EUROCONTROL contribution to the 3-Agency framework on Performance-Based Certification

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Abstract
This document has been drafted as the CMAC contribution to the 3-Agency (EUROCONTROL, EDA, NATO) cooperation programme on performance-based certification/equivalent performance. It provides some options for defining a concept of performance-based certification which could be applied to military airborne ATM/CNS systems with a view to their certification by the competent authority.

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EXECUTIVE SUMMARY

This document has been drafted as the CMAC contribution to the 3-Agency (EUROCONTROL, EDA, NATO) cooperation programme on performance-based certification/equivalent performance.

It provides some options for defining a concept of performance-based certification which could be applied to military airborne ATM/CNS systems with a view to their certification by the competent authority.

It cannot be used as a stand-alone document, rather it must be considered in the wider context of seeking mutual recognition of military certification between military authorities and beyond, if necessary.

The proposals described in this document are a follow-up to the EUROCONTROL “White paper on performance-based certification of military airborne systems to meet civil ATM/CNS requirements”. These proposals take into account the outcomes from this white paper and apply them to the certification environment of the military certification authorities.

The document extensively discusses the notion of “proportionality”, but EUROCONTROL does not provide final legal advice on this matter, allowing States to make their own national legal analyses of this complex notion, originating in EU laws outside the field of aviation.

Proportionality provides the leverage to allow regulatory and certification authorities some flexibility in the application of the civil aviation certification framework. But this flexibility has limits which pose new problems to the certification authorities when applying performance-based certification.

Nevertheless, efficient performance-based certification is bound by performance-based rules and standards. That is why such rules and standards must remain the first port of call when regular certification is not achievable. It is not recommended to apply alternate solutions if the rules and standards route can be successful.

However, if this route does not offer acceptable outcomes, there may be other possible strategies. This document does not claim to be an exhaustive summary of all potential solutions: a high-level description of just two of them is set out here.

Finally, these solutions can be demonstrated to be workable only if they are validated in an actual real-life case.
1. Introduction

This document is a follow-up to the approved “White paper on Performance-based certification of military airborne systems to meet civil ATM/CNS requirements” (2013).

It is designed to complement this White Paper by discussing more concretely implementation of the performance-based certification (PBC) concept.

The goal of aviation regulations and processes is to ensure safe operations for all airspace users and third parties.

In a very challenging and evolving technological environment, aviation authorities have been setting up an efficient and effective collaborative system which is allowing safe operations through standardized capabilities and interoperability, along with a strong oversight methodology which includes all the actors of aviation, from design to operations.

To be allowed to operate within certain airspace, aircraft are required to meet standardized individual performances and to be able to dialogue with the other relevant actors. This will be even more important in the coming net-centric operational environment being built in the context of Single European Sky (SES) / Single European Sky ATM Research (SESAR).

Besides the information-sharing capabilities, regulations supporting the expected standardized performances have often focused on mandatory equipage and/or system architecture to ensure safe implementation of the performance requirements. Such a way of implementing operational capabilities has the result of excluding systems which are not compliant with the pre-defined target equipage and/or the system architecture but which could meet the standardized performances with another equipage and/or system architecture (Figure 1).

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**Figure 1**
Since collaborative decision-making processes for defining aviation regulations in Europe were not sufficiently mature to include all airspace users, some of them (often the military) had significant difficulties meeting the airspace requirements. This led to the setting-up of a system of exemptions and/or derogations, placing an extra burden on the entire operational chain (both civil and military) in order to meet safety targets despite discrepancies in approved capabilities.

With the evolution of military operations and the expansion of civil aviation, military systems increasingly have to operate in any airspace, including in a mixed environment context, and therefore must meet the common ATM/CNS requirements. Because it is hampering the performance of the entire network, the use of exemptions and/or derogations has to be minimized as traffic increases.

This paradox today has been understood by many actors in aviation and is starting to be resolved for the new operational capabilities through the implementation of emerging performance-based standards. But there is no plan to switch “legacy” operational capabilities to such performance-based standards, even though they form the baseline of the Single European Sky.

It is time to start changing the paradigm when specific systems meet the performance, safety and interoperability requirements but are excluded because they cannot be certified. The new paradigm we are referring to is “performance-based certification”.

The technical objective of this document is to discuss the legitimate access of military aircraft to common non-segregated airspace volumes relying on systems which meet the performance requirements and which do not hinder the safety level associated with that airspace and to support mutual recognition of certificates from different certification environments.

