U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Carriage of Cargo | **Date:** 1/25/22 | **AC No:** 120-85B
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This Flight Standards Service advisory circular (AC) contains guidance on air carriers' and operating Certificate Holders' cargo operations. Proper cargo loading is essential for safe flight operations. Air carriers and operators must have procedures in place that provide information or instructions relating to safety per Title 14 of the Code of Federal Regulations (14 CFR) part 91, § 91.1025(r); part 121, § 121.135(b)(26); part 125, § 125.73(r); and part 135, § 135.23(s)). These should include procedures to ensure that employees and vendors are properly trained in the process, the loading is properly completed, and cargo restraints and loading devices are properly maintained. The operator must ensure that employees with the duty of supervising the loading of aircraft and preparing the load manifest, including the flightcrew, the load supervisor, loading personnel, and the person designated by the operator to perform Weight and Balance (W&B) calculations, all take responsibility to ensure that the process is completed correctly per § 121.665. The Federal Aviation Administration (FAA) intends this AC for air carriers and operating Certificate Holders.

This AC has been revised following evaluation of special cargo operations, load planning, restraint calculations, restraint methods, freight staging, freight forwarding, and interlining of cargo operations. It enhances the safety of flight operations by clearly identifying responsibilities of parties and provides guidance concerning an operator's W&B control program and procedures for cargo restraint and aircraft loading, unit load devices (ULD) and restraint devices, and the transport of special cargo. It also provides clarity regarding cargo handling training requirements. Adhering to the recommendations in this AC is one means, but not the only means, for operators to manage their cargo operations.

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CHAPTER 1. GENERAL INFORMATION

1.1 Purpose of This Advisory Circular (AC). This AC provides operators with recommended procedures for managing cargo operations. Developing and using these comprehensive procedures is key to establishing a safe and efficient cargo operation. The AC provides guidance for aircraft bulk cargo loading, approved unit load device (ULD) cargo, and special cargo, including cargo loading systems (CLS). This AC is not mandatory and does not constitute a regulation.

1.1.1 The contents of this AC do not have the force and effect of law, and are not meant to bind the public in any way. This document is intended only to provide clarity to the public regarding existing requirements under the law or agency policies.

1.1.2 The terms "must" and "will" in this AC indicate a mandatory requirement established by regulation that is to be followed when using the guidance in this AC. The term "should" is used in this AC to indicate a recommendation and not a requirement when using the guidance in this AC.

1.1.3 This AC describes an acceptable means, but not the only means, of complying with applicable regulations to manage cargo operations. However, if you use the means described in this AC, you should follow it in all important respects. While this is nonbinding guidance, you still must comply with the applicable regulations.

1.1.4 Since this AC represents an accepted means of compliance, an applicant seeking an alternative to any requirement or recommendation within this AC may need to discuss other means of compliance with the responsible Aircraft Certification Service office in order to achieve compliance with applicable regulations to manage cargo operations.

1.2 Audience. The audience for this AC includes air carriers and Operating Certificate holders conducting cargo operations.

1.3 Where You Can Find This AC. You can find this AC on the Federal Aviation Administration's (FAA) website at http://www.faa.gov/regulations_policies/advisory_circulars and the Dynamic Regulatory System (DRS) at https://drs.faa.gov.

1.4 What This AC Cancels. AC 120-85A, Air Cargo Operations, dated June 25, 2015, is canceled.

1.5 Background. This air cargo operations AC was originally developed in 2005, after a cargo-related accident involving a McDonnell Douglas DC-8 aircraft and in response to National Transportation Safety Board (NTSB) safety recommendations. Those recommendations included development of advisory material for Title 14 of the Code of Federal Regulations (14 CFR) part 121 operators and principal inspectors (PI). Recommended changes also included detailed training curriculum content for cargo handling personnel which includes, but is not limited to, Weight and Balance (W&B), cargo handling, cargo restraint, and hazards of misloading. Refer to NTSB Safety Recommendations A-98-044, A-98-045, A-98-046, and A-98-047.

1.5.1 Revision A. In April 2013, a Dubai-bound Boeing 747-400 crashed just after takeoff from Bagram Air Base, Afghanistan. It was transporting heavy military vehicles, known as "special cargo" loads. Following an NTSB recommendation, the FAA revised this AC after evaluating W&B personnel training, special cargo operations, load planning, restraint calculations, restraint methods, freight staging, freight forwarding, and interlining of cargo. Refer to NTSB Safety Recommendations A-15-015, A-15-016, A-15-017, and A-15-018.

1.5.2 Revision B. This revision includes new information as a result of reviews of operator cargo manuals and input from cargo operators. It also includes new definitions that align with those found in Operations Specification (OpSpec) A002, Definitions and Abbreviations.

1.5.3 Cargo Operations Program. Your cargo operations program is the foundation for safely transporting air cargo. This program includes such features as:

1. Acceptance of cargo by the operator;
2. Associated calculations and load analysis supporting carrying that cargo;
3. Maintenance and airworthiness of CLS components;
4. Processes by ground personnel for the buildup, handling, loading, and restraint of cargo;
5. Training of all personnel associated with your cargo program; and
6. Calculations and verification of an aircraft's W&B by ground and flight personnel.

1.6 Document Organization. This AC has three chapters and several appendices:

1. Chapter 1 contains general information about the AC.
2. Chapter 2 addresses separate operational processes and procedures of cargo operations, with individual paragraphs addressing specific operational aspects.
3. Chapter 3 details administrative information about how to obtain copies of publications, and describes the Feedback Form for this AC.
4. The appendices contain information supporting the AC (and list related documents), including:
   - Regulations (Appendix A),
   - Guidance material (Appendix B),
   - Definitions (Appendix C),
   - Acronyms and abbreviations (Appendix D), and
   - An example of active ULD marking information (Appendix E).

CHAPTER 2. OPERATIONAL PROCESSES AND PROCEDURES

2.1 General. This AC does not contain information pertaining to hazardous materials (HAZMAT).

2.1.1 Purpose. This chapter informs operators of the importance of providing necessary guidance to loading personnel for proper cargo buildup, weighing and restraint, and aircraft loading and unloading. These kinds of information may be included in your manual under 14 CFR part 91, § 91.1025(r); part 121, § 121.135(b)(26); part 125, § 125.73(r); and part 135, § 135.23(s).

2.1.2 Airplane Weight and Balance Manual (WBM). The WBM is part of the operating limitations section of the Airplane Flight Manual (AFM). Per 14 CFR part 21, § 21.41, operating limitations are part of the aircraft type certificate (TC) and are typically changed only by amending the TC or with a Supplemental Type Certificate (STC). Revisions to the AFM are approved as AFM supplements, and approval is based on a finding that, with the AFM revisions, the airplane continues to meet airworthiness standards. You must comply with the operating limitations in the AFM, as required by § 91.9. The aircraft WBM (also referred to as a W&B Loading and Control Manual) is often a separate document, but remains part of the AFM. Title 14 CFR part 25, § 25.1583(c) authorizes the WBM as a separate document incorporated by reference in the AFM.

2.1.3 Company Operating Manuals. Certificate Holders must have operating manuals, as required by §§ 91.1023, 121.133, 125.71, and 135.21. You can find the content requirements for these manuals in §§ 91.1025, 121.135, 125.73, and 135.23. If your aircraft manufacturer's procedures do not have sufficient detail and guidance, you may develop supplemental procedures and submit them to the FAA for acceptance. Any time you develop a procedure, it cannot contradict regulations. Only a responsible Aircraft Certification Service office approves changes to limitations that are referenced in paragraph 2.1.2 above. Supplemental procedures ensure cargo handling personnel have the guidance to maintain safety of flight operations. Certificate Holders should have a training program in place for cargo buildup, cargo loading system (CLS) configuration, aircraft loading/unloading, and special cargo (if applicable). Personnel performing these job functions and supervising cargo loading operations should be trained and qualified in these positions.

Note: Appendix B lists guidance materials that can be used as a resource to develop your supplemental procedures. However, we may still request additional data based on the submitter's operation.

2.1.4 Process and Procedure Guidance. We recommend including the following in your manual, and consider these recommendations essential to air cargo operations. These recommendations are discussed in more detail throughout this chapter. This is not an all-inclusive list.

2.1.4.1 Procedures for control of W&B.

2.1.4.2 Procedures to study and evaluate the capability of any aircraft the operator may use to transport any type of cargo, including special cargo. Operators may include a reference to the source document for this evaluation.

2.1.4.3 Procedures for special cargo recognition.

2.1.4.4 Procedures for loading and unloading all types of cargo.

2.1.4.5 Procedures to restrain cargo in aircraft compartments, including main deck, lower deck, fore and aft compartments, or pods, per the requirements of the design approval holder's (DAH) WBM supplement for authorized unit load devices (ULD), certified ULDs, noncertified ULDs, bulk-loaded cargo, and special cargo.

2.1.4.6 Procedures for the use, storage, and evaluation of condition serviceability of cargo restraints—such as straps, netting, and ropes—which restrain bulk, ULD, or special cargo. Procedures should confirm routine serviceability checks and identification and removal of any unserviceable or expired restraint devices. Newer straps may indicate expiration dates. Procedures should also provide a process to follow if failed restraints are identified while in use.

2.1.4.7 Procedures to control the use, calibration, or verification of weigh scales for operators and vendors.

2.1.4.8 Repair procedures for ULDs, aircraft CLSs, cargo restraint devices, and other miscellaneous aircraft cargo handling equipment required for loading or unloading aircraft. These procedures should also include installed nets and installed smoke barriers.

2.1.4.9 Procedures in your manual system for the control of all manuals and manual revisions applicable to air cargo operations. These procedures should ensure you:

1. Have current versions of the manuals, and
2. Provide authorized maintenance personnel and vendors with current manuals and manual revisions.

2.1.4.10 Procedures to ensure that all personnel are properly trained, qualified, and authorized to perform their job function(s).

2.1.4.11 Procedures for reconfiguring the CLS and documenting that the appropriate personnel have been notified. This ensures maintenance personnel, flightcrews, and loading crews are aware that center of gravity (CG) limits may have changed for current and future flights.

2.1.4.12 Procedures and processes for handling the carriage of special cargo.

2.1.4.13 Procedures for freight forwarding, interlining, and freight staging.

2.1.4.14 Procedures for the carriage of HAZMAT, per §§ 121.135(b)(25)(ii), 125.73(o), and 135.23(p)(2).

2.1.4.15 Procedures for incorporating a Continuing Analysis and Surveillance System (CASS) to verify the performance and effectiveness of your CLS maintenance program, and provide corrections to deficiencies discovered in the program (per §§ 121.373 and 135.431).

2.1.4.16 Procedures for incorporating a closed-loop system that monitors the elements of surveillance, analysis, corrective action, and followup to verify the performance and effectiveness of your W&B control program—including cargo operations—and provide corrections to deficiencies discovered in the program. Note that this should be a part of your Safety Management System (SMS) per 14 CFR part 5, § 5.53.

2.2 W&B Control Program.

2.2.1 Develop a W&B Control Program. Type-certificated (TC) aircraft have an FAA-approved AFM/WBM provided by the DAH. Aircraft modified by an STC affecting W&B will have a manual supplement to the WBM approved by a responsible Aircraft Certification Service office. The DAH WBM for an aircraft is the basis for an operator's W&B control program. Including appropriate operating instructions may help ensure compliance with the operating limitations in the WBMs.

2.2.1.1 **Modified Aircraft.** For aircraft with passenger-to-cargo conversions or other modifications, such as an aircraft CLS, a WBM supplement describing the modification's effect on the aircraft is FAA-approved and is issued as part of an STC or amended TC.

2.2.1.2 **Program Contents.** The Certificate Holder's W&B control program should include the following applicable items:

1. Loading limitations, including limitations on empty or unoccupied positions with missing or damaged restraints;
2. Information on aircraft cargo restraint systems, such as aircraft CLSs, installed nets, ULDs, and other restraint devices;
3. Requirements for special cargo loads;
4. A list of ULDs authorized for use with the CLS;
5. Aircraft operating weights;
6. Information for the determination of an aircraft's CG;
7. Weight limitations for each compartment and zone, when applicable;

8. Procedures for incorporating fuel loading and usage into the aircraft's W&B calculations;
9. Instructions for, and samples of, load documents and manifests;
10. Aircraft loading schedules; and
11. Processes and procedures to monitor the W&B control program.

2.2.2 Contents of an Operator's WBM. Sections 121.135, 121.141(b), and 135.23 allow operators to develop internal WBMs. As part of the AFM, the operating limitations contained in the WBM must be complied with in accordance with § 91.9(a). Operator WBMs must be accepted by the Administrator and must be based on an aircraft's WBM data, amended TCs, and applicable STCs. Further, the operator's WBMs should not exceed limitations in the aircraft's DAH W&B data. Section 121.141(b) allows the operator to develop airline-specific operating procedures.

2.2.2.1 **Aircraft Basic Operating Weight Control.** An aircraft must conform to its basic operating weight as determined by the operator and specified as an operating limitation in its AFM (per § 91.9(a)). Operators should also consider other limiting weights in the WBM, such as zero fuel weight and minimum flight weight.

2.2.2.2 **Zone and Compartment Weight Limitations.** An operator's aircraft must conform to all operating limitations in its AFM, including zone weight limitations and compartment weight limitations provided in the DAH specifications (per § 91.9(a)).

2.2.2.3 **CG Range Limitations.** The operator should include reference charts and/or tables in its WBM or other manual that provides the FAA-approved weight and CG range limitations. An operator should ensure CG range limitations in preprogrammed electronic W&B/CG calculators meet the operating limitations.

2.2.2.4 **Aircraft Weight.** An operator's aircraft must conform to the DAH's WBM requirements as an operating limitation contained in the AFM (see § 91.9(a)). The operator should establish procedures for weighing the aircraft using the manufacturer's WBM requirements or other FAA-approved or accepted methods. One accepted method is contained in AC 120-27, Aircraft Weight and Balance Control.

2.2.2.5 **Aircraft Major Alteration Requirements.**

2.2.2.5.1 The operator should have a procedure in place to ensure all relevant supplemental information developed, issued, and approved for that aircraft is incorporated into the operator's W&B control program.

2.2.2.5.2 All major alterations or major repairs to an aircraft (§§ 121.379 and 135.437) must use FAA-approved aircraft data, including data that change the W&B

requirements and/or limitations (per 14 CFR part 43, § 43.5(c), § 121.135, and § 135.413).

