



U. S. NAVAL ORDNANCE TEST STATION  
CHINA LAKE, CALIFORNIA

IN REPLY REFER TO:

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Mr. Grote Reber  
National Radio Astronomy Observatory  
Green Bank, West Virginia

Dear Sir:

I have followed with great interest the various accounts of your achievements in Radio Astronomy over the past 25 years. For some time now, I have been thinking about the problems involved in the construction of a very large steerable parabola. I am enclosing a proposal which describes in a rough fashion what I had in mind.

Some additional facts about the device have become evident since I wrote the proposal:

1. The average shape of the ball must be made spherical to a very close tolerance in order that the ball-reflector combination can be balanced about one point.

2. The most efficient way of rotating the ball would be to apply a torque proportional to pointing error at a point lying on the axis of the parabola in a plane perpendicular to the axis. Torque might be applied by a directed fan whose exhaust can be swiveled in the plane of torque application in order to control direction of rotation. If the direction of torque applied by the fan reaction force could be rapidly changed, the magnitude of force vector could remain constant, as with a constant speed fan. The servo system would therefore be non-linear. The rotation of the ball would be very smooth, in spite of the "bang-bang" character of the servo, because of the very high polar moment of inertia of the sphere. I have sketched the fan arrangement on the last page of the report.

3. With the use of the servo drive outlined in section 2, an additional advantage of the system becomes evident. The servo drive is divorced from a ~~ground~~<sup>ground</sup> reference coordinate system. Regardless of the position of the antenna with respect to the ground, the servo loop gain is constant, i.e., "trunnion lock" is not a problem as it is near zenith with an alt-azimuth mount.

4. Wind forces may be a problem, however, aerodynamic spoilers may be usable.

It has been nearly two years since I wrote the proposal, and I have been unable to get much support for further investigation. I am building a two-foot diameter scale model to demonstrate the servo drive.

I would appreciate any comments you would care to make on the design. If you believe that the ideas have any merit, any suggestions you might offer on how to obtain support for such a project would be very welcome.

Sincerely yours,

John M. Boyle