



Harmonising airworthiness

In a time of extreme pressure on defence budgets, harmonising military airworthiness among allies can bring big benefits. Air Vice-Marshal **MARTIN CLARK** FRAeS, Director (Technical), Military Aviation Authority, reviews recent progress.

In his September 2014 *AEROSPACE* article, Howard Wheeldon described how the Military Aviation Authority (MAA) had grown and developed since its creation in April 2010. As part of its drive to re-establish the importance of managing military airworthiness effectively, the UK MAA has continued to support, and often lead, the extension of this work into Europe and beyond to improve understanding and consistency in approach for this critical area among our international allies. Other benefits are anticipated through creating the opportunity to share work done by the military airworthiness community to help reduce the cost of procurement and support activity — for both the participating nations and national industries.

This work has its origins in the early 2000s, when it became clear that international military aircraft projects were being managed in a variety of different ways. Each nation had developed its own sovereign regulations or laws governing military aviation, often informed by lessons learned from the national perspective, and there seemed little appetite to change. However, as defence spending reduced, the cost of these international programmes came increasingly under the spotlight. It was in this context that the UK championed a proposal

to harmonise military airworthiness arrangements across Europe. This gathered broad support and work was initiated formally by the 26 participating member states (pMS) of the European Defence Agency (EDA) who, on 10 November 2008, agreed to the formation of the Military Airworthiness Authorities (MAWA) Forum. In addition to the pMS, observers from the AeroSpace and Defence Industries Association of Europe (ASD), the European Aviation Safety Agency (EASA) and other interested organisations were invited to participate in the MAWA Forum.

The Forum was tasked to harmonise military airworthiness requirements across Europe. To achieve this goal, the pMS set down a Ministerially-approved roadmap of objectives in a Basic Framework Document (BFD). The objectives were to achieve:

- Common regulatory framework
- Common certification processes
- Common approach to organisational approvals
- Common certification/design codes
- Common approach to preservation of airworthiness
- Arrangements for mutual recognition



IT ALSO BENEFITS INDUSTRY, IN THE SENSE THAT ONLY ONE ORGANISATIONAL APPROVAL OR MILITARY TYPE CERTIFICATE MAY NEED TO BE HELD OR DEVELOPED FOR A PARTICULAR AIRCRAFT BEING OPERATED BY SEVERAL NATIONS

Airbus Defence and Space A400M Atlas. The UK, France and Spain are already taking steps to harmonise A400M continuing airworthiness assurance.

- Formation of a European Military Joint Airworthiness Authorities Organisation (EMJAAO)

The concept of the EMJAAO was that the pMS would come together as a club of 'like-minded' nations, comparable to the original Joint Aviation Authorities's approach within civil aviation. There was no intention to create a central or over-arching regulator. Indeed, from a sovereignty perspective this would have been wholly inappropriate. Hence the EMJAAO would fulfill a co-ordinating function under the auspices of the EDA, a role now better articulated by the new description of the proposed organisation as the Permanent Military Airworthiness Co-ordination Cell.

HARMONISATION

10%

COST SAVINGS
DURING
DEVELOPMENT

50%

REDUCTION IN
PROGRAMME
DURATION
(EDA)

Military airworthiness framework

To achieve the BFD objectives, the MAWA Forum elected to draw heavily upon the civil regulatory framework created by EASA. This provided the model on which the harmonised European Military Airworthiness Requirements (EMARs) would be based. In this way EMARs would be as military as necessary but as civil as practicable. The nomenclature for the EASA airworthiness model has been retained, hence the EMAR framework comprises:

- EMAR 21 — Certification of Military Aircraft and Related Products, Parts and Appliances, and Design and Production Organisations
- EMAR M — Requirements for Continuing Airworthiness Organisations
- EMAR 145 — Requirements for Maintenance Organisations
- EMAR 66 — Military Aircraft Maintenance Licensing
- EMAR 147 — Aircraft Maintenance Training Organisations

The drafting of EMARs has been undertaken by four Task Forces (primarily made up of Subject Matter Experts from the pMS), two of which have been chaired by the UK.