2.2.2.5.3 In cases of multiple STCs applied to a single aircraft, the STCs should be evaluated for effect on each other and on the appropriate limitations applied. At a minimum, an operator should include the supplemental information described above and cross-reference the supplemental information in the operator's WBM. In addition, the operator should organize the supplemental information in a way that facilitates use by trained and qualified personnel.

2.2.2.6 Aircraft CLS Limitations. The operator must act in accordance with and apply the W&B and CG limitations of the aircraft CLSs, as established by the DAH WBM as operating limitations (per § 91.9). The operator should consider all limitations established by the DAH. The operating limitations are defined within the WBM. The WBM may allow for the reconfiguration of the CLS. The operator should have a method to determine W&B calculations for any reconfiguration of a CLS. When the operator modifies the aircraft, such as adopting a CLS STC, the associated instructions for continued airworthiness (ICA) are also incorporated into its maintenance and/or inspection program. The operator should include the supplemental information provided by the ICAs in the operator's WBM, and any charts or tables that indicate proper weight and CG range limitations.

2.2.2.7 Carriage of Other Persons (Other than Flightcrew). Sections 121.583, 125.331, and 135.85 permit, under certain circumstances, the carriage of persons aboard an airplane without compliance with certain passenger-carrying requirements of parts 121, 125, and 135, respectively. They may be carried aboard an airplane because of their necessity for the safety of the flight, their relationship with the air carrier, or by virtue of certain knowledge and abilities attributed to them through selection and training. An operator must establish procedures for the carriage of other authorized persons. At a minimum, the procedures should address:

1. A method for calculating the weight of other authorized persons and their carry-on and checked baggage, such as actual weight or standard average weight (refer to AC 120-27 for guidance on calculating weights);
2. Any special procedures or limitations when carrying other authorized persons aboard an aircraft. These limitations are specified by the exemption, if required, for the carriage of other authorized persons; and
3. Instructions for documenting the weight of other authorized persons, and for communicating the information to the pilot in command (PIC) or other authorized, trained, and qualified personnel for determining W&B.

2.3 Classifying Cargo Compartment for Fire Suppression, CLS Components, Installed Nets, and Smoke Barriers.

2.3.1 Classification of Cargo Compartments for Fire Suppression. Aircraft cargo compartments are designed to accept and restrain cargo in various ways. Cargo compartments are classified as Class A, B, C, E, or F, depending on accessibility and fire protection requirements. Under § 25.857, cargo compartments are classified as follows:

1. A Class A compartment is one in which:
   - The presence of a fire would be easily discovered by a crewmember while at their stations, and
   - Each part of the compartment is easily accessible in flight.
2. A Class B compartment is one in which:
   - There is sufficient access in flight to enable a crewmember, standing at any one access point and without stepping into the compartment, to extinguish a fire occurring in any part of the compartment using a hand fire extinguisher;
   - When the access provisions are being used, no hazardous quantity of smoke, flames, or extinguishing agent will enter any compartment occupied by the crew or passengers; and
   - There is a separate approved smoke detector or fire detection system to give warning at the pilot or Flight Engineer (FE) station.
3. A Class C compartment is one not meeting the requirements for either a Class A or B, but in which:
   - There is a separate approved smoke detector or fire detection system to give warning at the pilot or FE station;
   - There is an approved built-in fire extinguishing or suppression system controllable from the cockpit;
   - There are means to exclude hazardous quantities of smoke, flames, or extinguishing agent from any compartment occupied by the crew or passengers; and
   - There are means to control ventilation and drafts within the compartment so that the extinguishing agent used can control any fire that may start within the compartment.
4. A Class E compartment is one on airplanes used only for the carriage of cargo, and in which:
   - There is a separate approved smoke or fire detection system to give warning at the pilot or FE station;
   - There are means to shut off the ventilating airflow to or within the compartment, and the controls for these means are accessible to the flightcrew in the crew compartment;

- There are means to exclude hazardous quantities of smoke, flames, or noxious gases from the flightcrew compartment; and
- The required crew emergency exits are accessible under any cargo loading condition.

5. A Class F compartment must be located on the main deck and is one in which:
   - There is a separate approved smoke detector or fire detection system to give warning at the pilot or FE station;
   - There are means to extinguish or control a fire without requiring a crewmember to enter the compartment; and
   - There are means to exclude hazardous quantities of smoke, flames, or extinguishing agent from any compartment occupied by the crew or passengers.

2.3.2 Cargo Compartments Designed to Accept ULDs. These compartments are equipped with an aircraft CLS designed to restrain ULDs in the aircraft. The CLS comprises various assemblies, such as restraint locks, side rails, and ball and roller conveyors. Some CLSs are powered, and some may be installed in main deck and/or lower deck compartments. When the flightcrew and/or other persons are seated forward of the CLS, a smoke barrier should be installed (as applicable) between the CLS and those persons. In addition to a smoke barrier, protection of the occupants in an emergency landing is also required per §§ 25.561(a) and 25.853(e).

2.3.3 Cargo Compartments Not Designed to Accept ULDs.

2.3.3.1 These cargo compartments are called bulk compartments, and may have vertical or horizontal nets. Depending on its design and purpose, the net may restrain cargo from shifting vertically, longitudinally, and laterally within the compartment or from shifting onto the cargo door or cargo door area within the compartment. Bulk compartments protect aircraft systems and structures against damage from shifting cargo for all flight and landing conditions.

2.3.3.2 Some aircraft cargo compartments are versatile in that they may accept both authorized ULDs and bulk cargo. These compartments may also have a CLS to help in the movement of ULDs. The certification documents, either TC or STC, are the approval basis for these combined compartments. The combination bulk/ULD compartments can be found in the lower lobe and upper decks of appropriately certificated aircraft.

Note: Care should be taken when loading bulk cargo in these compartments to ensure that it does not block fire detection sensors or fire suppression agent nozzles, if installed.

2.3.4 Reconfiguring the CLS. The CLS contain components such as rails and locks that move and/or interchange in order to change the configuration of the CLS. An operator may

move/interchange these components using the DAH instructions that are typically found in one of the following source documents:

- TC, STC, and Type Certificate Data Sheets (TCDS);
- Service Bulletins (SB) or Service Letters (SL), if incorporated by reference into a mandatory advisory directive (AD); and
- Manufacturers' ICAs.

2.3.5 Owner-Produced Parts. Section 21.9 provides that an owner or operator may manufacture replacement and modification parts for use on its own aircraft. As it pertains to this AC, an operator or owner should have processes to:

1. Identify components manufactured for the aircraft CLS in its maintenance program;
2. Ensure another operator or vendor does not sell or distribute the parts it manufactures;
3. Show its owner-produced parts meet the equipment manufacturer CLS type design; and
4. Maintain the continued airworthiness of the owner-produced part.

2.3.6 Addressing CLS Component Discrepancies. An operator may address aircraft CLS component discrepancies by replacing or repairing the applicable component. If the operator discovers systemic problems with the reliability of its components, the operator should report such problems to the component manufacturer. An operator's CASS should track all cargo loading component discrepancies to measure the performance and effectiveness of the operator's maintenance and inspection program.

2.3.7 Replacing a CLS Component. An operator may replace a CLS component with a new, rebuilt, overhauled, or repaired serviceable component, in accordance with any applicable regulations.

2.3.8 Repairing a CLS Component.

2.3.8.1 **Operator Responsibility.** An operator may repair a component on the aircraft, or may have a vendor repair a component, in accordance with applicable regulations. Under certain circumstances, an accepted manual may allow minor repairs. The repair vendor may be under the direct control of an operator, or may be a vendor the operator designates. The operator has primary responsibility for determining that the component meets applicable regulatory requirements.

2.3.8.2 **Vendor Repair.** CLS components repaired by a vendor should undergo a receiving inspection using operator procedures. The component should also have documentation to (1) confirm each component is certified as serviceable,

and (2) provide traceability to the data used for repair. The documentation should include:

1. Identity of the company that owns the component;
2. FAA repair station certificate number, if applicable, and vendor name;
3. Component part number;
4. Component serial number, if applicable;
5. Component nomenclature;
6. Component times and/or cycles, if applicable;
7. Quantity of components;
8. Specifications used for repair;
9. Certification statement of procedures used; and
10. Traceability documentation.

2.3.8.3 Retention of Repair Records. The operator must retain its repair records per the requirements of §§ 121.380 and 135.439.

2.3.9 CLS Components in the Minimum Equipment List (MEL).

2.3.9.1 Operator Procedures. An operator wanting to place CLS components on an aircraft MEL must ensure the aircraft MEL for those components contains adequate instructions and procedures to meet the requirements of §§ 121.628 and 135.179. These procedures should identify:

1. The total number of items installed and minimum number required for dispatch;
2. The loading limitations because of missing or defective equipment;
3. The references showing the location of loading restrictions;
4. The appropriate category for repair; and
5. The instructions for ensuring MEL limitations are included in W&B computations and the load plan.

2.3.9.2 Procedures for Inoperative or Removed CLS Components. An operator should include procedures for inoperative or removed CLS components in the operator MEL. These procedures should include any requirements for:

1. Reconfiguration of the aircraft, if necessary;
2. Voiding of adjacent positions, if necessary;
3. Accounting for limitations;

4. Notification to the PIC and other appropriate personnel the operator deems necessary of the inoperative components;
5. Instructions for ensuring MEL limitations and/or restrictions are included in W&B computations and the load plan; and
6. Annotation in the aircraft maintenance logbook.

2.3.10 nstalled Nets in the Maintenance Program. An operator maintenance program should contain procedures for maintenance and inspection of installed vertical and horizontal cargo compartment nets and 9g barrier nets. The program should encompass:

1. In-house or vendor repair procedures;
2. Receiving inspection procedures; and
3. Serviceability limitations.

2.3.11 Smoke Barriers and Nets.

2.3.11.1 Smoke Barrier Control Procedures. A smoke barrier is intended to act as a blockade between the cargo and crew, preventing smoke and flames from entering the passenger cabin and flight deck areas of the aircraft. They can be permanent or attachable and in a variety of forms, such as doors or curtains. An operator must have procedures to control the airworthiness and subsequent operational serviceability of smoke barriers (per §§ 121.367 and 135.425). The operator should provide aircraft-specific training on the description, operation, function, and preflight of smoke barriers.

2.3.11.2 Inspection. Operators should inspect the overall condition of the smoke barrier curtain (if installed), cockpit door seal, barrier net assembly, or solid bulkhead as required by the carrier's maintenance manual. Inspections should include, at a minimum:

1. The smoke barrier curtain, which must be free of tears, holes, and cuts to prevent smoke from entering the forward cabin and flight deck;
2. The cockpit door seal, for condition and integrity;
3. The barrier net, for condition and security (i.e., check for frayed straps, hardware integrity, and proper markings);
4. Cargo compartment retention nets, for condition and security;
5. The solid bulkhead, for condition and security; and
6. The required placards (such as loading, fire suppression, and so forth) for condition, legibility, and security.

2.4 ULDs and Cargo Restraint Devices.

2.4.1 Restraints. Aircraft cargo restraint methods have two general categories: primary and supplemental.

2.4.1.1 Primary Restraint. Primary restraint is the restraint of the cargo payload to the aircraft structure through the CLS or directly to tiedown points approved in the WBM. This restraint secures cargo in the forward, aft, vertical, and lateral directions. Primary restraint is used to secure:

2.4.1.1.1 Cargo.

1. To a pallet using a WBM-authorized net as the primary restraint;
2. Within a container (the container is the primary restraint);
3. To the aircraft structure as special cargo (straps, ropes, etc., are the primary restraint); or
4. To the ULD (pallet) using straps or ropes, as the primary restraint is considered special cargo.

2.4.1.1.2 ULD. To the aircraft structure using the CLS, such as locks and side rails.

2.4.1.1.3 Other Aircraft Restraints Per WBM Provisions. Some airplane WBMs may provide for additional tiedown to the aircraft structure to restrain ULDs if the following conditions exist:

1. The ULD allowable weight may be limited either by restraint configurations or by missing and/or inoperative restraints; or
2. The ULD is loaded to a weight greater than allowable for the chosen loading position with all restraints operative, and a greater weight is allowed by the aircraft WBM with tiedown (e.g., the floor is more capable than the restraint system).

Note: See paragraph 2.8 for additional guidance.

2.4.1.2 Supplemental Restraint. Supplemental restraint is additional restraint that prevents shifting and is used to stabilize cargo to a pallet or container. When supplemental restraints are attached to a CLS or aircraft structure, it creates a parallel load path to the ULD and is therefore classified as special cargo (see paragraph 2.8 for additional guidance). An exception would be straps or ropes used to prevent shifts or stabilize cargo in a certified bulk compartment. Operators may use supplemental straps at their discretion as long as the primary means of restraint has been complied with.

2.4.2 ULD Description. A ULD is a device for grouping, transferring, and restraining cargo for transit. It consists of a pallet with a net, or it may be a container. ULDs are defined in National Aerospace Standard (NAS) 3610, Cargo Unit Load Devices—Specification for;

Aerospace Standard (AS) 36100, Air Cargo Unit Load Devices—Performance Requirements and Test Parameters; and Technical Standard Order (TSO)-C90, Cargo Pallets, Nets and Containers (Unit Load Devices). The term "ULD" includes the equipment in paragraph 2.4.3 below.

Note: Cargo restrained on a pallet by straps is not a ULD.

2.4.3 Types of ULDs.

2.4.3.1 Background:

1. Authorized ULDs are defined in aircraft WBMs and require no further analysis.
2. Some ULD designs may exceed the structural capability of an aircraft. To preclude failures of the aircraft cargo restraint system, operators must meet the requirements of the aircraft WBM, as this is an operating limitation that is part of the AFM and must be complied with per §§ 91.9, 23.2620, and 25.1583.

2.4.3.2 Certified ULDs. A ULD meeting the requirements of TSO-C90; STC requirements, if applicable; or other FAA-approved certification standards. A certified ULD is structurally capable of restraining a load and/or protecting the aircraft systems and structure. Only ULDs that are authorized by the aircraft WBM (TC or STC) are authorized for use on that aircraft. To remain an authorized ULD for an aircraft, the ULD must be restrained by the aircraft's CLS in accordance with the aircraft's WBM, as an operating limitation contained in the AFM (per § 91.9). Examples of restraining ULDs by the aircraft's CLS include pallet locks and side guides. A certified pallet and the corresponding certified net is a certified unit, as defined by the WBM.