Performance-based certification must not lower certification standards, rather it must deliver better requirements on the basis of a performance-based approach which would benefit all airspace users.

Because of the variety of national military certification regulations, processes and certification authorities involved, this document does not define a performance-based certification framework, but is designed to discuss how performance-based certification might be implemented, bearing in mind that this is only one vision among many others.

It provides some insight on the matter to aviation authorities which are open to the concept of performance-based certification.

It is important to emphasize that the choice of certification methods is a sovereign matter for States, and that some of the features in that document might not be acceptable under certain national regulations and for some aviation authorities.

This document also supports the 3-Agency effort to create a harmonized aviation certification framework for CNS/ATM systems with the objective of facilitating mutual recognition of certificates.
2. Summary of the main outcomes from the “White paper on Performance-based certification of military airborne systems to meet civil ATM/CNS requirements”.

2.1 Definitions

**State aircraft**

“State aircraft” is an international term designating “aircraft used in military, customs and police services”. Moreover, “the contracting States undertake, when issuing regulations for their state aircraft, that they will have due regard for the safety of navigation of civil aircraft”.

**Definition of performance in this document**

In this document, performance means “the manner in which a system reacts or fulfils its intended purpose”. In contrast to the current practice with new ATM regulation, the term does not refer to financial efficiency.

The focus is placed on technical performance, which must be understood in a wide sense.

Technical performance includes (non-exhaustive list):

- functionality
- accuracy
- integrity
- continuity
- availability
- latency
- safety targets
- security

Note that performance must be complemented by interoperability to meet the safety targets/levels.

Performance-based certification is an process (an alternative to the existing comprehensive, legal and certification environment) which consists in checking that a system meets the technical performance requirements deriving from a regulation, with the possibility of meeting some of the requirements by other means while ensuring that the safety levels are equal to or better than the required safety objective and making explicit the set of requirements the system is certified against and the mitigation measures taken.

2.2 Principles of the performance-based certification concept

1- Safety is at the heart of the performance-based certification concept.

2- The competent certification authority is the national military aviation authority or another

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1 Chicago Convention, Article 3 Section (b)
2 Chicago Convention, Article 3 Section (d)
body mandated by the military.

3- The concept of performance-based certification is designed to focus on the technical performance of the system rather than its architecture or components, and is thus intended to define tailored means of compliance in support of the certification activity.

### 2.3 Conditions for proper use of performance-based certification

Performance-based certification is designed to be a substitute certification process in cases where conventional certification cannot be achieved or there is an advantage in not using it.

Some conditions need to be met for proper and reliable use of performance-based certification.

1- The labels and certificates issued by the certification authority using performance-based certification must provide at least the same level of confidence as those issued using different certification techniques.

2- The environment for maintenance of performance-based certification should be as reliable as that referred to in the EASA implementing rules and FAA FARs or similar certification environments.

3- Using performance-based certification does not create a specific environment for certification

4- Performance-based certification must be supported by appropriate safety cases.

   ➔ The safety cases which support the initial set of requirements must be assessed.

5- Performance-based certification requirements must be grouped in a specific functional requirements document when deviating from the initial set of requirements

   ➔ Identification of the deviations

6- Restricted information on technical components or functions must be assessed with a view to minimising the provision of such information.
3. Implementation of the performance-based certification concept

3.1 General

Performance cannot be disconnected from interoperability. Performance-based certification must also ensure that full interoperability is maintained within the context of the infrastructure operated by the airspace users and service providers just like in the ICAO performance-based context. In the new ICAO performance context\(^3\), where the operational requirements and the performance of a system are not based on technological dependencies, the underlying assumption is compliance of the system with the prescribed interoperability standards.

The first step is to consider the need for the operational capability on the basis of a broad assessment of the system itself, the intended missions and the operational environment. Only if there is a decision to implement an operational capability can the technical work start.

It is assumed here that certification is part of the technical work. Nonetheless, it is worth mentioning that other factors often contribute to an operational capability, such as training and certification of the aircrew or the ground personnel.

Performance-based certification may not always be appropriate for addressing an operational capability. It is anticipated that sometimes it will be more advantageous to fit certified systems instead of certifying other systems even though they meet the required performance. Prior to choosing any option, a cost/benefit analysis must be performed to support the option which will provide the most efficient operational capability.

Performance-based certification is made up of so many different aspects that a single methodology will most likely not be suitable for resolving all potential cases.

