92

Memorandum

To: Discovery Project Design Team

From: [redacted]

Date: 3/24/08

Re: Discovery Project Proposal

Good job working from the science pt of view and a to f down approach.

Next week will be the first meeting of the multi-disciplinary design team for the 2006 Discovery Program. The Announcement of Opportunity has been recently released and time is running out for the proposal deadline of April 5. This entire program is running under tight schedule and budget constraints, so the earlier we start organizing the direction of this project, the better. Luckily for us some of the work has been done by the Principal Investigator and their science team, but there are still several important decisions that need to be addressed within these all-important first two weeks.

set by AO which gives launch no later than date

Our mission scope and con-ops have already been established. This gives the design good general information for launch date and mission duration, but we need to determine much more specific data for the proposal. The first two weeks of the drafting will be extremely important and will be where many configuration decisions need to be made. To prove to the proposal investigations team that our design should be chosen we will need to have solid numbers and models ready. Since this is a scientific mission, collaboration with the science team is of utmost importance. Yes.

good!

The instrumentation team will work with the science team in determining what science payload will be needed to accomplish the mission objectives. The instrumentation team as well as the rest of the design team should gain a strong understanding of how these instruments work as soon as they can, so that we can better implement the science equipment onto the spacecraft. These instruments must be decided on within these two weeks so that the rest of the spacecraft can be easily designed to hold them and better margins can be set for them. By knowing these instruments, we can also set science requirements for the science aspect of the mission. Having requirements ready for the proposal will give the entire design a solid objective to aim for. The instrument part of the design will be optimized for the scientific objectives of the project. Specifically what should be ready for the proposal is a list of instruments, their best power and mass requirements, and any potential configurations for directional equipment. In the case of directional instruments a method such as Taguchi should be run to give an optimal baseline configuration for that equipment. The mass and power requirement should also be given proper contingencies and the total margins shall come down from the overall

should discuss work to derive Rqts. From scope/con ops & the AO which sets the LV which is where mass /vol onstraints ome rom ?

optimal not always best

where is the creative part of the design process?
How is baseline achieved? figures of merit?

design. Having these numbers now will give the overall design process direction and show that we know what we're working with and know where they might go within their margins. From the findings of the instrument team, the other teams should begin working on the other elements of the spacecraft that will accommodate the science payload. A bus capable of holding the instruments, a power system able to deliver power enough to operate them, and a propulsion system all need to be designed with the overarching science objectives in mind. The science objectives should also be held important when determining the requirements for the rest of the spacecraft. For the proposal specifically, we will need at the very least an approximate bus configuration, and an approximate power and propulsion system configuration ready. These need to be able to deliver to the instruments, but for this stage of proposal writing they are allowed to have more freedom of later modification within the instruments design. Obviously given the tight schedule of 3 years and budget of $425 million assigned to this Discovery Program, heritage will be an important consideration for the spacecraft design. There does not need to be any major innovation in the nonscientific parts of the spacecraft, so using proven ideas can be both safe and cost-effective. Thorough studies will be made into any heritage material to determine its applicability to this design and to see if these components actually do what they say they can. To make sure a concrete idea is ready within the proposal deadline, as long as the spacecraft can fulfill its requirements to the instruments it only needs to be minimized for cost. Again, due to the strict schedule a full grass-roots cost analysis will prove difficult. The cost should be as detailed as possible, but parametric and analogous estimations will more than likely form a large part of the cost estimation. Models of the spacecraft should have accompanying system hierarchy charts for each subsystem. From these initial models, we will need to obtain cost and mass estimates as well as appropriate contingency to present in the proposal. Other studies into this design include: propulsion type, delta-v used, power array configuration, solar-cell type, and battery type. These studies will all be included in the proposal. The numbers taken from these estimates and studies are just as important, if not more important to present as the actual design, because a proposal anchored in reality is much more trustworthy.

By solidifying these design decisions now, we are giving this project a strong direction early on. This will keep the project from straying or lingering which always ends in a waste of time. Having the design team learn as much about the science payload now will help them as they will have experience with the equipment they're designing the spacecraft for. Studies done now can be referenced later on to prevent any redundant designs. The steps taken after these initial weeks will be a continuation of the work done now. The instrumentation team will continue becoming familiar with the instruments and how to best configure them for their objectives. The other design teams should move on to further sharpen the design of the spacecraft. After minimizing a working design for cost, the design can be altered for performance. I'm sure that some unforeseen design changes will also have appeared by then and will be accommodated by the margins set earlier.

Yes, but also comm, c&dh, structures, ⇒ need to propose entire design

Should have more on heritage research & review.

✓

not proposing ideas but a design

?

Not clear what you want to accomplish in first mtg.

Your memo addresses the bulk of the 90 day effort.

[would be effective to include a closing statement to motivate team.