95

[redacted]

Homework 9 Part 2

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

   Yes, we agree with the recommendation of a long surface stay based on the information given. Longer surface stay offers greater flexibility in terms of launch windows and they provide less exposure to radiation and SPE. Less propulsion is needed since there is a smaller, more consistent delta V. In addition, a backup lander provides redundancy. The main advantage of the longer surface stay is that it allows for the maximum amount of exploration of the surface and gathering of scientific information at a given time.

   There are many disadvantages of the short surface stay. First, higher solar radiation exposure is experienced during transit due to traveling within 0.5 AU of the Sun. Second, there is an increase in the amount of time for traveling since only 5% of the mission is spent on the surface. When on the surface, there is a greater chance that there could be dust storms encountered since the surface stay involves a much smaller window. Third, there is a greater amount of fuel needed since a greater delta V is required. Finally, there is no redundant lander/habitat available.

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

   The main criticism we had is that the trade study was biased towards the longer surface stay. When the scientific requirements, mass comparison, and other data was provided, we felt that mostly cons were listed for the short stay and only the pros were listed for the long stay. If there weren't any pros for the short stay or any cons to the long stay, then it needs to be stated to help show there isn't a bias. Also, we didn't understand what the importance of the NTR and Chemical propulsion was for this trade study. Why weren't other forms of propulsion considered for this trade study, like Electric given on the Top-Level MAT Tree? Furthermore, we didn't feel that risk and cost were conclusively discussed. These factors have to be fully investigated since they could influence the overall design decision.

   Non trade study specific criticisms we had were that the presentation did not follow the outline, and inconsistencies, and typos were evident throughout the presentation. An example of the inconsistencies includes that it was stated for the short stay mission that the risk of behavioral problems was estimated at ~10-30% lower than the long stay mission, while stating for the long stay mission that the risk of behavior problems was estimated to be ~10-40% higher than the short stay mission.

yes

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

   First, there should be more detailed explanations and quantifiable numbers when talking about cost. Second, there needs to be more detail and more of an explanation required when talking about risks. Third, in terms of reliability we felt that the question of how does reliability affect the longer duration missions needs to be answered. Fourth, the physiological effect of long-duration missions was covered, but more information is needed on psychological effects. When you spend years with the same people, away from home and not experiencing gravity the entire time, it can wear on people mentally. Finally, with propulsion we felt that 2 questions needed to be answered. What is the significance of NTR versus Chemical propulsion?

good catch

good pt

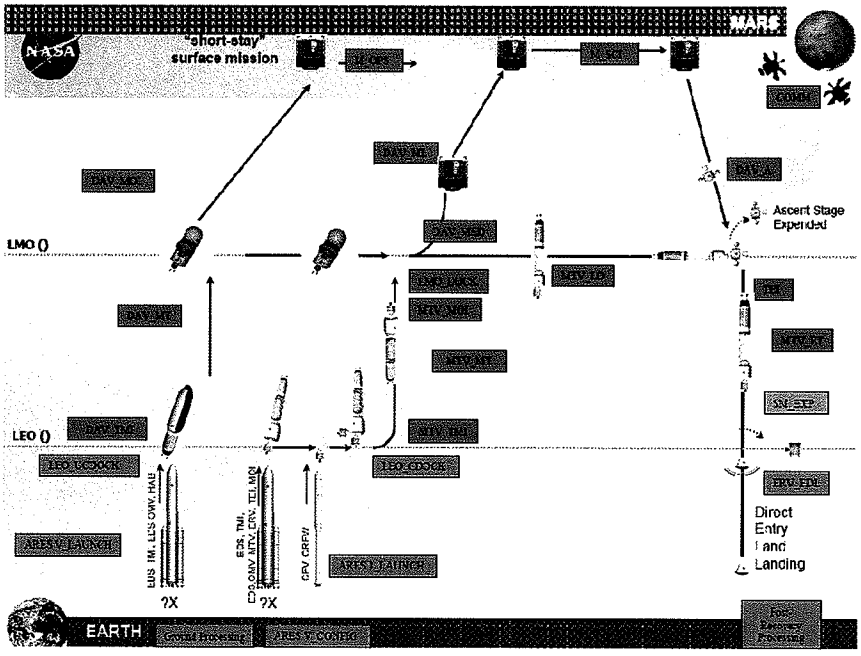
there are nested trades & they were doing them in an isolated fashion

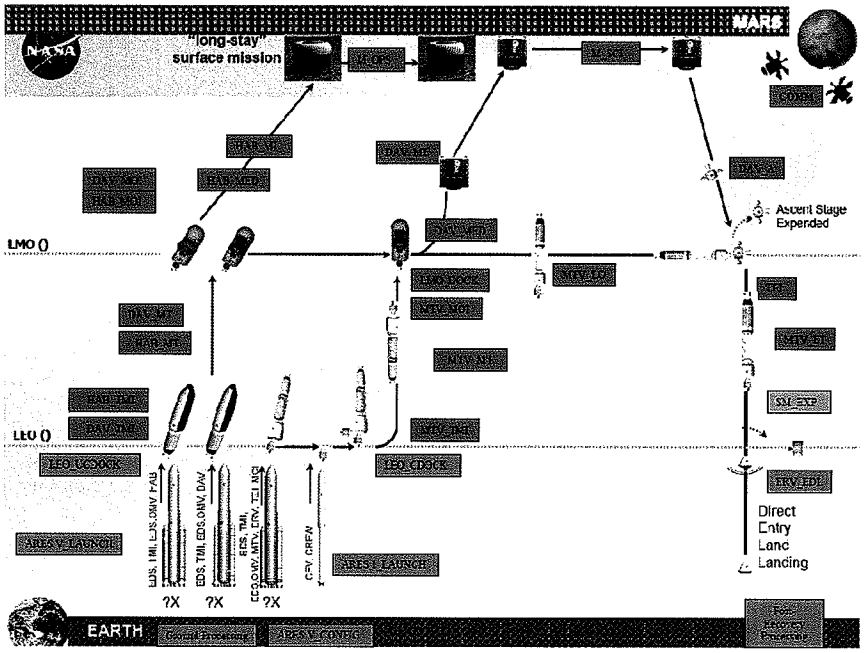
Why does the outbound leg take longer for a short duration mission than a long duration one?

