



AEROSPACE STANDARD

AS8057™**REV. A**Issued 2008-07
Revised 2021-12

Superseding AS8057

Minimum Design and Performance of Airplane Galley Insert Equipment, Electrical/Pressurized

RATIONALE

This standard is updated to (1) address, if appropriate, comments associated with TSO C184, (2) update RTCA publications to the latest standards, (3) clarify pass/fail criteria for environmental testing, (4) consolidate waste receptacle design and test requirements, (5) add performance requirements and associated verification tests for thermal protection devices, (6) clarify Interface Control Document requirements, and (7) provide other minor updates/clarifications.

FOREWORD

This SAE Aerospace Standard (AS) and AS8056 establish minimum design and performance requirements for galley insert equipment. The content of both standards is harmonized.

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1. SCOPE

1.1 General

This SAE Aerospace Standard (AS) establishes minimum design and performance requirements for galley insert equipment with an electrical and/or pressure system, as well as associated components intended for installation in galleys and other areas (e.g., bars) of transport category airplanes.

1.2 Purpose

1.2.1 This standard applies to the following equipment intended for installation in galleys and other areas (e.g., bars) within transport category airplanes, such as but not limited to the following:

- a. Ovens (e.g., convection, steam, induction, microwave, bun warmer, plate warmer)
- b. Beverage makers (e.g., coffee makers, coffee warmers, water heaters, espresso makers)
- c. Beverage cups and jugs (so-called hot cups and jugs)
- d. Self-contained refrigeration equipment (e.g., refrigerators, freezers, wine chillers, water coolers, air chillers)
- e. Trash compactors
- f. Rail assemblies
- g. Associated components, such as oven racks and trays, beverage servers

1.2.2 This standard does not:

- a. Address equipment covered in AS8056.
- b. Fully address design details that provide extended service life and continued airworthiness, since these are a function of: (1) total galley and food/beverage system design, (2) human factors engineering desired by individual operators, (3) techniques of care in servicing, and (4) maintenance philosophy. However, references to these considerations are included as appropriate.
- c. Fully address requirements that are covered by national aviation regulations, pertinent U.S. Public Health regulations and/or design details, which should be covered by galley operator/airplane manufacturer specifications for the subject equipment.
- d. Fully address requirements for equipment utilizing hydraulic systems (e.g., trash compactors).

1.2.3 When the term “equipment” is used in this standard, it refers to all of the items identified in the Purpose (1.2) unless specifically identified otherwise.

1.3 Mandating and Recommendation Phrases

a. “Shall”

The word “shall” indicates a mandatory criterion.

b. “Should”

The word “should” indicates a criterion for which an alternative, including non-compliance, may be applied if it is documented and justified.

NOTE: When reference to specific paragraphs of 14 CFR Part 25 are made, the intent is to identify requirements for meeting this AS standard, not to show compliance to the airworthiness regulations.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS-STD-401 Sandwich Constructions and Core Materials; General Test Methods

AMS2175 Castings, Classification and Inspection of

ARP4761 Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment

AS8056 Minimum Design and Performance of Airplane Galley In-Flight Carts, Containers, and Associated Components

AS39029 Contacts, Electrical Connector, General Specification For

AS50881 Wiring Aerospace Vehicle

2.1.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM C273 Standard Test Methods for Shear Properties of Sandwich Core Materials

ASTM C393 Standard Test Method for Flexural Properties of Sandwich Construction

ASTM D1781 Standard Test Method for Climbing Drum Peel for Adhesives

2.1.3 Code of Federal Regulations (CFR) and other FAA Publications

Available from the United States Government Printing Office, 732 North Capitol Street, NW, Washington, DC 20401, Tel: 202-512-1800, www.gpo.gov.

AC 25-17A Transport Airplane Cabin Interiors Crashworthiness Handbook

AC 25.856-1 Thermal/Acoustic Insulation Flame Propagation Test Method

14 CFR Part 1 Definitions and Abbreviations

14 CFR Part 25 Airworthiness Standards: Transport Category Airplanes

2.1.4 U.S. Government Publications

Copies of these documents are available online at <https://quicksearch.dla.mil>.

MIL-STD-889 Dissimilar Metals

2.1.5 U.S. Food and Drug Administration (FDA) Publication

Available at <https://www.fda.gov/interstate-carriers-and-support-facilities-guidelines>.

