

Helicopter Flight Deck Ergonomics

This Briefing Leaflet expands on IFALPA Position Paper [18POS01](#) addressing helicopter flight deck ergonomics. Fatigue and physical discomfort have a negative influence on human performance. IFALPA identifies that in helicopter design, crash worthiness has taken precedence over ergonomics. IFALPA supports the importance of crash worthiness, but believes that flight deck ergonomics is equally important.

ICAO Annex 8 IVB states that “during the design of the helicopter, account shall be taken of ergonomics factors including, ease of use and prevention of inadvertent misuse, accessibility, flight crew working environment, cockpit standardization, maintainability and also should take consideration into the flight crew operating environment including, effect of aeromedical factors such as noise and vibration, and effect of physical forces during normal flight.”

The following sections provide the perspective of the helicopter pilot community on what makes for good flight deck design.

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, 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 or 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 an accident.
- An emergency exit from the helicopter flight deck is provided.
- All pilot-operated equipment, such as instruments and controls, are pre-tested for ergonomics 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. These test should also be applicable for all pilot-operated equipment which do not require type certification, such as Electronic Flight Bags (EFB) class 1.
- The chance of inadvertent use of controls and switches is minimized.
- The locations and storage of extinguishers in the flight deck should be accessible by each required flight deck crew member when seated.
- Windscreen wipers should not limit outside view when operated or stowed.

COCKPIT ENVIRONMENT

- Provision should be made for keeping the flight deck at acceptable temperature and humidity levels in the air and on the ground at acceptable level 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.
- 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 induce physical stress. Further information is available in [17HUPBL01 Noise Protection](#).
- These noise levels should be reached when using normal headset only and should not require additional hearing protection.
- A headset should not hamper an emergency evacuation.
- Testing should demonstrate that the aircraft has no specific vibrations which may cause excessive fatigue and/or result in discomfort to the crew. Seat, floor, control, or equipment vibration which can be perceived either visually, aurally or tactually, should be minimized.
- Testing should demonstrate that the aircraft has no specific vibrations which may result in unreadability of instruments and/or distort visual clues during critical phases of flight.
- In case of 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 helicopter control to effect a safe landing.

SEATS AND HARNESES

- Flight deck seats should provide comfortable support for the body (including the extremities) during all phases of flight. In particular, design should ensure proper and adjustable lumbar support. Seats should be equipped with head rests.
- Seats should have the correct angle to prevent back problems.
- 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 forward 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, backrests and armrests must be adjustable in position and height to accommodate variation from the average physique (based on representative and current measurements) within reasonable limits, considering that human size has changed in recent decades.
- 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 harness design should ensure that no physical discomfort is encountered.
- The shoulder 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.

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 the instruments or controls used during 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.