ASSOCIATED UNIVERSITIES, INC.
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May 3, 1956

Mr. R. L. Lowry
Manager, Customer Relations
GEDA Products
Goodyear Aircraft Corporation
Akron 15, Ohio

Dear Mr. Lowry:

I was pleased that Mr. Miller stopped in my office a couple of weeks ago. When Mr. Karelitz and I visited Goodyear last year our primary concern was the structural design of a large (140-foot) radio telescope. Since then we have carried forward our studies and are now very much interested in all aspects of an operating instrument, including a precision drive and control system. It was in this latter regard that I recalled Goodyear's computer developments and I suggested to Mr. Miller that you might also be interested in that portion of our work.

I have studied the material forwarded with your letter of April 30 and am of the opinion that our requirements are very specialized. Briefly, the 140-foot radio telescope will probably be built in an alt-azimuth configuration. Except for a small zone of a degree or so at the zenith, we desire that the telescope be capable of tracking any star in any portion of the sky with an accuracy of 10 seconds of arc. Thus, there is involved a conversion of coordinates, from azimuth and altitude to hour angle and declination, which conversion must be done on a real-time basis and with an accuracy of only a few seconds of arc if the over-all tracking accuracy is to be of the order of 10 seconds. Because the earth's rotation corresponds to 15" of arc in one second of time, real-time for our application would have to be of the order of a few hundredths of a second of time.

In principle, all that needs to be done is to solve the familiar equations of spherical geometry. The latitude of the telescope (or tilt of the axis of the earth with respect to the horizon plane) would be a fixed quantity. The variables would be: a time input, from some reliable and precise source, such as WWV; the declination of the star, which would be fixed for any given star but which might have any value between + 90° and - (90° - latitude); and the right ascension of the star, or the equivalent of the hour angle of the star at the instant of starting the observations, which might be 90° or more both east and west of the meridian plane.

We have been examining components for indicating angular positions and believe there are two possibilities that might have accuracies of only a few seconds of arc. One of these is the equivalent of a multi-speed synchro, with a typical variation of output voltage with angular error; the other is a coded disk arrangement that would seem to lend itself easily to digital computation.

From the above, you will see that the problem to be solved is very simple compared to many that are done with modern computers. On the other hand, we require solutions in real time, for a wide range of the input variables, and with an over-all accuracy between input and output of a second or so of arc.

If Goodyear's GEDA could be tailored for this specific problem, it might prove to be an efficient component for the radio telescope system. I would be pleased to have comments from you and your engineers on this matter. If the application of GEDA equipment appears promising, it will probably be desirable to arrange a meeting for discussing the technical problems in more detail.

Sincerely yours,

RME

Richard M. Emberson
Assistant to the President

RME/jfl

cc: Dr. D. S. Meeschen, Harvard College Observatory, ✓
Cambridge 38, Massachusetts

Mr. M. B. Karelitz, Brookhaven National Laboratory,
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Mr. E. S. Miller, Radar and Electronics Products,
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