Attachment 3 to Guide to Inspections of Interstate Carriers and Support Facilities

2.1.6 National Sanitation Foundation (NSF) Publications

Available from NSF International, P.O. Box 130140, 789 N. Dixboro Road, Ann Arbor, MI 48105, Tel: 734-769-8010, Toll Free (USA): 800-NSF-MARK, www.nsf.org.

NSF/ANSI 51 Food Equipment Materials

2.1.7 AWS Publications

Available from American Welding Society, 8669 NW 36 Street, #130, Miami, FL 33166-6672, Tel: 1-800-443-9353 or 305-443-9353, www.aws.org.

AWS D17.1 Specification for Fusion Welding for Aerospace Applications

2.1.8 NASA Publications

NASA Technical Services, NASA STI Program STI Support Services, Mail Stop 148, NASA Langley Research Center, Hampton, VA 23681-2199, 757-864-9658, Fax: 757-864-6500, <http://ntrs.nasa.gov/>.

NASA-STD-3000 Man-Systems Integration Standards

2.1.9 RTCA Publications

Available from RTCA, Inc., 1150 18th Street, NW, Suite 910, Washington, DC 20036, Tel: 202-833-9339, www.rtca.org.

RTCA/DO-160 Environmental Conditions and Test Procedures for Airborne Equipment

RTCA/DO-178 Software Considerations in Airborne Systems and Equipment Certification

RTCA/DO-248 Final Report for Clarification of DO-178B "Software Considerations in Airborne Systems and Equipment Certification"

RTCA/DO-254 Design Assurance Guidance for Airborne Electronic Hardware

2.1.10 ISO Publications

Available from International Organization for Standardization, ISO Central Secretariat, 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, Tel: +41 22 749 01 11, www.iso.org.

ISO 3744 Acoustics-Determination of sound power levels of noise sources using sound pressure – Engineering method in an essentially free field over a reflecting plane

ISO 3745 Acoustics-Determination of sound power levels of noise sources using sound pressure – Precision methods for anechoic and hemi-anechoic rooms

2.1.11 EASA Publications

Available from European Union Aviation Safety Agency, Konrad-Adenauer-Ufer 3, D-50668 Cologne, Germany (for visitors and for mail over 1 kg) and Postfach 10 12 53, D-50452 Cologne, Germany (for mail 1 kg or less); Tel: +49 221 8999 000, www.easa.europa.eu.

CS-25 Certification Specifications and Acceptable Means of Compliance for Large Aeroplanes

2.2 Definitions

ACCEPTANCE TEST: A test conducted to verify that the operational and safety performance of each production unit conforms to its design and published technical data.

ANALYSIS: Verification by technical/mathematical evaluation using mathematical representations (i.e., models, simulation, and algorithms), charts, graphs, drawings and representative test data. An example means of analysis could be a bit comparison of the actual outputs of the equipment to be qualified with the expected outputs, given a specific set of inputs.

ASSOCIATED COMPONENTS: Defined as both of the following:

1. Items, such as oven racks and trays, as well as beverage servers, that are stowed in or connected with galley insert equipment, but are not part of the equipment part number.
2. Items that need to meet 14 CFR 25 requirements to be included as part of an airplane type design.

BEVERAGE CUP: Cup placed at the galley worktop, and with an electrical connector to a galley receptacle, designed to heat water (similar to household electric kettle).

BEVERAGE JUG: Container with integrated heating element, and with an electrical connector to a galley receptacle, designed to hold hot beverages.

CLOSED SYSTEM: (a) Galley insert equipment for which check valves or similar devices isolate the equipment potable water plumbing from the airplane potable water system or the ambient environment. (b) Self-contained refrigeration equipment with a vapor cycle.

CONFIGURATION: Relative arrangement of parts. The figure, contour, and pattern produced by a spatial arrangement of parts, assemblies, or structures.

CONSTANT FREQUENCY (CF): Designates AC equipment intended for use on airplane electrical systems where the primary power is from a constant frequency (400 Hz) AC system.

FAILURE: An event or condition, occurring within an equipment item or system, which prevents the equipment from performing its intended function or endangers passengers and/or crewmembers.

GALLEY INSERT: A mechanical component, used in conjunction with airplane food service, which is not an integral part of the galley and is removable from the galley without tools or with the use of simple tools (e.g., trolleys, standard unit, drawer).

