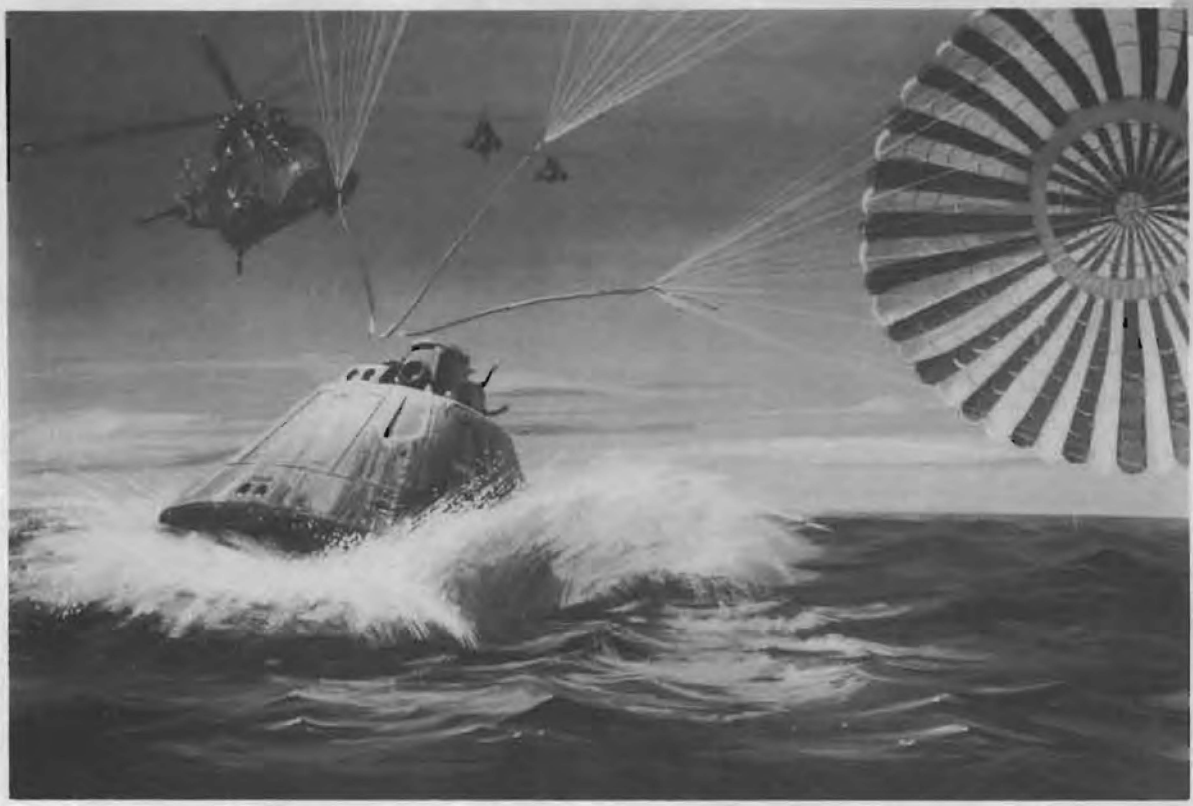
Ref 4-15

CUSTOMER ACCEPTANCE READINESS REVIEW
PROJECT APOLLO
CSM 012
PHASE II REPORT



Space and Information Systems Division
North American Aviation, Inc.
Downey, California

Coordinated By

Test Documentation
Apollo Test and Operations

ENC: 8

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : PR2/T.J. Adams, Chairman Panel 6,
Historical Data

DATE: MAR 23 1967

In reply refer to:
PF2/0-116-67

FROM : PF2/Project Engineer Block I Spacecraft

SUBJECT: Disposition of S/C 012 ΔCDR Action Items

In response to your request, related to the same subject, it is the policy that all Spacecraft ΔCDR Action Items be satisfactorily dispositioned prior to the spacecraft CARR or be submitted to the CARR Board for resolution. All of the S/C 012 ΔCDR Action Items were dispositioned prior to the S/C 012 CARR. The ΔCDR action items were handled as individual items and were individually closed out by the responsible NAA engineering supervisors and NASA ΔCDR Group Chairmen. Therefore, no final summary report was submitted. In accordance with MSC requirements, NAA did submit bi-weekly reports on the status of all of these items. This report was used as the basis for informal NAA and MSC Project Engineers' status reviews. Disposition of the final three items was completed at one of these reviews at NAA on July 18, 1966.

William W. Petynia

William W. Petynia

5010-108

TABLE OF CONTENTS

NOTICE

The Phase II CARR Report consists of the sections identified in the table of contents shown above.

These four sections are prepared and transmitted progressively as soon as available. The sections, when bound together by the recipient, constitute the total Phase II Report, and when combined with the Phase I report become the updated CSM 012 CARR report required by contract NAS9-150, Exhibit R.

ATO-D-TP-66-TD-243

INTERNAL LETTER

North American Aviation, Inc.

Date · 21 July 1966

TO Address · Those Concerned

FROM Address · J. F. Parker
642-001, B/6
Downey, FA-16

Phone · 5303

Subject · CSM 012 System Assessment Meeting Minutes and Action Assignments

The attached minutes of the CSM 012 Systems Assessment Meeting were prepared directly from the approved working group forms and discussions as presented to the Steering Committee on 19 July 1966.

Information contained in the minutes is organized to correlate directly with the paragraph numbers of the CARR report. Each section of the minutes is divided in two parts. Part A contains all the open action items. Part B contains historical information related to discussion item resolutions and added CARR report information.

It is mandatory that all action items be completed on or before their indicated completion dates. Action item responses are to be documented in a format similar to the CARR report, indicating paragraph number, action taken, documentation, who implemented action, and completion date. (See IL ATO-D-TP-66-TD-206)

The CSM 012 CARR Administrators are responsible for collecting, editing, typing on white bond, and compiling all action items assigned individuals within their department. All responses are to be accompanied by a cover letter transmitting the information formally to J. F. Parker, D/642-001, B/6 Downey, FA16, (CARR Project Administrator) and hand carried to F. Mohr D/642-063, Building 6, S101-E36(2) Downey, for insertion into the response package.

Note to contracts: Transmit this information to NASA; include CARR Administrators on distribution list.

J. F. Parker
Technical Assistant
Apollo Test and Operations

TWT/cdw

Attachment: CARR System Assessment Meeting Minutes

CSM 012 CARR
SYSTEM ASSESSMENT MEETING MINUTES

The Systems Assessment Meeting for Spacecraft 012 was held on 19 July 1966 in the Mockup Room, Building 1, Downey. The meeting was called to order at 0900 hours, and was concluded at approximately 2245 hours the same day.