2.4.3.3 Approved Cargo Pallet and Net (ULD). Most operator WBMs recognize a TSO cargo pallet and net combination as the primary restraint for unitized cargo. A cargo pallet net is the only restraint device that takes the shape of the cargo while restraining the load in all directions, so that the load is spread to the net fittings and pallet edge rails.

2.4.3.4 Noncertified ULDs. A ULD that does not meet the TSO-C90 or TC/STC certification requirements.

2.4.3.5 Active ULDs. Active ULDs include powered systems, such as temperature control and fire suppression systems. Active ULDs use batteries of multiple types to power these systems, and the manufacturers frequently integrate electrical wiring, fans, and components that should be able to withstand the handling, loading, and transport environments. Active ULDs are intended to be operating during flight. Active ULDs are battery-powered in flight and are only recharged while on the ground. Commonly used active ULDs are temperature-controlled containers. These systems consist of a highly insulated

container with a battery-operated heating/cooling system integrated into the construction of the container.

2.4.3.5.1 Active ULD Operational Approval and Use. Using active ULDs that interface with the pilot or aircraft avionics or electronic systems likely requires an STC If you intend to deploy these containers in your fleet, you should understand and assess the hazards of active ULDs before carrying such devices. Additionally, you should incorporate or reference the pertinent parts of the aircraft certification documents into your manual and have procedures to ensure the containers meet the handling and airworthiness requirements of the manufacturer. These may include:

- Required markings, placards, and labeling;
- ICAs, to include proposed limitations and restrictions necessary to safely carry the device on an aircraft; and
- Operating instructions for the device.

2.4.4 Other Restraint Devices.

2.4.4.1 **Other Types of Cargo Restraint Devices.** The operator may use cargo restraints such as straps, ropes, chains, and nets. The use of these types of restraints must not be contrary to aircraft manufacturer W&B documentation or STC holder documentation (per §§ 23.2620, 25.1583, and 43.13(c)). If the operator does not use an approved cargo pallet/net combination as the primary restraint, the operator's manual should have policies and procedures to address this issue. For example, if a strap is used as the primary restraint, the cargo may be:

1. Loaded in an aircraft compartment that meets the type design for compartment restraint; or
2. Restrained by cargo straps or other authorized devices to the aircraft as described in the aircraft's manual, an STC supplement, or a WBM.

2.4.4.2 **Certified Restraint Straps.** In TSO-C172, Cargo Restraint Strap Assemblies, the FAA describes the minimum performance standards (MPS) by which cargo restraint strap assemblies are pproved and identified with applicable TSO markings. Newer straps may have expiration dates marked on the straps.

2.4.5 Determining ULD Compatibility. It is critical to safety of flight for the operator to have procedures confirming that ULDs on board an aircraft are compatible with the aircraft, regardless of who owns the ULD. Not all ULDs are authorized as compatible with all aircraft, so an operator should have procedures for:

2.4.5.1 **Authorization.** Ensure ULDs are authorized for carriage on the specific aircraft by the DAH WBM.

2.4.5.2 **Communication.** Inform employees and vendors loading aircraft converted from passenger to all-cargo by an STC that the aircraft could have different ULD requirements than other STC conversions or production aircraft configurations in the operator's fleet.

2.4.5.3 **Differences.** Ensure personnel understand that compatibility, limits, or restrictions may exist between similar aircraft types with STC conversions, and that the aircraft may have been produced as a freighter by a TC holder. The following list details examples of the differences:

1. Aircraft weight limits;
2. Cargo zone index changes (forward/aft body);
3. CG limits;
4. Forward and aft body structure loading limits;
5. Fuel index tables;
6. Individual compartment maximum loads;
7. Lateral cargo unbalances;
8. Main deck door opening variances;
9. Maximum allowable loads limited by restraint;
10. Maximum allowable weight limits (takeoff, landing, zero fuel, etc);
11. Maximum area load limits;
12. Maximum cargo zone load limits, including cumulative loads above and below deck;
13. Maximum cumulative load limits;
14. Maximum floor loading limits;
15. Maximum ramp weight limits;
16. Maximum ULD gross weight restrictions by aircraft position;
17. Missing inoperative cargo restraint limits;
18. Reduced overwing zone capabilities;
19. ULD height restrictions;
20. Asymmetrical load limits; and
21. Zero fuel weight restrictions.

2.4.5.4 **ULD Contour and Dimensions.** Compare the size of the main and lower deck compartment door openings with the contour and dimensions of ULDs to be loaded. An operator must take into consideration any height restriction

within the aircraft cargo compartments if it is an operating limitation in the WBM (per § 91.9).

2.4.5.5 Approved ULD Limitations. Ensure approved ULD limitations are maintained in the manual. An operator should base these limitations on data from applicable aircraft WBMs or STC supplemental WBMs. The limitations should identify which ULDs are compatible with specific aircraft, and should be easily accessible by all responsible persons.

Note: The limitations section of the AFM or AFM supplement may include information from the aircraft WBM.

2.4.5.6 Authorized ULDs. Ensure the aircraft operator's WBM states which ULDs may be carried aboard the aircraft on the main deck or lower lobes. In certain instances, particularly with an aircraft's lower lobes, certain compartments ay be approved to carry bulk or restrained cargo, or both. The WBM should identify the ULDs by the type authorized to be carried aboard the aircraft, considering the aircraft and CLS capabilities.

2.4.5.7 Use of Noncertified ULDs. Ensure the operator does not use noncertified ULDs in any compartment of an all-cargo or combination aircraft, unless:

1. The ULDs are authorized by the WBM, or
2. Tiedown instructions describe how to restrain the ULDs as special cargo.

2.4.5.8 Unauthorized Pallet and Net Combinations. Ensure employees and vendors do not combine unapproved nets and pallets.

2.4.6 Responsibilities for Maintenance and Repair of ULDs, Pallets, and Nets If Operator Owned (per §§ 121.363 and 135.413). Operators should maintain ULDs, pallets, and nets using a program based on component maintenance manual (CMM) requirements for TSO'd items. The operator should have a program to determine the serviceability of ULDs before they may be placed on board the aircraft. If an operator repairs these items, it should (1) do so per the CMM of the item, and (2) approve the item for return to service per its procedures authorized by its operations specifications (OpSpecs).

2.4.7 Responsibilities of an Operator for ULDs.

2.4.7.1 Receiving a ULD. When receiving a ULD, an operator who owns or leases its ULDs should have trained, qualified, and authorized personnel perform a serviceability check of the ULD using the operator's procedures. The serviceability check should include processes, instructions, and guidelines to:

1. Check each ULD before it is put into service;

2. Review the documentation for new and repaired ULDs, or make the documentation for new and repaired ULDs available upon request, to ensure the ULD is serviceable; and
3. Conduct a visual inspection of the ULD.

Note: The operator may designate a trained, authorized, and qualified person to conduct the checks.

2.4.7.2 Maintaining ULD Repair Records. Certified ULDs should be maintained to the TSO. Noncertified ULDs should be maintained to standard practices or the ULD manufacturer's directions. The operator should ensure that a repair facility retains the records of those repairs. If an operator maintains its own ULDs, repair records retention should be in accordance with its accepted procedures authorized by OpSpecs issuance. An operator who maintains its own ULDs may maintain its own records or have repair vendors maintain the records, provided the operator can access them upon request within a reasonable period of time.

2.4.7.3 Procedures for Maintaining and Repairing ULDs. An operator that maintains its own certified and noncertified ULDs should have procedures in place to maintain those ULDs in accordance with CMMs and manufacturers' instructions. If the operator marks its owned certified and noncertified ULD as complying with a TSO, then the operator should ensure that the ULD is maintained per the latest version of that TSO. The procedures should be the same for both certified and noncertified ULDs. The procedures should:

1. Clearly state the data supporting the maintenance and repair; and
2. Address how frequently the operator, owner, or repair vendor should check ULD tare weights and how updated ULD tare weights should be marked. The operator or owner should manage control of ULD tare weights by documenting them and retaining the documentation using operator or owner procedures.

2.4.7.4 Guidance for Repairing ULDs. An operator or owner should have procedures to ensure that:

1. Personnel who repair ULDs are trained, qualified, and authorized;
2. ULDs are repaired per the operator's or owner's maintenance program for ULDs;
3. The appropriate current data is available to repair the ULD, including operator or owner maintenance manuals, noncertified ULD manufacturer maintenance manuals, SBs, ADs, or certified ULD manufacturer CMMs;
4. The tare weight of each ULD is checked using the operator's procedures;

5. The new tare weight is marked on each ULD using the operator's or owner's procedures; and
6. ULD repair is per the operator's, owner's, or standard practices procedures, whether the operator or a repair vendor performs the repairs.

2.4.7.5 Use of a Repair Station/Vendor to Repair ULDs.

1. An operator or owner should ensure the availability of all necessary data and manuals for repairing its ULDs.
2. An operator or owner should conduct audits of contracted repair stations:
   - For the vendor's training program; and
   - To ensure repair stations meet the operator's or owner's maintenance program requirements.

2.4.7.6 Returning a ULD to Service. An operator that owns ULDs should have procedures for repairing unserviceable ULDs and returning them to service. As provided in §§ 121.363(b) and 135.413(b)(2), an operator remains responsible for the airworthiness of its aircraft, which may be impacted by the use of owned or leased ULDs, whether they are maintained in-house or by contract. Maintenance personnel should be appropriately trained and should return ULD equipment to service consistent with the applicable CMM or operator instructions. FAA-certificated repair stations operating under 14 CFR part 145 should return ULDs to service using the operator's procedures.

2.4.7.6.1 Owners of certified and noncertified ULDs should have procedures established with repair entities that ensure repairs are conducted using the CMM or manufacturer's procedures that ensure the ULD is returned to a serviceable condition.

2.4.7.6.2 An operator should use FAA-acceptable data if it decides not to follow the requirements of the manufacturer's CMM. An operator may also choose to strictly follow the manufacturer's maintenance procedures.

2.4.7.6.3 An operator should use its SMS to verify the performance and effectiveness of its ULD maintenance program, if applicable, and provide corrections to any deficiencies discovered in the program.

2.4.8 ULD and Restraint Damage Limits.

2.4.8.1 Identifying or Revising Damage Limits. It is important that the operator specify damage limits for ULDs and related restraint equipment.

2.4.8.2 Standardization of Damage Limits for ULDs. An operator may standardize damage limits for ULDs transported upon its aircraft. The operator should

apply the most restrictive damage limits categorized by the type of ULD, unless it has engineering data to support less restrictive damage limits.

2.4.8.3 Exceeding Allowable Damage Limits of a ULD. A ULD that exceeds allowable damage limits to the ULD base needs careful evaluation to determine if it is usable. A ULD with damage to its shell may be accepted for use by installing an authorized net over the shell, provided a pallet/net combination is authorized. A reduced-weight requirement may be necessary when an operator uses this procedure. The operator should develop procedures for using the damaged ULD with a net.

2.4.9 Establishing Usage Limits for Cargo Straps. Operators should ensure cargo strap assemblies are serviceable prior to use. If a cargo strap manufacturer does not provide damage limitations for its cargo straps, an operator should develop guidance to include, at a minimum, not using the strap if:

2.4.9.1 Buckle Latch Mechanism. A buckle latch mechanism will not lock or stay engaged. This allows the web to slip while under tension, or may result in the web binding or being out of alignment.

2.4.9.2 Mechanism Integrity. Attached mechanisms, fittings, hooks, or rings are bent, deformed, cracked, broken, or missing.

2.4.9.3 Webbing Integrity. Webbing is partially cut or torn, knotted, unraveling, or has loose or missing sewn stitches.

2.4.9.4 Environmental Conditions. The strap is deteriorated due to environmental conditions.

Note: TSO-C172 is available and provides a set of approved performance standards for manufacturing new cargo restraint straps. Cargo restraint strap assemblies authorized under previous Technical Standard Order Authorization (TSOA) may still be manufactured under the provisions of its original approval.

2.4.10 Additional Procedures for Cargo Nets. If the operator owns or leases cargo nets, it should consider using additional procedures for cargo nets, such as:

1. Assigning a unique marking or serial number to nets and placarding that marking or number on the nets;
2. Placarding nets with their damage limits;
3. Attaching an identification tag to the operator's nets; or
4. Ensuring proper storage when not in use to prevent damage.

2.4.11 Temporary Repair on a Cargo Net.

2.4.11.1 Using Temporary Restraints. An operator must repair a cargo using temporary restraints in accordance with the AFM/WBM, and should have provisions for:

1. The net CMM authoring use;
2. A process in its manual system addressing the use and limits of temporary restraints; and
3. Personnel who install the temporary restraints are trained, qualified, and authorized.

2.4.11.2 Purpose. Temporary restraints are typically installed for the purpose of addressing items such as:

1. Using a bridge strap to bridge cut (or otherwise damaged) ropes, or missing or damaged fittings;
2. Installing temporary fittings and hooks to compensate for damaged or missing fittings, using equipment manufacturer or operator procedures; or
3. Installing net corner and supplemental lashing lines.

2.4.12 Performing Serviceability Checks on ULDs or Other Cargo Restraint Devices. An operator should perform a serviceability check for damage before using ULDs and other restraint devices (e.g., single and double stud rings, straps, and pallet couplers) for movement or buildup, and should conduct a final serviceability check before loading cargo aboard the aircraft.

2.4.12.1 Purpose. Serviceability checks are not intended to determine a ULD's airworthiness. Instead, they ensure the ULD or other restraint devices do not have obvious damage greater than their damage limits. An operator should not use ULDs or other restraint devices with damage greater than damage limits specified.

2.4.12.2 Individuals Who May Perform Serviceability Checks. Personnel who perform serviceability checks do not have to be FAA-certificated mechanics or repairmen. Operators should train, qualify, and authorize personnel to perform serviceability checks. Operator procedures should identify who performs these checks and when the checks are performed.

2.4.12.3 ULDs That Fail a Serviceability Check. An operator should have a procedure for clearly marking or identifying ULDs and other restraint devices that fail serviceability checks. The method for identifying failed equipment should clearly distinguish these items from serviceable equipment so the operator or cargo loading vendor does not inadvertently place failed equipment into service. A procedure should be in place for individuals to

report damage to persons responsible for maintaining the ULD. If transporting unserviceable ULDs to a place where repairs are available, the operator should determine the method of transportation in accordance with the AFM/WBM.

