

## **Proposed Special Condition for Installation of Overhead Sleeping Facility**

### **Applicable to Boeing B 747-8**

#### **Introductory note:**

The hereby presented Special Condition to the EASA Certification Basis 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 mandatory EASA airworthiness standards for the SWS Aeroloft system installed on B747-8 are determined as CS 25 Amendment 2, effective October 02, 2006.

The SWS Aeroloft system contains an Overhead Sleeping Facility (OSF) in the crown area of the B747-8 in front of the Cabin Crew Rest Compartment (CCRC).

The size of the OSF is similar to the CCRC and consists of 8 passenger sleeping compartments with single occupancy for each compartment. These facilities will have a separate staircase, located in the Main Deck door 4 area, for access in the front of the compartments.

The installation of an overhead passenger sleeping compartment is a new and novel design on B747-8 aircraft. The challenge for such installations that would allow passengers to rest in a separate compartment is the oversight by the cabin crew and the response to any foreseeable emergency situation.

The applicable airworthiness regulations not containing adequate or appropriate safety standards for this design feature, then, a Special Condition is required for the certification of this facility.

### **Boeing 747-8 – Special Condition D-100**

#### **- Installation of Overhead Sleeping Facility -**

The use of OSF is intended must be restricted to in flight use only (same as lavatories or cabin crew rest compartments). These facilities will only be opened for passengers when Cabin Crew is present. Dedicated cabin crew will be allocated for passenger briefing on emergency procedures and in the use of emergency equipment and systems of the passenger sleeping compartments.

The applicable special condition is based on what has been developed for the installation of cabin crew rest compartments and is amended to address the use by passengers.

## **Special Condition**

- 1) Occupancy of the Overhead Sleeping Facility (OSF) is not allowed during Taxi, Take-off and Landing (TT&L) phases.
- 2) Occupancy during flight is limited to one person per compartment.
- 3) The access to the OSF must be closed for TT&L.
- 4) The following signs and placards must be provided in the OSF:
  - a) At least one exit sign, located near each OSF emergency exit, exit door or hatch, meeting the requirements of JAR 25.812(b)(1)(i),
  - b) An appropriate placard located conspicuously on or near each OSF emergency exit, exit door or hatch that defines the location and the operating instructions for each evacuation route.
  - c) Placards must be readable from a distance of 30 inches under emergency lighting conditions.
  - d) The door or hatch handles and evacuation path operating instruction placards must be illuminated to at least 160 micro-lamberts under emergency lighting conditions.
  - e) The above requirements may be subject to specific evaluation and possibly to a finding of equivalent level of safety.
- 5) In addition there must be appropriate placards, at the entrance to the OSF and inside and outside of each of the passenger sleeping compartments to indicate:
  - a) The maximum number of occupants allowed during flight
  - b) That occupancy is not allowed during TT&L
  - c) That smoking is prohibited.
  - d) That all loose items must be stowed in the provided stowage provisions.
  - e) That the OSF must not be used for general stowage.
- 6) There must be at least one ashtray on the inside and outside of the entrance to the OSF.
- 7) Whenever passengers are present in the overhead sleeping compartment a dedicated cabin crew member must be present in the overhead facility. A cabin crew station must therefore be provided and it must be compliant with CS25.1447(c)(4) and all other requirements applying to stations for required cabin crew.
- 8) A limitation in the Airplane Flight Manual or other suitable means must be established to restrict occupancy to passengers briefed for the use of the compartment.
- 9) A cabin Crew procedures must be introduced that ensure briefing of the sleeping compartment occupants on:
  - a) The amount of personal belongings that can be brought into the sleeping compartment and their stowage provisions.
  - b) Normal usage of the compartment, e.g. lying direction, use of safety belt, location of attendant call button, etc.
  - c) Emergency procedures, e.g. actions following depressurisation, and the emergency escape routes, etc.

- 10) A cabin crew procedure must be introduced that ensures control of the access to the sleeping compartment.
- 11) For each occupant permitted in the OSF, there must be an approved seat or berth that must be able to withstand the maximum flight loads when occupied.
- 12) If doors will be installed, there must be a means to preclude anyone from being trapped inside the passenger sleeping compartment. If a locking mechanism is installed, it must be capable of being unlocked from the outside without the aid of special tools. The lock must not prevent opening from the inside of the compartment at any time.
- 13) There must be a means in the event of failure of the aircraft's main power system, or of the normal OSF lighting system, for emergency illumination to be automatically provided in the OSF.
  - a) This emergency illumination must be independent of the main lighting system.
  - b) The sources of general OSF illumination may be common to both the emergency and the main lighting systems if the power supply to the emergency lighting system is independent of the power supply to the main lighting system.
  - c) The illumination level must highlight the exits and escape routes compared to other areas of the compartment.
  - d) The illumination level must be sufficient for each occupant of the passenger sleeping compartment to locate a deployed oxygen mask.
- 14) There must be a means for manual activation of an aural emergency alarm system, audible during normal and emergency conditions, to enable crewmembers at each pair of required floor level emergency exits to alert occupants of the passenger sleeping compartment of an emergency situation. Use of a public address will be acceptable. The system must be powered in flight, after the shutdown or failure of all engines and auxiliary power units (APU), for a period of at least ten minutes.
- 15) An attendant call button must be provided within reach of the occupant of each berth or seat in the compartment.
- 16) There must be a means, readily detectable by seated, lying or standing occupants of the OSF, which indicates when seat belts should be fastened. In addition for those provided for seats, seat belt type restraints must also be provided for berths and must be compatible for the sleeping attitude during cruise conditions. There must be a placard requiring that the berth restraints be fastened whenever the berth is occupied. If compliance with any of the other requirements of these special conditions is predicated on a specific lying orientation, there must be a placard identifying this position.
- 17) Means must be provided to cover turbulence. If the OSF interior does not provide firm handhold, there must be a handgrip or rail to enable persons to steady themselves while moving within the OSF, in moderately rough air.
- 18) The following safety equipment must also be provided at the cabin crew station located in the OSF for dedicated cabin crew (see special condition 7):
  - a) At least one approved hand-held fire extinguisher appropriate for the kinds of fires likely to occur,