GALLEY INSERT EQUIPMENT (GAIN): Electrical equipment, used in conjunction with airplane food service, which is not an integral part of the galley and is removable from the galley without tools or with the use of simple tools (e.g., beverage maker, oven).

GALLEY INSTALLATION: An equipment/subsystem, used in conjunction with airplane food service, that is integral to the galley (e.g., Galley Potable Water System, Galley Waste Water System).

INDUSTRY SPECIFICATION: A specification that is accepted aerospace- industry wide (e.g., SAE [AS, ARP, and AMS], military [MIL and MS], and National Aerospace Standard [NAS]).

INTENDED FUNCTION: The activity equipment normally executes or provides.

INTERCHANGEABILITY: That quality which allows an assembly or part to substitute or be substituted for another and to meet all physical, functional, and structural requirements of the original.

INTERFACE: The fit and functional relationships of equipment with the galley or with other airplane structure.

INTERFACE CONTROL DOCUMENT: A document created for the purpose of communicating interface information.

JOINT: The line of meeting of two or more pieces or parts of equipment.

LATCH: A retaining device (e.g., hand-operated quarter turn or a spring-actuated latch for a door) that secures an item(s) during structural loading.

LOOSE COMPONENTS: Items, such as brew cups, beverage servers, or other components not attached to equipment, which are stowed in the equipment and are part of the equipment part number.

LOOSE EQUIPMENT: Galley Insert Equipment that is moveable and stowed in galley compartments when not in use (e.g., toaster, skillet).

MAXIMUM DUTY CYCLE: When operation of equipment is periodic, the maximum length of time for which the equipment is designed to operate at its rated capacity.

MAXIMUM NORMAL OPERATING PRESSURE (MNOP): The maximum attainable pressure of the equipment's pressure system when all the equipment's components are functioning normally. For wet equipment connected and open to the airplane potable water system, the maximum airplane water system pressure determines the MNOP.

NORMAL OPERATING PRESSURE RANGE: The range of pressures from the airplane potable water supply where the equipment is designed to be fully functional.

OPEN SYSTEM: Galley insert equipment for which the equipment potable water plumbing is not isolated from the airplane potable water system or the ambient environment by any device (e.g., check valves or similar devices).

OPTION: A function capable of being included as part of equipment. It shall be fully developed and able to be incorporated without adversely effecting compliance to the requirements of this Aerospace Standard.

PERIODIC TESTING: Testing conducted on each batch of material or product used to determine conformance to the process specification. Note: When consistent conformance has been demonstrated, reduced testing may be implemented in accordance with a quality assurance sampling plan.

POTABLE WATER: Water meeting the requirements of the U.S. Environmental Protection Agency Drinking Water Regulations or the U.S. Food and Drug Administration Bottled Water Regulations and filled into the water storage system of an airplane by an external source, i.e., service truck or filling port at the passenger bridge.

PRESSURE VESSEL: Equipment connected to the pressurized water system of the airplane or that generates pressures by heating elements or mechanical pumping. In general, water heater and beverage maker tanks, as well as refrigeration compressors, are pressure vessels.

PROCESS SPECIFICATION: A specification used by the equipment manufacturer that controls manufacturing processes (such as bonding or welding) or materials (such as sandwich panels) that are dependent on preparation, application, and procedure. These specifications ensure repeatability of the process or material for which it is written.

RAIL ASSEMBLY: A device provided for beverage makers, water heaters and air chillers, which simplifies interfaces between the equipment and the galley and facilitates easy installation and removal.

RESIDUAL WATER: Residual amount of water, after draining the equipment by gravity, under the worst case conditions defined in 3.6.4.

RETAINING DEVICES: A device such as a latch, stop, detent, guide, or other mechanical configuration used to retain items, such as doors, drawers, carts, modules, containers, equipment items, or other movable galley components.

SMOOTH SURFACE: Free of pits, pinholes, cracks, crevices, inclusions, rough edges and other surface imperfections detectable by visual and tactile inspection.

STOWED: Placed and retained in a stowage location, usually associated with taxi, takeoff, landing, and turbulence.

THERMAL FUSE: A thermal protector that interrupts power when an overheat condition is met, that cannot be reset, and that must be replaced by maintenance personnel action.