Note: The operator may correct clerical, data entry, or other error of omission resulting in misidentifying or removing a ULD from service, and have the ULD returned to service. The operator should have a procedure in its manual system for identifying and correcting such errors.

2.5 Cargo Weigh Scales.

2.5.1 Ensuring the Weight of Loaded Cargo is Accurate. An operator must ensure the weight of cargo loaded aboard its aircraft is accurately described in the load manifest (per §§ 121.693 and 135.443). The operator's W&B program should account for allowed tolerances to maintain approved W&B limitations.

2.5.2 Ensuring Weigh Scales Are Accurate. An operator should have a program to periodically check the accuracy of scales used for weighing cargo. The operator should conduct a periodic functional check using the weight recommended by the scale manufacturer for a periodic functional check. As an alternative, use weights simulating a typical load placed on the operator's aircraft. Periodic function and calibration checks should be performed in accordance with the operator's procedures and timeframes. Frequent checks and periodic calibrations ensure an operator accurately weighs the cargo loaded on its aircraft.

2.5.3 Ensuring Weigh Scales Are Calibrated. An operator should conduct periodic calibration of scales to ensure they are appropriately serviced and accurate to a known standard using an interval recommended by the scale manufacturer. Calibration records should show that scales are calibrated using a standard established by appropriate country, state, or local government regulations. Such standards could include the National Institute of Standards and Technology (NIST), an equivalent standard acceptable to the FAA, or standards recommended by the scale manufacturer.

Note: For more information on the standards provided by NIST, visit NIST's website at https://www.nist.gov/.

2.5.4 Maintaining Records of Calibration Checks. An operator should keep a record of its scale calibrations, with the following criteria:

1. The records should be in the English language. If the records are not in the English language, operators should have the records translated, when necessary. If the operator cannot provide an English language interpretation of operator records, that operator should allow those individuals using the scales to inspect the scales and perform a functional check onsite to ensure scale accuracy.
2. The operator should establish procedures to maintain the records.

2.5.5 Performing Functional Checks on Scales Used for Weighing Cargo.

2.5.5.1 Procedures. An operator should have procedures to functionally check scales used for weighing cargo between scale calibrations. A functional check should consist of field-testing the scale's accuracy within the tolerance of the scale manufacturer, or within a tolerance of ±1 percent, whichever is more restrictive, using an item of known weight.

2.5.5.2 Frequency. At a minimum, the operator should ensure that functional checks are performed at intervals specified in (1) the operator's procedures, or (2) the scale manufacturer's recommendations. The operator also should conduct the functional checks at intervals commensurate with the frequency of scale use, and conduct functional checks more often for scales used more frequently.

2.5.5.3 Recordkeeping. An operator should record completion of functional checks. The operator should maintain functional check records using accepted procedures. These records should include:

1. The identification number of the scale;
2. The date and time of the functional check;
3. The name or the initials of the person who performed the functional check;
4. The applied known weight of the item used for the functional check;
5. Instructions to ensure that the test load is completely free from all contaminants or any damage;
6. The scale's indication of the applied known weight; and
7. The difference between the applied known weight and the registered weight.

Note: If the registered weight recorded for the item of an applied known weight is outside the tolerances specified for the scale in the operator's procedures, the operator *should not* use the scale until the scale is inspected and calibrated. The operator should apply the scale variance to the total weight of the cargo being weighed.

2.5.6 Items for Which an Operator Should Know the Tare Weight. Personnel weighing cargo should know the weight of equipment such as dollies, slave frames, containers, and carts that are not being shipped on the aircraft but are only being used to facilitate loading of the aircraft. An operator should determine the tare weight of this equipment by weighing it on a calibrated scale.

2.5.7 Reweighing Loading Equipment for Tare Weight After Maintenance, Repair, or Modification. Immediately after any repair, maintenance, or modification of equipment such as dollies, slave frames, containers, and carts, the operator should provide a new tare

weight by reweighing the equipment. Operators should establish a method to communicate new tare weights to loading personnel before using the equipment to weigh cargo on a scale. This method may be in the form of the operator communicating the tare weight by stenciling it on the equipment or by providing notices to operator loading personnel.

2.6 Operations for Cargo Handling and Aircraft Loading and Unloading.

2.6.1 Overview. This section explains how to apply the content in paragraph 2.4 to an air carrier's cargo operations.

2.6.1.1 Procedures. An operator should have procedures in its manual system for ULDs, cargo requiring unique or special handling, special cargo, cargo buildup, loading and unloading, and restraining cargo. The procedures should include bulk loading and unloading of cargo, whether the cargo is compartment-restrained or restrained by other devices, if the operator permits. The procedures should use the operator's WBM and DAH/STC WBM.

2.6.2 Operator Procedures on ULD Buildup and Cargo Restraint. An operator's procedures covering ULD buildup and cargo restraint should address:

2.6.2.1 ULD CG Limits. Procedures should address maintaining the longitudinal, lateral, and vertical CG limits of a built-up ULD. The operator should consider the following guidelines when developing the procedures:

1. Place sturdier, heavier, and larger cargo pieces on the bottom of the load and evenly distribute them over the length and width of the pallet base.
2. Place smaller, lighter, and fragile cargo pieces on top and evenly distribute them from the center over the length and width of the ULD.
3. Level off the cargo in the ULD when less than full.
4. Interlock or overlap small pieces when practical.

2.6.2.2 Voided Space in ULDs. To minimize voided space within a ULD and between cargo pieces, the operator should consider using the following:

1. Supplemental restraint devices to restrain cargo within a container when less than full.
2. Dunnage in voided spaces. See Appendix C, Definitions Related to Air Cargo Operations, paragraph C.12.

2.6.2.3 Cargo Contours. The operator should have procedures for contouring cargo loads for the aircraft's interior dimensions when using a pallet/net combination, pallet/strap combination, or other restraint methods/devices. The operator should consider using techniques such as contour templates or

charts. Also, the operator should consider procedures for operational conditions in which variance in contouring might occur. For example, variances in contouring might occur when forming an aisle to access HAZMAT or ensure the integrity of a particular load. The operator must also account for height restrictions if required by the DAH WBM (per § 91.9).

2.6.2.4 ULD Identification Tags. The procedures should include providing tags to identify ULDs loaded aboard operator aircraft. This is especially important when using pallet/net or pallet/strap combinations; their identification is not always visible.

Note: Electronic tagging may be used but may present a concern about interference with onboard avionics equipment. Refer to AC 91.21-1, Use of Portable Electronic Devices Aboard Aircraft, for additional information.

2.6.2.5 ULD Weight Limits. The operator should include procedures so that cargo does not exceed ULD gross weight or area load limits if stated by the ULD manufacturer.

2.6.2.6 Serviceability Checks. The procedures should include checking the condition of ULDs and other restraint devices for damage before using them, conducting serviceability checks to ensure noted damage does not exceed damage limits, and providing a process to follow if failed restraints are identified while in use. The operator should base serviceability checks on information from:

- The equipment manufacturer,
- The STC, or
- Other data acceptable to the FAA.

2.6.2.7 Fastening Container Components. The operator's procedures should address the correct method of positive closure and locking of container nets, curtains, and rigid or flexible doors after buildup. The operator should base these procedures on information from:

- The container manufacturer,
- The DAH, or
- Another source with information acceptable to the FAA.

2.6.2.8 Fastening a Cargo Net to a Pallet. The operator's procedures should address how to fasten a cargo net to a pallet properly after buildup. The operator should base these procedures on information supplied by the pallet/net manufacturer or the DAH.

Note: Personnel whose job functions include determining compatibility of pallet and net combinations (per operator's

procedures), pallet and airframe compatibility, and cargo restraint devices (e.g., intermixing straps) should have training in these areas.

2.6.3 Operator Procedures on Cargo Loading and Unloading. An operator's procedures for aircraft loading and unloading should address:

2.6.3.1 Sill Guards (if applicable). The operator's procedures should detail using, attaching, and detaching these devices. If an operator stows sill guards in the aircraft when they are not in use, the procedures should include the proper stowage in the aircraft.

2.6.3.2 Tail Posts (if applicable). The operator's procedures should address using a nonstructural device called a tail post if the operator needs it to measure the distance between the aircraft's tail section and the ground during loading and unloading. Procedures should include instructions on attaching, detaching, and using it. If an operator stows the tail post in the aircraft when not in use, the procedures should include the proper stowage in the aircraft.

2.6.3.3 Tail Stands (if applicable). The operator's procedures should address using a structural device called a tail stand if the operator needs it to prevent the aircraft from settling on its tail during loading and unloading. The procedures should include instructions on attaching, detaching, and using it.

2.6.3.4 Tail Tipping Avoidance. The operator's procedures should address methods to prevent the aircraft from tipping on its tail during loading and unloading. Examples of these methods include step loading and unloading of cargo, and nose gear tethering.

2.6.3.5 Aircraft Doors, Nets, and Smoke Barriers. The operator's procedures should address the proper use of cargo compartment and bulkhead doors, installed nets, and smoke barriers.

2.6.3.6 Aircraft Floor and ULD Base Load Limits. The operator's procedures should address the aircraft's floor load limits if the operator loads cargo directly onto the aircraft's floor. These limits can be expressed as area load or linear/running load limits. The procedures also should address floor load limits for a ULD base if the ULD manufacturer has a limit. Operators must base these procedures on information derived from FAA-approved data, the aircraft manufacturer, or an STC WBM or supplement, as the WBM is part of the AFM and must be complied with per § 91.9). The procedures should address how to distribute or shore cargo weight greater than a floor load limit. For more information, see paragraph 2.6.7.

2.6.3.7 Aircraft Weight Limits. The operator's procedures should address the weight limits for aircraft cargo positions, floors, zones, and compartments, and include measures to ensure the operator does not exceed them. The operator should base these limits on information derived from FAA-approved data, the aircraft manufacturer, or STC WBM or supplements.

2.6.3.8 Aircraft CG Range Limits. The operator's procedures should address the CG range limits for the aircraft and longitudinal, lateral, and vertical CG limits for cargo positions. The procedures also should prevent an operator from exceeding these limits. The operator should base these procedures on information derived from FAA-approved data, the aircraft manufacturer, or STC WBM or supplements.

2.6.3.9 Cargo Access Aisle. The operator's procedures should address a method for creating a flightcrew access aisle to cargo requiring access during flight. Examples of cargo requiring such access include certain HAZMAT or live animals.

2.6.3.10 Aircraft Damage Avoidance. The operator's procedures should prevent damage during loading and unloading to the cargo handling system, cargo liners, smoke detectors, light fixtures, fire retardant flow nozzles, and similar devices.

2.6.3.11 Aircraft Damage Notification. The operator's procedures should provide for notification of flightcrew members or authorized maintenance personnel of a damaged or inoperative cargo compartment, cargo handling system, installed net, or smoke barrier and related components. These procedures should include a general guideline or list of what specific items cargo loaders should report to flightcrew members or authorized maintenance personnel, such as holes in the cargo compartment liner, damaged or missing cargo handling system restraints and rollers, and installed nets and smoke barriers.

2.6.3.12 Cargo Clearance. The operator's procedures should detail the minimum clearance (or distance) requirements between cargo and airplane systems and structure (e.g., cargo compartment liners, light fixtures, fire suppression systems, and smoke detectors).

2.6.3.13 CLS. The operator's procedures should describe how to use the aircraft's CLS to restrain ULDs. The operator should engage all CLS restraints for loading ULDs, including voided positions, unless the compartment contains no ULDs. Engaging cargo restraints in voided positions may help prevent a large cargo shift in the event that a ULD's restraint located forward/aft fails.

Note: Only FAA-certificated personnel may adjust CLS components by physical removal and reinstallation where tools are required. Trained, qualified, and authorized loading personnel may reconfigure the CLS based on the operator's WBM.

2.6.3.14 Bulk-Loaded Cargo. The operator's procedures should describe how to properly load bulk cargo in cargo compartments and pods approved for bulk cargo. The operator must not bulk-load cargo in a cargo compartment or pod contrary to the aircraft manufacturer's WBM or STC, or to the operator's manual system (per § 25.1583). If the aircraft manufacturer's WBM or STC

does not contain enough detail for bulk-loading cargo, the operator should establish procedures to ensure the safety of flight that address:

2.6.3.14.1 Cargo Clearance. The minimum clearance (or distance) requirements between cargo and airplane systems and structure (e.g., light fixtures and smoke detectors).

2.6.3.14.2 Load Distribution. Evenly distributing or spreading the cargo within compartments and pods over their length, width, and height.

2.6.3.14.3 Aircraft Nets. Properly using installed nets.

2.6.3.14.4 Aircraft Smoke Barriers. Properly using installed smoke barriers between cargo and flightcrew members and passengers.

2.6.3.15 Cargo Requiring Special Handling Procedures. Some cargo may require additional or unique procedures to protect cargo or the aircraft during handling, acceptance or loading, or in flight. Examples of special handling procedures include ceremony or instructions for transporting human remains, feeding live animals in transit, signature service forms for tracking mail/cargo, compatibility with HAZMAT, and protective gear when handling cryogenics. The operator's procedures should address cargo loads requiring special handling, which may include the following:

Note: Do not confuse special handling with special cargo. Not all special handling requires special cargo procedures. Refer to the definition of special cargo in Appendix C and OpSpec A002, Definitions and Abbreviations.

1. Offset cargo;
2. Overweight cargo;
3. Overhanging cargo;
4. Outsized cargo;
5. Sharp or piercing cargo;
6. Crated heavy machinery;
7. Reels or spools;
8. Motor vehicles and other wheeled cargo;
9. Tall cargo;
10. Rigid cargo;
11. Tall rigid cargo (TRC);
12. Cargo not fully restrained by the CLS;
13. Human remains;

14. Foodstuff, feed, and postal mail;
15. HAZMAT (in compliance with Title 49 of the Code of Federal Regulations (49 CFR) and part 121 subpart Z);
16. Active ULDs (FAA-approved);
17. Temperature-controlled ULD containers (FAA-approved);
18. Live animals;
19. Small animals, such as mice, rats, dogs, and cats, typically shipped in self-contained boxes or containers and typically loaded with other cargo in bulk compartments and ULDs. The procedures should address measures to:
    - Reduce the risk of animals escaping from containers while in the aircraft.
    - Identify animals that have escaped from their containers in the aircraft.
    - Remove escaped animals from the aircraft.
20. Large animals, such as horses and cattle, typically shipped in special containers, stalls, or penning systems where primary restraint is by the aircraft CLS that is STC-approved or approved by other FAA means. The procedures should address measures to:
    - Verify that special containers, stalls, or penning systems are approved by the WBM for the aircraft, where primary restraint is by the aircraft CLS.
    - Verify that the special container, stalls, or penning systems restrain the large animal.