The methodology which is proposed in this document is one of many. Other methodologies will have to be developed, each tailored to a specific need.

![Figure 2](image)

Finally, technical performance has to be met at all times for each of the specification parameters. For example, navigation is not only reaching with a given accuracy point B when starting from point A, but also meeting the expected accuracy at any point between A and B, for straight or turning trajectories. This might exclude some systems which do not use the same formulas or algorithms.

\(^3\) ICAO is moving towards a performance-based context but it is still not approved or generalized (yellow document for PBCS for example) and certain future SES capabilities might be implemented using the former ICAO framework.
to calculate routes (e.g. Error! Reference source not found.4 loxodromy vs orthodromy).

The certification environment

The certification environment (Figure 1) is depicted functionally below using a five-ring display.

![Figure 1](https://commons.wikimedia.org/wiki/File:Loxodromie2.png#/media/File:Loxodromie2.png)

**Figure 1**

The certification of military systems is no different from that of civil systems. It follows the same strict rules and requires a legal framework supporting the actions of the certification authority.

The certification requirements are the basis for certification. The documented certification processes ensure that the certification is performed according to the expected standards and the certificates, labels and privileges are the outcome of the certification processes applied to a system (or individuals). In aviation, the certification environment is the cornerstone for the performance and interoperability of the certified systems.

Authority and the legal framework

As explained in principle #2, this document does not challenge the authority, the legal framework defining the role and responsibilities of the authority, or global requirements for airworthiness.

The certification requirements

In the EASA framework, the certification requirements for civil ATM/CNS systems are made up of three elements:

- The Implementing Rules (IR), which are binding
- The Parts which are not binding and encompass
  - the certification specifications (CS)
  - the acceptable means of compliance (AMC) and alternative means of compliance5

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The guidance material (GM)

- ‘Certification Specifications’ (CS) mean technical standards adopted by the Agency, indicating means to show compliance with Regulation (EC) No 216/2008 (aka the EASA Basic Regulation) and its Implementing Rules and which can be used by an organisation for the purpose of certification.


- ‘Alternative means of compliance’ are those means that propose an alternative to an existing Acceptable Means of Compliance or those that propose new means to establish compliance with Regulation (EC) No 216/2008 and its Implementing Rules for which no associated AMC have been adopted by the Agency.

**Difference between binding and non-binding elements**

- The binding elements should only describe what is to be achieved (in terms of performance, interoperability and safety levels)

- The non-binding elements describe how to achieve the binding elements. As they are non-binding, any means that meet the binding elements are acceptable, as long as they are properly demonstrated and safe.

This clean separation between the binding and the non-binding (i.e. the “what” and the “how”) is a prerequisite to a fair application of that framework.

Even when not deemed binding for military systems, the civil binding elements nonetheless remain the basis for certification against ATM/CNS operational approvals.

**The issue with legacy operational capability regulations**

Prior to the setting-up of the EASA framework and the understanding that regulation must not be an obstacle to emerging technologies, binding and non-binding material were often mixed up in regulatory documents, such as the JAA documents. With those documents, there was no clear distinction between the binding and the non-binding elements, leading to situations in which aircraft compliant with the required performance, interoperability and safety level could not be certified (e.g. RVSM for some military aircraft). It is assumed that the aircraft system complies with appropriate interoperability standards prior to assessing compliance with a performance specification.

What could be seen today as a flaw has spread across the entire aviation regulatory framework, including ICAO documents.

Unlike in the new ICAO performance context, all the current SARPS, documents and guidance material are not in line with the EASA framework and the industry-driven approach.

Some work has been done to transpose these legacy ATM/CNS regulations and standards into the

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5 **ARO.GEN.120 Means of compliance** The competent authority shall establish a system to consistently evaluate that all alternative means of compliance used by itself or by organisations and persons under its oversight allow the establishment of compliance with Regulation (EC) No 216/2008 and its Implementing Rules.
EASA framework (e.g. CS-ACNS), but the need for consistency with ICAO documents compromised the openness of the industry-driven approach and, although redrafted, clean separation between the “what” and the “how” has not been achieved.

Because the architecture of military aircraft is often very different from that of civil airliners, many requirements are prejudicial to the certification of the operational capabilities of military aircraft although safety, performance and interoperability requirements, which were initially at the heart of the objective of certification, are met.