UNIT UNDER TEST (UUT): An equipment article, identical to a production unit, used for tests, or an equipment article that is a modified production unit, provided the modifications do not affect the test results.

WASTE BIN LINER: A disposable item, installed in a waste cart, a trash compactor, or galley waste compartment, intended to assist in the easy removal of collected waste.

WIDE VARIABLE FREQUENCY (WF): Designates AC equipment intended for use on airplane electrical systems where the primary power is from wide variable frequency (360 to 800 Hz) AC system.

NOTE: Additional definitions are given in reference 2.1.5.

3. REQUIREMENTS

3.1 Introduction

Table 1 identifies applicable requirements for existing galley insert equipment designs. Novel designs may require compliance to additional requirements, or requirements in Table 1 not identified by a bullet. To use the table, find the equipment in question along the top row, and then read down that column; the row in which a bullet appears indicates requirements that shall be addressed. A bullet in brackets indicates that the requirements are applicable for only a part of the equipment in question.

Table 1 - Applicable requirements

AS Section	Requirement	Ovens	Beverage Makers	Beverage Cups/Jugs	Refrigeration Equipment	Trash Compactors	Rail Assemblies	Associated components
3.2	General	•	•	•	•	•	•	•
3.3	Structural	•	•	•	•	•	•	•
3.4	Electrical	•	•	•	•	•	•	
3.5	Thermal Protection/Overheat	•	•	•	•	•		
3.6	Wet Equipment Design Requirement	(•) ¹	•	•			•	
3.6.1	General	(•) ¹	•	•			•	
3.6.2	Wet Equipment Connected with the Airplane Potable Water System	(•) ¹	•				•	
3.6.3	Low Water Sensing	(•) ¹	•					
3.6.4	Self-Venting/Self-Draining	(•) ¹	•					
3.6.5	Pressure Vessels		•		•			
3.6.6	Pressure Limits	(•) ¹	•		•		•	
3.6.7	Water Taps/Faucets		•	(•) ²				
3.7	Equipment Ventilation/Exhaust Air	•	•	•	•	•		
3.8	Maximum Temperature Design Requirements	•	•	•	•	•		
3.9	Fire Properties of Materials	•	•	•	•	•	•	•
3.10	Placards	•	•	•	•	•	•	•
3.11	Acoustics	•	(•) ³		•	•		
3.12	Ovens	•						
3.13	Interchangeability/Installation/Removal/Replacement	•	•	•	•	•	•	•
3.14	Software	•	•	•	•	•		
3.15	Electronic Hardware	•	•	•	•	•		
3.16	Environmental Design Requirements	•	•	•	•	•	•	•
3.17	Power Quality – Constant and Wide Frequency Equipment (AC)	•	•	•	•	•		
3.18	Safety Analysis	•	•	•	•	•	•	•

¹ Steam Ovens only² Beverage Jugs only³ Beverage Maker with pumps and/or motors (e.g., espresso makers) only

3.2 General

3.2.1 Materials and Materials Control

Materials shall be proven by test to have strength and durability (14 CFR 25.603 and 25.613).

3.2.1.1 Materials

Materials, including finishes or decorative surfaces applied to the materials, shall be tested periodically (see definition for PERIODIC TESTING) to assure compliance with 3.9.

3.2.1.2 Sandwich Panel

- a. The mechanical properties of sandwich panels shall be controlled by process specification and the specification shall require periodic testing (see definition for PERIODIC TESTING) to assure conformance to the specification. At minimum, the specification shall contain requirements for the following, per AMS-STD-401 (or equivalent):
 1. Core Shear or Sandwich Shear (refer to ASTM C273)
 2. Sandwich Flexure (refer to ASTM C393)
 3. Sandwich Climbing Drum Peel (refer to ASTM D1781)
- b. Fasteners and inserts installed into or through the core shall be potted or sealed to prevent entry of moisture or water.
- c. Aluminum honeycomb core shall be finished for corrosion resistance at the time of core fabrication.

3.2.1.3 Fasteners

Fasteners shall be in accordance with industry specifications.

3.2.1.4 Castings

Castings shall be Class 3 per AMS2175 or equivalent, and shall be clean, sound, and free from blowholes, porosity, or surface defects. Imperfections may be removed if strength and serviceability are not impaired as a result.

