

NATIONAL RADIO ASTRONOMY OBSERVATORY
Charlottesville, Virginia

September 7, 1989

MEMORANDUM:

TO: Addressee

FROM: J. Payne

SUBJECT: Primary or Secondary Compensation

The likely composition of primary errors induced by the elevation dependent gravitational term will be a large scale, astigmatic type of error, accompanied by smaller scale errors due to the structural support ribs. The large scale errors will be on the scale of 90° radial portions of the telescope; the smaller scale on the scale of 15° radii.

Lee does not yet know the magnitude of these two error components and will not now until December.

It will be possible to correct for the large scale errors in a secondary reflector (the subreflector, for example) and probably the small scale errors as well. The important parameter is the size of the error "patches" on the secondary reflector in terms of wavelengths.

Even if complete correction is possible in a secondary reflector, I believe that correcting the primary is probably the way to go. It's a difficult choice and one that I would find difficult to vigorously defend.

Advantages of Actuators on Main Surface

1) Initial adjustment of surface is fast and simple. Fast may be important due to the structure changing (with temperature changes) during setting.

2) High frequency prime focus observations are not excluded.

3) The task is simpler. The design of a deformable subreflector may be difficult and the result may be expensive. We don't know for sure. Just finding out will take a considerable amount of engineering time - something of which we are short.

4) We are not restricted in the scale of errors for which we may compensate (provided they are larger than a raft). This means that we can, at a later date, compensate for wind and thermally induced errors with the main reflector.

5) The failure of an actuator has a less drastic effect on the overall performance than an actuator failure on the secondary.

6) We leave our options open. We can always add secondary optics later; it would probably be very difficult to add a primary adjustment scheme.

Disadvantages of Actuators on Main Surface

1) Expense: It will cost somewhere around 2 M\$ for the actuators and associated electronics. This is a bit of a guess on my part - I will refine it in the near future.

2) Reliability: Initial inquiries indicate a failure rate that is acceptable. I am still working on this, but I think we can assume that reliability will not be a reason for excluding actuators on the main surface.

Options

We have the following options as I see it:

1) Decide we are going to do the corrections in the secondary or tertiary, focus our efforts in that direction, leave space for actuators on the main reflector in case we change our mind.

2) Debate the issue some more - let me work on it for another few months and hope that more facts emerge to make the decision easier.

3) Decide that we are going with primary surface actuators and start work immediately.

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