CHAPTER 2. AIRFRAME

AIRWORTHINESS COMPLIANCE CHECK SHEET #13

1. SUBJECT: Modification and/or Installation of Seats - FAR 23 Aircraft

2. APPLICABLE FEDERAL AVIATION REGULATIONS

21.305 Approval of Material, Parts, Processes and Appliances
23.23 Weight and Balance
23.301 Loads
23.307 Proof of Structure
23.561 Protection
23.603 Materials and Workmanship
23.605 Fabrication Methods
23.607 Standard Fastenings
23.609 Protection
23.613 Material Strength Properties and Design Values
23.785 Seats and Berths
23.807 Exits
23.1301 Functional and Installation Requirements
23.1413 Safety Belts
23.1589 Center Gravity Position

Modification and/or installations of seats which are the same as those made by the manufacturer or other parties wherein previous approval has been obtained may be accepted without further investigation. When the modifications and/or installations are different from those previously approved, the following points are to be checked to assure satisfactory compliance.

3. CHECKLIST: SEAT MODIFICATION - FAR 23 AIRCRAFT

a. Structural Requirements

(1) Is the structure of the modified seat adequate to support the required loads? (FAR 23.301, .307, .561, .785)

This can be determined by one of the following methods:

(a) By direct comparison with an existing approved modification which has the same or similar weight, size, and design.

(b) By structural analysis or static test. Seat structures may not always lend themselves readily to analysis, but are normally adaptable to static test. In conducting the static tests on the modified seats, the procedure as described in TSO C25a/C39 should be followed.

b. Hazards to Aircraft or its Occupants

(1) Does the modification affect the amount of padding or cushioning material so that corners, fittings, knobs, or similar projections are more likely to cause serious injury by human impact? (FAR 23.561.)

(2) Does change in fabric or upholstery materials comply with flame-resistant requirements? (TSO C25a/C39)

(3) Does change adversely affect operating mechanism or other subcomponent of seat, in that it may effect the safety of occupant? (FAR 23.1301)

c, Detail Design Standards

(1) Does change affect the strength of safety belt attachment? (FAR 23.1413.)

(2) Does change to seat design or seat installation have any effect regarding the access to emergency exit (s)? (FAR 23.807)

(3) Does quality of workmanship appear to be equivalent to the original? (FAR 23.603, 23.605)

4. CHECKLIST: SEAT INSTALLATION - FAR 23 AIRCRAFT

a. Structural Requirements

(1) Is the seat to be installed an approved seat which complies with the requirements of TSO C25a/C39? (FAR 23.785)

(2) If the seat has been manufactured to conform with TSO requirements, has the strength of seat attachment to structure been determined by using the factor of 1.33 times (multiplied by) the acceleration loads prescribed by FAR 23.561? (FAR 23.785)

(3) If the seat does not have TSO approval, are the seat structure and the strength of the seat attachment adequate to support the required loads? (FAR 23.301, .307, .561, .785). In conducting the static tests on the seat and seat attachment to structure, the procedure as described in TSO C25a/C39 should be followed.

b. Hazards to the Aircraft or its Occupants.

(1) Does the seat installation create any hazard to other passengers or can it contribute to a serious injury in the event of a minor crash landing? (FAR 23.561, 23.1413)

(2) Has it been demonstrated that the seat installation functions properly in the airplane? (FAR 23.1301)

(3) Has the weight and balance effect of the seat installation been considered? (FAR 23.23, 23.1589)

(4) Does seat installation have any adverse effect regarding the access to emergency exit (s) or width of the main passenger aisle? (FAR 23.807.)

c. Detail Design Standards

(1) If the seat does not have TSO approval, do the design standards comply with approved requirements? (FAR 23.785)

AIRWORTHINESS COMPLIANCE CHECK SHEET #14

1. SUBJECT: Modification and/or Installation of Seats - FAR 25 Aircraft

2. APPLICABLE FEDERAL AVIATION REGULATIONS

21.305 Approval of Material, 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
25.561 Emergency Landing Conditions
25.603 Materials
25.605 Fabrication Methods
25.607 Standard Fastenings
25.609 Protection
25.613 Material Strength Properties and Design Values
25.615
25.785 Seats, Berths, and Safety Belts
25.813 Emergency Evacuation
25.815 Width of Main Aisle
25.853 Cabin Interiors
25.1301 Functional and Installation Requirements
25.1413 Safety Belts

Modification and/or installations of seats which are the same as those made by the manufacturer or other parties wherein previous approval has been obtained may be accepted without further investigation. When the modifications and/or installations are different from those previously approved, the following points are to be checked to assure satisfactory compliance.

3. CHECKLIST: SEAT MODIFICATION - FAR 25 AIRCRAFT

a. Structural Requirements

(1) Is the structure of the modified seat adequate to support the required loads? (FAR 25.301, .305, .307, .561, .785)

This can be determined by one of the following methods:

(a) By direct comparison with an existing approved

modification which has the same or similar weight, size, and design.