Certification processes and certificates, labels and privileges

Because of conditions #1 and #2, military authorities are assumed to be as reliable as civil authorities. Therefore, the legal framework should be in place and active, along with the appropriate processes and certificates. In this context, there is no need or no requirement for modifying that part of the certification environment of the military authorities.

Because of condition #3, performance-based certification does not create a specific environment for certification. That is why in Figure 2, the authority and the legal framework are both coloured in red to show that they will not be modified by performance-based certification.

Figure 2

Conclusion:

In Figure 2, the aspects identified in the red-coloured circles will not be modified in the performance-based certification.

Having identified that there is sometimes no clean separation between the “what” and the “how” in certification requirements, it is envisaged to take action to improve that situation to allow the certification of systems which meet the safety level, performance and interoperability requirements, but which are currently non-certifiable because of that intrinsic flaw in some part of the civil
regulation.
The objective is to propose modifications to build a reliable framework which allows a clean separation between the “what” and the “how” of current certification requirements, without degrading the overall safety levels in airspace, to support the performance-based certification of military aircraft systems.

3.2 The notion of proportionality

Discussion on proportionality

From recital (24) of Regulation (EC) No 549/2004 of the European Parliament and of the Council of 10 March 2004 laying down the framework for the creation of the single European sky (the framework Regulation), the principle of proportionality is applied when a regulation “does not go beyond what is necessary in order to achieve this objective”.

As stated in the Proposal for a Regulation Of The European Parliament and of the Council on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and repealing Regulation (EC) No 216/2008 of the European Parliament and of the Council, proportionality is one of the primary objectives of the present initiative (…ensuring safe, secure and environmentally friendly air transport for passengers and the general public), and measures aimed at making the current regulatory framework for aviation safety more proportional are an integral element of the final package of policy measures proposed⁶

To address the essence of this principle of proportionality, and to discuss the details of how to apply proportionality in the context of performance-based certification supporting civil-military interoperability, it is interesting to have a closer look at how the EU is dealing with the principle of mutual recognition when providing an “equivalent level of protection of the various legitimate interests involved”; indeed, this objective is very similar to the objective of the military aviation authorities in the domain of aviation safety, seeking mutual recognition of their equivalence of performance.

In EC communication 2003/C 265/02:

- “a technical rule means a technical specification which defines the characteristics required of a product, such as its composition (quality level or fitness for use, performance, safety, dimensions, markings, symbols, etc.), its presentation (the name under which the product is sold, its packaging, its labelling) or testing and test methods within the framework of conformity assessment procedures, which is obligatory, in fact or in law, to market or use the product in the Member State of destination.”

- the “proportionality of the application of technical rules” is defined as “for the application of a technical rule to a product to be proportionate, it must be both necessary and adequate”:
  - Necessary implies that “the technical rule must be based primarily on relevant technical or scientific features”

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⁷ Commission interpretative communication on facilitating the access of products to the markets of other Member States: the practical application of mutual recognition (2003/C 265/02)
“The application of a technical rule will be deemed not to be adequate if the requirements it is intended to protect can be protected equally effectively by less restrictive measures. In this context, it is necessary to assess the protection provided by alternative measures”

- “Consequently, the competent authority will be obliged to eliminate, on its own initiative, any technical rules which are not proportionate”

This communication states (in a non-aviation context) that, if a rule is either unnecessary or inadequate, it shall be eliminated from the conformity assessment (process similar to certification). The “adequacy” of the rule has been added to the initial “necessary” dimension to fully address the required proportionality.

In the aviation context, it is of course not acceptable to certify a product which would not meet the safety, performance or interoperability requirements. But this communication provides insight on proportionality and its components, the “necessary” or “adequate” requirements.

Note: Performance-based certification is sometimes substituted by “equivalence of performance”, particularly in other Agencies like NATO. The word “equally”, in the EC communication, demonstrates the similarities between the two concepts but it is mostly linked to “adequate”. The term “performance-based certification” will be preferred here because proportionality includes both “necessary” and “adequate/equivalent”

How to qualify requirements as “non-proportionate” in aviation?

Only the requirements related to the “what” can be binding.

The “how” requirements are non-binding because the industry must be given the opportunity to provide smarter, cheaper solutions to a binding requirement.

In the following, it is assumed that a requirement which is either unnecessary or inadequate (in the sense that it does not respect the clean separation between the “what” and the “how”) is deemed as “non-proportionate”.