3.2.1.5 Forgings/Extrusions

Forgings and extrusions shall be of uniform condition, free from blisters, fins, folds, seams, laps, cracks, segregation, and other defects. Imperfections may be removed if strength and serviceability are not impaired as a result.

3.2.1.6 Storage and Shelf Life

Perishable Materials (e.g., prepreg, finishes, sealants, resins, adhesives, and potting compounds) shall be controlled by process specification, which shall define minimum strength properties, storage control, shelf life, and re-test requirements of properties to assure that only acceptable material is used.

3.2.1.7 Hazardous Materials

Asbestos or other materials known to be a health or safety hazard shall not be used. Sealants used in food contact areas shall meet the requirements of the National Sanitation Foundation (NSF) Standard 51 or equivalent. Cadmium (e.g., cadmium plated fasteners) shall not be used on or adjacent to compartments, containers, or drawers designed to store ice or unpacked food.

3.2.1.8 Environmental Protection

Components shall be protected against deterioration or loss of strength in service due to environmental causes. Selection and finishing of material (including fasteners), where dissimilar metals may be placed in contact, shall be per MIL-STD-889 or equivalent. Material not inherently corrosion resistant shall be finished with a protective treatment or coating. Magnesium alloys shall not be used.

3.2.1.9 Finishes

Finishes (chemical treating, anodizing, powder coating, primer, etc.) shall be controlled by a process specification that includes, but is not limited to, the following:

- a. Surface preparation of the area to be finished.

- b. Control, preparation, and application of finish.
- c. Curing parameters with applicable tolerances.

Finishes at the interface with the galley or stowage unit shall be identified on the Interface Control Document.

3.2.2 General Construction

The methods of fabrication shall produce a consistently sound structure (14 CFR 25.605 and 25.613). A fabrication process (e.g., adhesive bonding, spot welding, or heat treating) requiring close control to reach this objective shall be controlled by a process specification.

Each part of the structure shall be suitably protected against deterioration or loss of strength in service due to any cause, including weathering, corrosion, and/or abrasion, and have provisions for ventilation and drainage where necessary for protection (14 CFR 25.609).

3.2.2.1 Fastener Installation

Fastener installations shall be controlled by a process specification that includes, but is not limited to, the following:

- a. Procedures to ensure thread length is sufficient to fully engage the nut, including any locking feature.
- b. Procedures to apply torque.

3.2.2.2 Sealing

The application of sealant shall be controlled by a process specification that includes, but is not limited to, the following:

- a. Surface preparation of the area to be sealed.
- b. Control, preparation, and application of the sealant.
- c. Curing parameters with applicable tolerances.

3.2.2.3 Potting

Process operations for potting used to install inserts or fabricate joints shall be controlled by a process specification. These processes shall include, but are not limited to, the following:

- a. Surface preparation of the area to be potted.
- b. Control, preparation, and application of the potting compound.
- c. Curing parameters with applicable tolerances.

3.2.2.4 Bonding

Bonded joints shall not be loaded primarily in tension. The bonding processes shall be controlled by a process specification that establishes detailed requirements for the following:

- a. Surface preparation of areas to be bonded.
- b. Control, preparation, and application of adhesives and primers.
- c. Maximum mismatch dimensions of parts during assembly, and minimum and maximum bond line thickness dimensions.
- d. Curing parameters with applicable tolerances.

3.2.2.5 Welding

Welding shall comply with AWS D17.1 or equivalent.

3.2.3 Waste Receptacles

The waste receptacle of equipment dedicated to, or that may be used for waste stowage (e.g., trash compactors) shall be fully enclosed, constructed of at least fire resistant materials (refer to 14 CFR 1.1) and must contain fires likely to occur in it under normal use. To be considered fully enclosed, the smallest gap between doors, flaps or other openings in the waste receptacle and the structure shall not exceed 0.125 inches (3.2 mm). The capability of the waste receptacle to contain those fires under all probable conditions of wear, misalignment, and ventilation expected in service must be demonstrated by test (14 CFR 25.853(h)).

3.2.3.1 Wear and Tear

The design of hinges, latches and other moving parts (e.g., springs) shall preclude degradation of fire containment capability due to service wear and tear. Multiple latches shall be used on doors for which fire-induced warp or wear effects may degrade the fire containment capability. These latches may be the same latches used to comply with 3.3.5. Hinges shall be durable and provide minimum air gap. Springs, such as those used on waste flaps, necessary to assure fire containment compliance shall have a fatigue life of 300000 cycles or greater.

