



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON, D.C. 20546

REPLY TO
ATTN OF:

SL(RSY:dr)

August 29, 1973

MEMORANDUM

TO: S/Associate Administrator for Space Science

FROM: SL/Chief, Planetary Biology

SUBJECT: Viking Biology Instrument Sterility

1. There are two biological contamination problems in Viking -

- 1) Contamination of Mars with terrestrial organisms and
- 2) Contamination of the Biology instrument with terrestrial organisms

Since terrestrial microorganisms are extremely unlikely to be able to grow on Mars it has been found acceptable for the Viking lander to deposit a small number (approximately twenty) of organisms on Mars and thus not be absolutely sterile. The chance of those few organisms growing is believed to be acceptably small. On the other hand, the Biology Instrument is designed to grow terrestrial type organisms so that theoretically, even one terrestrial organism in that instrument threatens us with a false positive answer, which is not acceptable.

2. A panel of the Life Science Committee of SPAC reviewed the Viking sterilization procedures early last Spring and in June reported their satisfaction with our procedures. At that meeting, the committee was asked to consider the general credibility of the Biology experiment in light of the one in a million chance that a terrestrial organism could find its way from the spacecraft, to the Mars surface, to the sample obtained for analysis and subsequently into the experiment. In other words, would the scientific community believe a yes answer from the Viking Biology Experiment? In order to assess that question, the sterilization and contaminant procedures for the Biology instrument was required. Such a review was held at TRW on the 21st of August 1973.
3. In preparation for this review, Drs. L. Hall, J. Stern, H.R. Klein, J. Soffen and R.S. Young met at Langley Research Center the preceding

week. At that time Dr. Hall presented data from his contractor laboratory at Cape Kennedy that a small ($\frac{1}{4}$ of 1%) percentage of the airborne organisms found in vehicle assembly areas at Cape Kennedy appear to be considerably more heat resistant than the average. Although he had suspected this to be the case for several months, this was the first data Dr. Hall had been able to obtain, due to the difficulty in obtaining sufficient numbers of these bacteria for study.

4. At the end of our presentation of Viking procedures to the Life Science Committee panel, these new data were also described. The panel understands the nature of the new problem and endorses our plans to attack it. These plans include:
 - a) More data on the heat resistant organisms, so as to increase our confidence in their numbers and distribution and thus their potential threat to the Biology Instrument. Dr. Hall has met with Dr. Klein (Leader of the Viking Biology team) and they have agreed to collaborate on studying these organisms at the Cape, determining their sterilizability, and studying their distribution at other sites (TRW, and Martin Marietta-Denver) where they might contaminate the instrument. They will also study the response of the Viking Biology Instrument to these organisms, if any. In other words, they will try to determine the real nature of the hazard these organisms present to the experiment.
 - b) At the same time, VPO and its contractors will look at ways of handling the Biology Instrument so that if these bacteria are a real threat, we can isolate the instrument in a way to prevent contamination. These studies will include separate Biology Instrument sterilization at a higher temperature and special handling procedures, and isolation of the instrument during checkout in a way as to prevent it from seeing contaminated air before terminal sterilization.
5. I believe the steps being taken are proper, and that the potential problem is soluble, although it is likely to be several months before the solution is in hand. I do not see a sizeable cost impact as the result of this problem, although there may be some. The critical point, in my mind, is to be certain that we fly a Biology experiment which is not compromised by the threat of contamination.
6. We can expect comments and recommendations on this issue from the Life Science Committee when this is brought to their attention by their panel.

Original Signed By
Richard S. Young

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