Current certification in aviation postulates that the rule is fair and universal, i.e. the rule is composed of adequate and necessary requirements. It makes those requirements consubstantial to the certified system to meet the safety and interoperability objectives.

But the application of the proportionality concept demonstrated that this postulate can be challenged for some legacy rules. For, if this concept were fairly applied, systems which meet the performance and interoperability requirements could not be denied certification.

Many legacy rules contain non-proportionate requirements, which prevent some systems from being certified. This proves that the proportionality concept is not always applied.

- A proportionate requirement is a requirement which allows any interoperable system meeting the performance and the safety levels to be certified according to the current certification processes.

- A non-proportionate requirement does not meet those criteria.

The proportionality of a requirement is assessed by checking its ‘adequate’ and ‘necessary’ characteristics (see Figure 3).
The description of the system architecture within the rule itself is a very common non-proportionate requirement. Most of the time, putting the system architecture within the rule — although it should be acceptable only at AMC level — arises from a confusion between the objective to be reached and the means of achieving it while writing the rule, or because the regulations were composed of both the “what” and the how” without applying the currently acknowledged clean separation between them.

Unfortunately, when transposed to a more modern regulatory framework, this confusion remained in most cases.

For example, a regulatory requirement imposing redundancy for a measurement or its display may have as an initial objective the integrity of that measurement or its display. But redundancy of a sub-system is only one way of achieving integrity. Other methods may exist.

Let’s take the example of RVSM, which provides for a typical non-proportionate requirement.

**SPA.RVSM.110 RVSM equipment requirements**

_Aircraft used for operations in RVSM airspace shall be equipped with:

(a) two independent altitude measurement systems;

....

If the safety objective sought is the integrity of the altitude measurement, item (a) “two independent altitude measurement systems” would be more accurately replaced by “an altitude measurement architecture designed to provide the crew with a continuous assessment of the level of integrity of the pressure altitude measurement” to provide a proportionate requirement.
It is clear that the new text implies the previous one: redundancy is a specific means of achieving the integrity of altitude measurement. This rewriting of the requirement does not downgrade the safety objective; it just brings additional opportunities in defining the architecture of the barometric system, while opening the door to certification, which is not possible today with the current text.

### 3.3 Alternatives for the implementation of PBC

**Adaptability of the requirements in the current certification system**

The current certification framework promotes the idea of adaptability, mostly at AMC level. Published AMC facilitate relations between the applicant and the certifying authority by proposing an accepted solution to comply with the requirements.

AMC are non-binding, such as certification specifications (CS). In aviation, the line drawn between binding and non-binding material lies between the IR and the CS. A CS could therefore be rightfully challenged, but in theory the IR may not.

The question of non-proportionality must nonetheless be raised when the issue lies at IR level. Such a situation may also arise when requirements are extracted from an ICAO document which is not performance-based oriented.

It is claimed here that even IR requirements can be challenged as pictured in Figure 4. Again, the conditions must be defined in a rigorous framework and such a claim will have to be extensively documented.

![Figure 4](image)

This way of implementing performance-based certification opens the door to the applicant modifying any non-proportionate requirements.

It is well understood that, when applied at IR level, such a privilege must be implemented with the greatest rigour, because it breaks the taboo of untouchable regulation and opens the door when wrongly used to huge infringements of safety levels.

As set out in Figure 4, performance-based certification can be implemented at IR or CS/AMC level.
3.3.1 Implementation at IR level: Transposition of “non-proportionate” requirements to support performance-based certification

Depending on each state, the authority responsible for military system certification is given the legal power to perform its duties. As an authority, it only has to refer to its own hierarchy and legal framework.

Such authorities are not seeking formal mutual recognition of their certificates from a civil authority.

Nonetheless, the military authority will discharge its responsibilities so that its certification environment is as reliable as that referred to in the EASA implementing rules, FAA FARs when applicable or similar certification environments.

The current civil certification environment is sometimes not open to alternative solutions only because of how the rules are written down. This closes the door to any performance-based solutions, but the principles developed in the EU communication on mutual recognition potentially provide grounds for developing an adequate certification solution.

Applying this to the specific case of the military certification of military systems against civil aviation rules, one of the main outcomes might be that, if an alternative measure (at the level of the requirement, not of the CS or AMC) provides the same level of protection of a technical rule, then it is legitimate to substitute it with another technical rule which is fully compatible with the safety case of the initial technical rule.

This should be the starting point for a performance-based certification methodology.