- b) One Portable Protective Breathing Equipment (PBE) devices approved to European Technical Standard Order (ETSO)-C116 or equivalent and meeting JAR 25.1439, closed to each hand-held fire extinguisher
  - c) One flashlight
- 19) A smoke or fire detection system must be provided that monitors the passenger OSF. This system must provide:
- a) A visual indication to the flight crew within one minute after the start of a fire
  - b) An aural warning in the OSF, certain to wake all sleeping occupants.
  - c) A visual indication, at a suitable location, providing information about the origin of the fire, e.g. in which compartment.
  - d) A warning in the main passenger cabin. This warning must be readily detectable by a cabin crew, taking into consideration the positioning of cabin crew throughout the passenger cabin during various phases of flight.
- 20) Fire fighting precautions.
- a) The design of the OSF must allow crewmembers equipped for fire fighting to have unrestricted access to the compartment.
  - b) The fire fighting procedures must describe the methods to search the passenger sleeping compartment for fire sources(s). Training and procedures must be demonstrated by test and documented in the suitable manuals.
  - c) The time for a crewmember on the passenger deck to react to the fire alarm, to don the fire fighting equipment and to gain access to the OSF must not exceed the time for the compartment to become smoke-filled, making it difficult to locate the fire source.
  - d) Large enclosed stowage compartments with subsequent impact on the crewmembers' ability to effectively reach any part of the compartment with the contents of a hand fire extinguisher are not allowed within the OSF.
  - e) It must be demonstrated that the complete fire detection and fire fighting procedure can be conducted effectively without causing a hazard to passengers due to excess quantities of smoke and / or extinguishant accumulating and remaining in occupied areas.
- 21) There must be a supplemental oxygen system equivalent to that provided for passenger decks for each seat and berth in the OSF (automatic drop down system with means by which the oxygen masks can be manually deployed from the flight deck). The system must provide an aural warning. The aural warning sound volume and duration must be justified as being certain to wake any sleeping occupant of the OSF. Simultaneously with the mask drop it must be automatically assured that the lighting level in the sleeping compartment will be sufficient for occupants to locate a deployed mask.
- 22) Materials, seat cushions and mattresses must comply with the relevant requirements of JAR 25.853, including CS25.853(c) in the case of mattresses.
- 23) Where a waste disposal receptacle is fitted, it must be equipped with an automatic fire extinguisher that meets the performance requirements of JAR 25.854(b).
- 24) Means must be provided that would allow the cabin crew to easily and comprehensively check the demeanour and actions of the occupant(s) of the sleeping compartment. The functionality of this means must be justified and must take into account issues such as (but not limited to) cabin crew workload in the event of cabin depressurisation, turbulence etc.,

the need to limit the minimum selectable lighting level in the compartment, and must allow for human factors issues such as reluctance by cabin crew to indicate to the occupants that they are being observed, such as would be the case when opening the door or operating a feature producing similar audible and/or visual cues.

25) No electrical power supply capable of being used by the passengers in the OSF may be installed in the OSF.

26) Evacuation of an incapacitated person from the OSF.

The evacuation of an incapacitated person (representative of a ninety-fifth percentile male in size, at the corresponding weight) must be demonstrated for all evacuation routes. The corresponding procedure must be established and demonstrated to work. This procedure must also be part of the required cabin crew training.

27) There must be at least two emergency evacuation routes, which could be used by each occupant of the OSF to rapidly evacuate to the passenger decks.

The routes must be located with sufficient separation within the OSF, and between the evacuation routes, to minimize the possibility of an event, either inside or outside of the OSF, rendering both routes inoperative.

The routes must be designed to minimize the possibility of blockage, which might result from fire (inside or outside the OSF), mechanical or structural failure, or persons standing below or against OSF exits.

Emergency evacuation procedures, including the emergency evacuation of an incapacitated occupant from the OSF, must be established and demonstrated.

There must be a means to prevent passengers on the passenger deck from entering the OSF in the event of an emergency, including an emergency evacuation, or when no flight attendant is present.

It must be shown by actual demonstration that the maximum allowed number of OSF occupants can easily evacuate the OSF using the main access route. This demonstration must also be performed using the alternate evacuation route.