



AC NO: 121-23

DATE: 2/10/77

# ADVISORY CIRCULAR

## DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION

**SUBJECT:** PREPARATION AND LOADING OF MAGNETRON TUBES AND  
MAGNETIC MATERIALS FOR AIR SHIPMENTS

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1. PURPOSE. This circular provides information relevant to the preparation and loading of magnetron tubes and magnetic materials for shipment in civil aircraft. Air transportation of improperly located or improperly shielded magnetron tubes or magnetic materials presents a specific hazard. Magnetic compass deviation of 125 degrees or more may be produced which will cause navigation errors and jeopardize the safety of transporting aircraft. Physical separation can contribute significantly to reduce magnetic interference. Procedures, as set forth herein, are not intended to supplement or alter basic packaging and marking requirements of applicable regulations.
  2. CANCELLATION. Advisory Circular AC No. 103-5 is canceled.
  3. DETERMINATION OF SHIELDING REQUIREMENTS. The magnetic field strength of magnetized materials may be measured using a gauss meter having a sensitivity sufficient to measure magnetic fields greater than 0.0005 gauss within a tolerance of  $\pm 5$  percent or with a magnetic compass sensitive enough to read a 2-degree variation, preferably in 1-degree increments or finer.
    - a. When a gauss meter is used, it is placed on one of two points positioned 15 feet apart and located in an area that is free from magnetic interference other than the earth's magnetic field. The gauss meter is then aligned with the second point and "balanced" to a zero reading. The magnetic article is placed on the other point and the magnetic flux measured by reading the meter while rotating the package 360 degrees on three mutually adjacent sides. If the maximum field strength observed is 0.00525 gauss or less, the article is acceptable for air transportation. When the maximum field strength exceeds 0.00525 gauss, to comply with Title 49 Code of Federal Regulations (CFR) 173.1020(b), apply shielding until a reading of 0.00525 gauss has been attained.
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2/10/77

- b. When a magnetic compass is used as a sensing device, it should be placed on the center mark of a circle scribed with a radius of 15 feet and in an area that is free from any magnetic interference other than the earth's magnetic field. The reference points of North, Northeast, East, Southeast, South, Southwest, West, and Northwest should be marked as reference and testing points. The packaged item is placed on each of the reference points and rotated 360 degrees for indication of compass deflection. This procedure should be repeated until two other of the three mutually adjacent sides have been checked. When the maximum compass deflection at 15 feet is 2 degrees or less, the article is acceptable for air transportation. When the maximum field strength of an item exceeds the predesignated 2-degree limit set, to comply with 49 CFR 173.1020(b), apply shielding to prevent stray magnetic lines of force from deflecting the magnetic compass more than 2 degrees.
4. MARKING, LABELING, AND PACKAGING REQUIREMENTS. When offering magnetized materials for air transportation, the shipper should:
- a. Plainly mark the outside of the package "ORM-C."
  - b. Place the "magnetized material" label described in Section 172.446, 49 CFR, on one side of each package.
  - c. In addition to proper shielding, pack magnets or magnetized devices so that whenever possible the polarities of each unit oppose one another.
  - d. Install keeper bars on permanent magnets to prevent the magnetic field from affecting the magnetic compass.
5. LOADING REQUIREMENTS. Magnetic materials, when loaded aboard an aircraft, should be placed at least 15 feet from a magnetic compass source whenever possible. A lesser distance may require a special compass compensation prior to flight.
6. HOW TO OBTAIN THIS PUBLICATION. Copies of this advisory circular, AC 121-23, "Preparation and Loading of Magnetron Tubes and Magnetic Materials for Air Shipments," may be obtained by writing to the Department of Transportation, Distribution Unit, TAD-443.1, Washington, D. C. 20590.



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