The difficulty of that methodology is determining the initial high-level objective to be met before it has been translated into a non-proportionate requirement.

A thorough study of the safety cases may provide very useful information, and a deep analysis of all the other requirements is helpful.

It must be borne in mind that both the safety and functionality of the system have to be maintained.

The first measure to address the issue at the level of the IR is to contact EASA to advise them that the IR is not performance-based, proposing an adequate solution to resolve the problem. If EASA does not take action vis-à-vis the European Commission to request a change in the current IR, then the competent authority may envisage certifying against the candidate IR.

This type of performance-based certification extends the privileges of applicants by authorising them to modify some of the requirements – even at the level of the rule itself – under very strict conditions and with a methodology that ensures transparency and safety.

This is acceptable only for non-proportionate requirements and if fully documented.

The binding technical rules are laid down by the implementing rules or documents of the same regulatory level.

This approach implies that the system is not certified against the official IR, but against a substituting IR. The legal consequences have to be thoroughly assessed nationally before any implementation.

Backwards compatibility

“Backwards compatibility” in the field of performance-based certification is the action of verifying that any former CS or AMC already approved is applicable against the new set of requirements.
Backwards compatibility is a necessary condition for ensuring that the new requirement is not incorrectly drafted. If backwards compatibility is broken, the new requirement cannot be used as a substitute.

**In practice, a new requirement at IR level must be compatible with any former CS/AMC** (Figure 5) and safety cases which support the former set of requirements.

*Important note: Positive backwards compatibility does not suffice to endorse a new set of requirements. It must also at least be demonstrated that the former requirement is a peculiar case of the new one.*

![Diagram of compatibility and requirements](image)

**Figure 5**

### 3.3.2 Implementation at CS/AMC level:

In the current certification framework, if the requirements at IR level are proportionate, a solution already exists through the development of alternate non-binding material, the CSs and the AMCs.

If it meets interoperability, the performance and safety level requirements, and also the **requirements from the binding material**, this alternate certification material will be acceptable for the certification process.

The development of an alternate CS and AMC must not be taken lightly, since they are an interpretation of the binding material, which is a potential source of error.

Nonetheless, the application of this methodology is widely accepted and it resolves the issue of certification for the target system.

The analysis of the system’s certification documents shows two sets of requirements, each divided into several categories:

The requirements linked to the system itself:

- Performance
The requirements linked to the environment of the system:
- Safety level
- Airworthiness
- Procedures
- Training
- ...

This document will focus on the requirements linked to the system and particularly on those listed in the CS and the AMC and assess their compliance with the "what / how" criteria.

The requirements linked to the environment of the system are usually defined in other documents or frameworks.

This particular application of performance-based certification aims first to assess the proportionality of the requirements.

The current way of certifying systems does not look kindly on a certification framework in which the rule itself is challenged. It could even be deemed inappropriate.

Today’s certification is mostly designed around audit techniques which strictly check compliance with a list of requirements. Even if those techniques open the door to a discussion with the applicant for certification, what is defined at the core of the requirements is not negotiable. Non-compliance with written requirements means no certificate.

It has been demonstrated that the proportionality of the requirements are an obstacle to the certification of systems which meet performance, interoperability and safety-level requirements only because of a confusion between the “what” and the “how” in the technical rule itself. This makes the technical rule non-proportionate, which raises the legitimacy of correcting it to meet the principle of openness to innovative industrial solutions.

It means that different requirements may be drafted and these requirements have to be validated.

A new requirement must be openly documented as the certification basis.

Definition of a process:

The European civil regulator implements performance-based CS for new operational capabilities. If successfully applied, such a positive evolution for the demonstration of compliance of (civil and military) systems has to be taken into account in the performance-based certification process to avoid unnecessary effort.

But using a performance-based certification process can only be efficient in a more global context in which a regulatory influence has been implemented upstream to avoid wherever possible the need to use a certification process somehow different from the regular process. The objective is first to use a smooth and mainstream certification process before turning to a process that requires additional work. Figure 6 describes this process.

