

Proposed alternative Means of Compliance replacing AMC to CS-E800(1)(c)(iii)
“Medium and small flocking birds”

Applicable to TP400-D6 Engine

Introductory note:

The hereby presented alternative Means of Compliance has been classified as important even if not directly addressing the airworthiness codes, environmental protection certification specifications and/or applicable Means of Compliance with Part 21 and as such shall be subject to public consultation, in accordance with EASA Management Board decision 02/04 dated 30 March 2004, 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:

AMC to CS-E800(1)(c)(iii) states:

“In the tests performed under CS-E800(d), the engine is required to produce at least 75% of test conditions power or thrust after ingestion of small and medium birds. Nevertheless, a momentary power/thrust drop below this value is acceptable but its duration should not exceed 3 seconds after the ingestion”

The engine designer proposes an alternative MoC, corresponding to a complete recovery of test conditions power, reaching 75% in 3,8 seconds, and 100% in 5 seconds.

Discussion:

The TP400-D6 Engine was subject to a Medium Bird Ingestion Test in accordance with CS-E 800 (d).

As result of the test it has been demonstrated that the Engine met the acceptance criteria of CS-E 800 (d)(2), i.e. “the ingestion must not cause more than a sustained 25% power loss and the Engine to be shut down during the test”. Actually, the Engine recovered to 100% power level in 5 seconds. Moreover, the Engine suffered no mechanical damage, did not exceed any of the Engine operating limitations, did not show immediate or subsequent loss of performance and was able to successfully perform the run-on schedule of CS-E 800 (d)(1)(iii) while producing the required power and keeping acceptable handling characteristics. The results are in accordance with the requirements of Airworthiness Code CS-E BOOK 1.

The Engine performance parameters were only slightly changed, to an extent consistent with the presence of bird debris in the compressors. Additionally, the Engine hardware was thoroughly inspected and no damage was found.

Proposed alternative MoC:

Consequently, and based on the test results, the engine designer proposes an alternative Means of Compliance to demonstrate that the 3.8 seconds recovery time to 75% of test conditions power, from the Engine Medium Bird Ingestion Test, is acceptable for the TP400-D6 to show compliance to Certification requirements of CS-E 800 (d) and CS-E 540 (b)(1):

- Power recovery to 100% of the test conditions power within 5 seconds; exceeding after 3.8 seconds the pass/fail criteria of CS-E 800 requirement which allows a sustained 25% power loss.
- The Engine not suffering any damage and being consequently capable to provide the same performance and handling characteristics up to full power after the transient loss.
- The test data showing that the Engine starts to re-accelerate no later than one second after the surge, which would allow the crew to recognize the self recovery and avoid any inappropriate crew action.
- Engine acceleration to Take Off power in normal operation in line with or better than the state of the art. During the Medium Bird Strike the Engine also demonstrated similar acceleration time to normal operation.

EASA Position:

EASA has reviewed the evolution of the rule and associated guidance material back to BCAR Section C, Issue 6 of 1966 and can confirm that no consideration of A/C performance was used when defining the limit of the 3 seconds, and that the 3 second recovery time recommendation was established from the expected time for surge recovery and consideration that a flight crew would not try to recover the surge within that time.

EASA agrees that compliance to CS-E 800(d) and compliance to CS-E 540(b)(1) can be demonstrated by applying the criteria as stated in the above mentioned alternative MoC.