



# EASA

European Aviation Safety Agency

# General Structural Aspects of Antenna Installations

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# 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

Figure 6

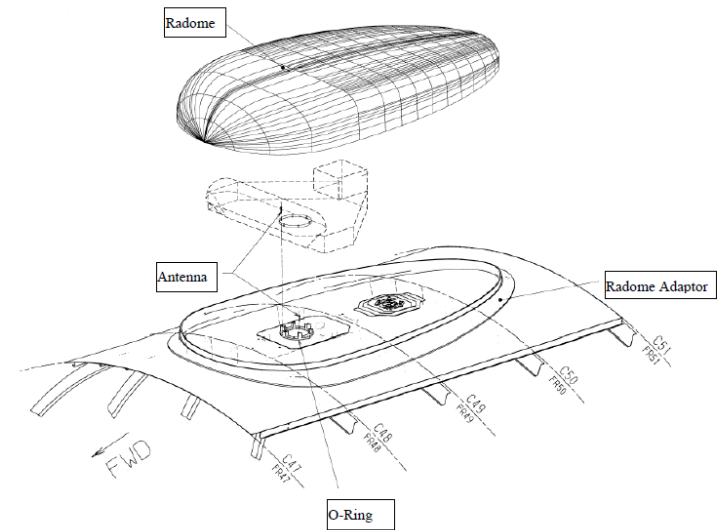
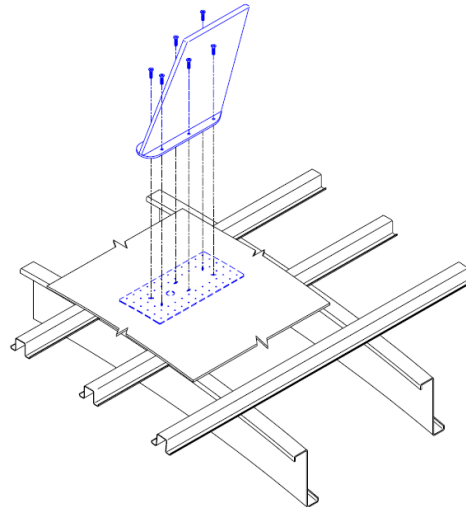


Figure 2





# Design Issues

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

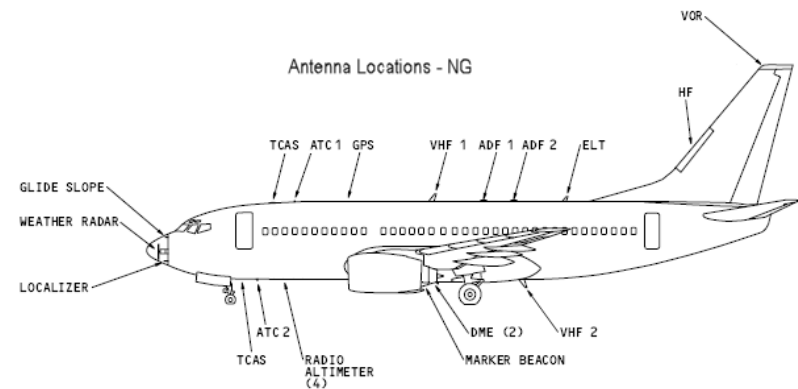
### ➤ “Large” or “Small”

- 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](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 (“ $2.5\Delta p$ ”), 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



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**Thank you for your attention!**

Any questions....?

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