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DEPARTMENT OF THE AIR FORCE
WASHINGTON

OFFICE OF THE SECRETARY

JAN 16 1967

MEMORANDUM FOR DR. FLAX

SUBJECT: Extended Lifetime Support Module for MOL

During the last management meeting, you indicated that a paper should be prepared for Dr. Foster which would indicate the line of action being taken by the MOL Program to provide extended lifetime for the automatic version of the MOL. Attached is a memo for your signature which would provide such information. We have discussed the contents with Mr. Kirk and he concurs in the approach taken.

Harry L. Evans

HARRY L. EVANS
Major General, USAF
Vice Director, MOL Program

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DATE 6/24/87
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DATE 6/26/87

MEMORANDUM FOR DIRECTOR OF DEFENSE RESEARCH & ENGINEERING

SUBJECT: Extended Lifetime Support Module for MOL

You will recall that in our discussions with PSAC which have continued since November 1965, and in our comparison studies of MOL with wholly unmanned systems, an extended lifetime version of the unmanned MOL system was a subject of active interest. In the past few months studies have been made of a support module which could extend the lifetime of an unmanned MOL up to 60 days. These studies have shown that such a system extension is entirely feasible within the payload constraint of the TITAN III-M booster.

Of the several possible arrangements of data reentry capsules investigated, our studies resulted in the selection of a preferred configuration that will permit the use of up to eight capsules, and include a simple automatic film feed, cut-off and sealing mechanism. Propellants and reactants sufficient for 60 days lifetime can be carried, and it was found that the current baseline design for cryogenic tankage can be used. The fuel cells themselves will also function for the extended lifetime when operated at the lower power levels characteristic of the unmanned automatic system. An outline sketch of the selected configuration is attached.

The extended lifetime analysis also identified some laboratory and mission module components which will require some limited extended time testing to determine if a lifetime problem exists. Attached hereto is a brief summary of the situation in this regard as it now stands.

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Our studies indicate that it is desirable and prudent in any event to design the baseline system so that a growth to a 60-day life can be achieved when desired but to qualify the system only for 30 days. Hence, we have concluded that the two unmanned flights in the present baseline program should be configured for a nominal 30-day lifetime but that all volume, weight, and other provisions be made in the design to allow growth to 60 days in the normal course of the program; this procedure has been successfully followed in other reconnaissance programs of the NRO. This will include the use of components which have been validated for, or have been modified to permit 60 days of life on orbit. If this growth flexibility is built into the unmanned support module now, before we are committed to final design, the estimated cost of the module would rise from $23 million to $25 million. This seems a worthwhile investment to protect the option to exploit the full potential of the unmanned MOL configuration at a later time.

Your concurrence with this approach is requested as soon as possible in order that all necessary actions may be taken early in the design phase to obviate or minimize any necessity for redesign.

Alexander H. Flax

Alexander H. Flax
Assistant Secretary
(R&D)

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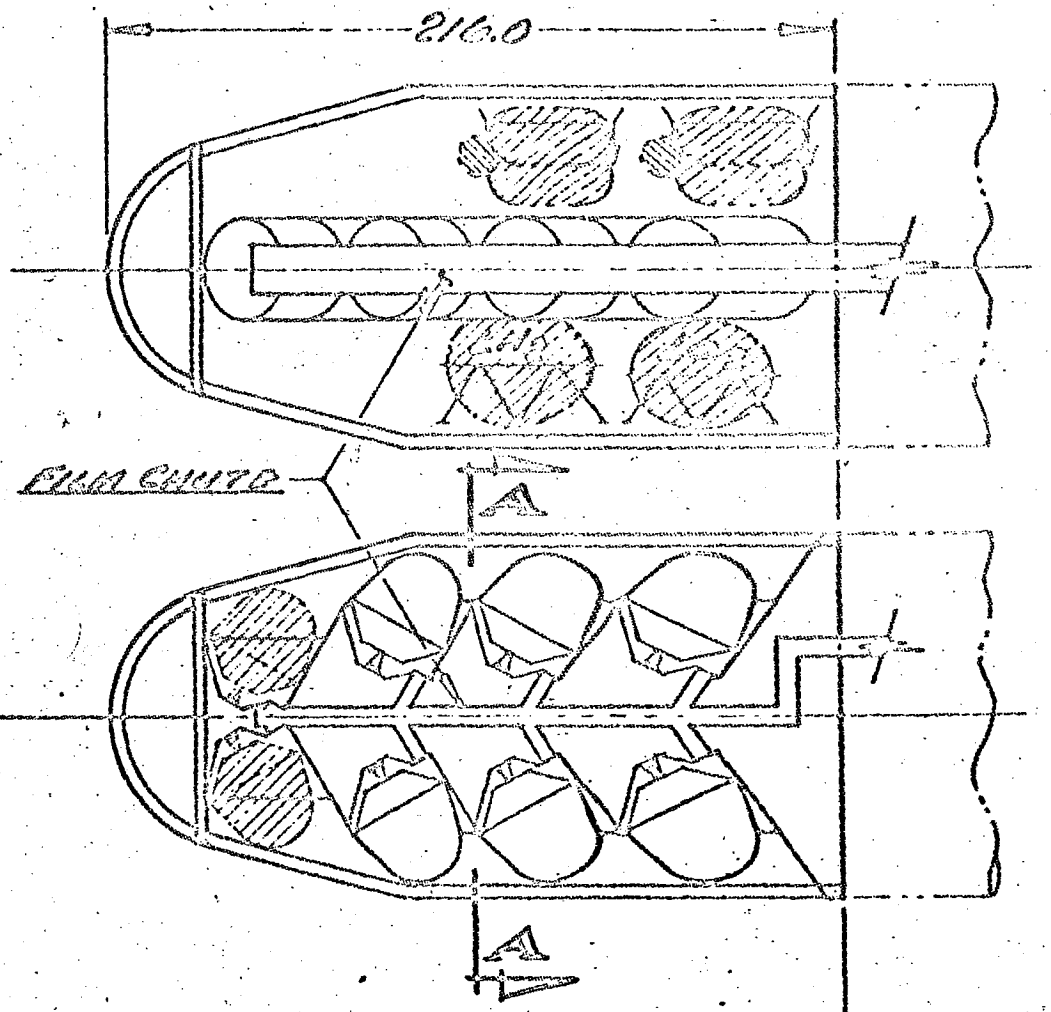
WHS-155

