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Brief 71-10190

NASA TECH BRIEF

Wallops Station

Inexpensive, Large-Diameter, Radar Tracking and Calibration Spheres

Firm, lightweight, large diameter, conductive-coated plastic spheres can be used to replace expensive, small diameter, metal spheres as radar tracking and calibration targets. The plastic models can be produced to within 0.02 cm (0.01 in.) accuracy, in various diameters designed to meet the exact requirements of the particular radar system frequency spectrum. They are inexpensive and do not require the special handling imposed on metal spheres, especially with regard to FAA flight restrictions.

Various plastics were evaluated, and expandable polystyrene beads were chosen as the most appropriate for this application. The beads are preheated to ten times their original size and allowed to cool. Final expansion occurs when the beads are placed in a special hemispheric mold where they are subjected to high steam temperature and pressure. Two hemispheres, each designed with interlocking lips, are fastened together with an epoxy cement. The result is a rigid sphere of exact diameter, with a 1.11 cm (7/16 in.) thick wall. Special coatings are used to seal and cover the sphere, giving it the desirable conductivity and reflectivity of a consistent cross-section calibration target.

Experiments have proven the feasibility of using a silver-conductive coating which would meet the requirement that a sound, uniform reflective surface have no more than a 5 Ω resistance across the sphere.

The sphere is assembled for launch by inserting an aluminum rod through its center and attaching the looped end of the rod to a gas-filled balloon, using a nylon cord. Assembled, a plastic sphere weighs approximately 0.45 kg (1 lb) and costs only $10.00 to produce. The only known spheres of equal diameter, 56.4 cm (22.21 in.), are made from aluminum, weigh 6.4 kg (14 lbs), and are more than 30 times as expensive.

Note:

Requests for further information may be directed to:

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Patent status:

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