(b) By structural analysis or static test. Seat structures may not always lend themselves readily to analysis, but are normally adaptable to static test. In conducting the static tests on the modified seats, the procedure as described in TSO-C25a/C39 should be followed.

b. Hazards to Aircraft or its Occupants

(1) Does the modification affect the amount of padding or cushioning material so that corners, fittings, knobs, or similar projections are more likely to cause serious injury by human impact? (FAR 25.561 and 25.785.)

(2) Does change in fabric or upholstery material comply with flame-resistant requirements? (FAR 25.853)

(3) Does change adversely affect operating mechanism or other subcomponent of seat, in that it may effect the safety of occupant? (FAR 25.1301)

(4) Does the modification affect weight and balance of aircraft? (FAR 25.25, 25.27)

c. Detail Design Standards.

(1) Does change affect the strength of safety belt attachment? (FAR 25.1413)

(2) Does change to seat design or seat location have any effect regarding the access to emergency exit (s) or width of main passenger aisle? (FAR 25.813)

(3) Are acceptable government and industry standards followed with respect to: materials, fastenings, fabrication methods, protection of seat structure, and design criteria? (FAR 25.603, .605, .607, .613, .615) (See also TSO-C25a/C39)

4. CHECKLIST: SEAT INSTALLATION - FAR 25 AIRCRAFT

a. Structural Requirements

(1) Is the seat to be installed an approved seat which complies with the requirements of TSO-C25a/C39? (FAR 21.305, 25.785)

(2) If the seat has been manufactured to conform with TSO requirements, has the strength of seat attachment to structure been determined by using the factor of 1.33 times (multiplied by) the acceleration loads prescribed by FAR 25.561? (FAR 25.785)

(3) If the seat does not have TSO approval and is thus being approved as part of the aircraft, are the seat

structure and the strength of the seat attachment adequate to support the required loads? (FAR 25.561, 25.785, 25.301, 25.305, and 25.307).

This can be determined by the application of loads as described in FAR 25.785. In conducting the static tests on the seat and seat attachment to structure, the procedure as described in TSO-C25a/C39 should be followed.

b. Hazards to the Aircraft or its Occupants

(1) Does the seat installation create any hazard to other passengers or can it contribute to a serious injury in the event of a minor crash landing? (FAR 25.561 and 25.1413)

(2) Has it been demonstrated that the seat installation functions properly in the airplane? (FAR 25.1301)

(3) Has the weight and balance effect of the seat installation been considered? (FAR 25.25, 25.27)

(4) Does the seat installation have any adverse effect regarding the access to emergency exit (s) or width of the main passenger aisle? (FAR 25.813 and 25.815)

c. Detail Design Standards

(1) If the seat does not have TSO approval, do the design standards comply with approved requirements? (FAR 25.785)

AIRWORTHINESS COMPLIANCE CHECK SHEET #15

1. SUBJECT: Landing Light Installations - FAR 23 Aircraft

2. APPLICABLE FEDERAL AVIATION REGULATIONS

23.301 Loads
23.307 Proof of Structure
23.337 Maneuvering Load Factors
23.341 Gust Load Factors
23.473 Load Factor for Landing Conditions
23.603 Material and Workmanship
23.605 Fabrication Methods
23.607 Standard Fastenings
23.609 Protection
23.611 Inspection Provisions
23.1301 Functional and Installational Requirements
23.1351 Electrical System Installation

Generator

23.1357 Fuses or Circuit Breakers
23.1361 Master Switch Arrangement

23.1383 Landing Lights

Landing Light Installations

91.33 An electric landing light is required by the operating rule (FAR 91.33) only when (1) the aircraft is operated for hire and (2) the aircraft is operated at night or under IFR. Landing light 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 installation capable of withstanding the required loads? The effect on other structure (primary or secondary) should be considered. (FAR's 23.301, 23.337, 23.341, and 23.473.)

NOTE: Particular care should be taken on the installation of landing lights since they are usually recessed into existing structure in the wing or fuselage. The leading edges of stress skinned (and some fabric covered) wings are usually structural to a large degree and would be adversely affected by cutouts which are not sufficiently or correctly reinforced. While the extreme nose sections of the fuselage are usually not primary structure, care should be taken on these installations. It is recommended if there is any doubt as to whether the proposed installation in the wing or fuselage is affecting primary or secondary structure, that the Engineering Service Representative be contacted for assistance. It is further recommended if the structure is definitely primary that the Engineering Service Representative be contacted for assistance in the evaluation of the installation.

(2) Is the material used in the installation suitable for the purpose intended and is the workmanship of a high standard? (FAR 23.603)

(3) Will the fabrication methods used result in a consistently sound installation and are standard approved fasteners used? (FAR 23.605, and 23.607.)