      Note: Open-top stalls, where animals have no vertical restraint, are not acceptable.

    - Ensure special containers, stalls, or penning systems are properly installed in the aircraft.
    - Protect the aircraft from damage by animal waste, such as urine or solid waste.
    - Manage out-of-control animals in the aircraft.
    - Remove animal waste from the aircraft.
21. ULDs;
22. Radio frequency identification (RFID) cargo; and
23. Special cargo.

Note: Cargo requiring special handling procedures is a separate but related concept to special cargo. See paragraph 2.8 for more

information and to assist in identifying when one of the "cargo requiring special handling" examples listed above is classified as special cargo.

2.6.4 Use of Cargo Restraint Devices Other Than ULDs. An operator may use other restraint devices as the primary restraint of cargo unless prohibited by (1) the aircraft manufacturer AFM/WBM or (2) the STC supplementary WBM. The manufacturer's AFM/WBM or supplementary WBM should include serviceability limits and operational and repair procedures, and meet the flammability requirements of part 25.

2.6.5 Procedures for Use of Primary Restraint Devices Other Than the CLS. If an operator uses straps and other restraint devices as primary cargo restraints, it should have procedures for their use. These procedures must be based on the information provided by (1) the aircraft manufacturer or (2) the DAH. These procedures should address:

2.6.5.1 Installing straps or other restraint devices to aircraft structure, to include the CLS (e.g., floor tracks, rings, and hardware). An operator must emphasize in its procedures that reduced load limits and minimum separation requirements may exist between tiedown points if using the same aircraft floor track, ring, or hardware for multiple tiedowns. Operators must address minimum tiedown separation requirements for pallets so they do not overstress the aircraft floor attachments. These limits are found in the aircraft WBM.

Note: Intermixing cargo restraint devices made of different materials is not recommended.

2.6.5.2 Calculating other restraint devices for a given cargo load based on the restraint criteria in the aircraft's AFM/WBM.

2.6.5.3 Calculating the number of straps or restraint devices required based on the device's rated strength and limiting factors specified in the aircraft's AFM/WBM or its supplement. The manufacturer's AFM/WBM or its supplement may require strength reductions of the strap or other restraint devices based on limiting factors, such as aircraft sidewall or floor angles and the strength of attachment hardware.

2.6.5.4 Cargo strap and angle and G-force loading to determine the minimum number of straps necessary to safely secure the cargo.

2.6.5.5 Properly arranging straps or other restraint devices around the cargo or attached to the cargo. Instructions should include correctly cinching adjacent net panels together with a net corner lashing rope and securing the end of the rope to the net panel to prevent disengagement.

2.6.5.6 Restraining cargo using the aircraft's ultimate load conditions described by the manufacturer's AFM/WBM or its supplement. These devices must provide restraint in the forward, aft, vertical, and lateral directions.

Note: The FAA does not recommend that an operator tie multiple pieces on a pallet with straps or other restraint devices without an approved TSO net encompassing the load. Cargo, because of its size, condition, or shape that cannot be netted, should be classified and transported as special cargo.

2.6.6 Operator Procedures for Supplemental Cargo Restraint Devices. If the operator uses other restraint devices as supplemental cargo restraints, it should have procedures for their use. These procedures should be based on the information provided by (1) the aircraft manufacturer, (2) the DAH, or (3) other sources acceptable to the FAA. These procedures should address:

1. Using and attaching other restraint devices to the aircraft's installed seat track, tiedown track, and/or tiedown rings (see paragraph 2.8);
2. Using and attaching other restraint devices to commercial pallet cargo restraint tiedown tracks or to military pallets (436L) cargo restraint tiedown rings in accordance with the pallet manufacturer requirements; and
3. Properly arranging other restraint devices around the cargo or attached to the cargo.

Note: The operator should use care when positioning straps on cargo to prevent contact with sharp edges or irregular surfaces. The strap should not be prone to slippage from its intended position on cargo, and the operator should engage the lock mechanism so the strap is taut.

2.6.7 Procedures for Cargo Shoring. Aircraft floors and some pallet bases have a load-bearing weight limit, also called a floor load limit. Shoring is a technique to distribute the weight of a cargo piece over a larger area greater than its original load-bearing area, which is also called a footprint or contact area. Cargo pieces heavier than a load-bearing weight limit require shoring. The operator should have procedures describing:

1. Materials acceptable for use in shoring, such as wood planks or plywood;
2. Shoring weight (which must be included in the gross weight);
3. Calculations or methods for determining the amount and thickness of shoring materials; and
4. Methods for applying shoring material to the cargo piece.

2.6.8 Blocking and Bracing Techniques. An operator may need to stabilize cargo pieces such as large cable reels, motor vehicles, wheeled cargo, or odd-shaped cargo to prevent shifting during loading, unloading, and flight conditions. The operator should use blocking and bracing techniques to stabilize such cargo. The operator's procedures should describe:

1. Acceptable materials for blocking and bracing;

2. Calculations or methods for determining the amount and thickness of blocking and bracing materials;
3. Methods to account for the weight of the blocking and bracing materials, as part of the total weight; and
4. Methods for applying blocking and bracing materials to the cargo piece.

2.6.9 Frangible or Compressible Cargo. Frangible or compressible cargo may be required in certain positions for protection of the aircraft and its occupants, and its ability to withstand emergency landing conditions, as required by the aircraft WBM. Aircraft manufacturers' W&B documents vary on the definitions of these terms; therefore, those documents should be referenced prior to developing procedures.

2.6.10 Cargo Loading Procedures for Combi-Configured Aircraft. Aircraft configured for carrying passengers and cargo on any deck, such as combi-configured aircraft, may require special cargo loading procedures. The operator should have special procedures to load such aircraft, and these special procedures should be based on requirements established by the aircraft manufacturer or DAH.

2.7 Load Supervision, Load Verification, and Operator Audits.

2.7.1 Supervising Cargo Loading. An operator should designate a trained, qualified, and authorized person or persons with the duty of supervising the loading of the aircraft, such as a load supervisor, to ensure:

1. All cargo is properly built up and weighed;
2. Vendor's cargo scales have current calibration certificates;
3. Planning and calculation of cargo and passenger placement maintains the aircraft within permissible CG and structural load limits;
4. Cargo is properly secured with the appropriate type(s), quantity, and placement of cargo restraints, and all pallet locks are engaged when used;
5. The aircraft is correctly loaded and unloaded using the operator's procedures;
6. Cargo is placed on the aircraft in such a way to prevent overloading sensitive sections of the airframe and cargo floor;
7. CLSs, ULDs, and other restraint devices are in serviceable condition and properly used;
8. Flightcrew members or authorized maintenance personnel are notified of damaged or inoperative cargo compartments, CLSs, installed cargo nets, or smoke barrier components;
9. All cargo-related documents are accurate and properly completed before submission to flightcrew members; and
10. The person supervising the loading and/or signing the load manifest is a trained, qualified, and authorized person, as outlined in § 121.665.

Note 1: Operators may use different terminology to identify the person who has the duty of supervising the loading of the aircraft. The load supervisor may physically load the aircraft, but primarily supervises loading crews and procedures.

Note 2: The signature of the person supervising the load, on the load manifest, attests that the aircraft is loaded correctly.

2.7.2 How to Verify Cargo was Loaded Properly. Operators should designate personnel to provide information to the PIC or the operator's authorized, trained, and qualified loading personnel about how the aircraft was loaded. The designated loading personnel may provide loading information on one or more forms or documents, and may present it in hardcopy or electronic form. They may include additional information and certifications based on operator-specific requirements for cargo, such as HAZMAT, live animals, or special cargo.

2.7.3 Information Needed to Verify Cargo is Loaded Properly. The information indicating that cargo is properly loaded should include:

1. The flight date.
2. The flight number.
3. The aircraft registration number.
4. The origin of the flight leg.
5. The destination of the flight leg.
6. The ULD numbers (for cargo carried in ULDs).
7. The weight of each ULD loaded aboard the aircraft.
8. The weight of the bulk cargo, by compartment or position, as applicable.
9. The special cargo analysis function (SCAF) restraint plan (see paragraph 2.8.2).
10. A statement verifying that:
    - All ULD locks are up;
    - All installed nets or smoke barriers are properly attached;
    - All ULDs loaded are in an operational condition;
    - All cargo was loaded using operator cargo loading procedures; and
    - All cargo was loaded aboard the aircraft as depicted on the load plan form, verification form, or other similar documents.
11. The signature (or electronic equivalent) of the load supervisor or other authorized, trained, and qualified loading personnel.
12. Location and quantity of any HAZMAT carried, and the HAZMAT notification to crewmembers, if applicable (per 49 CFR part 175, § 175.33).

2.7.4 Maintaining Records of Cargo Loading Verification Information. Operators should have procedures to retain a completed and signed copy (or electronic equivalent) of the document(s) containing the information listed in paragraph 2.7.3 above with the load manifest, per § 121.695 or § 121.697, as applicable.

2.7.5 Performing Cargo Buildup and Loading Audits. Operators should have a program for periodic audits of cargo planning, building, and loading. The audits should be of sufficient scope and frequency to ensure that all cargo handling personnel are following operators' cargo procedures. (See paragraph 2.2.)

2.8 Transport of Special Cargo.

2.8.1 Special Cargo. Cargo that requires special handling and securing/restraining procedures within the limitations specified in the AFM/WBM approved by the TC/STC. Special cargo may be enclosed in an approved bulk compartment if the WBM has limitations supporting procedures for securing and restraining the special cargo.

2.8.2 Special Cargo Analysis Function (SCAF). The operator should identify a person who has overall responsibility for the SCAF. Operators should develop policies and procedures for the identification, acceptance, and carriage of special cargo. If an operator carries special cargo, it must comply with the operating limitations included in the DAH's AFM/WBM (per § 91.9). Operators should use the SCAF to determine if the cargo is indeed special cargo, evaluate associated risks, and develop a plan to ensure a safe flight using the DAH's AFM/WBM data. The operator should ensure participants are trained, qualified, and authorized to perform the functions listed below in paragraph 2.8.3.

2.8.2.1 Persons With Overall Responsibility. Examples of persons with overall responsibility of the SCAF who do not require the technical expertise of SCAFs may be:

1. The Director of Safety (DOS);
2. The chief pilot;
3. The Director of Operations (DO); or
4. The Director of Maintenance (DOM).

2.8.2.2 SCAF Participants. Examples of SCAF participant(s) who will require technical expertise in SCAFs may include:

1. The person supervising the load;
2. Engineering personnel; or
3. Other trained and qualified persons.

2.8.3 Procedures for Planning a Special Cargo Transport. The operator should develop policies and procedures for transporting special cargo. Procedures should be based on approved

data from the aircraft manufacturer/STC AFM/WBM (per §§ 23.2620 and 25.1583) and comply with all operating limitations.

2.8.3.1 SCAF Responsibilities. Based on the operator's procedures, the SCAF should:

2.8.3.1.1 Evaluate Cargo Transport. Determine the aircraft's ability to safely transport the cargo without causing structural damage. Evaluate the cargo and identify its tiedown capabilities. Take into account the special handling needs, placement of special cargo, weight limits, floor loads, and cargo clearance. See paragraph 2.8.4, which provides characteristics associated with special cargo.

2.8.3.1.2 Determine Restraint. Provide a method to determine the appropriate quantity and types of restraint, shoring, and arrangement confirming the determination of the load's restraint capability in each direction, whether restrained directly to the airplane or to a ULD restrained in the CLS. The operator should demonstrate that the orientation secures the load for all aircraft operations. Restraint loads must not exceed the rating of cargo tiedown points, pallet tiedown fittings, or aircraft structure. The operator should also be able to determine how restraints are distributed in accordance with the aircraft TC/STC AFM/WBM.

2.8.3.1.3 Construct a Special Cargo Restraint Plan. Construct a diagram/pictorial schematic or textual description based on an FAA-approved AFM/WBM/supplement. The special cargo restraint plan should:

1. Calculate the restraint and develop a tiedown special cargo restraint plan for each special cargo item.
2. Include the number and angle of primary restraints and the attachment points from the special cargo to the aircraft structure confirming the determination of the load's restraint capability in each direction. Some aircraft have approval to allow straps to pallets as the primary restraint.
3. Illustrate the position of all pieces of special cargo in relation or adjacent to the CLS and all other cargo having special requirements resulting from the carriage of the special cargo.

Note: The special cargo restraint plan must comply with the FAA-approved AFM/WBM/supplement and can be incorporated into the operator's manuals (per §§ 23.2620 and 25.1583). A separate special cargo restraint plan is not necessary for the items incorporated in the operator's manuals. However, when using this procedure, the operator should reference the manual name and diagram, illustration, or instruction number on a cargo loading document and retain it with the load manifest.

2.8.3.2 Operator's Responsibilities. The operator should:

2.8.3.2.1 Loading. Make the special cargo restraint plan and any necessary instructions available to the load supervisor, ground personnel, and flightcrew, as appropriate. Documents should be made available to those personnel involved with, or responsible for, the loading and securing of cargo.

Note: The operator should ensure that persons with the duty of supervising the cargo loading utilize the special cargo restraint plan and instructions during cargo loading.

2.8.3.2.2 Record Retention. File the special cargo restraint plan with the load manifest as outlined above in the note under paragraph 2.8.3.1.3.

2.8.4 Characteristics Associated with Special Cargo. Anytime a primary restraint—other than an authorized ULD restrained by a CLS—is used to restrain cargo, the cargo is classified as special cargo. The acceptance of special cargo requires a determination that the loading and restraint capabilities of the airframe and associated restraint devices provide compliance with all limitations contained in the FAA-approved TC/STC, AFM, and WBM. The operator should have procedures to determine if the cargo is indeed special cargo. The following list contains examples of characteristics to help make this determination:

2.8.4.1 Offset Cargo. Cargo positioned on the pallet in a manner that the cargo is shifted beyond the perimeter of the pallet resulting in either (1) the CG limits of the pallet being exceeded, or (2) the restraint by the net to the pallet becoming ineffective in protecting the aircraft and preventing cargo shift. A reason for offsetting the cargo could be to meet aircraft clearance requirements. Offset cargo is special cargo.