The minutes of the CSM 012 System Assessment Meeting, contained herein, represent the combined National Aeronautics and Space Administration and North American Aviation, Inc., evaluation of CSM 012 systems performance as supplemented by the Phase I CSM 012 CARR Report.

The Systems Assessment Meeting Steering Committee has approved the CSM 012 CARR Report, contingent upon completion of action items and delta information as defined in these minutes. All persons with action assignments shall complete all actions as defined in the minutes and provide an up-to-date status to their respective CARR Administrators prior to 29 July 1966.

J.F. Parker, D/642-001
Steering Committee Chairman
CARR Project Administrator
North American Aviation, Inc.

for G.W. Briggs
Branch Chief
Test Engineering Branch
NASA-RASPO

CSM 012
SYSTEMS ASSESSMENT MEETING MINUTES

TABLE OF CONTENTS

SECTION 1 – ELECTRICAL POWER SYSTEMS

Part A – Action Items

1.6.2 Originator W. Hutchinson NAA-ATO

PROBLEM - Dead Face Verification

Deadface verification was first accomplished in OCP 0129A - S/C 12. Circuit interrupter C15A1 did not open due to improper pressure (200 psi) and switch M3 in the SK231 did not operate.

DISCUSSION

This test was deemed inconclusive. The second test was accomplished during OCP 0129B S/C 012. The circuit interrupters operated satisfactorily as did the switches in the SK231. However 25 wires continued to indicate power. To reverify these wires it was decided to check the 25 wires during the abort run in OCP 0130B S/C 012. It should be noted that the interrupters were not actuated during either run of OCP-0130 S/C 012. This check was accomplished by TPS 0130-008A using a scope. Six wires were found to indicate power. The following is a recap of the results from this TPS.

J3A2-12 28V SPS sol value (deadface) - 28 vdc observed

J3A3-2C 28V ret SPS sol vlv - 28 vdc observed

} To be expected

J3C2-41 S/M quad D He indic. - 1 volt noise pickup observed

J3C2-42 SPS gauging (deadface)- 115V 400~ observed - to be expected

J3C2-94 EDS unsafe indic. -5V 400~

J3C2-97 EDS unsafe indic. -5V 400~

} Pickup

ACTION REQUIRED W. Hutchinson NAA-ATO 7-29-66

Verify that these items are open circuited by the deadface relay at Downey during ECS testing and report results.

1.6.3 Originator W. Hutchinson NAA ATO

PROBLEM - Noise on AC Bus 1
Modulation on AC Bus 1 and AC Bus 2 - during OCP 0129 S/C 012 was observed to be 1.5 percent.

DISCUSSION
The inverters have been qualified and meet requirements of 0.5 percent modulation from 50 - 100 percent full load. At light loads the modulation characteristics of the inverter could go to 0.9 percent modulation. The unexplained difference (0.5 percent to 1.5 percent) is due to some unexplained actively varying load.

ACTION REQUIRED W. Day NAA-ENG 7-29-66
Determine source of modulation. This will be performed on S/C 014 during 0126. The test setup and EMI instrumentation used, the test procedures and the test results are to be reported and related to anomilies observed on CSM 012. This test must also verify no S-Band dropout.

ACTION REQUIRED W. Hutchinson NAA-ATO
Retest the busses on CSM 012 during ECS testing to observe percent modulation and report results.

1.6.4 Originator Roger Chaffee NASA-Crew

PROBLEM - Unpotted Connectors/Loose Pins
Loose pins and unpotted connectors behind RH and LH C/B panels were reported.

DISCUSSION
One pin found to be recessed has been repaired. These connectors are of a type using moisture seals and do not require potting per NAA Specification MC414-014A. These connectors have been qualified.

ACTION REQUIRED NASA-R&QA
Verify qualification testing was satisfactory. 7-29-66

SECTION 1 – ELECTRICAL POWER SYSTEMS

Part B – Historical Information

1.6.1 Originator W. Hutchinson NAA-ATO

PROBLEM - CRT Display Loss

During OCP-P-0129 CRT Display of (CC0200), AC BUS 1 phase A voltage was lost.

RESOLUTION

C14A12 Fuse box F-1 opened due to an inadvertent short caused by technician during EMI evaluation. Removed and replaced C14A12 fuse box. Measurement is now satisfactory. Documentation: TPS V16-GEN-094.

1.6.5 Originator W. T. Armstrong (Flight Crew)

PROBLEM - Hughes Connectors

Several Hughes connectors in the C/M have been improperly torqued and some have an incorrect number of seals installed.

RESOLUTION

Hughes connectors in CSM 012 have all been verified by NAA and NASA QC for installation of the proper number of seals and correct torque values in following TPS's.

V16-GEN-154
V16-EPS-007
V16-EPS-008

Connectors were torqued to 5 ± 1 in lbs. at time of installation. A chart has been made to show the number of seals installed and the location of these connectors.

SECTION 2 – FUEL CELL/CRYO

Part A – Action Items

2.6.3 Originator W. H. Yahn NAA-ATO

PROBLEM - O_2 System Contamination

O_2 system contamination level is out of specification.

DISCUSSION

NAA engineering contends that the excessive contamination is due to system rework and that the existing CSM filters should remove contamination. NASA disagrees.

ACTION REQUIRED R. Larson NAA-ENG 7-20-66

Determine acceptable contamination levels and define methods which can be used to verify ESM is within limits specified for:

A. Fuel Cell System (O_2)

B. Personnel Use (O_2 ECS)

Report to R. W. Lanzkron on 7-20 and document NAA position.

2.6.4 Originator W. H. Yahn NAA-ATO

PROBLEM - VAC-ION Pump (MCR 1466) Checkout

Vendor testing of this unit has been completed at Beech but Downey checkout has not been completed. (O_2 Tanks only)

DISCUSSION

Beech (Colorado) is building checkout kluge equipment to measure the DC/DC converter output (VAC-ION Pump). This unit will not be available before CSM shipment to KSC.

ACTION REQUIRED D. Bell III NASA-MSC 7-29-66

Determine test requirements and define test methods and schedule time which can be used at Downey and KSC. This will include equipment requirements.

2.6.4 Continued

ACTION REQUIRED R. Larson NAA-ENG 7-29-66
Implement test requirements into process specification. Establish GSE requirements to perform this checkout.

