Improve Your Knowledge (IYK)

Considerations about Standards or Airworthiness Requirements in Civil Aviation

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It seems to us at least curious for those working in the Aeronautics Community (manufacturers or operators of commercial aviation), to know the "philosophy" that guides the Authority (FAA, ANAC, etc..) in his issue of standards or requirements (FAR, RBAC, etc.), for the development of aircraft (certification) and the respective operating phase thereof (continued airworthiness). The purpose of this IYK is exactly to give a minimal idea about it.

These standards or requirements are developed by Working Groups - WG, which are also responsible for the amendments to these documents, as they arise from time to time, based on new evidences surrounding the subject.

Before being approved and incorporated in the collection of patterns of the Authority, the drafts of these standards are presented to public scrutiny of the Aeronautics comunity to express their opinions about the document.

But for these activities exist rules, and these are contained on the FAR 11 (General Rulemaking Procedure), in the case of the FAA, or RBAC 11 (Procedimentos e Normas Gerais para a Elaboração de Regras e Emendas aos Regulamentos Brasileiros da Aviação Civil), in the case of ANAC.

But it is important to make clear that the standards do not arise before the aeronautical progress, that is, they are not born before the existence of a technology on the market. The technology comes before and not seeking passage to the Authority, that is, it does not seek permission to the Authority to develop itself.

Because of that, sometimes can arise unconventional aircraft, ie, with design technology not yet forecasted in the existing standards. In such cases, paragraph 16 of the FAR 21 - Special Conditions, or paragraph RBAC 11:29 21 - Condições Especiais, gives an answer to how to proceed. The history of aviation is full of such examples (Concorde, Boeing 787, etc.).

An interesting point to be considered is the question about severity of the airworthiness standards. Here comes up the basic concept of "Security Level". It seems normal for us to admit that the authorities could be tempted to create very restrictive standards, even thinking honestly in security. But they have to be very attentive to this, because the most likely result of such attitudes could be to make practically impossible to certify a type design, for economic and technical reasons.

Therefore, it is necessary that, in these airworthiness standards, there is a balance in terms of safety between the acceptable and that which can be practiced. Whenever we enforce rules, we impose spending. Surely, the increased safety is not proportional to the severity of the rule. There is a point from which large safety spending usually produces negligible effects on this characteristic.

The rule is simple, ie, a proposed requirement should have the following features: economy (reasonably economical), practicality (technologically practicable) and appropriate for each type of aircraft.

As we know, there are various types of aircraft. For reasons of practicality, the aircraft have been grouped into several categories, each one so homogeneous as possible. Thus, we have, for example, the category of smaller aircraft (takeoff weight up to 5,670 kg - 12,500 lb) described as normal, utility, acrobatic, and commuter, whose requirements were grouped in FAR 23 (23 CFR Part 14), in the case of FAA, and RBAC 23, in the case of ANAC. Similarly, we have the category of large transport aircraft (with no weight limitation) grouped on the requirements of the Part 25 - FAA, and RBAC 25 - ANAC. The fact that the aircraft have been classified into different categories does not mean that one category is more important than another in terms of safety. Just consider, for example, that designs relating to aircraft framed in the Part 25 (RBAC 25) are more complex than those of the aircraft framed in Part 23 (RBAC 23). Therefore, the requirements may be different.

We will now present an example of the "philosophy" that guides the authority in issuing its standards or requirements.

In case of engine failure in a single-engine aircraft, the same becomes a glider. If this condition is not controllable by the pilot, in terms of safety, the engine failure "never" should happen. But an engine that never fails exists only in the imagination. This "never" is not feasible. Therefore, the aircraft must glide controlled by a pilot with medium expertise, that is, the pilot does not have to be an ace. This can be considered as a drawing of a requirement.

In its approach for landing, the aircraft must have a stalling speed (Vso) limited to 61 knots. Like other values set in requirements, the Vso was not chosen randomly. Generally, these values are the result of lessons learned in the analysis of accidents that took place in the same situation.

But the requirement present in this example does not guarantee a safe landing in all the areas where the aircraft can land. Thus, there is always the possibility of an accident. Therefore, other requirements arise, that is, more restrictions, in order to minimize the effects of an eventual accident. This is the case, for example, of the setting of the aircraft seats, which must remain in place upon impact against the ground. But here again there is a physical limit for the acceleration that can be imposed as requirement.

Thus, the range of conditions increases, according to the conditions observed during the operation phase of the aircraft, but always taking into account, we repeat, at least the practicability and the economy.

Well, our goal here was to give an idea of the "philosophy" that guides the Authority in developing its standards or requirements. There is much more to learn in the study of this regulation system of the Authority.

Thank you for your attention.

References:

- (1). **FAA:** CFR 14 Part 11, General Rulemaking Procedure, USA.
- (2). **FAA**: CFR 14 Part 23, Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category Airplanes, USA.
- (3). **FAA**: CFR 14 Part 25, Airworthiness Standards: Transport Category Airplanes, USA.
- (4). **ANAC:** RBAC 11, Procedimentos e Normas Gerais para a Elaboração de Regras e Emendas aos Regulamentos Brasileiros da Aviação Civil, Brazil.
- (5). **ANAC**: RBAC 23, Requisitos de Aeronavegabilidade: Aviões Categoria Normal, Utilidade, Acrobática e Transporte Regional. Brazil.
- (6). **ANAC**: RBAC 25, Requisitos de Aeronavegabilidade: Aviões Categoria Transporte, Brazil.