



EASA

European Aviation Safety Agency

General Structural Aspects of Antenna Installations

Wim Doeland

(willem.doeland@easa.europa.eu)

EASA Structures Expert

Presented at EASA/NAA/Industry Workshop

Cologne, 17/18 September 2014

Your safety is our mission.

An agency of the European Union 



Purpose & Contents

➤ Purpose

- To provide a general introduction to structural aspects of aircraft antenna installation

➤ Contents

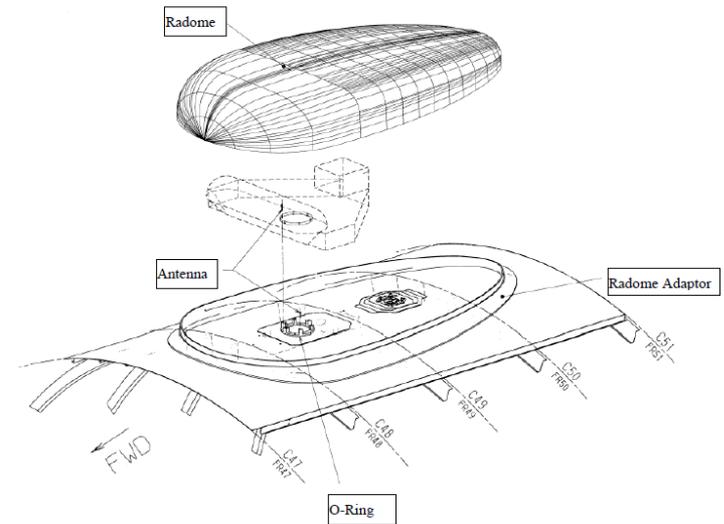
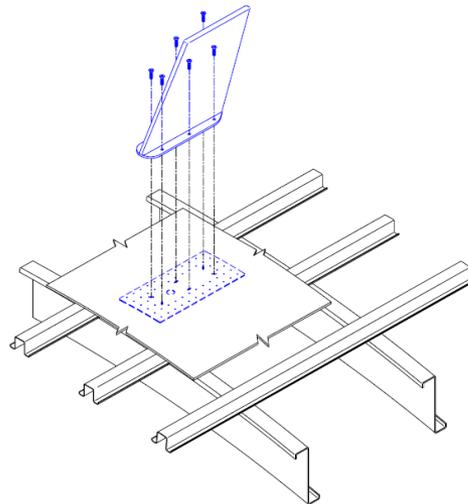
- Design issues
- Airworthiness issues

- Focus in this presentation is on CS-23 Small Aeroplanes & CS-25 Large Aeroplanes



Design Issues

- Different sizes, shapes and locations of antenna installation
 - Mostly blade and radome type





➤ Different sizes, shapes and locations of antenna installation (cont'd)

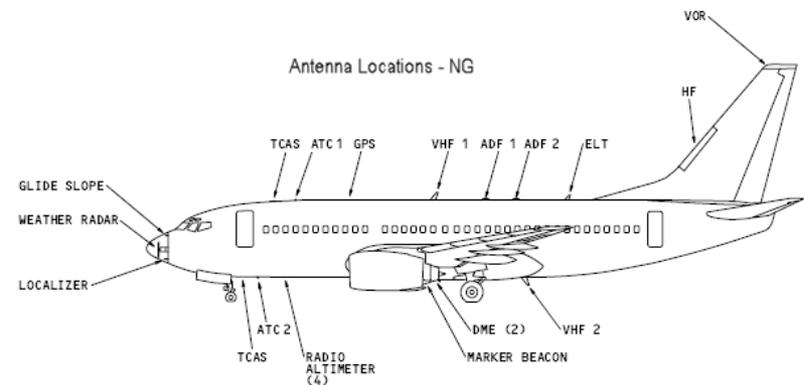
➤ “Large” or “Small”

- Typically “small” when antenna installation is confined within one skin bay (two adjacent frames and two adjacent stringers)
- Boundary layer criterion: see Large Antenna presentation

➤ Fuselage

- Cross-section: top, bottom
- Longitudinal: forward, aft

➤ Empennage





- Additional considerations
 - Pressurised / unpressurised fuselage
 - Aircraft approved for high altitude operations (above 41.000 / 45.000 feet)
 - Metallic vs. composite baseline structure
 - Interrelationship with baseline structure, modifications and repairs
 - Known / identified interrelationships to be addressed by Applicant
 - Responsibility of installer (see statement in EASA STC's)
 - Location and installation of systems (TCAS, GPS, Live TV,...):
 - Inside/outside the cabin/cockpit
 - Equipment racks, trays, shelves, brackets,...
 - Penetrations through pressure bulkheads



Airworthiness Issues

- Antenna installations approved as:
 - Part of initial Type Design (“TC Configuration”)
 - Installations “post-TC”
 - By TC Holder (Design Changes / STC’s)
 - By STC Holder
 - Own resources, or through an arrangement with the TC Holder (ref. 21A.113(b))
 - Solely referring to installations from other companies is not an acceptable means of compliance



Airworthiness Issues

- Classification (ref. 21A.91 & 21A.101) of antenna installations
 - Typically “Non-significant”
 - See EASA website FAQ (for General Aviation)
http://easa.europa.eu/system/files/dfu/FAQ_change_classification.pdf
 - Rule of thumb (for all aircraft):
 - Typically Major if:
 - Large antenna installation, and/or:
 - Pressure vessel penetration



- **Applicable Requirements**
 - **Establishment of Design Approval Basis (ref. 21A.101)**
 - Compliance with TC Basis of aircraft being modified
 - Compliance with later requirements
 - **Differences between various airworthiness codes**
 - E.g. CS-23 vs. CS-25
 - **Differences between CS/JAR and FAR requirements**
 - **Different CS/JAR and FAR Amendment levels, e.g.:**
 - **Emergency landing load factors**
 - (pre/post JAR-25 Change 13 / FAR 25 Am.64)
 - **Fatigue & Damage Tolerance**
 - (pre/post JAR-25 Change 7 / FAR 25 Am.45, or pre/post FAR 25 Am. 96)



➤ Applicable Requirements (cont'd)

➤ Retro-active requirements

➤ Ageing Aircraft (Proposed EASA Part 26 / CFR Part 26)

➤ Generic CRI / IP's for Large Antenna Installations

➤ High altitude operation

➤ Above 41.000 ft: Generic CRI (CS-25 / CS-23 HPA)

➤ Loss of antenna needs to be considered

➤ Above 45.000 ft: FAR 25.365(d) requires 1.67 factor ("2.5 Δp "), whereas CS 25.365(d) requires 1.33 factor



➤ Applicable Requirements (cont'd)

➤ Main CS-25 requirements

- Vibration & buffeting – 25.251, 25.305(e)
- Loads – 25.301(b)
- Static strength – 25.303, 25.305, 25.307, 25.613
- Composites - 25.603
- Rapid decompression – 25.365
- Emergency landing conditions – 25.561
- Fatigue & damage tolerance – 25.571, 25.1529
- Aeroelasticity – 25.629
- Bird strike - 25.631
- High altitude flight – 25.841
- Engine Sustained Imbalance – 25.901



EASA
European Aviation Safety Agency

Thank you for your attention!

Any questions....?

Your safety is our mission.

An agency of the European Union 