2.8.4.2 Overhanging Cargo. Cargo that extends beyond the perimeter of the pallet in at least one direction and prevents the net from performing its intended function.

2.8.4.3 Outsized Cargo. Cargo that exceeds the maximum allowable contour of an aircraft ULD such that the ULD must be loaded on board an aircraft as a non-CLS restrained ULD, as instructed by the AFM/WBM (per §§ 23.2620 and 25.1583).

2.8.4.4 Sharp or Piercing Cargo. Cargo of a piercing or penetrating nature, or cargo with sharp edges or corners, such as rods, pipes, extrusions, or beams, that could become a projectile hazard during flight operations.

2.8.4.5 Unusually Shaped Cargo. Cargo that is irregular in nature, such as crated heavy machinery, reels, spools, compressed springs, and actuators. Risks associated with these items include:

1. Can roll and shift during transportation due to their shape;

2. Hard to lift and move without damaging the edges;
3. Can be bundled together and require blocking and bracing techniques to prevent cargo shift;
4. Can become projectiles if not handled and secured properly; and
5. The weight is concentrated in a very small area and often exceeds the floor-bearing weight capacity of the aircraft.

2.8.4.6 Motor Vehicles and Other Wheeled Cargo. Motor vehicles and other wheeled cargo with heavy weights represent a higher hazard and should be systematically handled with reinforced precautions, checks, and cross-checks, to include:

1. Fuel levels,
2. Load shoring and restraint,
3. Blocking and bracing (chocking) wheels to restrict movement, and
4. Tiedown attachment points.

2.8.4.7 Tall Cargo and TRC. Currently, TRC only applies to the Boeing 747. Tall cargo is cargo greater than 98 inches tall. Certain sections of tall cargo can be frangible and certain sections can be rigid. If any part of the rigid section of tall cargo is above 98 inches, the tall cargo is TRC. If the entire rigid section of tall cargo is at or below 98 inches, the tall cargo is not TRC. It is the responsibility of the operator to determine if cargo is tall cargo or TRC.

2.8.4.8 Cargo Not Restrained by the Aircraft CLS. Cargo not fully engaged by the cargo loading restraint system but secured to the aircraft structure. Cargo not fully restrained by the aircraft CLS becomes special cargo.

2.8.4.9 Cargo Using a Sandwich Pallet. A sandwich pallet is when one or more pallets are placed on top of another. In some cases, wood (skid or plywood) is placed in between the pallets. In all cases, the upper pallet becomes cargo. A base pallet that is not secured by the CLS is special cargo.

Note: If a cargo net is placed over all the cargo and attached to the base pallet which is secured by the CLS, it is not considered special cargo.

2.8.4.10 Floating Pallet. ULD positioned over one or more pallet position and not fully restrained by the aircraft CLS, but restrained to the aircraft structure by means of strapping to tiedown fittings. Floating pallets are special cargo.

2.9 Use of Multiple Entities.

2.9.1 Interlining. Interlining is when cargo is transferred from one operator to another, whether using the same or different aircraft types. The receiving operator should ensure that all

cargo being transferred is acceptable and capable of transportation on the receiving operator's aircraft.

2.9.1.1 Procedures an Operator Should Have for Interlining. The operator should develop standards for accepting cargo in accordance with its policies and procedures, or state that it does not interline. Policies and procedures should include, at a minimum:

1. Cargo check (visual examination), including serviceability of ULDs;
2. ULD compatibility with aircraft (see paragraph 2.4.5); and
3. Special cargo verification and validation, if applicable.

2.9.1.2 Using Vendors to Interline or Build Up Cargo. The use of third parties, foreign and/or domestic, reduces the need for the operator to employ personnel or to contract directly for interlining built-up cargo, aircraft loading, unloading, and cargo handling at a particular location. See Appendix C and paragraph 2.9.2 for additional information on vendors.

2.9.2 Vendors.

2.9.2.1 Vendors Performing ULD Handling or Buildup.

2.9.2.1.1 Under §§ 121.363 and 135.413, an operator is primarily responsible for the airworthiness of its aircraft. This includes work done both in-house and under contract with an outside source. This necessarily includes responsibility for the security of the cargo and safety of flight. There are multiple entities involved in the movement of cargo, which include shippers, vendors, freight forwarders, contractors, subcontractors, customs brokers, and service providers. All play a role in the air transportation of cargo and these roles may include cargo buildup, freight staging, cargo loading, and tiedown. Vendors performing ULD handling or buildup should ensure that:

1. Requirements are met in accordance with the instructions of the operator;
2. Sufficient and proper ULD storage capacity is available for all units handled;
3. All staff or supervising staff receive training appropriate to the tasks performed; and
4. Full access is guaranteed to enquiries or audits from the operator's quality control (QC) departments.

2.9.2.1.2 An operator should have a system in place to perform audits of a vendor at regular time intervals in line with its SMS process.

2.9.2.2 Operator Program for Vendors to Use in ULD Buildup or Loading. Given that it is common practice for an operator to carry cargo loads that vendors have built up or loaded, an operator should have a program that ensures vendors perform cargo buildup and loading using the operator's procedures. Under such a program, an operator should have procedures to:

1. Train a vendor employee to train other vendor employees (train-the-trainer method), or accept the vendor's training program and procedures provided they meet or exceed the standards established in the operator's training program and procedures.
2. Designate a trained, qualified, and authorized person to oversee the vendor services to ensure the vendor performs the services in accordance with the operator's procedures.
3. Audit vendors for compliance with the operator's procedures and training programs.
4. Have a recordkeeping system to track all trained individuals, including vendors, in cargo operations that are authorized, qualified, and trained by the operator.

Note: All cargo built up by authorized, trained, and qualified personnel should meet operator standards before being loaded. In some cases, some operators may have trained and qualified personnel inspect and accept the built-up freight prior to loading on the aircraft instead of having all of the vendor's employees trained to the operator's specific program.

2.9.3 Freight Forwarding. An operator may engage with other companies such as freight forwarders for organized shipment of cargo. An operator should have a system in place to perform audits of a freight forwarder at regular time intervals. An operator should have a system in place to perform audits of a vendor at regular time intervals in line with their SMS process.

2.9.4 Responsibility for Multiple Entities. The FAA recognizes it is common practice for multiple entities to perform different services associated with air cargo operations, but the operator is always ultimately responsible for cargo loading and securing and safety of flight. Therefore, the operator should ensure that those multiple entities are trained, qualified, and authorized to perform duties, audit third-party operations, and ensure adherence to the operator's procedures, when applicable. Alternatively, the operator may use a trained and qualified person to inspect, accept, and supervise the loading of the freight on the aircraft.

2.10 Freight Staging.

2.10.1 Staging Cargo at Different Operating Locations. An operator may engage in the process of staging cargo at different operating locations. When storing or staging cargo, the operator should consider the following, when applicable:

1. Proper security of all cargo is maintained;
2. Proper special handling of cargo is provided;
3. Proper storage of cargo that is also safe from natural elements is provided;
4. Appropriate climate control for cargo is provided, if applicable (e.g., refrigeration); and
5. Proper documentation of all cargo is maintained.

2.11 Checklists and Job Aids.

2.11.1 Using Checklists and Job Aids. The operator should develop a system when performing tasks to incorporate controls as part of its processes and procedures. In other words, checks and balances are designed into a process to ensure a desired result. This could be a checklist or job aid. For example, a loading checklist or job aid and predeparture checklist or job aid may be used together to positively verify that the condition, weight, and sequencing of each pallet is correct for each loaded position on the aircraft. Examples of checklists and job aids with related items (not all-inclusive) to accomplish this may include the following:

1. Cargo acceptance:
   - Documentation;
   - Visual check;
   - Special cargo (SCAF); and
   - HAZMAT (refer to 49 CFR § 175.33).
2. ULD serviceability:
   - Net limits not exceeded; and
   - Damage limits not exceeded.
3. Cargo buildup:
   - CG;
   - Cargo contour; and
   - Marking and labeling.

4. Aircraft preloading, loading, and unloading:
   - Preloading: Visual check of CLS for broken and missing components;
   - Loading: Adequate restraint used to secure cargo; and
   - Unloading: Check to make sure no locks are damaged or missing. If locks are damaged or missing, notify maintenance.
5. Predeparture and postflight cargo checks by trained and qualified person(s):
   - Final check that cargo is secured properly;
   - Load manifest signed and supporting documentation is available; and
   - After flight, whether any broken restraint devices were identified.
6. HAZMAT. The shipping paper required by 49 CFR § 175.33 has been provided to the PIC, and Notification to Captain (NOTOC).
7. Live animals.
8. Special cargo:
   - SCAF; and
   - Special cargo restraint plan.
9. Vehicle inspection:
   - Leaking fluids; and
   - Fuel tank levels.
10. Station audit (depending on station classification):
    - Documentation;
    - Training records;
    - Scale calibration;
    - Operator's manuals; and
    - Vendor audits.

2.12 Operator's Evaluation System for W&B Control.

2.12.1 Overview. An operator should establish and maintain an SMS for the continuing analysis, evaluation, and surveillance of the performance and effectiveness of its W&B control program. You can find these elements in AC 120-79, Developing and Implementing an Air Carrier Continuing Analysis and Surveillance System.

Note: This is a shared responsibility between operations and maintenance roles. A process should be in place to ensure that the operator reports and tracks this information to the CASS or another closed-loop system.

2.12.2 System List. The system should define how and when operators audit the W&B cargo operation control system to include, at a minimum:

- Aircraft loading;
- Cargo buildup;
- Carriage of special cargo;
- Vendors;
- Personnel training;
- Freight forwarders; and
- CLS.

2.12.3 System Performance. System performance should be monitored to include such items as load plans, load manifests, aircraft configuration changes, cargo loading and restraint system performance (e.g., broken straps identified after use in flight and in-flight shift of cargo), and human factors issues with loaders, load supervisors, and vendors.

2.12.4 System Effectiveness. System effectiveness should be monitored to identify the reliability of the overall performance for cargo operations.

2.13 Training Programs. Operators should develop cargo operations and W&B training programs. Training should explain employee functions (commensurate with their tasks and responsibilities) and express expectations of job duties and responsibilities according to the operator's procedures. An operator should have procedures to train its employees, managers, and vendors to its standards. Personnel performing cargo operation functions should be trained, qualified, and authorized, as defined in the operator's manual. This training should be easily identified by documentation in training records and authorization documents readily available.

2.13.1 Training Program Components. The operator's training program should include:

1. A curriculum acceptable to the FAA.
2. Procedures for maintaining training records.
3. Recurrent training requirements in accordance with the operator's manual.
4. A description of the training program methods. The program may consist of one or more of the following methods:
   - Classroom sessions;
   - On-the-job training (OJT);
   - Computer-based training (CBT); or
   - Other training methodologies operators consider appropriate.
5. A periodic review and update of the program.

6. Proper identification of employees authorized to provide the training.
7. Content, application, and use of DAH/STC WBMs (source documents).

2.13.2 Identifying Individuals Who Need Training. An operator should have procedures to properly identify those individuals who need training, whether they are employees of the air carrier or of a vendor. These individuals may include:

1. Aircraft loading personnel;
2. Maintenance personnel;
3. Crewmembers;
4. Dispatchers/flight followers;
5. Supervisory loading personnel;
6. Ground handlers;
7. Cargo buildup personnel;
8. Load planners; and
9. Persons involved with W&B and CG calculations.

2.13.3 Curriculum for W&B and Cargo Operations Training.

2.13.3.1 W&B.

2.13.3.1.1 W&B Fundamentals. All operator and vendor personnel involved in W&B calculations should receive fundamental W&B training at a general subject matter level, appropriate to their roles, to include:

1. Familiarization with varying aircraft weights based on manufacturer requirements;
2. The importance of conforming to and applying aircraft manufacturer and TC/STC requirements and zone or compartment limits;
3. The importance of accurate W&B calculations;
4. The importance of proper communication among various personnel; and
5. Recognition of special cargo.

2.13.3.1.2 W&B and CG Calculations. The operator's training course for personnel or contractors involved with W&B and CG calculations should include, at a minimum:

1. Conforming and applying weight limitations by position, zone, or compartment of an aircraft using the aircraft manufacturer's requirements;

2. Determining CG limits for the aircraft;
3. Loading the aircraft per CG limits;
4. Calculating W&B and CG using operator procedures, to include automated or manual calculation systems;
5. Notifying the flightcrew of the W&B of the aircraft;
6. Accounting for the effect of weights of crews, other persons, cargo, and baggage;
7. Communicating W&B or CG issues to personnel involved with cargo loading;
8. Position of cargo and baggage; and
9. Processes that factor CG offsets into cargo, both loaded into ULDs and loaded onto the aircraft.

2.13.3.2 CLS. An operator should provide CLS training to personnel with job functions involving equipment installed to the floor of an aircraft cargo compartment used to restrain ULDs. The CLS usually consists of ball mats, rollers, side guides, and locks for securing ULDs to the aircraft structure. Operators should educate personnel under a training program that includes procedures, as applicable, for:

1. Inspections for serviceability, including reporting/accounting for damaged or missing restraint devices;
2. Repairs;
3. Reconfiguration within an approved TC/STC design configuration;
4. Loading procedures and their effect on aircraft performance;
5. Restraint requirements; and
6. Restraint systems for each of the operator's aircraft types.

2.13.3.3 Cargo Buildup Training. All personnel involved in cargo buildup should receive cargo buildup training appropriate to their function, and the cargo should be inspected by trained personnel prior to being loaded on the aircraft. Elements of cargo buildup training include:

1. Concentrated loads;
2. Pallet load limitations;
3. Restraints;
4. Damage limits for ULDs and restraint devices;
5. Compatibility of aircraft/pallet and net/pallet combinations;
6. HAZMAT;

7. Scales;
8. Proper ULD configuration;
9. Container configurations and conditions;
10. CG offsets, profiling, and authorization for use on a particular aircraft;
11. Training on how to build up a ULD to comply with CG control; and
12. Documentation.

2.13.3.4 ULD. Personnel whose job functions include determining compatibility of pallet/net combinations (per operator's procedures), pallet and airframe compatibility, and cargo restraint devices (e.g., intermixing straps) should have training in these areas.