2.6.5 Originator R. W. Lanzkron NASA-MSC

PROBLEM - O_2 Tank Fan Operation Checkout

There is no existing procedure to determine that both O_2 fans are operating.

DISCUSSION
This is an action carry over from CSM 011 which had an inoperative fan.

ACTION REQUIRED R. Larson NAA-ENG 7-29-66
Determine checkout method for verifying that both fans are operating.

2.6.6 Originator W. H. Yahn NAA-ATO

PROBLEM - Hydrogen Gas in Potable Water
Hydrogen Gas is introduced gradually into the Potable Water by the fuel cells during operation.

DISCUSSION
It is felt that this is not a problem but further investigation should be made to verify that the hydrogen in the potable water is not detrimental. Concern was expressed over possible adverse effects caused by H_2 content in potable water used for food reconstitution.

ACTION REQUIRED D. Bell III NASA-MSC 7-29-66

1. Report results of existing engineering studies on S/C 008.

2. During S/C 008 testing NAA will determine quantity of hydrogen which will occur in CM atmosphere and in potable water by taking periodic samples and reporting test results.

2.6.7 Originator W.H. Yahn NAA-ATO

PROBLEM - Hydrogen Venting in Flight
Hydrogen/water vapor may freeze during fuel cell venting to space.

DISCUSSION
Engineering feels that this is not a problem since calculations show that during purging operations, the H_2 and water vapor will not cause a problem.

ACTION REQUIRED J.R. Nash NAA Eng
7-19-66
Verify purging operations during CSM 008 low temperature testing and report results.

2.6.8 Originator W.H. Yahn NAA-ATO

PROBLEM - Flow Meter Inaccuracy
H_2 and O_2 flow meter accuracy is out of limits. It has also caused the Master Caution and Warning to trip.

DISCUSSION
The Meters and PCM readings were squawked (Re OCP-P-1509, Sqk. #29). The caution and warning display was not squawked. This inaccuracy has been observed at low flow rates.

ACTION REQUIRED J.R. Nash NAA-ENG
7-19-66
Resolve system and or meter problems using logic and data to support conclusions. This analysis must include the master caution and Warning display.

2.6.9 Originator W.H. Yahn NAA-ATO

PROBLEM - F/C Reactant Shutoff Valve
Due to reactant shutoff valve failures in CSM 008, CSM 011, and CSM 012, NASA wants to know if there is a problem either with design, method of operation, ACE compatibility or other parameters.

DISCUSSION
NAA Cryogenic engineering feels that there is not a spacecraft problem with the reactant shutoff valves, but that external problems have caused the reactant valve failures.

2.6.9 Continued

The valves were checked during integrated test and were found to be satisfactory.

There is a Mod to be incorporated on CSM 012 which will apply 6V holding power during boost until shut off by the astronaut. (See 2.1.6.2, Part B) The C14-241 has been modified to prevent inadvertent application of power.

ACTION REQUIRED R. Larson NAA-ENG 7-29-66
Study and report Engineering analysis and logic of all failures on these valves.

2.6.10 Originator W.H. Yahn NAA-ATO

PROBLEM - Excess Operating Time on O_2 Tank

DISCUSSION
Total amount of operating time accumulated under operating pressure is 417.3 hours. Sqk 207 Reference O_2 tank No. 1 P/N ME 282-0026-0060 Rev "L" S/N 10024E620413 sheet 40 of Data Pack. Spec MA0201-0077 "E" states earth replacement required after 150 hours operating time. This is under investigation and will require new spec and EO when resolved. MA0201-0077 time requirement will be changed to eliminate operating time incompatibility. It was also noted that there should be a time requirement for the Fans.

ACTION REQUIRED J. Adelstone NAA-REL. 7-29-66
C. Bowman NAA-ENG 7-29-66

2.6.12 Originator D. Bell III NASA-MSC

PROBLEM - Fuel Interface Connections
The fuel cell reactant tubing and water glycol tubing that interface with the fuel cell are not supported and aligned in the proper position prior to fuel cell installation.

DISCUSSION
During fuel cell installation, these lines are bent into place causing possible stresses and strains and leakage problems. Also, fuel cell installation is difficult because of the improper alignment of eight hand lines, "B" nuts and Voi-Shan washers associated with each fuel cell.

2.6.12 Continued

A non-flight bracket to hold these lines in position until F/C installation, is recommended.

ACTION REQUIRED R. Larson NAA-ENG 7-29-66
Develop method to do this and document implementation method.

SECTION 2 – FUEL CELL/CRYO

Part B – Historical Information

2.6.1 Originator W.H. Yahn NAA-ATO

PROBLEM - Fuel Cell W/G System
Experience on SC 011 has shown that radiator leaks and/or damage may occur to water/glycol system subsequent to W/G fill at Downey which would require a complete purge and refill cycle. Also, GSE and other special equipment has never been required for Downey or CSM 012.

RESOLUTION
It was recommended that the fuel cell W/G system be serviced at KSC rather than at Downey. The system will be filled at Downey as previously directed by NASA.

2.6.2 Originator W.H. Yahn NAA-ATO

PROBLEM - Reactant Shutoff Valve
MCR 1542 (Reactant Shutoff Valve holding circuit) is not released in system.

RESOLUTION
This installation is pending MCR and EO release (not presently a problem). It will be installed at Downey except the panel which will be installed at KSC due to panel delivery on 8-19 which will not support the CSM ship date.

2.6.11 Originator W.H. Yahn NAA-ATO

PROBLEM - F/C Shear Web
Fuel cell shear web installation planned for KSC should be done at Downey with F/C installation.

RESOLUTION
The shear webs will be installed at Downey during fuel cell installation.

SECTION 3 – ENVIRONMENTAL CONTROL SYSTEMS

Part A – Action Items

3.6.1 Originator E. White NASA-MSC

PROBLEM - Heat Exchange Evaporator
Define inflight use of suit heat exchanger evaporator section.

DISCUSSION
Glycol evaporator has been re-designed and modified (Blk II configuration) to provide a reliable heat exchanger, and should be used in place of the suit evaporator. It is recommended by NASA that the glycol evaporator should be used.

ACTION REQUIRED J. Ross NAA-Eng 7-22-66
Provide necessary information to justify the NAA position to continue use of the suit evaporator. Submit report on water carry over, etc. prior to CARR. This report will include mode of operation.

Provide to R. Lanzkron by 7-20-66 at 1400 hours.