- The regulatory influence, a preamble to applying performance-based certification processes

Influence is a legitimate action of a stakeholder to ensure that its interests are not disregarded or overlooked when compared to another stakeholder. A legitimate interest can be operational or financial.
In addition to their regular training or operational missions in European airspace, the military are performing sovereign or safety-of-life missions for their State or for civilian traffic in distress or when all ATC communications fail. To make sure that those safety-of-life missions can be performed in a way that does not hamper ATM performance, airspace regulations must take into account the specifics of the military as well as being more performance oriented. The way preparatory work on regulations and standards is organized today does not give the military the appropriate leverage to influence proceedings. This has to be improved but even in the best-case scenario, it will take time; the objective of this document is to provide short-term solutions that do not need to fundamentally review the structure of activities in the field of regulations and standards.

Experience over the last decade does not indicate any major improvements in the influence the military has on regulatory work in aviation. At the same time, only a very few regulations and standards in aviation are truly performance based.

It is acknowledged that:

- if a regulation or a standard is performance-based then it is much easier for military aviation to be certified against that certification specification and it is easier to draft regulations/standards which are consistent with performance-based regulation.
- if a regulation or a standard is not performance-based then the military must have a special channel with the regulator to explain the main problems which hinder efficient certification and indicate which non-proportionate requirements need to be changed.

EASA decision 18/2015 of 15 December 2015, in article 3(f) and 3(i), lists performance-based regulation as one of the factors to be considered when drawing up the EASA rulemaking programme. The military stakeholder can use that decision to propose a new or a modified CS if it is not performance-based.

Nonetheless, the solutions provided through this channel must be fast enough to allow military aviation authority issues to be resolved in a timeframe which is consistent with its imperatives. Those imperatives may vary, encompassing such aspects as fleet consistency, operational needs or regulatory deadlines.

If the proposed solution is not satisfactory and a different architecture or equipage meets the performance and interoperability written into the rule, the military aviation authority may use performance-based certification processes.

➢ **Performance-based certification processes in cases where the regulatory influence is not successful**

The first step is to address the non-proportionate requirements and check whether they can be substituted with other requirements without jeopardizing safety while meeting interoperability and other performance requirements. It must be noted that even this solution may require changes to the system.

This contribution identifies two potential ways of certifying the system:

- Using the EMAR 218 framework, which allows special conditions9 as described in EMAR 21 section 21.A.17A (e);
- The performance-based certification described in this document which opens the way to alternate requirements and to proceeding with certification against functional requirements documents (FRD).

If not possible, then there might be no choice other than envisaging an equipment-based retrofit to

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9 In section 21.A.16B (a), the EMAR 21 opens the way for special conditions where “adequate” or “appropriate” safety standards are not available. They are respectively similar to “adequate” and “necessary” described in this document. In 21.A.16B (b) it also points out that the level of safety must be maintained.
fully comply with the CS.

It could then be acknowledged that the system will not be certified if the costs or technical system cannot be adapted without massive changes.

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**Figure 6**

[Flowchart showing the process for Performance-Based Certification (PBC) with options for regulatory influence and performance-based certification processes.]
4. Conclusion

This document details a process for implementing performance-based certification as defined in the EUROCONTROL white paper on performance-based certification.

It is intended to be the EUROCONTROL/CMAC contribution in the framework of the 3-Agency approach on performance-based certification. Its purpose is to be a starting point for more detailed discussion with the national military certification authorities. It has not yet been verified or validated by certification authorities and should not therefore be used as it stands by any implementation programme.

The main measures identified in this document for implementing performance-based certification are as follows:

- Identify the target safety levels at IR/CS level
- Identify the interoperability requirements at IR/CS level
- Identify the performance requirements at IR/CS level
- Check the IR/CS requirements: Assess the proportionality of the requirements
  - Necessity
  - Adequacy
- Use regulatory influence channels to change the IR/CS whenever it is required.

If regulatory influence does not provide satisfactory results:

- Develop alternative requirements if requirements are inadequate or not necessary
- Check that the alternative requirements are consistent with current CS/AMC where appropriate (“ascending compatibility”)
- Validate this alternative requirement with the former or a new safety case
- Apply the regular certification processes as approved in the certification environment.

In addition, whenever an operational improvement is to be certified for an airborne military system, it is emphasized that performance alone is not enough to claim equivalence. It must be complemented by interoperability and also by checking the potential gaps created by operating such an additional system to support a given function.

Also, the amount of work and tests may not cover the operational improvement gained. Also, there is no guarantee that this process will be successful. Again, any decision to implement an operational improvement and the associated certification is a Staff decision which has both operational and budgetary consequences. This document assumes that the cost-benefit assessment has been made and is deemed positive.

Those two aspects have not been detailed in this document, but must not be overlooked.