EASA European Union Aviation Safety Agency	**Equivalent Safety Finding**	Doc. No.: **ESF E-12** Issue : 01 Date : 29 November 2019 Proposed ☐ Final ☒ Deadline for comments: NA

SUBJECT	:	**Starting Tests**
REQUIREMENTS incl. Amdt.	:	**CS-E 750(d) amdt. 04**
ASSOCIATED IM/AMC[1]	:	Yes☐ / No ☒ *[Delete last page of associated IM/MoC if not applicable]*
ADVISORY MATERIAL	:	

INTRODUCTORY NOTE:

The following Equivalent Safety Finding (ESF) has been classified as important and as such has been 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.*"

IDENTIFICATION OF ISSUE:

CS-E 750(d) requires that, for free power-turbine Engines for Rotorcraft, each normal start required by CS-E 750 must be made with the free power-turbine locked and subsequently followed by a run at Ground Idling Conditions for 3 minutes with the free power-turbine stationary. This is conducted in order to simulate the operation of the Engine in the Rotorcraft with the rotor system locked.

The number of completed free power-turbine locked starts declared by the applicant is significantly below the number that is required by CS-E 750(d). The CS is prescriptive and the number of locked starts that must be made is defined and testing is required.

The applicant claims that for this particular engine model, the differences between the test conditions during a free power-turbine locked start and a free power-turbine unlocked start are negligible and therefore both types of starts are comparable in terms of severity. The applicant proposes to use a combination of analysis and test data to demonstrate that sufficient confidence in the ability of the Engine to cope with the free power-turbine locked can be gained while running only a limited number of free power-turbine locked starts. The applicant's proposal is supported by applying the compensating factors described later in this ESF.

Considering all the above, the following Equivalent Safety Finding is established:

Equivalent Safety Finding to CS-E 750 (d) Amdt 4

Starting Tests

It is acceptable to only partially run the free power-turbine locked start prescribed by CS-E 750 (d) if the following compensating factors are applied:

1. The applicant shall demonstrate by analysis, supported by test data from a significant number of CS-E 750(d) locked starts, that the intent of the test prescribed by CS-E 750(d) is met if certain number of locked starts are replaced by unlocked starts. The required analysis shall assess:
    a. the mechanical and thermal loading of the affected engine components through examination of the main engine parameters affecting the severity of the test;
    b. the sealing efficiency of oil cavities achieved by the secondary air flow during the locked start;
    c. any potential new vibration excitations in the locked configuration and the expected response of the relevant engine components.
2. The applicant shall show that a full set of CS-E 750(d) test data has been successfully obtained, and compliance with the subparagraph has been demonstrated, on a comparable design. Any design differences between the engine models that may affect the conclusions of this ESF shall be described and assessed. This shall include at least the engine architecture, main engine parameters, operating conditions and design features.
3. An exhaustive examination of the service experience regarding locked starts on engines of a similar design shall be performed and shown to be acceptable to the satisfaction of EASA. Any relevant design difference between the engines that may affect this ESF shall be described and assessed. This shall include at least the engine architecture, main engine parameters, operating conditions and design features.