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

The trade study data was discussed in both written and graphical form. While this introduces repetition, it allows for more detailed explanations than only graphical form. Some graphs were easy to interpret while others remain ambiguous.

The bad example is the following 2 BAT charts. A poor attention to detail was provided when making the charts. There is no explanation of these charts within the presentation. They are just thrown into the presentation. The abbreviations are ambiguous and leave the reader guessing what they mean. Also, it is very difficult to compare between the long and short stay missions since the two charts are so similar. It is hard to tell what the differences are at a quick glance.

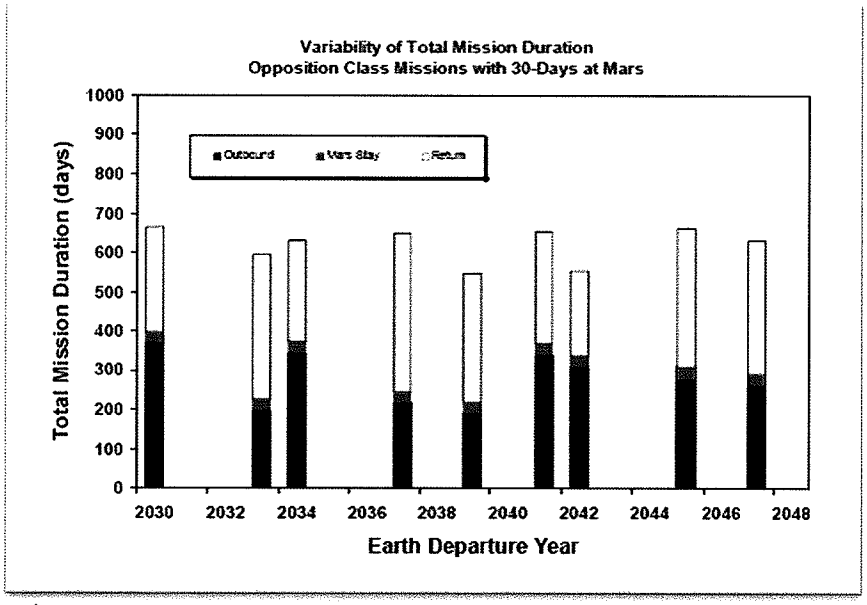


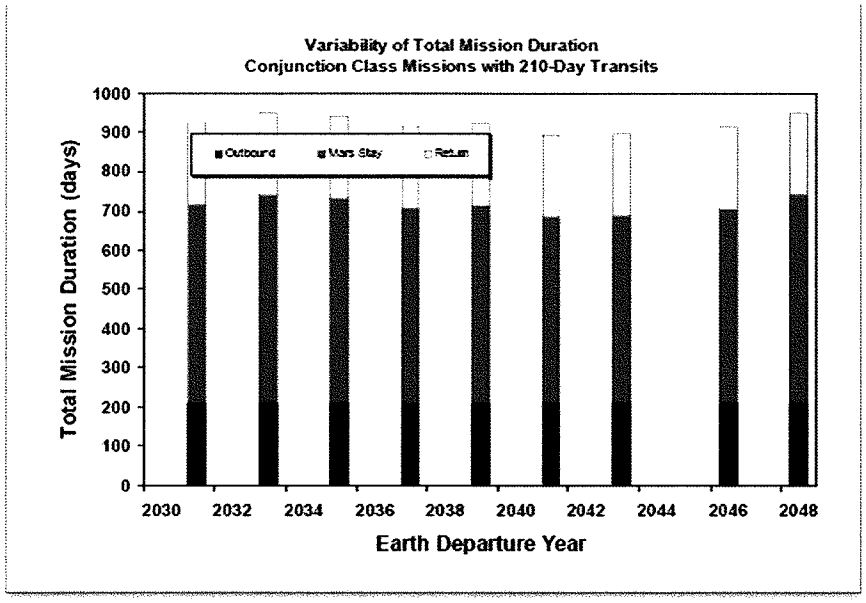


The good example is provided below showing variability of total mission duration. These charts are simple to compare to each other especially since they have the same scales and are clearly labeled. It is obvious that the majority of the time for a short duration stay is spent in transit. It can be seen that the long surface stay has more consistent mission duration despite the launch date. Finally, these graphs allow for an easy observation that the short surface stay mission on the surface is less than for the long surface stay.

shows you that quantitative data comparison is always preferred

→ RUWR can then make own interpretation





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

We felt that the Figures of Merit evaluated covered the necessary topics of importance for the trade study. However we felt that the probability of loss of crew, loss of mission, and backup lander could be lumped into a single FOM known as Risk. In addition, the crew exposure to radiation, crew exposure to Zero-G, and any additional health concerns should be combined into another single FOM, Crew Health. Finally, we believe a relative weight for each FOM should be provided to the reader. It is important to know how they compare to each other because only two advantages for one side could heavily skew the decision if they are heavily weighted.

good pt

weighting imp as well as Ranking is No weight used.