NATIONAL RADIO ASTRONOMY OBSERVATORY
EDGEMONT ROAD
CHARLOTTESVILLE, VIRGINIA 22901
TELEPHONE 804-296-0211
TWX 510-587-5482

POST OFFICE BOX 2
GREEN BANK, WEST VIRGINIA 24944
TELEPHONE 304-456-2011
TWX 710-938-1530

SUITE 100
2010 NORTH FORBES BOULEVARD
TUCSON, ARIZONA 85705
TELEPHONE 602-882-8250

June 19, 1975

25 METER - MILLIMETER WAVE TELESCOPE

MEMO #26

Mr. Herb Oas
Tinsley Lab. Inc.
2448 Sixth Street
Berkeley, Calif. 94710

Dear Mr. Oas:

I enjoyed speaking with you on Wednesday and appreciated the time you spent discussing the problems involved in making surface plates for the contemplated millimeter wave telescope. I realize that you were at a disadvantage since you had no prior background or knowledge of our project. The enclosed material will remedy that defect, at least in part.

As you know, we are in the process of preparing a proposal for the construction of a 25-meter millimeter wave telescope. The surface of such a telescope and therefore the individual surface plates must be machined as precisely as technology will allow within reasonable budget constraints.

Figure III.12 shows 8 series of plates each approximately five (5) feet in length with widths that vary from 12 to 42 inches. Our design goal is to have a manufacturing accuracy of one thousandth (.001) of an inch RMS over the entire surface. 25 μm

At this time we are looking toward establishing one or more sources that might have the expertise, knowledge and equipment to undertake a machining job of the magnitude indicated. The time scale we are looking at for manufacture is two to four years from now. Therefore, consideration may be given to contemplated changes in the state of the art or improved techniques that might be applicable in that time frame.

Without obligating your company or yourself we will appreciate any comments that you care to make in response to the following questions:

1. What do you consider as a commercial tolerance for work of this type?

2. Is one (.001) thousandths inch RMS

   a. achievable?

   b. repeatable for 528 pieces?

3. In your opinion what is the best surface tolerance achievable with techniques and machinery now available?

4. Can you give an order of magnitude of cost to achieve:

   a. .002" RMS (50 μm)

   b. .0015" RMS (38 μm)

   c. .001" RMS (25 μm)

   d. .0005" RMS (13 μm)

5. Can you estimate the average time for machining of one plate, from cast to finish surface?

Finally, would your company be interested in machining a "proof" panel to indicate the lowest tolerance achievable in your shop? If so, can you give an order of magnitude cost for machining such a test panel?

We will appreciate any help and suggestions that you may be willing to give us toward reaching the sought after result.

Associated Universities, Inc., a non-profit corporation, operates the National Radio Astronomy Observatory under contract with the National Science Foundation. A brief description of the Observatory facilities is enclosed for your information.

I shall look forward to hearing from you in the near future. Please don't hesitate to call me if you have any questions.