3.6.2 Originator W. T. Armstrong (Flight Crew)

PROBLEM - Glycol Evaporator Wick Temperature
A crew compartment indication of glycol evaporator wick temperature should be provided.

DISCUSSION
A fix is in work per MCR 1534. The plug-in module is being built to satisfy the requirement. This is CSM stowed equipment and anticipated delivery is 9-2-66.

Checkout to be at KSC.

ACTION REQUIRED R. Larson NAA-ENG 7-29-66
Provide mockup of plug-in module for crew compartment fit check.

3.6.3 Originator J. Whalen NASA-MSC

PROBLEM - ECS Checkout Requirements
Additional test requirements to ECS functional - OCP-5051 are listed below:

1. Provide system readiness verification prior to crew ingress
2. Service suit heat exchanger wicks
3. Verify suit loop temp control functions during manned run
4. Post landing valve checks and blower and attitude switch C/O
5. Suit gas analysis prior to crew insertion
6. Suit loop integrity check
7. CO_2 sensor check - response only

DISCUSSION
The present OCP-5051 does not include the above tests since these are new requirements not reflected in engineering specifications. It is recommended that these tests should be implemented.

ACTION REQUIRED R. Larson NAA-ENG 7-29-66
NASA directed that the above testing be implemented. A deviation is required at CARR if these items can not be accomplished. This implementation includes:

Revise Process Specs to accomplish these checks.

ACTION REQUIRED J. Cuzzupoli NAA-ATO 7-29-66
Revise OCP's to include the above checks and perform tests at Downey.

3.6.4 Originator E. White NASA-MSC

PROBLEM - Urine Dump Nozzle Freeze-Up
It is not felt that the capability of the urine dump system to operate on a 14-day mission without freezing has been satisfactorily demonstrated.

3.6.4 Continued

DISCUSSION
NAA development testing shows a 5.7 watt heater to be adequate. NAA qual tests have been satisfactorily completed. Development tests at MSC show that freeze up during the above tests was encountered at high discharge rates and under special lab test setup conditions.

ACTION REQUIRED J. Ross NAA-ENG 7-29-66
NAA and MSC to investigate problem - send review qual test data.

3.6.5 Originator Wm. Novitsky NASA-MSC

PROBLEM - Urine Nozzle Heater
Electrical wiring diagram of the urine dump nozzle heater indicates that a short in this heater would also cause the loss of both steam duct heaters.

DISCUSSION
Loss of the urine nozzle heater due to open or shorted conditions would allow the urine nozzle to freeze over and result in the loss of the capability to dump urine. Shorting of the urine nozzle heater could also cause loss of the steam duct heaters. This would cause the loss of water boiling capability of the glycol evaporator and the inability to vent excess S/M water and EPS battery gases due to freezing. One proposed fix would require addition of two switches and additional wiring from aft compartment to cabin.

ACTION REQUIRED J. Ross NAA-ENG 7-29-66
Single point failure analyses are required. Recommended fix must be provided to R. Lanzkron NASA by 7-20-66 at 1400 hours.

3.6.6 Originator E. White NASA-MSC

PROBLEM - Relief Tube Urine Backup
Urine backup in the relief tube was experienced during one out of six urinations during testing at MSC of the urine dump system.

DISCUSSION
MSC tests indicate that the direct over-board urine transfer system is adequate. Astronaut Joe Kerwin was a subject

3.6.6 Continued

during these tests and mentioned preliminary approval of the system.

ACTION REQUIRED J. Whalen NASA-MSC
To investigate and establish NASA position. 7-29-66

3.6.7 Originator F. Brown NAA Eng

PROBLEM - O_2 Relief Valve Change

SCN 21 (ECP 0086) to SID 64-1080 O_2 relief valve is not yet approved.

DISCUSSION
ECP submitted by letter 66 MA 3641, 3-18-66. NASA action required.

ACTION REQUIRED J. Whalen NASA-MSC 7-29-66
NASA reply required NASA-MSC. The requirement will be rejected and logic defined.

3.6.8 PROBLEM - Urine Dump Rate
The urine dump rate may not be sufficient under certain circumstances.

DISCUSSION
Over filling will cause overflow into the crew compartment. Even though the dump nozzle has been redesigned to increase flow rate.

ACTION REQUIRED J. Whalen NASA-MSC
Define problem if any and propose fix. 7-29-66

3.6.9 Originator E. Wright NASA-KSC

PROBLEM - Quick Disconnect Valves
SM W/G quick disconnect valves have not been leak checked at Downey.

DISCUSSION
OCP 5049 or 5017 and process spec does not call out a requirement to leak check valves.

3.6.9 Continued

ACTION REQUIRED J. Ross NAA-ENG 7-29-66
Review requirement to determine actual test requirement and planned implementation. Report to R. Lanzkron, NASA by 7-20-66 at 1400 hours.

3.6.10 Originator J. Whalen MSC-NASA

PROBLEM - Retest of O_2 Supply System

Proof pressure and leak check of C/M O_2 Supply System (high pressure side) is required after rework.

DISCUSSION
Some high press aluminum O_2 lines have been replaced with stainless steel lines. Proof pressure and leak check of these lines is required after installation in CSM 012 at Downey.

ACTION REQUIRED J. Jolley NAA-ATO
Retest at Downey. 7-29-66
Reference item 3.6.18.

3.6.11 Originator J. Whalen NASA-MSC

PROBLEM - OCP 5017 Supplemental H_2O System

GN_2 tank pressure regulator relief function of valve has not been checked.

DISCUSSION
Additional requirement. Specification required from engineering in order to perform check.

ACTION REQUIRED J. Ross NAA-ENG 7-29-66
Add requirement to checkout specification.

ACTION REQUIRED J. Jolley NAA-ATO
Test at Downey. 7-29-66
Reference item 3.6.18.

3.6.12 Originator E. E. Wright NASA-KSC

PROBLEM - SM W/G Q/D Leak Check
SM W/G quick disconnect valves are not leak checked at Downey.

3.6.12 Continued

DISCUSSION
OCP 5049/5017 and process spec does not call out a requirement to leak check valves.

ACTION REQUIRED J. Jolley NAA-ATO
Perform leak check. 7-29-66
Reference item 3.6.18.

3.6.14 Originator J. Beaman NAA-ATO

PROBLEM - ECS Instrumentation
Flight qualification instrumentation on ECS not operating properly.

CF0050 W/G ΔP branch 2

CF0481 W/G temp to coldplate

CF0327 Waste H_2O pressure

CF0245 O_2 reg.

