

Subject: FW: Any Report

Date: Thursday, September 27, 2018 at 2:46:49 PM Eastern Daylight Time

From: David Arnold

To: Mike Pearlman

I have added some more to the report.

From: David Arnold <david-arnold@earthlink.net>

Date: Tuesday, September 25, 2018 at 7:55 AM

To: Mike Pearlman <mpearlman@cfa.harvard.edu>

Subject: Re: Any Report

Mike,

The statement of work is the same.

Work has been primarily on continued support of the LARES-2 project. The use of small 1.0 inch COTS cube corners that need no dihedral angle offsets has been recommended to avoid the expense of custom cubes with specific dihedral angle offsets. Simulations have been done of possible configurations of small cube corners to determine the variation of the range correction with incidence angle on the array. The simulations show that the variation of the range correction with velocity aberration is less for the small cubes. The small cubes are less sensitive to thermal effects. Simulations have been done to compute the effect of thermal gradients on the diffraction pattern of the cube corner. There has been no final decision on the material for the satellite. The thermal analysis will need to be repeated for the actual material. According to the ADL report done for LAGEOS the cube needs to be radiatively decoupled from the core. This can be done with a low emittance for the mounting cavity.

A new task has been computing the effect of changes in the dihedral angle offsets on the diffraction pattern of a large hollow cube corner that could be used on a Lunar ranger. The dihedral angles can change by up to 4-10 arcseconds at different temperatures. Another task is a new array on the surface of the moon. One possibility is to use a variation of the LRO array. This would be similar to the APOLLO retroreflector arrays but smaller. The Lunokhod arrays are smaller than the APOLLO arrays. They work in the dark, but have problems when sunlit.

David Arnold

From: Mike Pearlman <mpearlman@cfa.harvard.edu>

Date: Monday, September 24, 2018 at 9:33 PM

To: "Arnold, David" <david-arnold@earthlink.net>

Subject: Re: Any Report

David,

Did you charge anything to the contract? If so, just give a general explanation. You don't have to give detail. You could be studying options.

Let me know.

Mike

On Mon, Sep 24, 2018 at 6:57 PM David Arnold <david-arnold@earthlink.net> wrote:

Hi Mike,

I have nothing at this point.

I have had to deal with other problems like Ignazio. It took a lot of emails and biting my tongue but I finally got him to agree to reasonable rules on authorship and content for my paper.

My paper for the conference has been all but destroyed by the lack of any final design for the satellite. All I have is calculations for endless cases none of which are guaranteed to be the final design. My paper will have to be rewritten solely on theoretical calculations for a geodetic satellite without mentioning LARES-2.

The change in material for the core has put the whole thermal design in limbo. The material for the core will almost certainly have a high emissivity. This will significantly increase the uncertainty in the range correction due to thermal effects. I cannot guarantee that thermal effects will be small. Good thermal behavior requires a floating mount and low emissivity to isolate the cubes thermally from the core. The change in material appears to have been dictated by other considerations. The thermal design has low priority at this point.

There is a pressing need to calculate the temperature of the core and cube corners with different values of the emissivity. This has to precede any thermal simulations. The project never did any calculations of the temperature of the satellite for any material.

As a start on a report I backed up the files for the work done over the past year. It was a lot more than I thought. I don't remember what I did without actually going through the emails and reports.

I am caught between trying to remember what I did to write a report and dealing with all these unexpected new problems.

David Arnold

From: Mike Pearlman <mpearlman@cfa.harvard.edu>

Date: Monday, September 24, 2018 at 6:04 PM

To: "Arnold, David" <david-arnold@earthlink.net>

Subject: Any Report

David,

I am preparing my annual report to NASA. Due now, Do you have anything that I should include? I need to know post haste.

Mike