

CHAPTER 3. RADIO AND ELECTRICAL

AIRWORTHINESS COMPLIANCE CHECK SHEET #24

1. SUBJECT: Buffet Installation (Electrical Portion) - FAR 23 Aircraft
2. APPLICABLE FEDERAL AVIATION REGULATIONS
 - 23.1351 Electrical System Installations
Generator
 - 23.1357 Fuses or Circuit Breakers
 - 23.1361 Master Switch Arrangement
 - 23.1365 Electric Cables
3. CHECKLIST
 - a. Structural Requirements:

None (See ACCS on Buffet Installations)
 - b. Hazards to the Aircraft or its Occupants:
 - (1) Is a fuse or circuit breaker, of appropriate rating to protect the cable, installed in the circuits to the buffet? (FAR 23.1357.)
 - (2) If a circuit breaker is used, is it of a type which will open the circuit irrespective of the position of the control in case of a fault? (FAR 23.1357.)
 - (3) Are the connecting cables to the buffet in accordance with recognized standards for electric cable of a slow-burning type? (Cable conforming to military specification MIL-W-5086 or the equivalent is acceptable.) (FAR 23.1365.)
 - c. Operating Aspects:

None
 - d. Detail Design Standards:
 - (1) Are the electric cables to the buffet installed in such a manner that they are suitably protected from fuel, oil, water (including probable drippings from the buffet itself), and other mechanical damage? (FAR 23.1351.)
 - (2) Is the circuit to the buffet connected through the master switch arrangement? (FAR 23.1361.)
 - (3) Output ratings should be compared to maximum probable loads per AC 43.13-1, paragraph 238. (FAR 23.1351)

AIRWORTHINESS COMPLIANCE CHECK SHEET #25

1. SUBJECT: Buffet Installation (Electrical Portion) - FAR 25 Aircraft
2. APPLICABLE FEDERAL AVIATION REGULATIONS
 - 25.1309 Equipment, systems, and installations
 - 25.1351 Electrical system capacity
 - 25.1353 Electrical equipment and installations
 - 25.1357 Electrical protection
 - 25.1363 Electrical system and analyses
3. CHECKLIST
 - a. Structural Requirements:

None. (See ACCS on Buffet Installation.)
 - b. Hazards to the Aircraft or its Occupants:
 - (1) Is a fuse or circuit breaker, of appropriate rating to protect the cable, installed in the circuits to the buffet? (FAR 25.1357.)
 - (2) If a circuit breaker is used, is it of a type which will open the circuit irrespective of the position of the control in case of a fault? (FAR 25.1357.)
 - (3) Is the buffet electrical equipment so installed that a probable malfunction will not expose the crew or passengers to harmful electric shock? (FAR 25.1309.)
 - c. Operating Aspects:

None
 - d. Detail Design Standards:
 - (1) Are the electric cables to the buffet installed in such a manner that they are suitably protected from spillage of liquids or other detrimental substances? (FAR 25.1353.)
 - (2) Are the electrical cables and the electrical components of the buffet installed in such a manner that operation of any one unit or system of units will not affect adversely the simultaneous operation of any other electrical unit or system of units essential to the safe operation of the airplane? (FAR 25.1353.)
 - (3) Is the electric power system capable of supplying the added maximum buffet load without electrical

or thermal distress? This may be determined by revision of the original load analysis, conducting a new load analysis, or by actual flight or ground tests. In any case, it should be determined that the system is not overloaded. (FAR 25.1309, 25.1351, 25.1363.)

AIRWORTHINESS COMPLIANCE CHECK SHEET #26

1. SUBJECT: Radio Racks and Radio Equipment Installation - FAR 25 Aircraft

2. APPLICABLE FEDERAL AVIATION REGULATIONS

21.305	Approval of Materials, Parts, Processes and Appliances
25.25	Weight Limitations
25.27	Center of Gravity Limitations
25.301	Loads
25.305	Strength and Deformation
25.307	Proof of Structure
25.321	Flight Loads
25.471	Ground Loads
25.561	Emergency Landing Conditions
25.603	Materials
25.605	Fabrication Methods
25.607	Standard Fastenings
25.609	Protection
25.611	Inspection Provisions
25.613	Material Strength Properties and Design Values
25.1309	Equipments, Systems, and Installations
25.1351	Electrical System Capacity
25.1357	Electrical Protection
25.1431	Radio and Electronic Equipment

Radio racks and radio equipment installations which are the same as those made by the airframe manufacturer, or other installations which are already approved, may be accepted without further investigation. On other installations, the following points should be checked to determine that the installation is satisfactory.