DISCUSSION
Trouble shooting presently in work, to be resolved prior to ECS checks.

ACTION REQUIRED J. Jolley NAA-ATO
Trouble shoot repair and reverify. 7-20-66
Reference item 3.6.18.

3.6.15 Originator W. Armstrong (Flight Crew)

PROBLEM - Manual Control of Glycol Evaporator Water Supply
Manual control of the water supply to the glycol evaporator should be provided.

DISCUSSION
Fix incorporated per MCR 1534.

ACTION REQUIRED J. Jolley NAA-ATO 7-20-66
Incorporate change per MCR 1534 prior to ship if possible.
Reference item 3.6.18.

3.6.16 Originator W. Armstrong (Flight Crew)

PROBLEM - Waste Management System Venting
Venting the fecal cannister into the suit loop is unacceptable. The fecal cannister must be vented overboard.

DISCUSSION
Fix in work per MCR 1516

ACTION REQUIRED R. Sexton ATO-Eng 7-20-66
Incorporate change per MCR prior to ship if possible. Reference item 3.6.18.

3.6.17 Originator W. Armstrong (Flight Crew)

PROBLEM - Pressure Suit Ventilation
The ECS Breadboard Test has indicated that pressure suit ventilation is inadequate. The capability to operate both suit-loop fans simultaneously must be provided.

DISCUSSION
Fix in work per MCR 1547.

ACTION REQUIRED J. Jolley ATO-Eng 7-20-66
Incorporate change per MCR 1547 prior to ship if possible. Reference item 3.6.18.

3.6.18 Revised ECS Test Plan

All ECS additional tests stemming from new requirements recommended at the System Assessment meeting are being integrated into a revised ECS test plan which is being formulated in a meeting with R. W. Lanzkron at 1400 on 7-20-66. This revised test plan will specify all the ECS tests remaining to be performed at Downey prior to shipment.

SECTION 3 – ENVIRONMENTAL CONTROL SYSTEMS

Part B – Historical Information

3.6.13 Originator J. Whalen NASA-MSC

PROBLEM - Relief Valve Reseat Pressure

OCP 4172, C/M leak check, indicates that the cabin pressure relief valve reseat pressure was 5.41 psig. NAA should verify that this pressure level is acceptable.

RESOLUTION

5.41 psig is an acceptable initial cabin pressure. The 0.21 psi spread between cabin pressure regulation and cabin pressure relief is sufficient to prevent interaction.

Valve will be tested at KSC to verify relief valve operation in conjunction with cabin pressure regulator operation.

SECTION 4 – COMMUNICATIONS SYSTEM

Part A - Action Items

4.2.1 Originator D. Moore NASA-MSC

PROBLEM - HF Recovery Antenna Deployment
The HF antenna has consistently failed deployment under static conditions.

DISCUSSION
The vendor has not demonstrated that the antenna is capable of confident deployment in actual post landing environment.

NAA Eng. contends that qual test is completed on HF antenna to CTN requirements. The CTA, EAR etc have been submitted to NASA. NASA disagrees with this determination since the CTR requirements are less severe than CSM 007 test environment.

ACTION REQUIRED J. Williams NASA-MSC 7-29-66
Advise NAA of any requirements which differ from the qual test specifications.

ACTION REQUIRED R. Larson NAA Eng 7-29-66
Evaluate data and determine effect on antenna test and design and provide report.

4.6.1 Originator D. Marfice NAA-ATO

PROBLEM - VOX Sensitivity
While running OCP-P-0129 Seq. 12-016, using Communications Carriers (soft hats) P/N XA-1991-000, VOX circuit was energized with a VOX SENS setting of "1" and normal voice level input.

DISCUSSION
VOX circuit was energized by background conversation with a setting of "5". VOX circuits should not be energized with a normal voice input with VOX SENS at "1". DOC: V16-GEN Squawk #245 (Open)

4. 6. 1 Continued

Problem not adequately identified as written. Subsequent tests indicate that original acoustical isolation between mike and earphone was inadequate, based upon improvement obtained by addition of isolation grommets. Problem is aggrevated by improper position of voice tubes. The mikes were designed to operate in a pressure of 5 psia. Under atmospheric pressure (14. 7 psia), VOX SENS setting will be at a lower number than normal. Therefore, if the VOX triggers occasionally at a setting of "1", this is normal.

ACTION REQUIRED W. Petynia NASA-MSC 7-29-66
Action will be determined in a special meeting to be called by NASA. Report conclusions.

4. 6. 2 Originator C. Olesen NASA-RASPO

PROBLEM - VOX Keying of HF Transceiver
When in VOX operating mode of, the HF Transceiver, the received voice was garbled and intermittent.

DISCUSSION
This was observed during OCP-P-0129A. It was found that at a VOX setting of 9 with loud earphone volume (7), the received HF voice would trigger the VOX causing the received voice to be interrupted. This could also be caused with a volume setting of 9 (uncomfortably loud) or a VOX setting of 7-1/2. When both controls were at normal positions (VOX = 5, VOL =6), proper operation of the HF was obtained.

ACTION REQUIRED W. Petynia NASA-MSC 7-29-66
Action will be determined in a special meeting to be called, by NASA. Report conclusions.

4. 6. 3 Originator NASA Flight Crew

PROBLEM - VOX Elimination
The current VOX is not acceptable to the astronauts for flight.

DISCUSSION
The mechanical isolation between earphone and microphone has been improved. However, it is recommended that the VOX should be eliminated. This would decrease the amplifier sensitivity and would increase the background noise.

4.6.3 Continued

ACTION REQUIRED W. Petynia NASA-MSC 7-29-66
Action will be determined in a special meeting to be called by NASA. Report conclusions.

4.6.4 Originator D. Marfice NAA-ATO

PROBLEM - Audio Feedthru
With an audio center turned off completely, (all under control panel switches at center) audio can still be heard at a very low level.

DISCUSSION
This audio is intercom from another position and reciever outputs. One audio center position must be turned on to get this feedthru. Doc. TPS-OCP-P-0129-008A (Engr. evaluation). Audio feedthru from one position to another is thru the Caution and Warning system tone generator. This was verified on S/C 014, TPS-V16-COM #237, by removing the S/C connector from J-153 on the caution and warning tone generator. Recommendations on how to eliminate problems on S/C 012.

1. Install cutoff switch for use during sleep cycle

2. Remove earphone during sleep cycle

3. Add active isolation amplifier in caution and warning tone generator.

ACTION REQUIRED W. Petynia NASA-MSC 7-29-66
Action to be taken will be determined in a special meeting to be called by NASA. Report conclusions and initiate action.