3.2.3.2 Unacceptable Features

Features proven by experience to be unreliable shall not be used.

Examples include, but are not limited to:

- Tape
- Hook and loop type fastening
- Snaps or other attachment means that are easily fouled by waste
- Bonded catch plates
- Hollow core (pop) rivets
- Seals bonded to structure without mechanical attachment or capture
- Seals exposed to tear-out from repetitive insertion/removal of waste
- Plates, doors, and panels that exhibit "oil-canning" behavior due to insufficient stiffness

3.2.4 Injury Hazard

3.2.4.1 Edges, Corners, and Protrusions

Equipment shall be constructed without sharp corners, sharp edges, projections or other potential mechanical hazards to minimize injury potential to occupants or damage to the airplane cabin. Equipment design should comply with NASA-STD-3000, Volume I, Section 6.3.

3.2.4.2 Exposed Crushing Components

Trash Compactors shall operate in a manner that minimizes potential injury hazards. All moving components used for the purpose of extending a platen or otherwise crushing frangible trash shall be rendered automatically inoperative when exposed to any personnel and shall automatically remain inoperative until doors, bins, or trash deposit openings are securely closed. Crushing components shall remain inaccessible during operation. Safety switches or mechanical safety devices shall be installed in locations only accessible to maintenance personnel.

3.2.5 Interface Clearances

Interface clearances between equipment and the surrounding galley or structure required for ventilation, heat dissipation, installation, loading, etc. shall be clearly defined and included on the equipment Interface Control Document and shall account for the equipment and airplane tolerances.

3.2.6 Sanitary Construction

Equipment shall comply with U.S. Food and Drug Administration (FDA) requirements for sanitary construction in sections 1, 2, 4, and 6 of Attachment 3 "Guidelines for Sanitary Construction of Aircraft Galleys and Galley Equipment" to FDA document "Guide to Inspections of Interstate Carriers and Support Facilities" (see 2.1.5).

3.2.7 Identification

a. The following information shall be legibly and permanently marked on equipment:

1. Manufacturer's Part Number
2. Manufacturer's Serial Number
3. Date of Manufacture
4. Manufacturer's Name and Address

b. For equipment that will be removed from the airplane for maintenance purposes only, the following information should be visible without removal of the equipment (e.g., second placard) to aid maintenance personnel:

1. Manufacturer's Part Number
2. Manufacturer's Serial Number
3. Manufacturer's Name and/or Trademark

c. All loose components shall be legibly and permanently marked with a part number.

3.2.8 Continued Airworthiness

Maintenance instructions that allow equipment to be kept airworthy shall be provided. The maintenance instructions shall account for the detrimental effects of wear and rough handling in typical operation.

3.3 Structural

3.3.1 General

- a. Equipment shall be designed to meet the structural loading as specified in 4.2.1.
- b. Equipment shall meet all structural requirements independently of the galley structure.

3.3.2 Design Load Factors

- a. The structure of equipment shall address the load case in each direction and be verified according to 4.2.1.
- b. The loading conditions shall be determined by assuming installation of equipment around the z-axis of the airplane (see Figure 1).

- c. Equipment and associated retaining devices shall comply with the emergency landing, flight, and ground loading cases defined by 14 CFR 25.301 – 25.307, 25.331 – 25.351, 25.471 – 25.519, 25.561(b), 25.787, and 25.789(a).
- d. Failure shall not occur under ultimate load cases. All permanent deformation that occurs under ultimate or limit load cases shall be included in the Interface Control Document.

NOTE: Flight and ground load cases are typically specified in the airplane manufacturers' specifications.

3.3.3 Local Attachment Factor

A local attachment factor of 1.33 shall be applied in addition to the design load factors for attachments (such as door hinges, latches and retaining devices).

3.3.4 Material Strength Properties and Material Variability

Material strength properties shall be based on tests of material meeting industry specifications to establish design values on a statistical basis. Design values shall be chosen to minimize the probability of structural failure due to material variability (14 CFR 25.613). The applicable specifications are Metallic Materials Process Development and Standardization (MMPDS, formerly MIL Handbook-5) and the Composite Materials Handbook (CMH-17), formerly MIL Handbook-17.