(4) Is adequate protection provided to protect against

deterioration or loss of strength in service due to weathering, abrasion or other causes? Are adequate inspection means provided and will the installations have an adverse effect on the inspection provisions for other components of the aircraft? (FARs 23.609, and 23.1383.)

b. Hazards to the Aircraft or its Occupants:

(1) Is the pilot compartment free from dangerous glare, halations or reflections which would interfere with the pilot's vision during operation of the landing light? (FAR 23.1383.)

A night-flight check should be performed to assure that no interference with pilot vision exists. Reflections from the propeller disc are particularly troublesome.

(2) Is a fuse or circuit breaker of the rating appropriate to the cable used installed? (FAR 23.1357.)

(3) 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.)

(4) Are the connecting cables 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:

(1) Does the landing light provide sufficient properly directed runway illumination to permit safe landings during night VFR operations? (FAR 23.1383.)

NOTE: A night-flight check should be performed to check landing light effectiveness.

(2) Is the landing light switch located so as to be readily accessible to the pilot? (FAR 23.1301.)

(3) Is the landing light switch adequately labeled as to operation and function performed? (FAR 23.1301.)

d. Detail Design Standards:

(1) Are the electric cables for the landing light installed in such a manner that they are suitably protected from fuel, oil, water and other detrimental substances, and mechanical damage? (FAR 23.1351.)

(2) Is the circuit to the landing light connected through the master switch arrangement? (FAR 23.1361.)

NOTE: A flight check should be performed to determine possible adverse flight

characteristics with light in extended position.

AIRWORTHINESS COMPLIANCE CHECK SHEET #16

1. SUBJECT: Landing Light Installations - FAR 25 Aircraft

2. APPLICABLE FEDERAL AVIATION REGULATIONS

21.305	Approval of Materials, Parts, Processes and Appliances
25.301	Loads
25.305	Strength and Deformation
25.307	Proof of Structure
25.321	Flight Loads
.331	
.333	
.337	
.341	
.349	
.351	
25.471	Ground Loads
.473	
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
25.1301	Functional and Installational Requirements
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
25.1383	Landing Lights

Landing light 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 installation capable of withstanding the required loads? The effect on other structure (primary or secondary) should be considered. (FARs 25.301, .305, .307, .321, .331, .333, .337, .341, .349, .351, .471, .473, .561.)

Particular care should be taken on the installation of

landing lights since they are usually recessed into existing structure in the wing or fuselage. The leading edges of stress skinned wings are usually structural to a large degree and would be adversely affected by cutouts which are not sufficiently or correctly reinforced. While the extreme nose sections of fuselage are usually not primary structure, care should be taken on these installations. It is recommended if there is any doubt as to whether the proposed installation in the wing or fuselage is affecting primary or secondary structure, that the Engineering Service Representative be contacted for assistance. It is further recommended if the structure is definitely primary that the ESR be contacted for assistance in the evaluation of the installation.

(2) Is the material used in the installations suitable for the purpose intended and is the workmanship of a high standard? (FAR 21.305, 25.603, 25.613.)

(3) Will the fabrication methods used result in a consistently sound installation and are standard approved fasteners used? (FAR 25.603, 25.605, 25.607.)

(4) Is adequate protection provided to protect against deterioration or loss of strength in service due to weathering, abrasion or other causes? Are adequate inspection means provided and will the installations have an adverse effect on the inspection provisions for other components of the aircraft? (FAR 25.609, 25.611.)

b. Hazards to the Aircraft or its Occupants

(1) Are the landing lights so installed that there is no glare, reflection, or halation which would interfere with the pilot's vision during operation of the lights? (FAR 25.1383)

Note: A night flight check should be performed to assure that no interference with pilot vision exists. Reflection from the propeller discs is particularly troublesome.

(2) Is a fuse or circuit breaker of appropriate rating to protect the cable installed in the landing light circuit? (FAR 25.1357.)

(3) 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.)

(4) Are the cables to the landing lights so installed that damage to essential circuits will be minimized in the event of a fault in a landing light cable? (FAR 25.1353.)

c. Operating Aspects

(1) Are the landing lights so installed that they provide sufficient illumination to permit safe landings during night VFR operations? (FAR 25.1383)

Note: A night flight check should be performed to check landing light effectiveness.

(2) Are the landing light switches readily accessible to the crew and suitably labeled as to operation and function performed? (FAR 25.1301)

(3) Is a separate switch provided for each landing light? (FAR 25.1383.)

Note: If two or more lights are installed in each wing, a switch for each set of lights is acceptable.