3. CHECKLIST

a. Structural Requirements:

(1) Is the equipment installed in such a manner that it can withstand the required loads? (FARs 25.301, 25.305, 25.307, 25.321, 25.471, 25.561)

NOTE: See item 4. below.

(2) Do shock mounted items have sufficient clearance for normal vibration and swaying of the equipment without hitting adjacent equipment or parts of the airplane? (FAR 25.1309)

- (3) Are junction boxes of sufficiently rigid construction to prevent "oil-canning" of the sides to avoid possibility of inside shorting? (FARs 25.301, 25.305, 25.1309)
- (4) Is the structure of the radio rack adequate to support the required loads? The effect on other structure (either primary or secondary) should be considered. (FARs 25.301, 25.303, 25.307, 25.321, 25.471 and 25.561)

This answer can be determined by either of two methods:

- (a) By direct comparison with an existing approved installation having the same or similar (approximately the same weight, size, and arrangement) equipment installed.
- (b) By structural analysis or static test. Such installations do not necessarily lend themselves to analysis but are adaptable to static test. In conducting the test, the following procedure may be used?
 - 1 Determine the wt. and c.g. position of the equipment item.
 - 2 Mount the rack either in its position in the airplane or in a rig simulating the actual installation insofar as attachments to the airplane are concerned.
 - 3 Dummy equipment or a rig simulating the equipment items should be installed utilizing the attaching points to which the equipment is to be attached. The dummy equipment or rig should be so that the required loads can be applied at the c.g. position of the actual equipment.
 - 4 The required loads should then be applied by any suitable means.

All items of mass which would be apt to injure the passengers or crew in the event of a crash landing should have their supporting structure designed to the crash load requirements of FAR 25.561 or the applicable critical flight or landing load factors of FARs 25.321, whichever is greater. (FARs 25.321 and 25.471)

Supporting structure of other mass items should be designed to the critical flight or landing load factors of FARs 25.321, 25.471.

The values shown in FAR 25.561 may be used in lieu of a determination of these values.

- (5) Are suitable materials used in the construction, including standard fasteners, and will the method of fabrication result in a consistently sound structure? (FARs 25.603, 25.605, 25.607, 25.613 and 21.305)

b. Hazards to the Aircraft or its Occupants:

- (1) Is the rack installed so that it does not adversely affect other structure (either primary or secondary) or cause interference with any controls, emergency exits, or necessary access provisions? (FAR 25.1309)
- (2) Will the installation of the rack and related equipment adversely affect weight and balance and c.g. position? (FARs 25.25, 25.27)
- (3) Is a fuse or circuit breaker of the rating appropriate to the cable used installed? (FAR 25.1355)

c. Operating Aspects:

- (1) In the case of dual installations, are the operating controls and instruments suitably identified to prevent misapplication by the pilot? (FAR 25.1309)
- (2) Have the necessary operational tests been performed to assure that the equipment will not adversely affect the operation of other communication or navigation systems? (FAR 25.1431)

d. Detail Design Standards:

- (1) Is the battery-generator combination adequate for the electrical loads imposed? (FARs 25.1309 and 25.1351)
- (2) Are terminal strips designed or mounted so that loose metallic objects cannot fall across the terminal posts? (FAR 25.1309)
- (3) If plug and receptacle type of connections are used, are the soldered connections of the wire to the plug and receptacle inserts individually insulated from each other and from metallic parts of the plug and receptacle? (FAR 25.1309)
- (4) Are junction boxes made of fire-resistant or nonabsorbent plastic material? (FAR 25.1309)
- (5) Are interconnecting wires and cables supported by

insulated clamps to avoid chafing? (FAR 25.1309)

- (6) Are the interconnecting cables and wires installed in such a manner that they are suitably protected from fuel, oil, water, and other detrimental substances, and mechanical damage? (FAR 25.1309)
- (7) Is the equipment located where it will obtain sufficient cooling and will not be a smoke hazard or ignite readily flammable parts of the airplane? (FAR 25.1309)
- (8) Are adequate means provided for inspection of the rack, related equipment, or adjacent components which require periodic inspections? (FAR 25.611)

AIRWORTHINESS COMPLIANCE CHECK SHEET #27

1. SUBJECT: Radio Antenna Installations - FAR 25 Aircraft
2. APPLICABLE FEDERAL AVIATION REGULATIONS

25.251 Flutter and Vibration
25.301 Loads
25.629 Flutter, Deformation, and Vibration
25.1301 Functional and Installation Requirements
25.1309 Equipment, Systems, and Installation
25.1323 Flight and Navigational Instruments
25.1325 Flight and Navigational Instruments
25.1327 Flight and Navigational Instruments
25.1329 Flight and Navigational Instruments
25.1331 Flight and Navigational Instruments
25.1431 Radio and Electronic Equipment

Radio antenna installations, when made the same as installations by the airframe manufacturer or other installations which are already approved, may be accepted without further investigation. When installations are not the same as ones already approved, the following points should be checked to determine that they are satisfactory.

