

Interplanetary Subcommittee
National Aeronautics and Space Administration Oct. 31, 1960

Further Comments on Mars 1964 (Exobiology)

1. Previous comments (8-8) on Mars 1964 were predicated on the tentative assumption that the capsule could maintain direct communication to earth at a very limited rate but for many days or weeks. This program would have made it impossible to conduct any very detailed experiments involving high rates of information transfer but the long duration of contact would have encouraged longer term culture experiments.

More recent information on the current analysis of the situation suggests a rather different program involving a relay to the passing bus. On this basis, a channel of about 1 KC might be available for about an hour, this decaying to 1 cycle in about a day. Such a design puts a very different complexion on the mission, primarily insofar as it opens up the opportunity for a substantial number of photographs to be transmitted during the early stages of the mission. Such photographs can be taken at very long range from the passing bus but the opportunity for close-ups is much more exciting. Such close-ups should be invaluable in setting the scene for later experimentation by delineating the overall habitat and its variability. In addition, some specific aspects of the geological history of the planet, and even (as a remote possibility) the presence of larger recognizable forms of life might be apparent.

If something of the order of 25-50 photographs could be obtained during the first hour or two, we might wish to reconcile two conflicting aims: (1) to obtain views as close up as possible and (2) to reconnoitre over as large an area as possible in order to secure a broader perspective of the planet. The first objective might seem to entail a definitive landing, while the second would be better met by a slow descent utilizing an air foil or a balloon.

After some debate as between these alternatives, a third possibility has been brought up for discussion and is submitted with a view to eliciting a critical analysis of its feasibility. This would involve a semi-buoyant structure which might graze the ground and then be lifted again either by wind action or by programmed release of buoyant gas.

An additional advantage to this design is that it may afford a possibility of solving the rather perplexing problem of how best to collect samples of the ground surface with the least complication in gadgetry. The grazing balloon could be expected to scrape loose material from the surface into small drag buckets, thus utilizing wind energy in place of more complex schemes of mechanical actuation.

Until the capabilities and limitations of the system have been explored, it would be difficult to enumerate all of the most desirable experiments. The following are of evident interest:

1. Vidicon photography at various focal lengths. For pictures from altitude, a video-signal-controlled Zoomar could even serve as a range altimeter. The close-ups should include magnifying lenses that could give down to 1 mm resolution with the hope of identifying "vegetation".

2. Vidicon microscopy - in effect, another objective lens for the Vidicon system. At minimum, this lens could look at dust collected on a sticky tape mounted at the focal plane. Resolution to 10 microns should not be too difficult to obtain and 1 micron should be attempted. The possibility of mounting a small illuminating lamp (draw 100 milliwatts) within the objective deserves consideration. If this is feasible the microscope need not weigh more than a few ounces all together.

3. A radiobolometer.

4. A contact thermometer for the calibration of 3. at points of contact.

5. A microphone can serve as an impact sensor and function as a relatively cheap source of cues to meteorological and tectonic activity, dust and sand storms, even animal life.

6. Solar spectrum in UV and IR.

7. Insofar as analytical instruments can be perfected, the humidity of the atmosphere and of soil samples; pH and conductivity of the soil when saturated with added water to furnish data on electrolyte content. The last item could

give some clue as to the importance of volcanic emission and of aqueous erosion in the earlier history of the planet.

8. The microbial culture device might still be justified as an alternative or backup to the microscopic examination, particularly if the communication parameters are altered during the development of the vehicle. Although this approach would command a second priority in terms of the concept, the present paper may still be pertinent and may become even more so for other ventures.