(4) Is a means provided to indicate to the pilots when the landing lights are extended? (FAR 25.1383)

d. Detailed Design Standards

(1) Are the landing lights and cables capable of withstanding critical environmental conditions? (Cable conforming to Military Specification MIL-W-5086 or the equivalent is acceptable.) (FAR 25.1353)

(2) Are the landing lights and cables so installed and designed that operation of the lights will not affect adversely the operation of any other 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 lighting 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 #17

1. SUBJECT: Interior Light Installations - FAR 23 Aircraft

2. APPLICABLE FEDERAL AVIATION REGULATIONS

23.773 Vision
23.1301 Functional and Installational Requirements
23.1351 Electrical System Installations

Generator

23.1361 Master Switch Arrangement
23.1357 Fuses or Circuit Breakers
23.1381 Instrument Lights

Instrument Light Installations

Interior light 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:

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

b. Hazards to the Aircraft or its Occupants:

(1) If instrument lights are installed, are they of such construction that there is sufficient distance or insulating material between current carrying parts and the housing so that vibration in flight will not cause shorting? (FAR 23.1381.)

(2) Are the instrument lights and other cabin lights so installed that their direct rays (or reflected rays from the windshield or other surfaces) are shielded from the pilot's eyes? (FARs 23.773, and 23.1381.)

(3) Are interior lighting fixtures so installed that lamps do not come in close proximity with combustibles such as interior trim or baggage? (FAR 23.1351.)

(4) Is a fuse or circuit breaker of the rating appropriate to the cable used installed? (FAR 23.1357.)

(5) 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.)

(6) Are the connecting cables 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:

(1) If instrument lights are installed, do they provide sufficient illumination to make all instruments and controls easily readable and discernible? (FAR

23.1381.)

(2) Are all interior lighting switches (which are significant to safety) readily accessible to the pilot and suitably labeled as to operation and function performed? (FAR 23.1301.)

d. Detail Design Standards:

(1) Are the electric cables for the interior lights installed in such a manner that they are suitably protected from fuel, oil, water and other detrimental substances, and mechanical damage? (FAR 23.1351.)

(2) Is the circuit to all interior lights 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 #18

1. SUBJECT: Interior Light Installations - FAR 25 Aircraft

25.1301	Functional and installational requirements
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
25.1387	Instrument lights

Interior light 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:

Caution should be used in attaching lights, receptacles 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) Are the instrument lights and other interior lights of such design that there is sufficient distance or insulating material between current carrying parts and the housing so that vibration in flight will not cause shorting? (FAR 25.1309.)

(2) Are the interior lighting fixtures so installed that a probable malfunction will not expose the crew or passengers to harmful electric shock? (FAR 25.1309.)

(3) Are the instrument lights and other cabin lights so installed that their direct rays (or reflected rays from the windshield or other surfaces) are shielded from the pilot's eyes? (FAR 25.1387)

(4) Are interior lighting fixtures so installed that lamps do not come in close proximity with combustibles such as interior trim or baggage? (FAR 25.1309.)

(5) Is a fuse or circuit breaker, of appropriate rating to protect the cable, installed in the lighting circuit? (FAR 25.1357.)

(6) 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.)

c. Operating Aspects:

(1) Are the instrument lights so installed that they provide sufficient illumination to make all instruments and switches easily readable? (FAR 25.1387.)

(2) Is a means of controlling the intensity of the instrument lights provided, except where it can be shown that nondimmed lights are satisfactory under all expected conditions of flight? (FAR 25.1387.)

(3) Are all interior lighting switches (which are significant to safety) readily accessible to the crew and suitably labeled as to operation and function performed? (FAR 25.1301.)

c. Detail Design Standards:

(1) Are all lighting fixtures and cables capable of withstanding critical environmental conditions? (Cable conforming to Military Specification MIL-W-5086 or the equivalent is acceptable.) (FAR 25.1353.)

(2) Are all lights and cables so installed that the operation of any one unit or system of units will not affect adversely the simultaneous operation of any other electrical unit or system or units essential to the safe operation of the airplane? (FAR 25.1353.)

(3) Is the electric power system capable of supplying the added lighting 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 tests. In any case, it should be determined that the system is not overloaded. (FARs 25.1309, 25.1351, and 25.1363.)

AIRWORTHINESS COMPLIANCE CHECK SHEET #19

1. SUBJECT: Anticollision Light Installations - FAR 25 Aircraft

2. APPLICABLE FEDERAL AVIATION REGULATIONS

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
25.629	Flutter, Deformation and Vibration
25.773	Pilot Compartment Vision
25.1309	Equipment Systems and Installations
25.1353	Electrical Equipment and Installations
25.1357	Electrical Protection
25.1401	Anticollision Light System

Anticollision light installations which are the same as those made by the airframe manufacturer, or their 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. The existing anticollision system requirements in FAR 25.1401 were effective April 1, 1957, and, therefore, apply only to aircraft for which an application for a type certificate was made on or after that date. Anticollision lights now installed on earlier aircraft (for which application for a type certificate was made before April 1, 1957) do not necessarily comply with latest regulations. The information contained in AC 43.13-2, Chapter 4, may be used in evaluating anticollision light modifications on such aircraft. The material below should be used when the applicant is required to (or elects to) comply with the existing requirements.

