Proposed Equivalent Safety Finding on CS 23.1357(b) at Amendment 3

IMA Individual Circuit Protection - Applicable to Pilatus PC-24

Introductory Note

The hereby presented Equivalent Safety Finding has been classified as an important Equivalent Safety Finding and as such shall be subject to public consultation, in accordance with EASA Management Board Decision 12/2007 dated 11 September 2007, Article 3 (2.), which states:

"*2. Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency.*"

Statement of Issue

The Pilatus PC-24 aircraft is a commuter twin turbojet with capacity for 10 or more passengers, capable of IFR operations and having a highly integrated glass avionics suite controlled from 2 central IMA units.
The CS23 rule requires that a protective device for a circuit essential to flight safety may not protect any other circuit. It is today for modern integrated systems difficult or impossible to show compliance to this rule even if the level of safety often exceed those of legacy federated system.

The FAA added the FAR 23.1357(b) in 1977 with the amendment 23-20 when only federated equipment were installed in aircraft. Safety analysis came along in 1990 with the amendment 23-41 of the FAR 23.1309. Guidance material AC-23.1309-1A had been provided 2 years later in 1992.
With the NPRM 75-23 dating back to 1975, EASA understands that the definition of an essential circuit in the FAR 23.1357(b) can only be seen as a federated essential function at the aircraft level. The intention of the rule was to avoid the loss of more than one essential function at the aircraft level when a protective device pops up or that a non-essential function in failure condition does not switch off an essential function. With this rule the regulator imposed an electrical architecture in response to a simple safety analysis. It cannot be accepted that the definition of “essential circuit” is reduced to a box (unit) that needs one power supply from the aircraft electrical bus.

Since the technology has evolved and large integration of functions is available in today’s IMA avionics, an equivalent level of safety shall be provided.

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With the Equivalent level of safety and considering the electrical power supply to the IMA units, the safety assessment shall address § 23.1357(b) – “A protective device for a circuit essential to flight safety may not be used to protect any other circuit.”

1. "Essential to flight safety" is related to those whose failure conditions are classified as “major,” “hazardous,” or “catastrophic”.

2. The applicant shall demonstrate through a design analysis that each function or combination of functions (i.e. COM-NAV) at the aircraft level is equivalent (or exceed) in safety to a federated architecture that complies with §23.1357(b).
3. The analysis reflects the design isn't subject to single point of failure or common causes.
4. The failure of each circuit breaker that powers a component of IMA cabinets shall be analyzed for their impact on aircraft safety in case of failure (i.e. including cooling fans).