July 26, 1968

MEMORANDUM FOR RECORD

SUBJECT: MOL Electrical Power System Status

Subject reviewed by Dr. Yarymovych and Mr. Hubbard at MDAC on 23 July. Briefing was given by Dr. A. Johnson. Additional present were Col F.H. Dietrich, SAMSO; Mr. Barry Moore, Aerospace; Mr. Fred Harvey, MDAC; and Mr. Robert Johnson, MDAC; intermittantly.

The basic issue appears to be the concern that the P&W PC3 fuel cell will be marginal in its ability to supply peak power loads throughout a 30 day mission. This concern is well supported by data. Certain minor improvements in cell performance are possible but only to a degree that would make the system slightly less marginal not satisfactory. Consequently, there seems to be little question that a change in basic fuel cell technology is required. There also appears to be little question that the capillary matrix approach is the most (feasible) at this time.

It should be noted that the marginal nature of the PC3 cell's ability to supply the peak loads is not due to cell performance falling below specification. Rather, the system power budget estimate appears to have undergone a rather substantial increase. This could serve as a very significant factor in any termination proceeding with P&W depending, of course, on the MDAC/P&W contract wording. P&W might even be able to claim change of scope and insist on the authority to make whatever changes required within the bounds of the existing contract. Such a situation would argue against re-competing.

MDAC has received differing degrees of technical proposal type information from both AC and P&W on fuel cell developments to meet currently recognized system power needs. AC proposes a matrix cell adapted from the NASA program which will, within the current PC3 envelope, meet program requirements. P&W also proposes a matrix cell, tailored exactly to the PC3 interface, which will also meet program requirements. Both proposals share a number of attractive features vis-a-vis the PC3. For example: lower reactant consumption, lighter weight, improved reliability, better thermal characteristics, faster start up and shut down, plus much better performance. Additionally, either matrix cell will meet a sixty day mission with some, said to be, minor modification.

115

All of these attractive features were known to be potentially available in mid-1965 when the power cell competition was held. However, the development status at that time would not support the MOL schedule. Progress made since 1965 in fuel cell technology by both AC and P&W and the current schedule picture now make consideration of the matrix cell quite feasible.

A somewhat puzzling aspect of the AC/P&W affair is the 2 to 1 (20 + million P&W vs 10 + million AC) ratio of development costs for the matrix cell. MDAC intends to be exceptionally specific in any RFP to assure, insofar as feasible, that all parties are dealing with precisely identical parameters.

Yet another interesting development turns out to be a General Electric proposal for a new and improved version of the Gemini fuel cell. This features a new membrane that does not degrade badly and has much improved physical characteristics. The power cell to meet program needs is estimated at just over 80 lbs., less than half that for the matrix. The degradation characteristic promises an almost flat time versus performance curve for almost indefinite endurance. There is no data on cost or development time for such a cell.

The proposition to re-compete the MOL power cell continues to appear sound. Col Dietrich feels that the PC3 contract can be terminated for the convenience of the G vernment and the question raised in paragraph 3 above is of little consequence. I'm not sure P&W will agree if they should lose the competition, but the Government convenience is a most powerful consideration.

S/
SAMUEL H. HUBBARD
Chief, Technology & Plans
Division, SAFSL

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