Proposed Special Condition on "Soft Go Around Mode"

Applicable to Airbus A350-941

Introductory note:

The following Special Condition has been classified as an important Special Condition 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.) of 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 A350 is proposed to be equipped with a new thrust setting "Soft Go Around (Soft GA)" which is available after Go-Around (GA) initiation. This function was first introduced on A380.
When the pilot selects TOGA during an approach to initiate a go-around, the Soft GA thrust is «armed», and becomes active when thrust levers are retarded by the pilot to the MCT/FLX position. In this case, thrust levers at the MCT/FLX position command Soft GA thrust. Auto thrust (A/THR) is engaged but not active and AP/FD modes switch to Go-around mode (SRS / GA TRK or NAV).
At Thrust Reduction Altitude (LVR CLB flashing on FMA), the pilot brings back the thrust levers to CLB position and Engine Limit mode changes to "CLB" and the A/THR becomes active (to SPEED/THR CLB mode).
At any time during a Soft Go-around, TOGA thrust can still be commanded by pushing thrust levers to TOGA detent.

In case of engine failure before commencing the go-around or during go-around, use of Go around soft mode is prohibited and TOGA thrust must be commanded by manually setting the thrust levers to the TOGA detent.

Thus, there are two different thrust setting AFM procedures available to perform a Go Around, the first one for which one thrust levers push would be required (TOGA Go Around procedure), and another one for which a thrust levers push followed by a retard to MCT/FLX would be required (Soft Go Around procedure).

1- Due to these two different thrust setting procedures, there is a potential risk of piloting error, and TOGA thrust may not be achieved in case of go-around with one engine failed. Whereas this concern only emerged during A380 compliance activities, it is however potentially unsafe for twin engine aircraft like A350.

The new "Soft GA" thrust setting procedure which requires two successive actions and which induces availability of two different thrust setting procedures, is therefore considered as a novel and unusual design feature as defined in Part 21.A.16B, and it necessitates to raise a Special Condition.

2- Soft Go-around setting is a function of weight, altitude and temperature designed to provide the thrust necessary to achieve 2000ft/min. When the 2000ft/min is forecasted not achievable, TOGA thrust is automatically used for Soft GA with thrust levers at the MCT/FLX detent.

According to CS 25.1587 (b)(3)(ii), the climb gradient in the approach configuration must be established in the Aeroplane Flight Manual in the Performance section:

Quote

25.1587 Performance information

…

(b) Each aeroplane Flight Manual must contain the performance information computed under the applicable provisions of this CS-25 (including CS 25.115, 25.123 and 25.125 for the weights, altitudes, temperatures, wind components, and runway gradients, as applicable) within the operational limits of the aeroplane, and must contain the following:

(1) In each case, the conditions of power, configuration, and speeds, and the procedures for handling the aeroplane and any system having a significant effect on the performance information.

(2) VSR determined in accordance with CS 25.103.

(3) The following performance information (determined by extrapolation and computed for the range of weights between the maximum landing weight and the maximum take-off weight):

(i) Climb in the landing configuration.

(ii) Climb in the approach configuration.

(iii) Landing distance.

Unquote

AMC 25.1581 6d. (13), (15) & (16) gives further guidance as follows:

Quote

(13) Climb Limited Landing Weight. The climb limiting landing weight, which is the most limiting weight showing compliance with CS 25.119 and 25.121(d), should be provided.

(15) Approach Climb Performance. For the approach climb configuration, the climb gradients (CS 25.121(d)) and weights up to maximum take-off weight (CS 25.1587(b)(3)) should be presented, together with associated conditions (e.g. procedures and speeds). The effects of ice accretion on unprotected portions of the airframe and the effects of engine and wing ice protection systems should be provided.

(16) Landing Climb Performance. Data for the landing climb configuration should be presented in a manner similar to that described for the approach configuration above.

Unquote

In the above material, it has been implicitly assumed that the all-engines-operating go-around climb gradient would be higher than or equal to the one-engine-inoperative (OEI) go-around climb gradient, and that publishing the latter in the Aeroplane Flight Manual would therefore be sufficient.

The new “Soft GA” thrust setting, potentially leading to lower climb performance with all engines operating than with one engine inoperative, invalidates this assumption and is therefore a novel and unusual design feature as defined in Part 21.A.16B, which necessitates to raise a Special Condition.

Similar special conditions have already been proposed for Airbus A380 aircraft and a public consultation process has been completed in 2013 accordingly. Nevertheless, the public consultation process for A380 only addressed the item 1 of the below Special Condition that is still shown in this consultation paper for better understanding of the context.
Therefore, only the item 2 (text is highlighted in yellow) of the below Special Condition shall be subject for comments under the scope of the current public consultation.

Airbus A350-941 - Special Condition

- Soft Go Around Mode -

1) CS 25.1587(b)(3)(ii) shall be amended as follows (new text is highlighted in Italic):

25.1587 Performance information
(b) …
(3) …
(ii) Climb in the approach configuration

Published approach climb performance shall represent the lower of
a. the performance obtained with GA thrust and one engine inoperative
b. the performance obtained with "Soft GA" thrust and all engines operating
OR

When "Soft GA" thrust setting is used and resulting climb gradient is lower than the climb gradient that would be obtained with GA thrust and one engine inoperative, there shall be a clear and unmistakable means to alert the flight crew of this situation.

2) An appropriate alert is required if the total aircraft thrust in the conditions OEI and throttle in MCT/FLX position are less than the total aircraft thrust obtained in OEI and throttle in TOGA position

For the particular case where an engine failure happens either immediately before or immediately after the G/A initiation with aircraft in landing configuration (landing gear extended), it should be shown at the landing in critical climb condition, by test or calculation that a safe go-around can be made at decision height with

- the critical engine inoperative
- a configuration and speed initially for landing and then in accordance with the go-around procedures, using actual time delays and, except for movements of the primary flying controls, not less than one second between successive crew actions.
- the power available with the thrust levers initially in the MCT/FLX position
- the landing gear retraction being selected after a steady positive rate of climb is achieved.

Alternatively, if a safe go-around can only be performed with an immediate crew action resetting the Thrust levers to TOGA position, a warning alert is required to prevent an unsafe condition.

The reset of the engine power/thrust setting must be demonstrated as acceptable in terms of pilot detection and required actions in high workload environment.