4.6.5 Originator D. Marfice NAA - ATO

PROBLEM - No TV Video
During OCP-P-0129 Seq. 19-192, were unable to obtain a TV picture at this time.

Ref. OCP-P-0129 Squawk #2

TPS 0129-040 T/S

V16-GEN Squawk #160

4.6.5 Continued

DISCUSSION
Connector J195, which connects to TV camera at LEB position, had broken wire at Pin 10. Connector J195 was repaired and subsequent TV checks were good. Probable cause was moveable TV bracket interfacing with cable.

ACTION REQUIRED J. Cuzzupoli NAA-ATO 7-29-66
Ensure interference problem is corrected by rerouting cable as required and report.

4.6.6 Originator D. Marfice NAA-ATO

PROBLEM - Audio Center VOX Release Time
Audio Center VOX release time is now adjusted based on verbal request.
DDC. TPS V16-GEN 126

TPS OCP-P-0130A-008

V16-GEN Squawk #218

DISCUSSION
The VOX release time was originally set at vendor to 2 seconds. Verbal requests from NASA MSC Project Office and S/C 012 astronauts, were for a VOX release time of 0.75 sec. ATO felt the 0.75 seconds was too short, so all three audio centers were set for 1 second release time. The astronauts indicate that the 1 second release time is satisfactory.

ACTION REQUIRED R. Larson NAA ENG 7-29-66
1. Document the VOX release time setting.

2. Change audio center functional checkout procedure, MA 0205-0954, to indicate the desired release time.

4.6.7 Originator C.E. Olesen NASA-RASPO

PROBLEM - MDC Panel 19 Replacement (V16-771349)
Panel No. 19 will be replaced after OCP-P-0130B.

DISCUSSION
This panel has the following COM functions and controls: 1. UP TLM CMD RESET 2. S-BAND AGC METER 3. LEM recorder TAPE MOTION. This panel should be retested.

4.6.7 Continued

LEM recorder Tape Motion Monitor will be checked during LEM recorder checkout. S-Band AGC meter and UP TLM CMD reset function can be checked during the TV checkout period.

ACTION REQUIRED J. Cuzzupoli NAA-ATO 7-29-66
S-Band AGC meter and UP TLM CMD reset functions will be checked by TPS prior to shipment.

4.6.8 Originator D. Marfice NAA-ATO

PROBLEM - TV Camera Checkout
TV Camera operation has not been checked under worst lighting conditions, that is, looking at CCC with all couch floodlights turned to maximum brightness.

DISCUSSION
It is presently planned to check the TV Camera operation under these conditions during the ECS Suit Loop Checks in the aft heat shield fixture. No Process Specification or OCP requirements exists for this test.

ACTION REQUIRED J. Cuzzupoli NAA-ATO
Perform test by TPS prior to shipment. 7-29-66

4.1.3.7 Originator D. Marfice NAA-ATO

PROBLEM - C14-442 CTS Displayed Verify Error on Update Check

When sending test message from C14-442 to USBE, a "VERIFY ERROR" was indicated at the C14-442. Also, no validity was received on ACE. (Ref. Phase I Report.)

RESOLUTION

Add to Resolution. It was found that the 1 KC reference in the bi-phase UDL signal was reversed by 180°. An EO 450477, was worked to the CTS wiring. Subsequent checks during OCP-P-0129 with CTS on up-data were good.

4.1.3 Originator D. Marfice NAA-ATO

PROBLEM - Updated Results of OCP-P-8100

RESOLUTION

All sequences were satisfactorily performed. The Phase Report lists the significant problems encountered during the test run of OCP-P-8100.

4.6.9 Originator D. Marfice NAA-ATO

PROBLEM - Poor TV Video

OCP-P-0130A - Sequence 12-073. Unable to verify picture on TV monitor in RF room - TV being transmitted from C/M via S-Band.

Ref. TPS OCP-P-0130A-007

OCP-P-0130A Squawk No. 3

V16-GEN Squawk No. 217

RESOLUTION

Coax connector P141, which carries TV video, has an intermittent short between center conductor and shield. Connector P141 was replaced. Subsequent checks on TV video were good. Investigation determined that the cable and connector were separated apparently due to human error.

4. 6. 10 Originator D. Marfice NAA-ATO

PROBLEM - S-Band PRN Delay Time

During OCP-P-0130B, S-Band PRN delay time was measured by C14-348 Manual Measurement Technique because of a malfunction in the C14-348 digital readout. Ranging delay time was approximately 170 nanoseconds higher than in previous tests. This reading is acceptable pending remeasurement of GSE delays using manual measurement technique.

Doc. OCP-P-0130B Squawk No. 25

RESOLUTION

Manual measurement does not agree with previous C14-348 ranging delay measurements. The reading obtained in OCP-P-0130B is not acceptable but previous C14-348 measurements will be used for delay time. Ranging delay measurements will also be made at Florida Facility.

4. 6. 11 Originator D. Marfice NAA-ATO

PROBLEM - VHF/AM Sounded Garbled on Facility Intercom

During OCP-P-0130B Sequence 19, after establishing communications with CCL position via VHF/AM, it was almost impossible to understand garbled voice transmissions.

RESOLUTION

The difficulty in understanding CCL was due to improper adjustment of the GSE VHF reciever and the audio amplifier that interfaced with facility intercom network. The heavily loaded facility intercom adds much noise to the system and careful adjustment of the GSE is required for the best voice quality. VHF/AM voice checks were loud and clear when not connected to facility intercom.

4. 6. 12 Originator C. Olesen NASA-RASPO

PROBLEM - Sync Loss on S-Band & VHF/FM PCM

During OCP-P-0130B, periodic momentary loss of sync occured at TGS. This caused a loss at ACE since TGS were furnishing them the PCM airborne data.

4. 6. 12 Continued

RESOLUTION

Some momentarily sync losses were expected and noted in the OCP during antenna switching tests. As for other sync losses, TGS played back recorded PCM tapes and sync losses did not appear at the same time as they appeared in real time. This indicates problem was injected by the TGS. Additional ACE SYNC losses were experienced because of TGS/ACE interleaver interface problems. Additionally, the use of electromagnetic environment in this area of Bldg 290 creates an electromagnetic environment in this area, that could cause these momentary losses when radiating in the open loop configuration.

This will be monitored on future CSM. Report at CSM 014 S. A. meeting.

