

## Proposed Deviation on Thrust Reverser inner wall structure

Applicable to [Boeing B777-200 / -300](#) (powered with Rolls Royce engines)

### **Introductory note:**

The following Deviation has been classified as an important Deviation 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.) 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 inner wall of thrust reversers installed on Rolls Royce powered Boeing Model 777 aircraft have experienced several structural failures in service to date. In some cases this has resulted in parts departing the airplane.

The root cause of the failures has been determined to be thermal damage to the composite honeycomb sandwich inner wall structure. Various actions have been instated (e.g. inner wall structural inspection, sealing of thermal blankets) to limit the impact to the structure from over-heating. The final solution involves an extensive design improvement of the thrust reverser inner wall thermal protection system.

In parallel to this issue, operator findings indicate that engine intermediate pressure compressor stage (IP8) bleed air exhaust, has caused thermal damage to the thrust reverser inner wall downstream of the bleed port. Investigations have confirmed that IP8 bleed valve exhaust is an additional cause for structural temperatures of the thrust reverser inner wall to exceed design limits.

In addition to the above improved thrust reverser thermal protection system, Rolls Royce is currently developing a reconfigured IP8 bleed valve exhaust screen to mitigate the effects of its exhaust air flow onto the thrust reverser inner wall.

Taken separately, each of the modifications, necessary to restore the design integrity, do not fully demonstrate compliance with the following JAR requirements: 25.301, 25.303, 25.305, 25.307, 25.601, 25.603, 25.613, 25.901(b.2), 25.901(c) 25.1103(d), 25.1191 and 25.1301(d), as they relate to thrust reverser inner wall. However in order to minimise the degradation of existing thrust reversers and provide a practical retrofit embodiment programme, Boeing has requested that these changes are approved individually.

## **Boeing 777-200 / -300 (powered with Rolls Royce engines) - Deviation E-09**

### **- Thrust Reverser inner wall structure-**

Boeing is requesting EASA to allow a deviation from the following JAR requirements: 25.301, 25.303, 25.305, 25.307, 25.601, 25.603, 25.613, 25.901(b.2), 25.901(c) 25.1103(d), 25.1191 and 25.1301(d) as they relate to thrust reverser inner wall, to allow independent incorporation of design changes improving :

- Thrust reverser inner wall thermal protection system.
- Thrust reverser blanket retention stud insulation.
- Engine IP 8 exhaust bleed screen.

Full compliance with the certification requirements will be achieved when the whole set of design improvements will be certified and embodied.

In order to implement these design improvements, depending upon their certification, Boeing is currently planning for a fleet retrofit program envisioned in two separate phases.

In the first phase, the improved thrust reverser inner wall thermal protection system would incorporate new thermal blankets and new cooling provisions and thermally insulated covers over the blanket retention studs.

In the second phase, the improved IP 8 bleed valve exhaust screen would replace the current one.

It is noted that incorporation of either or both of these design improvements would not provide terminating action for the repeat inner wall structural inspections. The current inspections mitigating the risk of damage propagation from areas of existing, but undetected thermal degradation, will be carried on..

The EASA has determined that there is an overall safety benefit from granting a deviation to JAR requirements: 25.301, 25.303, 25.305, 25.307, 25.601, 25.603, 25.613, 25.901(b.2), 25.901(c) 25.1103(d), 25.1191 and 25.1301(d) when related to thrust reverser inner wall structure, by allowing the development, certification and embodiment of the individual changes in order to, for the thrust reverser inner wall thermal protection system and engine IP 8 bleed valve exhaust screen, to comply with the Certification Requirements.

Moreover, prior to an amended type certificate approval, Boeing shall demonstrate that the proposed design change:

- does not increase the applied loads or reduce the structural capability in the areas covered by this exemption; and
- does not have any adverse effect on the safety of the modified airplane compared to the unmodified airplane.