Sincerely yours,

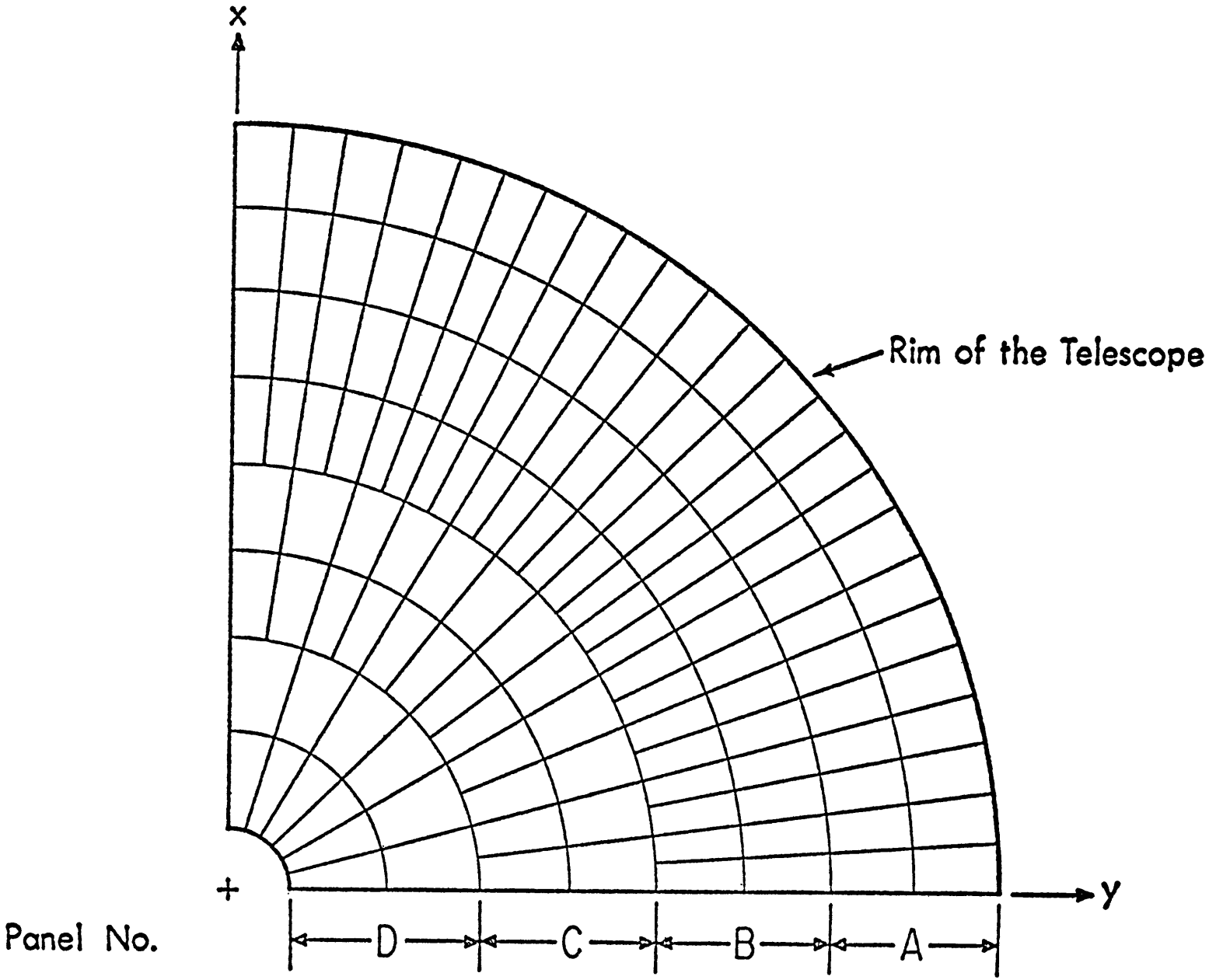
Woon-Yin Wong
Engineer

Attachment A: "Surface Plates"

Surface Plates

The 25-meter telescope has a surface area of 543 m^2. The parabolic surface is formed by 528 aluminum plates arranged in 8 concentric rings. Each plate has 4 adjustment jack screws, permitting surface alignment. The gap area between the plates is 0.2% of the total surface area. Each intermediate structure holds two rings of surface plates. Each plate is 1515 mm (59.625 inches) long, measured along the curved plate surface. The geometrical details of the surface plate configuration are given in Table III.3, and in Figs. III.11 and III.12.

One type of plate, shown schematically in Fig. III.12, was fabricated for NRAO. It consists of an aluminum casting alloy surface with a supporting rib structure, the surface of which is machined by a high accuracy milling machine. Alternate machining and heat cycling steps were employed to relieve internal stresses produced by the machining.



III.11 Surface plates arrangement on one quarter of the aperture.

