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Sent to Memo to
JCS - 9-18-62.
CAB

DA/Director of Medical Research and
Operations

PA/Manager, Apollo Spacecraft Program
Office

O₂ partial pressure monitoring

This memorandum is in response to your memorandum dated May 11, 1967, and pursuant to our agreement during the July meeting on this subject. Your position that pO₂ within the suit loop should be monitored is acknowledged and this concept is within our general principles of safety monitoring. At the meeting on July 11, 1967, with representatives of your directorate and CSD, the following options were considered:

a. A contractor-supplied pO₂ sensor, the output of which would be telemetered in real time and dumped to ground monitoring sites.

b. A GFE pO₂ sensor supplied by CSD, the output of which may be read on board, telemetered in real time, and dumped.

c. A GFE pO₂ sensor supplied by CSD which may be read on board.

d. A differential pressure measurement which may be read on board, telemetered in real time, and dumped to ground monitoring sites.

Option a. is not considered feasible at this time.

Option b. is not considered feasible due to wiring changes which would be necessary in order to telemeter this signal, although you indicated that this represented your preference.

Option c. is considered feasible. Development of such a sensor was requested in my memorandum PD5/M138-154, dated May 5, 1967. I have the assurance of CSD that such a sensor is available and is sufficiently reliable for this measurement.

Option d. is a standard method of instrumentation which will indicate that the suit loop is being maintained at a pressure several mm above that of the cabin so that contamination from the cabin is highly unlikely.

It is my opinion that options c. and d. should be implemented prior to the first manned Apollo flight. In implementing these requirements, certain mission constraints may have to be accepted and an appreciable amount of crew participation will be required.

The suit/cabin delta P will insure against contamination of the suit loop only if continuous monitoring of this measurement is accomplished and at no time has the suit pressure dropped below cabin pressure. Intermittent readings from the pO_2 sensor will be required as a direct measurement of the suit pO_2 . These readings must be included in the OCP for prelaunch operations and in the flight plan for each station passage prior to cabin purge. Continuous surveillance of this instrument along with other onboard environmental instrumentation will be necessary.

In taking this course of action, we realize that in the event either of these instruments give an abnormal reading, the suit loop must be purged until the nature of the difficulty can be established.

Mission rules will have to state the prelaunch requirement for these measurements, include a positive check of the inflight calibration of the pO_2 sensor, and provide actions for valid decreases in suit pO_2 .

I recognize the primary importance of insuring a level of pO_2 in the crewman's breathing environment which will prevent hypoxia and deter the occurrence of dysbarism. I also recognize the important fact that in cases of hypoxia, the crewman

is not a valid sensor and may not be relied upon to take proper corrective action. I believe I have reiterated correctly the physiological principles to which we agreed, including the requirement you stated for specific physiological training of the crews in handling an air/oxygen mixture.

Please advise me if the implementation of procedures described in this memorandum is not satisfactory.

George M. Low

cc:

DA/A. D. Catterson, M. D.

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G. F. Kelly, M. D.

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