Support Mount

30 Day - With 60 Day Growth Capability



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Extended Lifetime Support Module

Extended Life Test Requirements (Preliminary Estimate)

1. Laboratory Vehicle (Douglas)

a. One critical component has been identified. This is the liquid hydrogen separator pump in the Electrical Power Subsystem Fuel Cell. The problem is simply bearing wearout. This fix is mandatory, and consists of a minor bearing redesign and qualification. There is no schedule impact, and cost impact is minimal. This fix will be adopted as standard for both 30 and extended lifetime versions of MOL.

b. Only two components have been identified as possible marginal items. These are the electronics associated with the Electrical Power Subsystem, and the attitude control and Translation Subsystem. An extended life test of both electronics packages will be conducted to determine if any weakness exists. It is currently estimated that fixes, if required will be minor, and no impact on schedule and little on costs is expected.

c. The humidity control component of the Environmental Control and Life Support Subsystem will require additional testing to establish its capability to perform for extended times. Control of humidity is considered important by Eastman Kodak to proper function of some camera equipment components, although the specific problems which might arise have not been identified as yet. An extended life test of the humidity control will be undertaken to determine if weaknesses exist. No major redesign is expected. No impact on schedule and little on costs is expected.

d. Mission Termination Subsystem electronics and propulsion components which are normally dormant during the active phase of the mission will require testing to determine if they will function properly after storage on orbit for extended times. This is considered a minor revalidation and no problems are anticipated.

2. Mission Module (General Electronic)

a. No critical items, nor clearly marginal subsystems were identified in the extended lifetime studies. There are a number of components, however, which will require extended life testing

to reveal weaknesses if they exist. This is particularly true of mechanical and electro mechanical components. At the present time, it is expected that no difficulty will be experienced with 50% of the items, some minor work may be required on 40%, and of the remaining 10%, considerable work involving minor redesign and requalification may be required. At present no impact on schedule and minor impact on cost is expected. The components identified were:

(1) Rate Gyros
(2) Star Tracker
(3) Star Tracker Controller
(4) Mode Controller
(5) Tracking Mirror Drive (Drive "A") Electronics
(6) Viewport Drive (Drive "B") Electronics
(7) Drive "A" Pitch Torquer
(8) Drive "A" Roll Torquer
(9) Drive "B" Synchro Transmitter
(10) Drive "B" Synchro Receiver
(11) Drive "A" Shaft Position Encoder-Roll
(12) Clamshell Door Drive (Drive "D") Electronics
(13) Drive "D" Motor
(14) Drive "D" Motor Controller
(15) Programmer - Sequencer
(16) Computer
(17) PCM Multicoder
(18) 256 Channel Multiplexer
(19) 128 channel Multiplexer
(20) 5 Volt Power Supply
(21) Mission Data Adaptor Unit (MDAU)
(22) Alignment Monitor Electronics
(23) Power Transfer and Isolution Components
(24) Power Controller
(25) Power Conditioners
(26) Data Recovery Capsules

The problem with the Data Recovery Capsule is simply shelf life. It is presently qualified for 9 months. However, it is considered prudent to requalify it for a somewhat longer time so that it will not run out of time during its progress through system checkout launch base activities, and extended stay on orbit.

3. Camera-Optical-Assembly (Eastman Kodak)

a. Although the effects of extended life on the Camera Optical Assembly are still under study, no critical items have been identified. Work will continue to isolate any components which may be marginal