

## Flight deck design

### Preamble

ICAO Annex 8 states that “the design of the flight crew compartment shall be such as to minimize the possibility of incorrect or restricted operation of the controls by the crew, due to fatigue, confusion or interference. Consideration shall be given at least to the following: layout and identification of controls and instruments, rapid identification of emergency situations, sense of controls, ventilation, heating and noise.” This position paper expands on the ICAO Annex 8 provisions.

### General design features

The design of the flight deck should ensure that:

- ▶ A safe working environment is provided.
- ▶ The comfort and well-being of the flight crew is optimized.
- ▶ The risk of fire, jamming of controls, short circuits or other untoward incidents caused by simple mishap is minimized.
- ▶ Loose objects or liquids cannot fall through small gaps (e.g. lever quadrants), reach inaccessible areas or otherwise interfere with intended system operation.
- ▶ It is possible to store loose items required for the flight such as charts and portable electronic items.
- ▶ There are not any sharp edges, bolt heads and other such hazards in the immediate proximity of the flight crew stations.
- ▶ Equipment installed or carried remains in its desired position and does not become a hazard to the flight crew in turbulence or in a survivable accident.
- ▶ An emergency exit from the aircraft is provided.
- ▶ All pilot-operated equipment, such as instruments and controls, are pre-tested in a simulator, both as individual items and as grouped items. The tests should cover all phases of flight and should extend over a sufficiently representative period.
- ▶ The locations and storage of extinguishers in the flight deck should be accessible by each flight crew member when seated at their duty station with their oxygen mask on, and without the mask unsealing from the flight crew member’s face.

### Cockpit environment

- ▶ Provision should be made to keep the flight deck at acceptable temperature and humidity levels in the air and on the ground when occupied by the flight crew.
- ▶ To avoid the adverse effects of fatigue and enhance pilot efficiency, under normal operations flight deck temperature should be controllable between 18-30°C inclusive, with a preferred relative humidity in the range of 25 - 50%. For abnormal operations, a fixed value within these ranges may be acceptable.
- ▶ Individual fresh air ducts should be provided at each flight crew station.
- ▶ The air circulation should be such that air from other compartments and cabins of the aircraft does not enter the flight deck. Air from re-circulating air conditioning systems should not be introduced into the flight deck.
- ▶ Design should prevent condensation from reaching the flight crew or the equipment.
- ▶ IFALPA considers that elevated noise levels are a safety issue. Provisions should therefore be made to reduce flight deck noise to a level such that prolonged exposure does not result in hearing loss or induced physical stress.
- ▶ Tests should demonstrate that the aircraft has no specific vibrations which may cause excessive fatigue to the crew. Seat, floor, control or equipment vibration which can be perceived either visually, aurally or tactually, should be minimized.
- ▶ For continuous smoke generation within the cockpit, means should be provided to reduce smoke such that any residual smoke (haze) does not inhibit the flight crew from retaining aeroplane control to effect a safe landing at the nearest suitable aerodrome.

## Seats and harnesses

- ▶ Flight deck seats should provide comfortable support for the body (including the extremities) during all phases of flight. In particular, design should ensure proper lumbar support. Seats should be equipped with head rests.
- ▶ Seats should be designed to minimize the effects of aircraft vibration, uneven airport surfaces and turbulence.
- ▶ Each flight deck seat should be accessible without disturbing the other flight crew member(s).
- ▶ Rotating or movable crew seats should be capable of being locked in an emergency position.
- ▶ The seat rails should be provided with a positive position lock capable of adjustment. The range of fore and aft movement of the seat should be such as to ensure that access is not impeded by the central pedestal and that controls cannot be inadvertently operated when changing crew position.
- ▶ Seats and armrests should be adjustable to accommodate the variation from the average physique within reasonable limits.
- ▶ The centre lines of the pilots' seats should accurately align with the longitudinal axis of the aircraft.
- ▶ The seat certification process should include actual or simulated flight checking over a representative period of time.
- ▶ Seats should be provided with seat reference marks to enable flight crew members to reproduce easily their correct eye reference position in any aircraft of a particular type.
- ▶ Full safety harness should be provided for all flight deck positions.
- ▶ The harness design should ensure that, under normal conditions, the free movement of the flight crew's upper body is not restricted.
- ▶ The upper harness should be capable of release separately from the seat belt.
- ▶ In addition to the normal inertial lock, the harness should also incorporate a manual lock feature to permit the restraining of an incapacitated flight crew member.
- ▶ Secure cup holders should be provided at each flight crew member's station.
- ▶ Provisions should be made for a meal tray which will not interfere with the controls and which can be rapidly removed in case of emergency.

## Stowage facilities

- ▶ Secure stowage should be provided on the flight deck for the flight crew's carry-on equipment and clothing.
- ▶ A holder adequate for the documentation to be used in-flight should be provided at each pilot's station. The holder should not obstruct the view of any of the instruments or controls used during any phase of flight.
- ▶ Stowage should be provided beside the pilots' seats for documentation which may be required for all normal and abnormal phases of flight.
- ▶ Readily accessible stowage should also be provided for the aircraft library, with provision for securing it in place.