Analytical substantiation of material strength shall be based on material design values shown to be statistically reliable by repeated structural testing.

Strength substantiation shown by full scale testing shall account for the variability of the materials and processes used to fabricate the parts by applying an appropriate overload factor. Refer to chapter 2 in General Aviation Manufacturer's Association (GAMA) document Publication 13 for guidance in determining the appropriate overload factor. There is no requirement to add the overload factor for material variability to other required factors, e.g., the 1.33 local attachment factor.

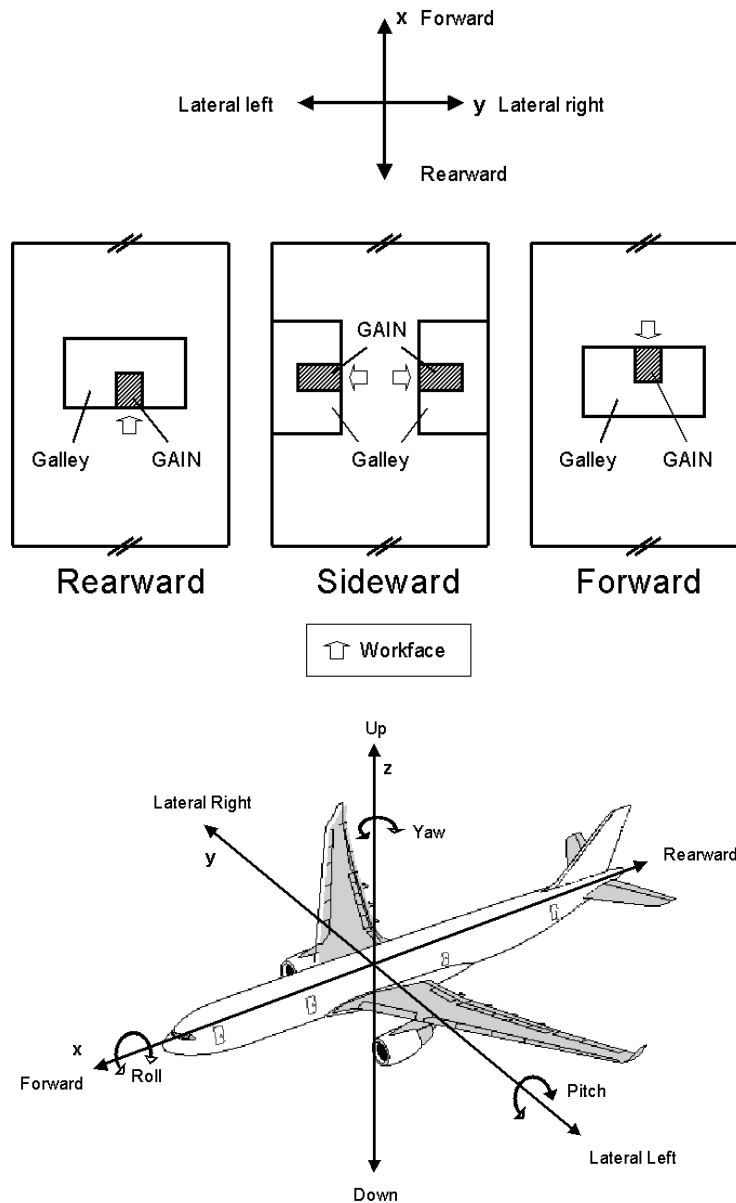


Figure 1 - Typical gain directions relative to airplane

3.3.5 Retention of Items of Mass

- Equipment (except loose equipment) shall be designed to allow installation in a compartment without a door.
- Equipment that mounts onto rail assemblies shall be permanently attached to the rail assembly (which requires a tool for removal) or have dual means of retention.
- A moveable component (e.g., doors) of equipment, that can, by its motion, cause injury or impede emergency evacuation, shall be secured by dual retaining devices or equivalent.
- A loose and/or associated component (e.g., beverage server, brew cup) of equipment that can, by its motion, cause injury shall be secured by dual retaining devices, or equivalent, or be placarded to require stowage during taxi, takeoff, turbulence, and landing.
- Loose and/or associated components of equipment, required to be retained or stowed separately from the equipment during taxi, takeoff, turbulence, and landing, shall be shown and have their stowage requirements defined in the Interface Control Document.