In addition a handbook was constructed, initially based on the US MIL-HDBK-516 — Airworthiness Certification Criteria, to address the objective of common certification and design codes. The new European Military Aircraft Certification Criteria (EMACC) handbook contains harmonised certification criteria developed to address European requirements. Against each of these harmonised criteria, the relevant US and European airworthiness requirements from the military and civil domains have been identified, covering manned and unmanned, fixed and rotary wing aircraft. The intention is that the EMACC handbook will be used to build a tailored set of certification criteria for the procurement, or major change, of a specific aircraft type, for example, a manned large aircraft, that will then allow detailed airworthiness requirements to be determined.

Within the UK, military airworthiness requirements will continue to be drawn from Def Stan 00-970 — Design and Airworthiness Requirements for Service Aircraft, which has evolved from its first formal appearance in February 1918 as the *Handbook of Aircraft Strength Calculations*. The MAA is now re-writing and re-structuring the Def Stan to separate out those requirements that are military specific and those that are the same as civil standards; where appropriate, the civil standards will simply be sign-posted, not duplicated. The first element of the Def Stan to be re-written in this

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way (Part 5 — Large Fixed Wing Aircraft) has been published. The remainder of this task is a significant body of work that is likely to take up to four years to complete.

EMAR implementation

Once approved by the MAWA Forum, the intent is for National Military Airworthiness Authorities (NMAAs) of the pMS to implement the EMARs (in part or in full) into national regulations, thereby maintaining sovereignty but driving towards the goal of a harmonised approach to airworthiness. With a common regulatory baseline, the pMS will be able to co-operate more easily and fully with each other in both Type (or Initial/Continued) and Continuing Airworthiness for collaborative projects, such as Airbus A400M, or where one pMS is buying a product from another.

Since the BFD roadmap was issued in 2009 much progress has been made by the pMS to develop the EMARs. As the work of the Task Forces has come to fruition, the pMS have been consulted on the content of the draft EMARs. These have then been approved by the MAWA Forum for implementation. To date, the EMACC handbook and EMARs 21, 145, 66 and 147 have all been approved¹, along with accompanying Acceptable Means of Compliance and Guidance Material. EMAR M remains under development and is likely to be approved by the MAWA Forum in late 2015. With approval of the EMARs, work has been undertaken by the pMS to consider implementation into national regulation, either by adopting the requirement directly or by claiming compliance based on the national approach that has been taken. To support this work, several pMS, typically those with more mature NMAAs, have formed the EMAR Implementation Group to both share experiences of integrating the EMARs into their national regulations and to provide a forum for encouraging, guiding and sustaining the momentum for the implementation of EMARs.

Within the UK, EMAR 145 is already encompassed in the Continuing Airworthiness Engineering series of the MAA Regulatory Publications (MRP), as MRP Part 145, and has replaced the UK's previous approach to Maintenance Organisation Approvals that was set down in Def Stan 05-130. Known as the Maintenance Approved Organisation Scheme, there are currently 34 Approved Maintenance Organisations across 64 sites in the Defence Aviation Environment (DAE).

Although EMAR M is not yet approved by the MAWA Forum, the UK has already published its own approach to the requirements likely to be contained in the draft being developed. These requirements were implemented to allow the MAA to address



Implementation of EMAR 21 offers the potential to reduce time and cost of Eurofighter Typhoon upgrades.

key recommendations from the *Nimrod Review* to improve Continuing Airworthiness Management of individual aircraft across the RN, Army and RAF fleets. The MRP Part M regulations were published in June 2012 and have led to the establishment of some 42 Continuing Airworthiness Management Organisations, 17 of which have so far been approved. The MAA is using the experience of this work to inform the development of EMAR M.