4. 6. 13 Originator D. Marfice NAA-ATO

PROBLEM - No PCM Modulation on VHF/FM and S-Band

During Seq. 28 of OCP-P-0130A, TGS reported no PCM modulation existed on S-Band on VHF/GM.

RESOLUTION

Doc. OCP-P-0130A Squawk No. 6 PRR M118845
TPS-0130A-009 T/S P. A. R. MA025658
TPS-V16-GEN-134

Checks showed no Low Pass Filter or Band Pass Filter outputs from the PMP to the VHF/FM and S-Band Transmitter. The PMP ME 478-0021-0004 was replaced. Original S/N 026720120025 NEW S/N 026720120024. Subsequent checks with PCM modulation were good. Additional copies of PMP discrepancy action records and resolution for unit in S/C 012 were supplied to NASA.

SECTION 5 – INSTRUMENTATION SYSTEMS

Part A – Action Items

5.6.1 Originator H. Roshon/R. Roush NAA-ATO

PROBLEM - Bad Transducer
(CF0550P), diff. press. CP No. 2 branch. Signal conditioner outputs 5.5 vdc with no pressure on ECS lines. S/B 0 vdc. T/X TPS V16-GEN-105 Sqk. No. 180.

DISCUSSION
TPS V16-GEN-175 removes and replaces CF0550P. Meas. verif. to be made during c/o of ECU.

ACTION REQUIRED H. Roshon NAA-ATO 7-29-66
Verify test is completed and data recorded, prior to ship.

5.6.2 Originator H. Roshon/R. Roush NAA-ATO

PROBLEM - Bad Transducer
(CF0481), reads 99.9 percent, should be approx. 23 percent. (CP inlet temp). T/S TPS V16-GEN-074, COM Sqk. No. 337.

DISCUSSION
TPS V16-GEN-101 replaces CF0481T. Meas. verif. to be made during c/o of ECU.

ACTION REQUIRED H. Roshon NAA-ATO 7-29-66
Verify test is completed before shipment and data recorded.

5.6.6 Originator H. Roshon NAA-ATO

PROBLEM - (CT0012X), Tape Motion Monitor, Lamp Stays On When Tape Stops

T/S TPS OCP-0129-059 Sqk. No. 76

DSE converter circuit treatment of 51.2 kc clock, and NRZ data from PCM is such that a feedback or leakage voltage of +2.5 and 0.5 vdc is placed on the B+ and B- (+12 and -5 vdc) lines respectively, of the tape motion sensor module when the

5.6.6 Continued

normal B+ and B- voltages are cut off. A resultant signal of 1.8 vdc is present on the output line of this module. The PCM counts this 1.8 vdc as a binary "one" and outputs the event thus giving a false tape motion "on" indication.

DISCUSSION
EO M521317 changes tape motion sensor module output to reduce the present value of residual voltage (1.8 vdc) to a value below the binary "one" threshold level (1.2 vdc) of the PCM.

This is a DSE design problem.

NOTE: EO not as yet received and no work as yet accomplished.

ACTION REQUIRED Release EO.	D. Turk/G. Mitchell	NAA Eng 7-29-66
ACTION REQUIRED Accomplish mod and verify prior to ship.	J. Cuzzupoli	NAA-ATO 7-29-66

5.6.7 Originator — H. Roshon/R. Roush — NAA Eng

PROBLEM - Battery Charger Output Display
(CC0215) Battery charger current monitor. Output displays 0.01 amps on CRT when C/M meter display indicates greater than 1 amp charging current through battery shunt R4. When a diff. voltage of 100 mv was applied to Diff. Amp. across shunt R4, (with 0 vdc common mode voltage) the CRT display was normal indicating 5 amps. When common mode voltage on shunt was increased to 13 vdc, CRT display dropped to 0.01 amps.

DISCUSSION
Procurement Document MC 901-0081 pp. 3.5.1.3.5.1. specifies common mode rejection to be greater than -95 db up to only 10 vdc. CSM application has this module sensing 2 line having a common mode voltage of greater than 35 vdc. Module P/N 512-3041. T/S TPS OCP-0129-054 Sqk. No. 78, V16-EPS-124 Sqk. No. 167. Current fix proposed, requires conditioner mod with long lead time precision resistors.

5.6.7 Continued

ACTION REQUIRED C. Zeminick NAA-ENG 7-29-66
Make detailed analysis and recommend alternate solution. Either a different fix which does not require a revised signal conditioner or a quick fix using proposed method.

5.6.9 Originator H. Roshon/R. Roush NAA-ATO

PROBLEM - Heat Shield Instrumentation
The aft shield instrumentation has not been tested while connected to the spacecraft.

DISCUSSION
This test will be conducted when the heat shield is electrically mated to C/M while in the heat shield fixture at Downey.

ACTION REQUIRED H. Roshon/R. Roush NAA-ATO
Verify completion of test and report. 7-29-66

5.6.12 Originator L. Braquet NASA-KSC

PROBLEM - Q Ball Vector Display
Q Ball Vector sum meas. LS000 IV spacecraft display was checked out; however this does not prove that the system will function properly with the Q ball, panel meter, and PCM. KSC reported S/C 009 had a problem with loading of this circuit.

DISCUSSION
Further investigation of the interface is required as there may be an incompatibility between the two.

ACTION REQUIRED F. Rotramel NASA MSC
7-29-66

Investigate and report.

ACTION REQUIRED L. Troolines NAA Eng
7-29-66

Verify ICD for meter and Q-Ball requirements.

5.6.15 Originator C. E. Olesen NASA-RASPO

PROBLEM - Panel Replacement
Rework of panel 19 and retest is required.

DISCUSSION
Check out flight qualification recorder switch after panel installation with mission equipment for proper operation.

ACTION REQUIRED H. Roshon NAA-ATO 7-29-66
Will be checked during TV checkout with aft heat shield checkout at Downey.

5.6.17 Originator NASA Crew

PROBLEM - Calibration Curves
Need calibration curves for CSM panel meters.

DISCUSSION
None

ACTION REQUIRED R. Parsons NAA-ATO 8-20-66
Provide calibration curves for CSM panel meters and TM data. Information to go to Astronauts at KSC.

5.6.18 Originator R. Lanzkron NASA-MSC

PROBLEM - CTE Mod on CSM 011 NAA-ATO 7-29-66
Is this mod to be accomplished on CSM 012? (This is an input filter.)