3. CHECKLIST.

a. Structural Requirements:

(1) Is the installation capable of withstanding the required loads? The effect on other structure (primary or secondary) should be considered. (FARs 25.301,

25.305, 25.307, 25.321, 25.471 and 25.561)

NOTE: The information contained in AC 43.13-2, Chapter 4, may be used for assistance in determining compliance. For installations involving cutting of pressurized fuselage structure or fin and rudder installations, the regional Engineering Service Representative should be contacted for assistance in the evaluation.

(2) Will the installation affect the flutter and vibration characteristics of the aircraft? (FAR 25.629)

NOTE: The regional Engineering Service Representative should be contacted for assistance in evaluating this installation, particularly if it involves the fin, rudder, or top of fuselage just forward of the fin.

b. Hazards to the Aircraft or its Occupants:

(1) Are the anticollision lights so located that their output is not detrimental to the flight crew's vision? (FARs 25.773 and 25.1401)

NOTE: A night-flight check should be performed to determine that there are no hazardous reflections from such sources as the propeller discs, nacelles or wing surfaces.

(2) Are the anticollision lights so located that they do not detract from the conspicuity of the position lights? (FAR 25.1401.)

(3) Is a fuse or circuit breaker (of a rating appropriate to the cable used) installed? (FAR 25.1357.)

(4) 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)

c. Operating Aspects:

(1) Does the system illuminate in all directions within 30 degrees above and 30 degrees below the horizontal plane of the aircraft, except for a solid angle obstructed visibility not exceeding 0.03 steradians in the rearward direction? (FAR 25.1401). A relatively simple method to determine the solid angle obstruction due to the tail fin is as follows:

(a) Position the levelled aircraft in a darkened hangar so that its longitudinal axis is perpendicular to the hangar wall. Place a small light at the desired top anticollision light location. Measure the areas of the tail fin shadow on the wall above the height of the lamp.

This area, divided by the square of the distance from lamp to wall (in the same units), is approximately equal to the solid angle obstruction in steradians. The distance from lamp to wall should be as large as practicable to keep errors low.

(2) Is the obstructed visibility (if any) confined within a solid angle equal to 0.15 steradians centered about the longitudinal axis of the aircraft in the rearward direction? (FAR 25.1401) (See information under paragraph (1) above on measurements of steradians.)

(3) Is the effective flash frequency of the anticollision light system, as observed from a distance, between 40 and 100 cycles per minute? (FAR 25.1401)

(4) If the anticollision light system is made up of two or more individual lights, is the effective flash frequency less than 180 cycles per minute in the overlap regions? (FAR 25.1401)

(5) Is the color of the lights aviation red in accordance with the specifications of FAR 25.1397? (FAR 25.1401) (Pending issuance of a TSO on these lights, light manufacturers' or other laboratory test reports may be acceptable as proof of color)

(6) Are the minimum light intensities in all vertical planes measured with the red filter and expressed in terms of "effective intensities", in accordance with Figure 25.1401? (FAR 25.1401)

d. Detail Design Standards:

(1) Are the lights and wiring components designed to withstand probable environmental extremes (of temperature, vibration, pressure, etc.) to which they could be exposed?

(2) Are approved materials used in the installation, including standard fastenings? (FARs 25.603, 25.607)

(3) Will the fabrication methods used result in a consistently sound structure? (FAR 25.605)

(4) Is the installation protected against deterioration due to weathering, corrosion, abrasion or other causes? (FAR 25.609)

(5) Are adequate inspection provisions made for this and other affected components? (FAR 25.611)

AIRWORTHINESS COMPLIANCE CHECK SHEET #20

1. SUBJECT: Buffet and Cabinet Installations - FAR 23 Aircraft

2. APPLICABLE FEDERAL AVIATION REGULATIONS

23.23 Weight and Balance
23.301 Loads
23.307 Proof of Structure
23.337 Maneuvering Load Factors
23.341 Gust Load Factors
23.473 Load Factor for Landing Conditions
23.521 Water Load Conditions
23.561 Protection
23.603 Materials and Workmanship
23.605 Fabrication Methods
23.607 Standard Fastenings
23.609 Protection
23.611 Inspection Provisions
23.613 Material Strength Properties and Design Values
23.807 Exits
23.1301 Functional and Installation Requirements
23.1431
23.1557 Baggage Compartment - Limitations
23.1589 Center of Gravity Position

Since FAR 23 design requirements do not adequately provide for buffet and cabinet installations, the following check list is intended to be used as guidance material when approving buffet and cabinet installations and is also to be used when approving modifications to existing buffet and cabinet installations.

3. CHECKLIST

a. Structural Requirements:

(1) Is the structure adequate to support the required loads? (FARs 23.301, 23.307, 23.337, 23.341, 23.473, 23.521, 23.561, and 23.23.)

This answer can be determined by either of two methods:

(a) By direct comparison with existing approved installation having the same or similar characteristics of weight, size, and arrangement.
(b) By structural analysis or static test. Structures, such as buffets and cabinets, do not lend themselves readily to analysis but are normally adaptable to static test.