The next significant step for the UK will be the integration of EMAR 21 into the MRP. The development work is currently underway and will lead to formal consultation and engagement with MoD stakeholders and industry at the end of the first quarter of 2015. Among other important changes, a review of current regulation on Military Type Certification and the UK's Design Approved Organisation Scheme (which has been in place since 1928 and currently has 92 Design Approved Organisations across the DAE) will be included in this work.

Work is also underway, in conjunction with stakeholders, including industry partners, on the approach to be taken to address the intent of EMARs 66 and 147. Licensing of military and civilian technicians undertaking military aircraft maintenance, and approval of the associated technician training organisations, represents a natural evolution of the MAA's regulatory work to date, and would further enhance the delivery of Continuing Airworthiness. However, implementation of these requirements in the UK needs to be framed carefully to recognise existing military trade structures and current military technician training policies, and to minimise any associated



administrative activity. Implementation planning must also take account of the way in which EASA might adjust its training requirements for technicians undertaking civil aircraft maintenance in the future. The MAA's approach is likely to be defined by mid-2015 and all stakeholders will be consulted fully. In this training and licensing domain, the early indications are that benefits are more likely to be realised in collaborative projects where significant leverage is available through pooling of spares, underpinned by nations' confidence in the competence and training of each other's maintenance technicians.

Towards recognition

Based on the foundation provided by harmonising airworthiness requirements and driving towards a common regulatory baseline across the EDA pMS, the MAWA Forum has developed an approach to determining whether NMAAs in themselves work in an acceptable and recognisable manner. This work, which can lead to pMS recognising formally the acceptability of other NMAAs, has been approved and published as the European Military Airworthiness Document Recognition (EMAD R). To help standardise the process, the document contains the Military Authorities' Recognition Questionsets (MARQ) to assist NMAAs going through Recognition to explain their regulatory approach. This is made up of four subsets of questions based on the ICAO's airworthiness safety goals².

The benefits that can accrue from recognition revolve around the potential for one NMAA to use

artefacts (such as Organisational Approvals or Military Type Certificates) that have been granted by another NMAA and, thereby, reduce or avoid the need for duplicating the work. Not only does this benefit the NMAA but also industry, in the sense that only one Organisational Approval or Military Type Certificate may need to be held or developed for a particular aircraft being operated by several nations. Since EMAR 145 has been approved, the UK, France and Spain have implemented the EMAR into their national regulations and have engaged in recognition activity in the scope of Continuing Airworthiness assurance to support the A400M programme. This will lead in due course to the NMAAs being able to adopt Maintenance Organisation Approvals granted by another nation, either in full or with limited further checking.

Although less advanced, the implementation of EMAR 21, coupled with recognition, offers the potential to considerably reduce time and cost in the certification of modifications on Eurofighter Typhoon. Early work to address the use of Design Organisation Privileges is underway to allow, for example, Eurofighter partner companies (once approved) to self-certify the design of minor modifications and repairs. The UK has already put regulations in place to facilitate this ahead of the full UK implementation of the EMAR. Realisation of the full scope of the benefits from this work is dependent on recognition covering Type Airworthiness assurance between the UK, Germany, Italy and Spain being completed, as well as all the nations addressing EMAR implementation. Plans are being developed to achieve the recognition component of this challenge before the end of 2015 but the individual national challenges of implementing EMAR 21 into regulation are likely to be considerable due to the broad nature of this particular set of requirements.

