must be checked by the NMAA to ensure that it conforms with the approved design [8].

In addition to the basic regulation, the main categories of norms used for design, manufacture and testing are as follows: AIR, MIL, NA, EN and SR EN (former STAS) etc.

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ABBREVIATIONS

EDA: European Defence Agency,
EDSTAR: European Standards Reference System,
FA: Fighter Attack,
LA: Light Attack,
LCA: Light Combat Aircraft,
LIFT: Lead in Fighter Trainer,
EASA: European Aviation and Safety Agency,
EMACC: European Military Airworthiness Certification Criteria,
EMAR: European Military Airworthiness Requirement,
EMJAAO: European Military Joint Airworthiness Authorities Organisation,
MAA: Military Aviation Authority,
MAWA: Military Airworthiness Authorities,
NMAA: National Military Aviation Authority.