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of Transportation
**Federal Aviation
Administration**

SAFO

Safety Alert for Operators

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http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/safo

A SAFO contains important safety information and may include recommended action. SAFO content should be especially valuable to air carriers in meeting their statutory duty to provide service with the highest possible degree of safety in the public interest. Besides the specific action recommended in a SAFO, an alternative action may be as effective in addressing the safety issue named in the SAFO.

Subject: Title 14 of the Code of Federal Regulations (14 CFR) Part 121 Air Carriers Transporting Heavy Vehicle Special Cargo Loads.

Purpose: This SAFO advises operators of the potential safety impact of carrying and restraining heavy vehicle special cargo loads. The purpose is to reemphasize current policy and guidance concerning: weight and balance control procedures, cargo loading procedures, loading schedules and loading instructions.

Background: Heavy vehicle special cargo loads are loads that may require special handling or restraint devices other than a Unit Load Device (ULD), such as a pallet or a container. The Federal Aviation Administration (FAA) is concerned about the procedures for carrying and securing heavy vehicle special cargo loads. This SAFO's purpose is to heighten awareness regarding heavy vehicle special cargo loads, the air carrier's approved weight and balance program, the FAA guidance provided for air cargo operations, and best practices for heavy vehicle special cargo loads and restraint.

It is the air carrier's responsibility to maintain the highest level of safety. Proper cargo loading is essential for safe flight operations. The air carrier must have procedures to ensure that employees and vendors are properly trained in the process, the loading is properly completed, and that cargo restraints and loading devices meet the requirements of the approved program.

Discussion: Heavy vehicle special cargo loads, due to the non-standard and irregular nature of the cargo itself, require careful consideration of the limitations of the aircraft and the characteristics of the cargo to ensure safe operation of the aircraft. There are often overlapping limitations on the basic airframe and floor; cargo loading system attachment limitations; shoring requirements; strap material; and orientation in the forward/aft, lateral, and vertical direction. All of these limitations must be considered before defining a safe restraint configuration for special cargo.

The Weight and Balance Loading Program should: Meet the requirements as specified in the Type Certificate Data Sheet;

- Provide guidance on load distribution;
- Ensure special load procedures are included in the manual;

- Meet floor load plan restraint requirements as defined by the Design Approval Holders (DAH);
- Meet restraint loading strap requirements in Technical Standard Order (TSO) C-172 or equivalent;
- Preclude intermixing of cargo restraint loading straps per individual load position (e.g. Kevlar/Nylon); and
- Ensure procedures for calculating the number of restraint devices required for any cargo load based on the restraint criteria provided in the airplane's weight and balance manual or in other FAA approved data.

As stated in Advisory Circular (AC) 120-85, Air Cargo Operations:

- Air carrier procedures for supplemental cargo restraint devices should be based on the information provided by the airplane manufacturer, Supplemental Type Certificate (STC) holder, or by other sources acceptable to the FAA, such as SAE, IATA, or the standards used by the U.S. Armed Services.
- An air carrier should have accepted procedures for ULD buildup, loading and unloading, and restraining cargo in its manuals system. The procedures should include the bulk loading and unloading of cargo, both compartment restrained and restrained by other devices, if the air carrier permits. The procedures should be in accordance with the air carrier weight and balance manual and be based on airplane manufacturer, STC, or other FAA-approved data.
- An air carrier should have specific procedures for all types of cargo restraint devices the air carrier is authorized to use (for example, installed nets, the cargo handling system, certified ULDs, uncertified ULDs, and other restraints).

Best practices for heavy vehicle special cargo operations and restraint

- Use accurate weight of the vehicle to include weight of pallet, shoring, and restraint equipment;
- Determine the aircraft type and position it is to be loaded on the aircraft;
- Ensure the aircraft cargo floor and tie-down limitations are not exceeded;
- Calculate restraint requirements for longitudinal, lateral, and vertical force;
- Make use of multiple restraint points on the vehicle to include vehicle tie-down points and axles;
- Prohibit use of different types of tie-down devices/materials on the vehicle or pallet as they have different rates of stretch under tension;
- Use at least a qualified loadmaster and a trained staff member to ensure loading and restraint processes are in accordance with your approved weight and balance program;
- Monitor clearances and ensure no damage is done to the aircraft during loading,;
- Secure cargo for the required amount of restraint with no less than the minimum number of tie-down devices;
- The maximum available restraint capability for any tie-down is determined by using the lesser rating of the following: the tie-down (floor) fittings used, the tie-down attachment points on the cargo item, or the effective strength of the tie-down device used;
- Attach tie-downs in a symmetrical pattern by using corresponding fittings on each side of the cargo floor centerline;
- Apply restraint in a symmetrical pattern around the cargo unit being restrained. Always attach an even number of tie-downs in pairs for restraint;
- Ensure there is sufficient space between vehicles to accommodate effective forward and aft longitudinal restraints;
- Do not exceed the capacity of the tie-down point on the vehicle;

- Place any unused cargo locks in the up position;
- Inspect restraints on each leg of the flight prior to take-off and verify cargo has not shifted;
- Consider that a broken strap may be an indication of an inadequately secured load; and
- Carefully inspect the cargo and do not continue to operate an aircraft if you believe there has been a cargo load shift.

Note: Unsymmetrical tie-downs permit load distributions that may ultimately result in tie-down failure. Such a failure would result from the different load-deflection rates of dissimilar materials or of identical materials of different length. Any material subjected to a tension load will stretch. A longer length tie-down has more stretch potential than a shorter length tie-down. If two tie-downs of the same type and capacity are used to restrain a load in a given direction and one is longer than the other, the longer tie-down, with its greater stretch potential, will permit the shorter tie-down to assume the majority of any load that may develop. If the shorter tie-down becomes overstressed and fails, the longer tie-down would then be subjected to the full load and it, too, would likely fail. Therefore, symmetrical tie-downs should be as close to the same length as possible.

Recommended Action: Each part 121 air carrier should review its approved weight and balance control program with emphasis on heavy vehicle special cargo loads.

Point of Contact: Any questions regarding this SAFO should be directed to Patricia Williams, Air Carrier Maintenance Branch, AFS-330, at (202) 385-6432.