Certification in Type Design Modifications (Civil Aviation)-II

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IYK 40 – AUG 02 2013

On IYK 39, we had the opportunity to speak in general about modifications of aircraft systems and equipment. In the end, we have listed the various possibilities for modification. In this IYK, we will address each of these possibilities.

As we have said, the main possibilities of modifications are as follows:

1) introduction of a new aircraft-level function;
2) installation of an equipment or system on an aircraft, without changing functions of the same;
3) adaptation in an aircraft of an equipment or system existing in other aircraft already operating;
4) modification of a system or equipment, without adding new functions to them; and
5) modification of an aircraft in the production line.

We must keep in mind that a modification always brings a configuration change, and should therefore be an object of concern of configuration management, be of the producer, be of the user.

As we said at IYK 39, normally there are consequences in Logistic technical support, namely: maintenance manuals, spare parts, training and GSE[1].

Whatever the mode of modification, it will be necessary to ensure that an equipment inserted in a system of an aircraft will not produce adverse effects on other systems and also cannot be interfered by these systems.

All modifications on an aircraft require tests on the ground and/ or in flight.

All that will be required by the Authority.

Let's see one by one the various possibilities for modifications.

(1) Introduction of a new aircraft-level function;

This generally means to install a new system or, less frequently, some modification of the original system.

Here, the applicant has to do exactly what he did, when developing the aircraft for a type certificate; in other words, he has to develop a FHA (Function Hazard Analysis) and check the failures conditions for this new function, identifying the severity of the potential effects of loss of function, allocating to each severity the relevant safety requirements.

The concern is always with the introduction of failure conditions with severity Catastrophic, Hazardous and Major.

(2) Installation of an equipment or system on an aircraft, without changing functions of the same

We believe that this is the type of modification that occurs more frequently.

In general, it is due to a change in requirements; a need to improve performance; correct a design error; improve the reliability and to replace an obsolete equipment.

But the fact is that, in this case, the modification does not change any function at aircraft level; but failure conditions of the new system may lead the loss of the function loss to a range of probability which no longer complies with the requirement of the authority.

If, for example, the loss of the function have a catastrophic severity, and the failure condition leads to a probability greater than 10^{-9}, the goal of safety will not be reached any more.

[1] Ground Support Equipment.

(3) Installation of an equipment or system on an aircraft, without changing functions of the same

Note that we are now talking about functions at systems level, or at equipment level and not more about functions at aircraft level.

Well, if we modify a system or equipment and its functions do not change, then we just must have to check if the the probability of loss the system will remain in the range of acceptable probability.

(4) Adaptation in an aircraft of an equipment or system existing in other aircraft already operating

There are two possibilities: (a) the equipment or systems of origin will perform the same functions on the new aircraft; and (b) the function performed on the aircraft of origin is a new function for the aircraft on which they will be installed

In case (a), if the applicant can demonstrate to the Authority the similarity of the two installations, there will not more to do; just install the items and obtain approval from the authority. If the applicant cannot provide proof of similarity; he will have to proceed as if you were installing an equipment or system on an aircraft in development phase.

In case (b), he must proceed as if he were installing an equipment or a system on an aircraft under development.

(5) Modification of an aircraft in the production line.

This kind of modification also happens frequently. Means modifying the type design already certified with incorporations in the production line and on aircraft already produced, that is, in operation.

See you. Thank you

References

(1) **SAE**: ARP 4754A, Guidelines for Development of Civil Aircraft and Systems, USA, 2010.

(2) **FAA**: CFR 14 Part 21, Certification Procedures for Products, Subparts D e E. USA, 1964.

(3) **ANAC:** RBAC 21**,** Certificação de Produtos Aeronáuticos, Subpartes D e E. Emenda 01, Brasil, 2011.