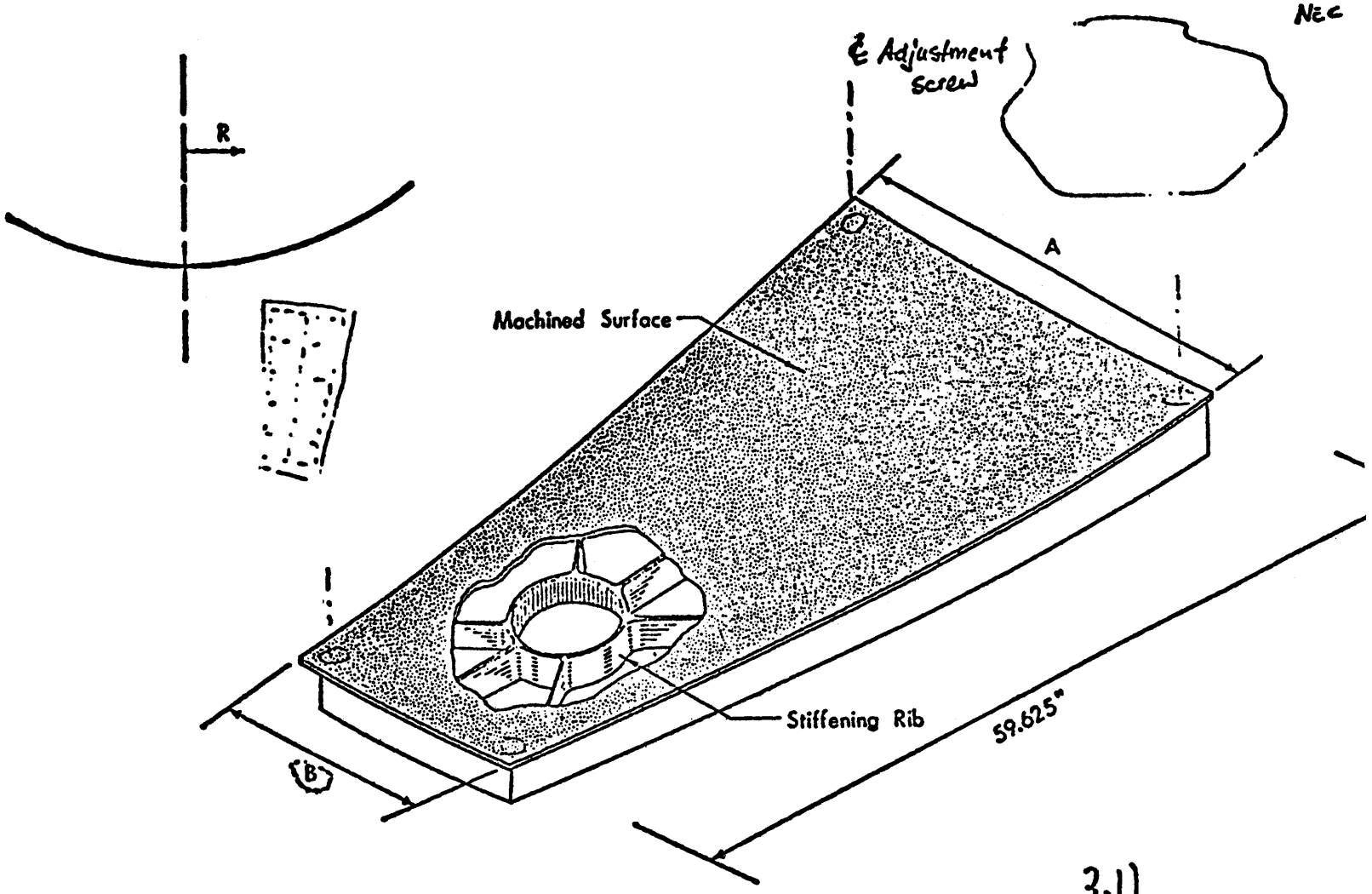


Table III.3 Sizes and Configurations of Surface Plates*

Ring No.	R	A	B	No. of Plates
1	42.295	26.616	11.603	24
2	101.664	42.036	26.616	24
3	218.706	28.629	21.018	48
4	275.871	36.111	28.629	48
5	331.893	21.722	18.056	96
6	386.653	25.306	21.722	96
7	440.076	28.803	25.306	96
8	492.124	32.209	28.803	96
				528

* R, A and B are dimensions in inches.

III.12 Dimension and shape of a proposed 25-m radio telescope plate.