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Certificate of Recognition from US Technical Airworthiness Authorities



MAA

Recognition further afield

The UK is in a unique position as it is the only nation to be a participating member of the EDA MAWA Forum, the NATO Airworthiness Committee and the Air and Space Interoperability Council (ASIC), the latter being a military community comprising the UK, US, Canada, Australia and New Zealand. Having led on the development of EMAD R within Europe, the UK has been able to take the idea of recognition to both ASIC and NATO, where the benefits of adopting such an approach have been acknowledged clearly. For the Technical Airworthiness Authorities (TAAs) of the US Army, Navy and Air Force, recognition helps them to comply with US DoD policy that requires them to assure the airworthiness of foreign-owned or foreign-leased aircraft that their personnel fly in. For the UK and other ASIC nations the benefit lies in



Recognition of US TAAs paves the way for more efficient procurement of US block upgrades — such as the Boeing AH-64E Apache Guardian.

potentially being able to use the military certification and Type Airworthiness artefacts produced for aircraft that are being procured from the US. Although NATO's approach to implementing its airworthiness policy is still evolving, it seems likely that it will wish to be assured of the airworthiness of aircraft being operated under its banner directly and, potentially, as part of a NATO operation; recognition will help build confidence in these areas. Unlike with the EDA MAWA pMS, there is not a common regulatory baseline developed from the EMARs on which recognition within ASIC and NATO can be founded, but nonetheless the use of the EMAD R process provides sound evidence on which to determine the acceptability of the respective NMAA.

Having embraced the European approach, the US National Airworthiness Council (NAC)³ has now developed its own detailed procedures based on EMAD R and agreed that recognition of other nations will typically be carried out by a lead TAA. The UK MAA has recently been recognised by the USAF TAA, taking the lead on behalf of the Army and Navy. In parallel, the MAA has completed its own recognition of the US Army, Navy and Air Force TAAs, with work carried out independently due to the different airworthiness regulations and processes that each uses. Through this recognition work, the UK MAA has been able to look in detail at how each of the US TAAs works, identifying the processes that they use for certification and mapping the outputs (the artefacts) to the UK military certification process. This provides the potential for the UK to obtain these artefacts and use them as evidence of compliance for certification of new aircraft or upgrades procured from the US, where the underlying airworthiness requirements are acceptable to the UK and there is no significant difference in the planned usage or operating environment. While this will not remove the need to

Further information can be found at www.gov.uk/maa

address differences in UK configuration, inherent shortfalls in the US evidence or UK specific design safety requirements, the opportunity provided through this work should deliver benefits in reduced cost and time for the core certification activity. Future work on C-17, C-130J, Rivet Joint, Lightning II, Chinook and Apache will allow this potential to be tested.

Summary

Since the goal of harmonising airworthiness requirements across Europe was set down in 2008 much has been achieved, with all but one of the EMARs approved by the EDA MAWA Forum, and the last scheduled to be approved by the end of 2015. This will deliver a common baseline for the EDA pMS to use in the development and modification of their national airworthiness regulations, and pave the way for recognition among the NMAAs to leverage the potential benefits that this harmonised approach offers. A recent EDA pamphlet noted that cost savings in the order of 10% for industry and government could be realised by using harmonised certification procedures for the development phase of multinational military aircraft projects, along with up to 50% reduction in programme duration. This is a prize that is worth striving for.

Outside of Europe, the benefits of recognition between NMAAs have been embraced by the ASIC and NATO communities, although without the advantage of a common regulatory baseline on which to build. From a national perspective, the recent recognition of the US Army, Navy and Air Force TAAs by the UK MAA paves the way for more efficient procurement of US-sourced aircraft and major changes, for example, baseline or block upgrades. While this needs to be stepped through carefully to ensure we do not lose focus on the important aspects of UK airworthiness requirements, there is clear potential to deliver benefit through this route.

There is still much to do in the realm of military airworthiness, but the work that the UK MAA has been involved in across Europe and beyond offers the opportunity to deliver tangible benefits and the promise of a much better understanding between nations of the importance of managing the airworthiness of military aircraft and working together to improve air safety.

REFERENCES

1. Full details can be found on the EDA website at <http://www.eda.europa.eu/certification/mawa-documents>.
2. ICAO Document 9760 Airworthiness Manual.
3. The NAC comprises the Technical Airworthiness Authorities of the US Army, US Navy, USAF, US Coastguard, Department for Homeland Security, NASA and FAA.