

April 11, 2008

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ASE 379L
Homework 9 - Part 2

Trade Study Assignment: Detailed description

Team: [REDACTED]

1. Do you agree with the trade study recommendation? Why or why not?

Yes, we agree with the recommendation of the trade study. The long stay seems to be a better option than the short stay - in terms of mission duration, mission return, feasibility, and other factors. Our group agreed that the long stay mission is less dangerous because its transit does not include close approach of the Sun. The "short stay" mission timeline has about 604 days in space, some of it within the orbit of Venus. Humans have never flown that close to the sun, and therefore, we have never designed a vehicle with life support systems for such a mission. Moreover, the difference in mission duration is not significant. The "short stay" has a round-trip time of about 650 days, as opposed to the long stay which has a round-trip time of 900 days. It seems that if we are designing a mission for a minimum of 650 days, it is reasonable to choose the long stay that will increase the mission time by 300 days, and have a greater scientific return. In addition, the long stay architecture has an additional safety measure. Supply packages would be sent for the next mission while the previous mission is still on the surface. Those supplies would arrive during their stay and could be used in case there are complications. The lunar and space station missions will provide the necessary knowledge to prepare ourselves for long period missions in orbit and on the surface. Overall, the long stay mission appears to be more robust. All the long stay mission profiles can be covered by the same vehicle design.

2. What particular criticisms does your group have with the analysis?

The trade study shows only two concepts with a somewhat biased view towards the "long stay" mission profile. The "short stay" is presented very negatively, and it appears as though the risk and cost are evaluated mostly by a general "feeling." It appears that the authors feel that the short stay mission has a lot of risks (proximity to sun during transit, time in transit), but they do not highlight any risks in the long term mission. More in-depth risk analysis is required in both mission scenarios. The cost is glossed over without much evidence. In the end, the cost for a long stay mission is stated as simply "slightly greater" and brushed aside as inconsequential.

We would have liked for the trade study to have considered more of the options available. The way the study is presented, the short stay mission profile is quickly found to be inadequate. Therefore, a more feasible candidate should have been compared to the long stay mission. We are interested in the benefits of other options such as aerocapture and in-situ resource utilization. More connections with the Exploration architecture (the Lunar missions) could provide a reason to believe in technologies that are not yet proven.

good catch [

3. What additional information would your group have liked included in the trade study?

Additional information that our group would have like to be included in the trade study is as follows. First, there could have been studies on the psychological and behavioral aspect of sending the crew for either duration of time. The scientific gains are meaningless if the crew cannot psychologically perform the mission, so more information on how humans behave in confined situations should have been provided. Next, our group thinks that cost

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and risk studies should have been included in the trade study, since they usually have a huge impact on the final decision. Finally, we would have liked to see more in-depth analysis on what could be done to shield the spacecraft from the excess radiation experienced on the "short stay" transit. The trade study vaguely described the problem but offered no viable solutions to the problem rather, only a mass estimate was given for a sunshield. We need to know if the problem can be solved.

4. Was the trade study data adequately displayed? Good example and/or bad example?

For the most part, the trade study data was adequately displayed. However, the "gear-ratios" data was difficult to comprehend. It attempts to show the sensitivity to changes in the mission architecture, however in the end it merely confuses us. It appears to "prove" that the long stay mission is less sensitive to the architecture changes. However, the proof is not really shown merely the results. We are curious as to the exact reason behind the sensitivity differences in the short stay vs. long stay mission architectures. The figure of merits table is an example of good representation of data. It summarizes the entirety of the findings and explains why each finding is important in the decision making process. However, a lot of the data is vague; words such as "somewhat" and "slight" are not a great basis for architecture decisions. The best presentations of data are the Mars trajectory plots and the scientific requirements. The trajectory plots clearly show the difficulty in planning a Mars mission. They also demonstrate the risks involved in the short stay, which has a longer trajectory and a closer approach to the sun. The scientific exploration requirements draw our attention to the science perspective, and show that the mission is not just about making it to Mars and surviving.

true
should have explained how arrived @ gear ratio
why imp.

but what are the FOM rankings are all FOMs = ?
Are some redundant?

5. Did your group agree with the selected figures of merit? Why or why not?

We do agree with the selected figures of merit because they seem thorough enough to cover almost all the important aspects of the mission. We especially liked the emphasis on the comparison of total useful days on the Mars surface for long versus short stay. This is better than just seeing how long one could stay on the surface, because work time is more critical than time simply spent there. Thus, this portion of the FOMs made the significance of those added days very clear. A few minor reservations we had about the FOMs include the lack of clarity with the gear ratios, the vague language used as the basis for architecture decisions such as "somewhat" and "slight". Finally, we felt that the FOMs should have been ranked according to their order of importance.

brings up good pt -> why are we going?

good