MOC VTOL Doors and Landing Gear

Prepared by EASA Panel 4 (FCS & Hydromechanical Systems)

Presented by Jonathan Hall CEng FIMechE
Introduction – MOC VTOL Doors

→ The vehicles are unpressurised (as also per Rotorcraft today).
→ Covers retention of doors closed, not emergency egress.
→ Crew or passenger door opening in-flight is considered unsafe, and seat belt (or equivalent) is not considered adequate mitigation.
→ Thus means of retaining the door closed, and indicating the status, is introduced into the MOC.
Scope – MOC VTOL Doors

→ Includes any external opening, not limited to passenger or crew doors, depends on the criticality of the door being open in flight.

→ MOC pertains to system aspects to latch the door and indicate status. Structural and emergency egress aspects are covered elsewhere.

→ Specific reference to PRA (e.g., Bird Strike) is important, from service experience on other aircraft types.
Content – MOC VTOL Doors

→ MOC-VTOL-Doors will provide:
  → Definitions.
  → A recognition of parts of the ASTM F3061 – 16a insofar as it pertains to Door latching and indication.
  → Additional guidance material to address other specificities
Requirements – MOC VTOL Doors

→ Provides MOC material for the following SC-VTOL requirement:
  → VTOL.2250 Design and construction principles
    → (e) Doors, Canopies and Exits

„Doors, canopies, and exits must be protected against inadvertent opening in flight, unless shown to create no hazard, when opened in flight.‟
Topics Covered – MOC VTOL Doors

→ Definitions and Exemptions
   → To ensure the scope of what is a “Door” is clear.

→ Latching
   → To prevent inadvertent or deliberate opening in flight, if this could be unsafe.

→ Passenger, Ground/Flight crew awareness of the Door status
   → Directly on or by the door and on Flight Crew display

→ Particular Risks
   → Especially Bird Strike, but not limited to.
Introduction – MOC VTOL Landing Gear

→ Usually take-off and landing are vertical (except possible emergency landing).
→ With commensurate braking requirements
→ Conventional wheels/tyres/brakes. Skid, ski, float etc out of scope.
→ Ground resonance is addressed at aircaft-level.
→ Any ground steering function is limited to low speed taxi
→ No significant longitudinal engine thrust on ground.
Scope – MOC VTOL Landing Gear

→ LG Extension/Retraction
→ Braking System
→ Ground Control (steering) System
→ Wheels/Tyres/Brakes
→ Warnings and Indications
→ Structural Aspects of the LG (including drop test) are covered elsewhere.
Content – MOC VTOL Landing Gear

→ MOC-VTOL- Landing Gear will provide:
  → Scope and Definitions.
  → Some limited reference to the ASTM F3061 – 16a as this is more applicable to the LG systems of fixed-wing aircraft whereby normal take-off and landing are running high-speed.
  → Additional guidance material to address other specificities
Provided MOC material for the following SC-VTOL requirement:

VTOL.2305 Landing Gear Systems

„VTOL.2305 Landing gear systems
(a) The landing gear must be designed to:
(1) provide stable support and control to the aircraft during surface operation; and
(2) account for likely system failures and likely operation environment (including anticipated limitation exceedances and emergency procedures).
(b) The aircraft must have a reliable means of stopping the aircraft with sufficient kinetic energy absorption to account for landing and take-off, in all approved conditions, and of holding the aircraft in position when parked.
(c) For aircraft that have a system that actuates the landing gear, there must be:
(1) a positive means to keep the landing gear in the landing position; and
(2) an alternative means available to bring the landing gear in the landing position when a non-deployed system position would be a hazard.”
Definitions and Exemptions
- Typically as stated in previous slides

Absence of interaction between ground steering and extension/retraction
- To prevent unwanted interference with the locus of the LG.

Towing
- To prevent damage to the LG and its systems, or ensure this is detected prior to take-off

Qualification of Wheels and Tyres
- Including wheel approval.

Brake Stopping Capability
- Assuming landings are vertical, except in case of emergency.
Topics Covered – MOC VTOL Landing Gear (2/2)

→ Park Brake Capability
  → Unbalanced ground forces, emergency egress, 10 deg slope

→ Brake wear indication

→ Compatibility with airframe and other systems
  → Ground Resonance not in scope

→ Indication of LG status
  → Including warning of LG not-extended

→ Emergency Extension
  → For retractable LG not manually powered.
Conclusion / Next steps

→ Release for public consultation
→ Review Comments
→ Publish Comment Response Document
→ Publish MOC VTOL
Thank you for your attention

Feel free to submit your questions on our live event platform.....