MAY 2 5 1971

STANFORD UNIVERSITY MEDICAL CENTER

STANFORD, CALIFORNIA 94305 • (415) 321-1200

STANFORD UNIVERSITY SCHOOL OF MEDICINE
*Department of Genetics*
*Instrumentation Research Laboratories*
*Elliott C. Levinthal, Director*

May 21, 1971

Mr. C. H. Robbins
NASA Langley Research Center
Langley Station
Hampton, Virginia 23365

RE: Viking '75 Project Mission Design Requirements, Objectives and Constraints, Document No. IR-3720055

Dear Mr. Robbins:

Last week, upon receiving this document, I called you to express my concern that the document did not either describe the ground data handling requirements necessary to carry out the mission or make clear that they were meant to be excluded from this document. It is the adaptive parts of the mission that impose the most stringent requirements. This is obvious in connection with site certification by the orbiter and should be made more explicit in connection with landed imaging requirements. Tables 4.2.1.1-1 and 4.2.1.2-1 of the requirements and objectives are a very good first guess of imaging sequences. The ground data handling and ground command capability must exist to provide adaptive variations from the sequence to take advantage of opportunities that are observed and unpredicted requirements.

In addition, I would like to make some comments about paragraph 2.4.6 entitled "Planetary Quarantine Constraint". As you may be aware, there is considerable dispute concerning the rationale and validity of the 17 year criteria which leads to the January 1, 1989 date. The 17 years were chosen to provide a basis of calculating the number of missions that might be used to carry out biological explorations. This permits spreading the risks of contamination over these missions. It does not follow from this that it should be used as the basis for calculating lifetime in orbit. I am enclosing a copy of a letter that Lederberg and I wrote to Dr. Herbert Friedman of the Space Science Board, November 4, 1969. This letter discusses this matter more fully. From a pragmatic point of view it may be possible to take care of the issue quite simply. My understanding of Paragraph 2.4.6 is that the a priori probability of violating the 17-year lifetime in orbit will be less than $2 \times 10^{-8}$ for each Centaur and less than $3 \times 10^{-5}$ for the Viking Orbiter and less than some number still to be determined for the bioshield cap and base. If this is true, based on the significant uncertainties that are bound to exist in a knowledge of the atmosphere and the solar radio flux, it

follows that orbits will be chosen which are likely to provide a reasonably high probability of lifetimes greater than 50 years. I think it would satisfy even the most conservative point of view, including mine, if the probability were greater than .95 that the lifetime-in-orbit would exceed 50 years. If my understandings are correct, this is not likely to be incompatible with the constraints of paragraph 2.4.6 because of the steepness of the lifetime-in-orbit curves and their sensitivity to atmospheric parameters. I urge, however, that this matter not be left ambiguous. An additional boundary condition asserting a reasonable probability that the lifetime in orbit would exceed 50 years should be added as an additional constraint.

I am forwarding a copy of this letter to Mr. Lawrence Hall for his comments on this matter.

Very truly yours,

Elliott Levinthal

ECL/mla

cc: Mr. Lawrence Hall
Dr. John Findlay
Dr. Richard Young
Dr. Thomas Mutch