U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: PREPARATION AND LOADING OF MAGNETIC MATERIALS FOR AIR TRANSPORTATION

Date: 3-19-87
Initiated by: ACS-100

AC No: 121-28
Change:

1. PURPOSE. This circular provides information relevant to the preparation and loading of magnetic materials for shipment in civil aircraft. Air transportation of improperly located or improperly shielded magnetic materials presents specific hazards in aircraft having compass master units located within the fuselage. Magnetic materials which are loaded in the vicinity of a magnetic compass or compass master unit could produce compass deviations as high as 125 degrees, cause navigation errors, and jeopardize the safety of the transporting aircraft. Physical separation can contribute significantly to reduce magnetic interference.

2. CANCELLATION. Advisory Circular 121-23 dated 2-10-77 is cancelled.

3. REFERENCE. Title 49 of the Code of Federal Regulations (49 CFR) Part 173.21(f) strictly forbids the carriage by aircraft of any material which, when packaged, has a measurable magnetic field of more than 0.00525 gauss when measured from any surface of the package at a distance of 15 feet. 49 CFR 175.85(g) states no person may load magnetized material (which might cause an erroneous magnetic compass reading) on an aircraft, in the vicinity of a magnetic compass, or compass master unit, that is a part of the instrument equipment of the aircraft, in a manner that affects its operation. If this requirement cannot be met, a special aircraft swing and compass calibration may be required.

4. DISCUSSION. A material is considered to be magnetized when it has a magnetic field strength greater than 0.00525 gauss at a distance of 15 feet from any point on the surface of the package, or which is of such mass that it could affect aircraft instrumentation, particularly magnetic compasses. Such material must be shielded to reduce the readings to a level that is no greater than 0.00525 gauss before being offered for transportation by aircraft.

Certain materials with a magnetic field of less than 0.00525 gauss were previously classified as hazardous materials. Auto fenders, automotive parts, metal stock and other large metal objects which are not intentionally magnetic, but have acquired magnetic properties during their manufacture or because of their

orientation with other cargo, fall into this category. Although slightly magnetized, such materials pose little or no transportation hazard. Modern aircraft use electronic compasses with magnetic compasses as backups. The sensors for magnetic backup compasses are sufficiently distant from the cargo bays, that a measurable deflection effect on the compass will not be caused by the potential marginal magnetic properties of metal objects such as those mentioned above.

5. HAZARDS. The hazard associated with the carriage of magnetized materials on older types of aircraft, where the magnetic master units are not located outside and away from the cargo compartments, is that a compass deviation as great as 125 degrees could be experienced and cause unacceptable navigation errors which can jeopardize the safety of the transporting aircraft.

6. PRECAUTIONS AND RECOMMENDATIONS.

a. When offering magnetized materials for air transportation, the shipper must ensure that each package has a magnetic field strength no greater than 0.00525 gauss when measured at 15 feet from all surfaces of the package.

b. The shipper should also take the following measures when offering magnetized materials for air transportation:

1. Whenever possible, magnets or magnetized devices should be packaged so that the polarities of each unit opposes the other.

2. Keeper bars should be installed on permanent magnets to prevent the magnetic field from affecting the magnetic compass.

7. LOADING REQUIREMENTS. When accepting magnetized material, aircraft operators should ensure that the shipper verifies that the maximum field strength is no greater than 0.00525 gauss when measured at 15 feet from all surfaces of the package. If the aircraft being used does not have the magnetic compass master unit in a remote location and amply distant from the cargo hold, it is recommended that a special aircraft swing and compass calibration be made after loading and prior to operation. Aircraft operators should also check their compass calibration when transporting large amounts of metal assemblies such as auto fenders, frames, or other material which may not be magnetic in themselves but may have magnetic properties due to their manufacturing process or their orientation when placed aboard the aircraft. Cargo of this nature should be placed aboard the aircraft as far as possible from magnetic compass master units.

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