2.13.3.4.1 The operator should develop a training program that includes:

1. ULD identification (this should include a review of unique ULDs and identify the risks of loading a ULD not authorized for loading aboard the aircraft);
2. Voided space in a ULD;
3. Cargo contours;
4. ULD identification tags, if applicable;
5. ULD weight limits;
6. Serviceability checks;
7. Fastening container components;
8. Fastening a cargo net to a pallet; and
9. Recurrent training for all loading personnel involved in ULD buildup. Operators should determine the time and type of recurrent training appropriate to the type of operation. Operators should require training if loading personnel involved in ULD buildup are no longer considered properly trained.

2.13.3.4.2 Persons performing ULD maintenance should undergo training on the operator's or manufacturer's maintenance program that includes:

1. Acceptance inspection;
2. Routine inspection;
3. Damage limits;
4. Repair;

5. Maintenance records; and
6. Return to service.

2.13.3.5 SCAF Training Elements (as applicable):

1. TRC: Determining TRC, loading procedures, and restraint methods;
2. Frangible/compressible cargo: Determining frangible/compressible cargo requirements, usage, and procedures, and providing training instructions;
3. Procedures for transporting special cargo;
4. Proficiency with the applicable content of DAH/STC WBMs; and
5. DAH manuals.

2.13.3.6 Loading/Unloading Training. All operator and vendor personnel involved in cargo loading and unloading should receive training appropriate to their function. This includes personnel whose cargo handling functions include ground transportation of cargo, movement of cargo onto or off of an aircraft, or movement/securing of cargo aboard the aircraft with appropriate devices and equipment. Elements of loading/unloading training may include, if applicable:

1. Sill guards;
2. Tail posts;
3. Tail stands;
4. Tail tipping avoidance;
5. Aircraft doors, nets, and smoke barriers;
6. Aircraft floor and ULD base load limits;
7. Aircraft weight limits;
8. Aircraft CG range limits;
9. Cargo access aisle;
10. Aircraft damage avoidance;
11. Damage notification;
12. Cargo clearance;
13. CLS;
14. Bulk-loaded cargo;
15. Cargo requiring special handling;
16. Shoring usage;

17. Blocking and bracing;
18. HAZMAT;
19. Frangible cargo; and
20. Material handling equipment.

2.13.3.7 Supervising Cargo Loading.

2.13.3.7.1 Responsibilities. The operator should ensure that the person supervising the loading of the aircraft and preparing the load manifest is responsible for the preparation and accuracy of the load manifest before each takeoff (per § 121.665).

2.13.3.7.2 Elements of Cargo Loading Supervision Training. Load supervision candidates should be trained in the elements listed in paragraphs 2.13.3.1, 2.13.3.2, 2.13.3.3, 2.13.3.4, 2.13.3.5, and 2.13.3.6; as well as the below topics, when applicable:

1. Interlining;
2. Aircraft cargo handling;
3. Cargo loading documentation;
4. Load planning;
5. COMAT; and
6. Familiarity with the accepted operator's W&B control program or operator's manuals, including the necessary DAH/STC WBMs.

2.13.4 Accident/Incident Reporting. An operator should have procedures to ensure it trains its personnel in accident/incident reporting procedures.

2.13.5 Providing Air Cargo Information to Flightcrew Members. An operator should inform the flightcrew of the following, when applicable:

1. Procedures used to ensure the aircraft weight is correct;
2. Procedures to report unserviceable ULDs;
3. Loading and weight limitations for removing or deferring cargo restraint components;
4. Proper load configurations when using nets, straps, or containers; and
5. Requirements when loading and restraining special cargo.

2.13.6 Use of Vendors to Provide Training. An operator may designate a person employed by a vendor, such as an aircraft company, ground handling company, or a freight forwarder authorized to train that company's employees. The operator should have procedures to accept the program.

2.13.7 Evaluation of Training. An operator's closed-loop system, which monitors the elements of surveillance, analysis, corrective action, and followup, should include an evaluation of the operator's cargo training program. The operator also may use an internal evaluation program to review its training program. The operator should ensure it has procedures to periodically review the training program and make changes as necessary.

2.13.8 Training Record Contents. At a minimum, an operator's training records, in accordance with the operator's training program, should contain:

- The name of the person trained;
- The initial training date and most recent recurrent training date;
- A description, copy, or the location of training material used, if available;
- The name and location of the person who provided the training; and
- A record that the person was tested and successfully completed training.

CHAPTER 3. ADMINISTRATIVE INFORMATION

3.1 How to Obtain Copies of Publications.

3.1.1 The current edition of the Code of Federal Regulations (CFR) is available at https://www.ecfr.gov.

3.1.2 Current editions of advisory circulars are available on the FAA website at https://www.faa.gov/regulations_policies/advisory_circulars/ and on the Dynamic Regulatory System (DRS) at https://drs.faa.gov.

3.2 AC Feedback Form. For your convenience, the AC Feedback Form is the last page of this AC. Note any deficiencies found, clarifications needed, or suggested improvements regarding the contents of this AC on the Feedback Form.

APPENDIX A. RELATED REGULATIONS

A.1 Title 14 of the Code of Federal Regulations (14 CFR).

A.1.1 Part 5, Safety Management Systems. Section 5.53, System Analysis and Hazard Identification.

A.1.2 Part 21, Certification Procedures for Products and Articles.

1. Section 21.9, Replacement and Modification Articles.
2. Section 21.21, Issue of Type Certificate: Normal, Utility, Acrobatic, Commuter, and Transport Category Aircraft; Manned Free Balloons; Special Classes of Aircraft; Aircraft Engines; Propellers.
3. Section 21.101, Designation of Applicable Regulations.
4. Section 21.303, Application.
5. Subpart E, Supplemental Type Certificates.
6. Subpart K, Parts Manufacturer Approvals.
7. Subpart O, Technical Standard Order Approvals.

A.1.3 Part 23, Airworthiness Standards: Normal Category Airplanes. Section 23.2620, Airplane Flight Manual.

A.1.4 Part 25, Airworthiness Standards: Transport Category Airplanes.

1. Section 25.23, Load Distribution Limits.
2. Section 25.301, Loads.
3. Section 25.787, Stowage Compartments.
4. Section 25.851, Fire Extinguishers.
5. Section 25.853, Compartment Interiors.
6. Section 25.855, Cargo or Baggage Compartments.
7. Section 25.857, Cargo Compartment Classification.
8. Section 25.858, Cargo or Baggage Compartment Smoke or Fire Detection Systems.
9. Section 25.1301, Function and Installation.
10. Section 25.1309, Equipment, Systems, and Installations.
11. Section 25.1519, Weight, Center of Gravity, and Weight Distribution.
12. Section 25.1529, Instructions for Continued Airworthiness.
13. Section 25.1581, General.
14. Section 25.1583, Operating Limitations.

15. Section 25.1583(c), Weight and Loading Distribution.
16. Section 25.1721, Protection of EWIS.
17. Appendix F.
18. Appendix H, Instructions for Continued Airworthiness.

A.1.5 Part 43, Maintenance, Preventive Maintenance, Rebuilding, and Alteration.

1. Section 43.5, Approval for Return to Service After Maintenance, Preventive Maintenance, Rebuilding, or Alteration.
2. Section 43.13, Performance Rules (General).

A.1.6 Part 45, Identification and Registration Marking. Section 45.15, Marking Requirements for PMA Articles, TSO Articles, and Critical Parts.

A.1.7 Part 119, Certification: Air Carriers and Commercial Operators.

1. Section 119.49, Contents of Operations Specifications.
2. Section 119.55, Obtaining Deviation Authority to Perform Operations Under a U.S. Military Contract.

A.1.8 Part 121, Operating Requirements: Domestic, Flag, and Supplemental Operations.

1. Section 121.135, Manual Contents.
2. Section 121.153, Aircraft Requirements: General.
3. Section 121.363, Responsibility for Airworthiness.
4. Section 121.367, Maintenance, Preventive Maintenance, and Alterations Programs.
5. Section 121.369, Manual Requirements.
6. Section 121.373, Continuing Analysis and Surveillance.
7. Section 121.375, Maintenance and Preventive Maintenance Training Program.
8. Section 121.379, Authority to Perform and Approve Maintenance, Preventive Maintenance, and Alterations.
9. Section 121.380, Maintenance Recording Requirements.
10. Section 121.400, Applicability and Terms Used.
11. Section 121.419, Pilots and Flight Engineers: Initial, Transition, and Upgrade Ground Training.
12. Section 121.422, Aircraft Dispatchers: Initial and Transition Ground Training.
13. Section 121.628, Inoperable Instruments and Equipment.
14. Section 121.665, Load Manifest.

15. Section 121.693, Load Manifest: All Certificate Holders.
16. Section 121.695, Disposition of Load Manifest, Dispatch Release, and Flight Plans: Domestic and Flag Operations.
17. Section 121.697, Disposition of Load Manifest, Flight Release, and Flight Plans: Supplemental Operations.
18. Subpart G, Manual Requirements.
19. Subpart Z, Hazardous Materials Training Program.
20. Appendix O, Hazardous Materials Training Requirements for Certificate Holders.

A.1.9 Part 135, Operating Requirements: Commuter and On Demand Operations and Rules Governing Persons On Board Such Aircraft.

1. Section 135.21, Manual Requirements.
2. Section 135.23, Manual Contents.
3. Section 135.179, Inoperable Instruments and Equipment.
4. Section 135.413, Responsibility for Airworthiness.
5. Section 135.425, Maintenance, Preventive Maintenance, and Alteration Programs.
6. Section 135.437, Authority to Perform and Approve Maintenance, Preventive Maintenance, and Alterations.
7. Section 135.439, Maintenance Recording Requirements.
8. Section 135.443, Airworthiness Release or Aircraft Maintenance Log Entry.

A.1.10 Part 145, Repair Stations.

A.1.11 Part 235, Reports by Air Carriers on Incidents Involving Animals During Air Transport. Section 235.3, Reports by Air Carriers on Incidents Involving Animals During Air Transport.

A.1.12 Part 382, Nondiscrimination on the Basis of Disability in Air Travel. Section 382.55, May Carriers Impose Security Screening Procedures for Passengers With Disabilities That Go Beyond TSA Requirements or Those of Foreign Governments?

A.2 Title 49 of the Code of Federal Regulations (49 CFR), Transportation. Subtitle B, Other Regulations Relating to Transportation; Chapter I, Pipeline and Hazardous Materials Safety Administration, Department of Transportation; Subchapter C, Hazardous Materials Regulations, as applicable.

A.3 Related International Regulations:

1. International Civil Aviation Organization (ICAO) Doc 9284, Technical Instructions for the Safe Transport of Dangerous Goods by Air.
2. ICAO Doc 9859, Safety Management Manual (SMM).

APPENDIX B. GUIDANCE MATERIAL

B.1 Advisory Circulars (AC) (current editions):

1. AC 00-58, Voluntary Disclosure Reporting Program.
2. AC 20-62, Eligibility, Quality, and Identification of Aeronautical Replacement Parts.
3. AC 21-43, Production Under 14 CFR Part 21, Subparts F, G, K, and O.
4. AC 25-9, Smoke Detection, Penetration, and Evacuation Tests and Related Flight Manual Emergency Procedures.
5. AC 25-18, Transport Category Airplanes Modified for Cargo Service.
6. AC 25-22, Certification of Transport Airplane Mechanical Systems.
7. AC 91.21-1, Use of Portable Electronic Devices Aboard Aircraft.
8. AC 120-16, Air Carrier Maintenance Programs.
9. AC 120-27, Aircraft Weight and Balance Control.
10. AC 120-59, Internal Evaluation Programs.
11. AC 120-79, Developing and Implementing an Air Carrier Continuing Analysis and Surveillance System.
12. AC 120-80, In-Flight Fires.
13. AC 120-92, Safety Management Systems for Aviation Service Providers.
14. AC 120-121, Safety Risk Management Involving Items in Aircraft Cargo Compartments.
15. AC 145-9, Guide for Developing and Evaluating Repair Station and Quality Control Manuals.

B.2 Federal Aviation Administration (FAA) Orders, Forms, Bulletins, and Technical Standard Orders (TSO) (current editions):

1. FAA Order 8110.4, Type Certification.
2. FAA Order 8110.48, How to Establish the Certification Basis for Changed Aeronautical Products.
3. FAA Order 8120.22, Production Approval Procedures.
4. FAA Order 8150.4, Certification of Cargo Containers with Self-Contained Temperature Control Systems (Active ULDs).
5. FAA Form 337, Major Repair and Alteration (Airframe, Powerplant, Propeller, or Appliance).
6. FAA Form 8100-9, Statement of Compliance with Airworthiness Standards.
7. FAA Form 8110-3, Statement of Compliance with Airworthiness Standards.

8. FAA Form 8130-3, Authorized Release Certificate, Airworthiness Approval Tag.
9. TSO-C90, Cargo Pallets, Nets and Containers (Unit Load Devices).
10. TSO-C172, Cargo Restraint Strap Assemblies.
11. TSO-C202, Cargo Stopper Devices.

B.3 Cargo AC Development Information:

1. Air Cargo System Implementation Plan, March 2003.
2. Cargo Strategic Action Plan, April 2002.
3. Civil Reserve Air Fleet Aircraft Procedures for the U.S. Military, FM 55-9.

B.4 Industry Information (current editions):

B.4.1 International Air Transport Association (IATA). Any IATA procedures used must not conflict with FAA regulatory requirements or aircraft limitations. The following documents are available at https://www.iata.org/en/publications/:

1. IATA ULD Regulations (ULDR).
2. IATA Airport Handling Manual (AHM).
3. IATA Ground Operations Manual (IGOM).
4. IATA Perishable Cargo Regulations (PCR).
5. IATA Live Animals Regulations (LAR).
6. IATA Dangerous Goods Regulations (DGR).
7. IATA Temperature Control Regulations (TCR).
8. IATA Lithium Battery Shipping Guidelines (LBSG).

B.4.2 International Organization for Standardization (ISO) International Standard ISO 4118, Air Cargo—Non-Certified Lower Deck Containers—Design and Testing, and other pertinent international standards. This standard is available at https://www.iso.org/home.html.

B.4.3 National Aerospace Standard (NAS) 3610, Cargo Unit Load Devices—Specification For.

B.4.4 SAE Aerospace Standards (AS). These standards are available at https://www.sae.org/standards/.

1. AS1130, Air and Air/Surface (Platform) Cargo Pallets.
2. AS1131, Air and Air/Surface (Platform) Cargo Pallet Nets.
3. AS1491, Interline Air Cargo Pallets.
4. AS1492, Interline Air Cargo Pallet Nets.

