Proposed Equivalent Safety Finding on "Pitot Heat Indication Systems"

Applicable to Airbus A350-941

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.) 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 certification basis of the A350 includes the requirements of CS 25.1326 at Amdt.8 that require:

*"**CS 25.1326 Pitot Heat Indication Systems***

If a flight instrument pitot heating system is installed, an indication system must be provided to indicate to the flight crew when that pitot heating system is not operating. The indication system must comply with the following requirements:

> *(a) The indication provided must incorporate an amber light that is in clear view of a flight-crew member.*
>
> *(b) The indication provided must be designed to alert the flight crew if either of the following conditions exist:*
>
> > *(1) The pitot heating system is switched 'off'.*
> >
> > *(2) The pitot heating system is switched 'on' and any pitot tube heating element is inoperative.*"

The A350 design does not provide a crew alert following the failure of a single pitot heating system and therefore **does not** meet the requirements of CS 25.1326(b)(2).

Airbus A350-941 – Equivalent Safety Finding to CS 25.1326

– Pitot Heat Indication Systems –

Design Proposal:
The A350 is equipped with a New Air and Inertial Automatic Data Switching function (NAIADS), which aims at improving the detection of misleading air data and inertial data and simplifying related crew tasks.

The selection of the Air Data Reference (ADR) data source, to be displayed on both Primary Flight Displays (PFDs) / Head-up Displays (HUDs), is performed by the Control and Display System (CDS) among the available and valid sources defined by the Primary flight control and guidance system (PRIM) computer. In application of CS 25.1301(a), CS 25.1302(b), (c) and CS 25.1309 (c), crew actions required in such situations, and so related crew workload, have been significantly reduced:

- In nominal mode, AIR DATA information from Air Data Inertial Reference Unit (ADIRU) 1 are displayed on the CAPT side, and AIR DATA information from ADIRU 2 are displayed on the F/O side;
- In case of Air Data Inertial Reference System' (ADIRS) loss and/or failure detection, the AIR DATA information are automatically displayed (i.e. without any crew action) on both PFDs/HUDs depending on the validity of the data source defined by the PRIM to ensure that no erroneous ADR data is displayed to the flight crew.

The status of the pitot heating system is part of the PRIM monitorings.
In case the pitot heating system is detected as inoperative, the related data source is rejected by the PRIM, ensuring that no erroneous air data information is displayed to the flight crew.

Justification:
As a consequence of the above design proposal and in application of CS 25.1301(a), CS 25.1302(b), (c) and CS 25.1309 (c), no dedicated alert is raised on A350 in case of single pitot heating failure because:

- There is no crew action to perform, and
- After this first failure, there is enough redundancy to ensure users' systems will work properly.

In case several pitot heating systems are detected as inoperative, the flight crew is informed when a flight crew action is required and/or when aircraft capabilities are lost as per CS 25.1301(a), CS 25.1302(b), (c) and CS 25.1309 (c) requirements.

Safety Equivalency Demonstration:
For the A350 Type Certification the design of the pitot heating system alerting function following a single failure, as described below, demonstrates an equivalent level of safety compared to compliance with CS 25.1326 (b) (2).

The A350 design provides:

1. automatic reconfiguration without indication to the flight crew (ie without any crew action) in case of Air Data & Inertial Reference Systems (ADIRS) loss and/or failure detection, and display of the valid information on PFD. This includes loss/failure of the pitot heating system.

2. Additional redundancy through back-up airspeed and altitude data, computed from engine air data and AOA data. This is used for PRIM monitoring and automatic display. The back-up airspeed and altitude data can also be manually selected by the crew in case of unreliable airspeed or altitude.

3. In case several pitot heating systems are detected as inoperative, the flight crew is informed when a flight crew action is required and/or when aircraft capabilities are lost as per CS 25.1301(a), CS 25.1302(b), (c) and CS 25.1309 (c) requirements.