In conducting the static test, the following procedure may be used:

1 Determine the weight and center of gravity position of the complete assembly to be tested.

2 Mount the unit either in its position in the airplane or in a rig simulating the actual installation in the airplane.

3 Dummy equipment items simulating the actual buffet units should be installed utilizing the attaching points by which the equipment is normally held in place. The dummy equipment should be such 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.

In accordance with FAR 23.561, all items of mass which would be apt to injure the passengers or crew in the event of a minor crash landing should have their supporting structure designed to the crash load requirements of (FAR 23.561) insofar as the forward, upward, and sideward direction are concerned. The applicable downward load factor shall be the critical flight or landing load factor specified in FAR 23.337, 23.341, and 23.473. In lieu of a calculated determination of the down load factor, the ultimate factors of 6.6, 6.6, and 9.0 may be used for the normal, utility, and acrobatic categories, respectively. For equipment locations not covered by FAR 23.561, the required loads (ref. FAR 23.301) are the flight and landing load factors of FARs 23.337, 23,341, and 23.473. In lieu of a calculated determination of these loads, the load factors of 23.561 plus the down load factors referenced above may be used.

(2) Is the buffet or cabinet installed so that it does not adversely affect other structure, either primary or secondary? (FAR 23.1431.)

(3) If the buffet or cabinet is installed in a compartment which has a placarded weight limitation, has this placard been changed to reflect the weight of the added equipment? (FAR 23.1557.)

b. Hazards to the Aircraft or its Occupants:

(1) As the result of the buffet or cabinet being installed, is the accessibility of the exits and doors adversely affected? (FAR 23.807.)

(2) Will an occupant, when making proper use of the safety belt, receive possible serious injury during minor crash conditions as the result of contact of his body with protruding or penetrating parts of the buffet or cabinet? (FAR 23.561.)

c. Detail Design Standards:

(1) Will the installation of the buffet or cabinet, and their contents, adversely affect the weight and balance

of the airplane for the most forward and most aft c.g. locations? (FAR 23.23 and 23.1589.)

Electrical aspects of buffet and cabinet installations are the subject of another ACCS.

AIRWORTHINESS COMPLIANCE CHECK SHEET #21

1. SUBJECT: Buffet and Cabinet Installations - FAR 25 Aircraft

2. APPLICABLE FEDERAL AVIATION REGULATIONS

21.305	Approval of Material, Parts, Processes, and Appliances
25.301	Loads
25.303	Loads
25.305	Strength and Deformation
25.307	Proof of Structure
25.321	Flight Loads
25.365	Flight Loads
25.367	Flight Loads
25.373	Flight Loads
25.471	Ground Loads
25.473	Ground Loads
25.489	Ground Loads
25.491	Ground Loads
25.499	Ground Loads
25.503	Ground Loads
25.507	Ground Loads
25.511	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
25.615	Material Strength Properties and Design Values
25.813	Emergency Evacuation
25.1301	Functional and Installation Requirements
25.1309	Equipment, Systems, and Installations
25.1353	Electrical Equipment and Installations
25.1583	Operating Limitations

Buffet and cabinet 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 structure adequate to support the required

loads? (FARs 25.301, 25.303, 25.305, 25.307, 25.321, 25.365, 25.367, 25.373, 25.471, 25.473, 25.489, 25.491, 25.499, 25.503, 25.507, 25.511, 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 characteristics of weight, size and arrangement.

(b) By structural analysis or static test. Structures, such as buffets and cabinets, do not lend themselves readily to analysis, but are normally adaptable to static test. In conducting the static test the following procedure may be used:

1 Determine the weight and center of gravity position of the complete assembly to be tested.

2 Mount the unit 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 items simulating the actual buffet units should be installed utilizing the attaching points by which the equipment is normally held in place. The dummy equipment 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.

Other mass items should have their supporting structure designed to the critical load factors of FARs 25.321, 25.365, 25.367, 25.373, 25.471, 25.473, 25.489, 25.491, 25.499, 25.503, 25.507,. 25.511. The load factors of 25.561 may be used in lieu of these factors.

(2) Is the buffet or cabinet installed in such a manner so that it does not adversely affect other structure, either primary or secondary? (FAR 25.307)

b. Hazards to the Aircraft or its Components

(1) As the result of the buffet or cabinet being installed, is the accessibility of the exits and doors adversely affected? (FAR 25.813)

(2) Will an occupant, when making proper use of the safety belt, receive possible serious injury during minor crash conditions as the result of contact of his body with protruding or penetrating parts of the buffet or cabinet? (FAR 25.561)

(3) Is the installation and surrounding area suitably protected to prevent corrosion resulting from spillage of corrosive liquids in the vicinity of the buffet? (FAR 25.609)

c. Detail Design Standards

(1) Will the installation of the buffet or cabinet, and their contents, adversely affect the weight and balance of the airplane? (FAR 25.1583)

(2) Are the locks and catches on each of the doors adequate to retain the buffet units stored within during emergency landing and severe gust conditions? (FAR 25.305)

(3) Are the materials used suitable for the purpose intended and the method of fabrication such that it will result in a consistently sound structure? (FARs 25.607, 25.615, 21.305, 25.603, 25.605)

(4) Are satisfactory inspection means provided for the installation and the surrounding area? (FAR 25.611)

The electrical aspects of these installations will be covered in another ACCS.