5. AS1677, General Requirements for Noncertified Cargo/Baggage Containers.
6. AS4041, Air Mode General Purpose Containers.
7. AS5385, Cargo Restraint Straps—Design Criteria and Testing Methods.
8. AS5896, Certified Containers for Lower Deck Compartments.
9. AS36100, Air Cargo Unit Load Devices—Performance Requirements and Test Parameters.
10. AS36101, Air Cargo Unit Load Devices—Load Distribution Model.

B.4.5 SAE Aerospace Recommended Practices (ARP). These documents are available at https://www.sae.org/standards/.

1. ARP1334, Ground Equipment Requirements for Compatibility with Aircraft Unit Load Devices.
2. ARP1554, Vehicle Transport Unit Load Device (ULD).
3. ARP1621, ULD for Aircraft Transportation of Horses.
4. ARP1840, Aircraft Engine Transport Devices.
5. ARP5486, Air Cargo Pallets—Utilization Guidelines.
6. ARP5595, Cargo Restraint Straps—Utilization Guidelines.
7. ARP5596, Cargo Shoring Guidelines.

APPENDIX C. DEFINITIONS RELATED TO AIR CARGO OPERATIONS

C.1 Active Unit Load Devices (ULD). ULDs with active temperature control systems for transporting temperature-sensitive cargo. These systems consist of a highly insulated container with a battery-operated heating/cooling system integrated into the construction of the container. Active ULDs are intended to be operating during flight. Active ULDs are battery-powered in flight and are recharged only while on the ground. The "active" component of these units typically consists of a vapor cycle refrigeration/heat pump type system that is powered by various types of large batteries, depending on the manufacturer.

C.2 Aircraft Loading Schedule. The loading schedule is used to document compliance with the certificated Weight and Balance (W&B) limitations contained in the manufacturer's Airplane Flight Manual (AFM) and Weight and Balance Manual (WBM). The loading schedule is developed by the operator based on its specific loading calculation procedures and provides the operational limits for use with the operator's W&B program accepted under this advisory circular (AC).

C.3 Approved Parts. Unless used with reference to another person, means parts approved by the Administrator.

C.4 Authorized Unit Load Device (ULD). A ULD, as defined by National Aerospace Standard (NAS) 3610, Cargo Unit Load Devices—Specification For; SAE Aerospace Standard (AS) 36100, Air Cargo Unit Load Devices—Performance Requirements and Test Parameters; Technical Standard Order (TSO)-C90, Cargo Pallets, Nets and Containers (Unit Load Devices); or other standards, for carriage within the airplane as specified in the AFM/WBM approved by the type certificate (TC) or Supplemental Type Certificate (STC). (Refer to Operations Specification (OpSpec) A002, Definitions and Abbreviations.)

C.5 Bulk Cargo. Cargo transported as individual pieces and loaded into a compartment approved for bulk cargo by the AFM/WBM that is approved by the TC or STC. These items are generally loaded planeside and loaded directly into the bulk compartment. (Refer to OpSpec A002.)

C.6 Cargo. Any property carried on an aircraft other than mail, stores, and accompanied or mishandled baggage. (Refer to OpSpec A002.)

C.7 Cargo Handling. An operator's methods of accepting, weighing, securing, and transporting cargo on the ground, and the loading and unloading of an aircraft.

C.8 Cargo Loading System (CLS). Equipment installed to the floor of an aircraft cargo compartment to restrain aircraft ULDs against ground and flight loads. It usually consists of such items as ball mats, end stops, rollers, side guides, and locks for securing ULDs to the aircraft structure. It does not include ULDs, barriers, and tiedown straps.

Note: The CLS is approved as part of either the aircraft's TC or an STC. Whenever a CLS is used, it includes cargo handling systems and cargo restraint systems.

C.9 Certified Restraint Straps. These devices should meet the requirements of TSO-C172, Cargo Restraint Strap Assemblies. In TSO-C172, the FAA describes the minimum performance standards (MPS) by which cargo restraint strap assemblies are approved and identified with applicable TSO markings.

C.10 Certified Unit Load Device (ULD). A cargo container (as defined by NAS 3610, SAE AS36100, TSO-C90, or other approval standards) that is authorized for carriage within the airplane as specified in the AFM/WBM approved by the TC or STC.

C.11 Company Materials (COMAT). Company material, commonly called COMAT, is an industry term used by operators to describe nonrevenue materials and supplies owned by the operator that are shipped by the operator in support of its operations.

C.12 Dunnage. Materials used to support and protect cargo in an aircraft cargo compartment or padding used in a shipping container to protect the container's contents.

C.13 Dynamic Load. Loads imparted on the structure of the aircraft by loaded cargo during taxi, takeoff, cruise, and landing.

C.14 Floating Pallet. A ULD positioned over one or more pallet position(s) and not fully restrained by the aircraft ULD restraint system, but restrained to the aircraft structure by means of strapping to tiedown fittings.

C.15 Frangible or Compressible Cargo. Aircraft manufacturers' W&B documents vary on this definition; therefore, you should reference the applicable manufacturer's documents.

C.16 Freight Staging. The holding of cargo awaiting transportation and the delivery of cargo to the aircraft in the correct sequencing of cargo according to the load plan.

C.17 Hazardous Materials (HAZMAT). Materials or substances meeting the definition of hazardous material in 49 CFR part 171, § 171.8.

C.18 Interlining. Transfer from one operator to another, whether the same or different aircraft types are used. For example, a ULD transferred from a domestic operator to a foreign operator.

C.19 Load Supervisor. The job title of the person with overall responsibility for supervising the loading of the aircraft. This person may be responsible for signing the load manifest. A person with a different job function may also sign the load manifest, if properly trained. Refer to 14 CFR part 121, § 121.665.

C.20 Noncertified Unit Load Device (ULD). A ULD that is not certified by the ULD manufacturer, does not meet the TSO-C90 or Parts Manufacturer Approval (PMA)

certification requirements, and/or is not listed in the design approval holder's (DAH) aircraft WBM (TC or STC).

C.21 Offset Cargo. Cargo positioned on the pallet in a manner that the cargo is shifted beyond the perimeter of the pallet resulting in (1) the center of gravity (CG) limits of the pallet being exceeded, or (2) the restraint by the net to the pallet becoming ineffective in protecting the aircraft and preventing cargo shift. Offset cargo may also include nonpalletized cargo loaded asymmetrically in the airplane.

C.22 Other Authorized Persons. Persons who are not members of the crew and who are carried on board the aircraft per § 121.583.

C.23 Overhanging Cargo. Cargo that extends beyond the perimeter of the pallet in at least one direction but still allows the net to perform its intended function. The pallet can still be restrained by the CLS and does not require additional straps to the aircraft structure.

C.24 Overweight Cargo. Cargo that exceeds the maximum allowable weight as defined by the aircraft AFM/WBM for aircraft ULD position.

C.25 Outsized Cargo. Cargo that exceeds the maximum allowable contour of an aircraft ULD such that the ULD must be loaded on board an aircraft as a non-CLS-restrained ULD.

C.26 Pallet (Air Cargo). A flat platform with a flat undersurface of standard dimensions, on which cargo is assembled and secured and which interfaces directly with the aircraft cargo handling and restraint system.

C.27 Piercing Cargo. Cargo of a piercing or penetrating nature, such as rods, pipes, extrusions, or beams that could become a projectile hazard under flight operational loads.

C.28 Pod. An external container attached to an aircraft for carrying cargo.

C.29 Primary Restraint. The restraint of the cargo to the aircraft structure for regulatory load conditions, such as flight and emergency landing. This restraint secures cargo in the forward, aft, vertical, and lateral directions.

C.30 Receiving Inspection. Inspection to ensure conformance to part number, purchase order, and/or other applicable criteria.

C.31 Rigid Cargo. Cargo with a density that is rigid in nature, as defined in the aircraft manufacturer's W&B document.

C.32 Sharp Cargo. Cargo that has a piercing or penetrating nature, or cargo with sharp edges or corners.

C.33 Special Cargo. Cargo that requires special handling and securing/restraining procedures within the limitations specified in the AFM/WBM approved by the TC/STC. Special cargo may be enclosed in an approved bulk compartment if the WBM has limitations

supporting procedures for securing and restraining the special cargo. (Refer to OpSpec A002.)

C.34 Special Handling Procedures. Additional or unique procedures, as determined by the operator, which may be required for some cargo in order to protect the cargo or the aircraft during handling acceptance, loading, or in flight.

C.35 Supplemental Restraint. Restraint that is utilized in addition to primary restraint in order to stabilize cargo and prevent shifting.

C.36 Tall Rigid Cargo (TRC). Tall cargo is cargo greater than 98 inches tall. Certain sections of tall cargo can be frangible and certain sections can be rigid. If any part of the rigid section of tall cargo is above 98 inches, the tall cargo is TRC. TRC is used only on the Boeing 747 aircraft.

C.37 Tare Weight. The weight of the empty ULD, including its normal complement of loading restraint devices. Tare weight also may include the empty weight of other material handling equipment, such as baggage carts and dollies, used to weigh cargo on a scale.

C.38 Temporary Restraint Device. Temporary net restraint fittings installed in place of damaged or missing fittings, or temporary net take-up hooks and net corner lashing lines.

C.39 Unit Load Device (ULD). A device for grouping, transferring, and restraining cargo for transit. It consists of a pallet with a net or it may be a container.

C.40 Unitized. Consolidated multiple packages or items loaded into or on a ULD.

C.41 Vendor. Any person or entity performing a service on behalf of the operator who is not an employee of the operator. This may include, but is not limited to, freight forwarders, service providers, contractors, subcontractors, customs brokers, shippers, or other operators who perform cargo buildup, aircraft loading, and unloading for the operator. This also includes repair services provided by an FAA-certificated entity.

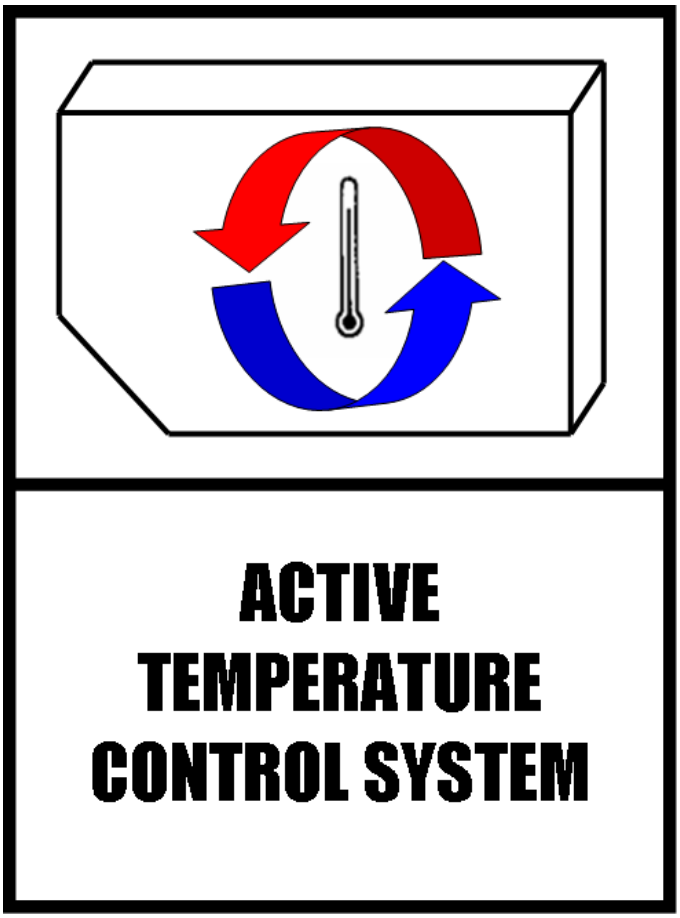
C.42 Zone Weight. Cumulative weight loaded within a designated zone in the aircraft as defined by the aircraft's WBM. That zone weight may include upper deck loads and lower loads directly beneath.

APPENDIX D. ACRONYMS AND ABBREVIATIONS

14 CFR	Title 14 of the Code of Federal Regulations
AC	Advisory Circular
ACO	Aircraft Certification Office
AD	Airworthiness Directive
AFM	Airplane Flight Manual
AIR	Aircraft Certification Service
CAMP	Continuous Airworthiness Maintenance Program
CASS	Continuing Analysis and Surveillance System
CBT	Computer-Based Training
CDL	Configuration Deviation List
CFR	Code of Federal Regulations
CG	Center of Gravity
CLS	Cargo Loading System
CMM	Component Maintenance Manual
COMAT	Company Material
CRAF	Civil Reserve Air Fleet
DAH	Design Approval Holder
DER	Designated Engineering Representative
FAA	Federal Aviation Administration
HAZMAT	Hazardous Materials
IATA	International Air Transport Association
ICA	Instructions for Continued Airworthiness
ICAO	International Civil Aviation Organization
ISO	International Organization for Standardization
MEL	Minimum Equipment List
MPS	Minimum Performance Standard
NAS	National Aerospace Standard
NIST	National Institute of Standards and Technology
NTSB	National Transportation Safety Board
OJT	On-the-Job Training
PC	Production Certificate
PI	Principal Inspector
PMA	Parts Manufacturer Approval
RCA	Root Cause Analysis
SB	Service Bulletin
SCAF	Special Cargo Analysis Function
STC	Supplemental Type Certificate
TC	Type Certificate
TCDS	Type Certificate Data Sheet

TRC	Tall Rigid Cargo
TSO	Technical Standard Order
ULD	Unit Load Device
W&B	Weight and Balance
WBM	Weight and Balance Manual

APPENDIX E. ACTIVE UNIT LOAD DEVICE MARKING



Advisory Circular Feedback Form

If you find an error in this AC, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by contacting the Air Transportation Division (AFS-200) at 9-AWA-AVS-AFS-200-Air-Transportation-Division@faa.gov or the Flight Standards Directives Management Officer at 9-AWA-AFB-120-Directives@faa.gov.

Subject: AC 120-85B, Carriage of Cargo

Date: _____

Please check all appropriate line items:

☐ An error (procedural or typographical) has been noted in paragraph _____ on page _____.

☐ Recommend paragraph _____ on page _____ be changed as follows:

_____

_____

☐ In a future change to this AC, please cover the following subject:
(Briefly describe what you want added.)

_____

_____

☐ Other comments:

_____

_____

☐ I would like to discuss the above. Please contact me.

Submitted by: _____ Date: _____