3. CHECKLIST

- a. Structural Requirements:

- (1) Is the installation structurally adequate? (FARs 25.301, 25.1301, and 25.1431.)

NOTES: The information contained in AC 43.13-2 for the installation of radio antennas may be used for guidance in this evaluation. Extreme caution should be used in evaluating installations involving the cutting of primary structure, particularly where the

pressurized portion of the aircraft is affected. Manufacturers' maintenance or repair manuals may be of some assistance in evaluating the significance of the structure affected. Once it is established that the point of installation is satisfactory, the effect of airloads and possible vibration of the antenna itself should be considered. If the antenna is of the stub or mast type, this can usually be evaluated by grasping the antenna and tugging on it to ascertain that the installation is reasonably rigid. Vibration characteristics can be ascertained by observation during engine operation on the ground and a flight check up at least Vne.

- (2) Will the installation affect the flutter and vibration characteristics of the aircraft? (FARs 25.251, and 25.629.)

NOTE: The regional Engineering Service Representative should be contacted for assistance in this evaluation, particularly for those installations involving the fin, rudder, or top of the fuselage just forward of the fin.

b. Hazards to the Aircraft or its Occupants:

- (1) Is the antenna mounted so as not to obstruct instrument pitot and static source areas? (FARs 25.1309, 25.1323, 25.1325, 25.1327, 25.1329, and 25.1331.)
- (2) Is the attachment of the antenna adequate to prevent its dislodgment with possible damage to airplane surfaces? (FAR 25.1309.)
- (3) Is the antenna installed so that it does not adversely affect other structure (either primary or secondary) or cause interference with any controls, emergency exits, or necessary access provisions? (FAR 25.1309.)

c. Operating Aspects:

- (1) Have the necessary operational tests been performed to assure that the equipment will not adversely affect the operation of other communication or navigation systems? (FARs 25.1301, and 25.1309.)

d. Detail Design Standards:

None

AIRWORTHINESS COMPLIANCE CHECK SHEET #28

1. SUBJECT: Appliance Outlet Installations - FAR 25 Aircraft

2. APPLICABLE FEDERAL AVIATION REGULATIONS

25.1309 Equipment, systems, and installations
25.1351 Electrical system capacity
25.1353 Electrical equipment and installations
25.1357 Electrical protection
25.1363 Electrical system tests and analyses

Appliances outlet installations which are the same as those made by the airframe manufacturer or other installations which are already approved may be accepted without further investigations. On other installations, the following points would be checked to determine that the installation is satisfactory.

3. CHECKLIST

a. Structural Requirements:

Caution should be used in attaching outlets or wire bundles to primary structure. Holes or notches may have an adverse effect on the structural integrity and should be judiciously placed.

b. Hazards to the Aircraft or its Occupants:

- (1) Is a fuse or circuit breaker, of appropriate rating to protect the cable, installed in the circuit to the outlet receptacle? (FAR 25.1357.)
- (2) If a circuit breaker is used, is it of a type which will open the circuit irrespective of the position of the control in case of a fault? (FAR 25.1357.)
- (3) Is the outlet receptacle capable of transmitting full outlet current (fuse or circuit breaker rating) without overheating? (FAR 25.1309)

c. Operating Aspects:

- (1) Is the appliance outlet identified as to function and as to system voltage, frequency (if alternating current), and maximum current? (FAR 25.1309.)

d. Detail Design Standards:

- (1) Are all items of equipment used in connection with the outlet capable of withstanding critical

environmental conditions? (Cable conforming to Military Specification MIL-W-5086 or the equivalent is acceptable.) (FAR 25.1351.)

- (2) Are the cables to the appliance outlet and the receptacle itself installed in such a manner that use of the outlet will not affect adversely the simultaneous operation of any other electrical unit or system of units essential to the safe operation of the airplane? (FAR 25.1353.)
- (3) Is the electric power system capable of supplying the added appliance outlet load (assuming full rating) without electrical or thermal distress? This may be determined by revision of the original load analysis, conducting a new load analysis, or by actual flight or ground tests. In any case, it should be determined that the system is not overloaded. (FARs 25.1309, 25.1351, and 25.1363.)