AIRWORTHINESS COMPLIANCE CHECK SHEET #22

1. SUBJECT: Installations or Modifications of Windshields With or Without Electrical Heating Provisions in Nonpressurized Aircraft (FAR 23)

2. INTRODUCTION: These guidelines are applicable to windshields in non-pressurized airplanes. Windshield installations which are the same as those made by the airframe manufacturer or other installations on the same type aircraft which are already approved may be accepted without further investigation. If the installation involves modification of the basic aircraft structure, (e.g., acrylic plastic replaced with polyester or plastic replaced by glass or glass replaced by plastic), a change in material thickness or method of mounting, then extreme caution should be used in the evaluation. Hidden details may affect such installations to a considerable extent, such as the method of containing the glass or plastic.

3. APPLICABLE FEDERAL AVIATION REGULATIONS

23.301	Loads
23.307	Proof of Structure
23.321	Flight Loads
23.347	Flight Loads
23.471	Ground Loads
23.603	Materials and Workmanship
23.605	Fabrication Methods
23.607	Standard Fastenings
23.613	Material Strength Properties and Design Values
23.773	Vision
23.775	Windshields, Windows, and Canopies
23.777	Cockpit Controls
23.1351	Installation
	Electric Power Sources
23.1357	Protective Devices Installation
	Spare Fuses
23.1361	Master Switch Arrangement
23.1367	Switches
	Switch Installation

4. CHECKLIST

a. Structural Requirements:

(1) Can the windshield and its supporting structure support the required loads? (FARs 23.301, 23.307, 23.321, 23.347, and 23.471.)

NOTE: The windshield is generally free-floating and nonload-bearing except for aerodynamic loads. Therefore, these requirements would only be of concern if the windshield opening is changed, if heat is used, or any appreciable change is made in the windshield thickness. Modifications, where it can be determined that equivalent or better structure has been installed, may be accepted after satisfactory completion of a test to Vne. This test should be conducted with caution and the speed V sub ne approached gradually. If the panel incorporates deicing or defogging provisions, the test should be performed with the windshield heat turned on, since the windshield interlayer material is more flexible at the higher temperatures. If some doubt exists or if the installation is quite complex, the Engineering Service Representative should be contacted.

b Hazards to the Aircraft or its Occupants:

(1) All internal glass panes shall be of a nonsplintering safety type. This would preclude the use of glass on the pilot side which is not a laminate of glass and plastic. (FAR 23.775.)

(2) If the windshield is electrically heated, is the electrical means properly protected by being laminated within the panel? (FAR 23.1351.)

(3) Are power leads, terminal attachments, and insulating covers installed so that they properly protect the pilot and copilot during a power-on condition? (FAR 23.1351.)

(4) Is power supply system properly safeguarded and electrically sound and adequate? Check the electrical system to the windshield for fuses, proper wire diameters, and specifications. (FARs 23.1351, 23.1361, 23.1357, and 23.1367.)

(5) Is there a cycling indicator to show power-on condition? (FAR 23.1351.)

(6) If the windshield draws 2 or more watts per square inch in any portion of the heated area, is there a temperature control system?

NOTE: Windshields drawing 2 watts per square inch of heated area or more may become excessively overheated. The control system should be adjusted to provide a nominal temperature of 100 degrees F. at the sensing element control. This may be accomplished by checking that the temperature on the outside of the windshield does not exceed 100 degrees F. when measured in still air with a thermocouple or thermometer.

It is acceptable to operate one or more similar panels from one control system turning all "on" and "off", with a temperature sensor in one panel. An interruption in any part of the circuit should cause the system to turn off power to all the windshield panels. The panels should be similar electrically and should have essentially the same heat output within reasonable tolerance limits.

(7) Is the magnetic compass or other instruments and equipment such as radio unaffected when the power is applied to the windshield? (FAR 23.1351.)

c. Operating Aspects:

(1) Is the pilot's view through the windshield sufficiently extensive, clear, and undistorted for safe operation of the airplane, particularly during a moderate rain condition? (FAR 23.773.)

NOTE: FAR 23.773 should be reviewed in this evaluation. For aircraft intended for night operation a flight test is required. This should be performed with heat on for deicing or defogging panels. (FAR 23.1351.)

(2) Do the windshields and side windows have a luminous transmittance value of not less than 70 percent? This applies only to those panels which are forward of the pilot's back when he is seated in normal flight position. (FAR 23.775.)

NOTE: If the windshield is not certified by the manufacturer as meeting the 70 percent luminous transmittance value, Federal Test Method Standard No. 406, Method 3022, or American Society for Testing Materials No. D 1003-52 can be used to determine the value. If the material is manufactured to a military specification, the luminous transmittance value may be read from the specification for the particular thickness used.

(3) Is the windshield heat switch within convenient reach of the pilot or copilot? (FAR 23.777.)

d. Detail Design Standards:

(1) Has experience or a test established the suitability and durability of the material being used? (FAR 23.603.)

NOTE: A plastic windshield may be replaced with another plastic material, or glass with glass, provided the materials are of the same type and quality and the dimensions are unchanged. If plastic is to be replaced by glass or if the reverse occurs, it is a new installation and should be reviewed per the note under Section 4.(1). The mechanical means of attachment may be critical.

(2) Do the materials conform to approved specifications? (FAR 23.603)

(3) Will the method of fabrication result in a consistently sound structure? (FAR 23.605.)

NOTE: Panel edges and any fastener holes should be smooth and without nicks. Laminated parts should have Parts Manufacturer approval.

(4) Are standard approved fasteners used? (FAR 23.607.)

AIRWORTHINESS COMPLIANCE CHECK SHEET #23

1. SUBJECT: Modification of an Exhaust Type Cabin Heater to Increase Heat Output Without any Changes to the Existing Exhaust System - FAR 23 Aircraft.

2. APPLICABLE FEDERAL AVIATION REGULATIONS

23.1125	Exhaust Heat Exchangers, Exhaust Heat Exchangers Used in Ventilating Air Heating Systems
23.1141	Powerplant Controls
23.831	Ventilation

The type of heater under consideration is a simple muff type assembly which encloses a portion of the exhaust manifold. Since the change being evaluated does not involve any modification of the exhaust manifold, these guidelines do not cover exhaust system changes. Inspector should refer to pertinent ACCS if exhaust system changes are involved.

3. CHECKLIST

a. Structural:

(1) Is the heater assembly constructed and supported to withstand vibration, inertia, and other loads which might be imposed during normal operation? (FAR 23.1125)

b. Hazards:

(1) Are the design and construction features of the heater such as to prevent the leakage of exhaust gases from joints or discharge points into the ventilating air? (FAR 23.1125)

(2) Is the ventilating air intake so located as to prevent the entrance of fumes or fluids from any source? (FAR 23.1125)

NOTE: Watch out for areas where breathers, drains or exhaust discharge.

c. Operational:

(1) Do the heater controls maintain their setting with the engine running? (FAR 23.1141)

(2) Do controls have adequate strength and rigidity to withstand operational loads? (FAR 23.1141)

(3) Has every possible source of carbon monoxide contamination of cabin air been investigated and

corrected? (FAR 23.831)

NOTE: If there is any evidence of suspicion that carbon monoxide might enter the cabin ventilating air, the Engineering Service Representative should be contacted to conduct a flight test. Carbon monoxide concentration shall not exceed one part in 20,000 parts of air, same as ACCS on engine exhaust system.

Test Procedure to Determine CO Content

A carbon monoxide indicator should be used in determining compliance with the above requirement. The instrument manufactured by the Mines Safety Appliance Company or the Bulb Type Colorimetric Indicator may be used for this purpose, one of which is located at each Flight Engineering and Factory Inspection Branch Office. The following procedure should be used:

a The aircraft should be flown in level flight at MC power or as nearly so as possible. Carburetor should be set full rich with all windows closed; reading should be taken in at least the following locations:

1 Along the floor (approximately 4 inches above) in front of each occupant.

2 On each side of the cabin approximately a foot forward of each occupant.

3 A few inches in front of each occupant's face.

4 In front of the cabin heater opening(s) with heat on.

b Conduct the same investigation as outlined in a 1 through a 3 except with window partially open, thus tending to produce a vacuum in the cabin.

c The aircraft should then be flown in a glide with power off (idling) and readings taken a few inches in front of each occupant's face with both windows open and closed as above.

d The highest reading obtained at any of the above points shall not exceed .005%

d. Detail Design:

(1) Will the material used for this heater withstand continued operation at operating temperature? (FAR 23.1125)

NOTE: Temperatures in the exhaust manifold at this point may run about 1000 degrees.

Temperatures in the muff portion may run about 400 degrees - 500 degrees F. Steel muff construction is recommended; however, aluminum alloy or similarly heat resistant material is usually acceptable unless temperatures over 600 degrees F. are expected.

(2) Are the critical areas which might affect the service life of the heater such as welds, sharp formed corners, etc., readily accessible for inspection? (FAR 23.1125)

(3) Is the heater easily removable for necessary routine inspection of the exhaust manifold? (FAR 23.1125)

(4) When installed, is the exchanger properly ventilated with the control valve in either the hot or cold position? (FAR 23.1125)

The occurrence of hot spots under the muff could result in fatigue and failure. Any suspicion of such areas should be investigated using thermocouples to measure the temperatures. Consult the Engineering Service Representative for advice if excessive temperatures are suspected.