DISCUSSION
Mod is being done on CSM 011 at the present time. NAA Eng recommends that this mod be accomplished on a non-interference basis. Do not modify CSM 014 until CSM 014 Systems Assessment.

ACTION REQUIRED R. Roush NAA-ATO 7-29-66
Make the CTE Mod on CSM 012 per released documentation (hardware is available) prior to ECU checkout.

5.6.21 Originator D. Marfice NAA-ATO

PROBLEM - LEM Recorder Checkout
The LEM recorder functional checkout has not yet been accomplished per MA0203-0402.

DISCUSSION
It is presently planned to perform the LEM recorder functional checkout with CSM in the heat shield fixture. GFE equipment not yet available.

ACTION REQUIRED J. Cuzzupoli NAA-ATO 7-29-66
Functional checkout of LEM recorder will be done by TPS prior to shipment.

SECTION 5 – INSTRUMENTATION SYSTEMS

Part B – Historical Information

5.6.3 Originator H. Roshon/R. Roush NAA-ATO

PROBLEM - Caution and Warning Alarm at Separation
(SP0020T) SPS Wall Temp Hi. Causes a Master Alarm during CSM separation. With C/W mode switch on panel 11 in the C/M position, only the SPS Wall Temp lamp on panel 11 is inhibited. The Master Caution is still received. T/S TPS OCP 130B-007A Sqk. No. 8.

RESOLUTION
(SP0020T) temp. sensor is the 4th resistance gage of a bridge ampl. in the Collins SCE in the C/M. On separation, the bridge ampl. senses the opened line input as a maximum increase in sensor resistance and ouputs the corresponding voltage level which in turn triggers the Master Caution Alarm as a high temp. condition.

All KSC procedures must indicate that the C&W switch will be set in the CM/SM position not CM.

5.6.4 Originator H. Roshon/R. Roush NAA-ATO

PROBLEM - Lack of DSE SYNC
Ref. OCP-P-0130 (Dry Run). Unable to obtain sync on S-Band or VHF-FM data playback from DSE.

T/S TPS OCP-0130-015 Sqk. No. 23. Track No. 4 data missing on playback ME 435-0013-0035 S/N 053330150015.

RESOLUTION

DSE package problem. Bits 4 and 8 missing from data in all words. This indicates faulty digital channel. CSM 012 DSE was replaced with SC 014 DSE. New package performance was OK in OCP 0129 and 0130 reruns.

SC 012 DSE had a module failure.

PAR No. 28656 dated 7-9-66.

5.6.5 Originator H. Roshon/R. Roush NAA-ATO

PROBLEM -
(SP0020T) SPS Wall Temp Hi. Indicates -26 F on CRT, should be +75 F nominal. Resistance of sensor measured properly at 3.3 K ohms. However, one side of sensor measured less than 1 ohm to VGP. Shield ground is electrically connected to one side of the temp. sensor which functions as the fourth side (active gage) of a differential bridge amplifier. This electrical connection is made within the Aerojet harness per Aerojet design but appears to be unstable and incompatible with the design of Collins diff. bridge ampl.

T/S TPS V17-GEN-107 Sqk. No. 199

RESOLUTION
EO M504005 removed VGP ref. to (Aerojet harness) shield of SP0020T. A complete end to end check will not be done at Downey. Ohmmeter check only will be accomplished.

5.6.8 Originator (Flight Crew)

PROBLEM - Digital Event Timer
When starting or resetting the digital event timer, it will spin rapidly prior to picking up the count.

RESOLUTION
This is normal for this digital counter. In order to reset in the time allowed all columns move to the correct setting at once.

5.6.10 Originator H. Roshon/R. Roush NAA-ATO

PROBLEM - Measurement
The following measurements were not installed for OCP 0130.

RESOLUTION
These measurements have been channel identified and polarity checked during subsystem OCP's and are listed for information only.

5.6.10 Continued

Measurement No.	Title
CA5480T	Temp Aft Heat Shield
CA5481T	Temp Aft Heat Shield
CA5482T	Temp Aft Heat Shield
CA5483T	Temp Aft Heat Shield
CA5484R	Flux Aft Heat Shield
CA5490T	Temp Aft Heat Shield
CA5491T	Temp Aft Heat Shield
CA5492T	Temp Aft Heat Shield
CA5493T	Temp Aft Heat Shield
CA5494R	Flux Aft Heat Shield
CC0178T	Temp Batt "A" Case
CC0179T	Temp Batt "B" Case
CC0188P	Press Batt Comp Manif
SC2160X	PH Factor H_2O Condition, F. C.
SC2161X	PH Factor H_2O Condition, F. C.
SC2162X	PH Factor H_2O Condition, F. C.
SC2060P	N_2 Press F. C. 1 Regulated
SC2061P	N_2 Press F. C. 2 Regulated
SC2062P	N_2 Press F. C. 3 Regulated
SC2066P	O_2 Press F. C. 1 Regulated

5.6.10 Continued

Measurement No.	Title
SC2067P	O_2 Press F.C. 2 Regulated
SC2068P	O_2 Press F.C. 3 Regulated
SC2069P	H_2 Press F.C. 1 Regulated
SC2070P	H_2 Press F.C. 2 Regulated
SC2071P	H_2 Press F.C. 3 Regulated
SC2081T	Temp F.C. 1 Cond Exhaust
SC2082T	Temp F.C. 2 Cond Exhaust
SC2083T	Temp F.C. 3 Cond Exhaust
SC2084T	Temp F.C. 1 Skin
SC2085T	Temp F.C. 2 Skin
SC2086T	Temp F.C. 3 Skin
CF0153T	Temp Comp Inlet
CF0008T	Temp Suit Suit Supply Manif
CF0012P	Press Suit Demand Reg Sense
CF0015P	Press Suit Compressor Dif
CF0016P	Press Glycol Pump Inlet
CF0017T	Temp Glycol Evap Outlet Steam
CF0018T	Temp Glycol Evap Outlet Liquid
CF0019Q	Quantity Glycol Accumulator

5.6.10 Continued

Measurement No.	Title
CF0034P	Back Pressure Glycol Pressure
CF0135R	Temp Compressor Inlet
CF0136R	Flow Rate Man Inlet to Suit 2
CF0137R	Flow Rate Man Inlet to Suit 3
CF0184T	Temp CO_2 Absorber Outlet
SF0041T	Temp O_2 Tank 1
SF0042T	Temp O_2 Tank 2
SF0043T	Temp H_2 Tank 2
SF0044T	Temp H_2 Tank 2
SR5001P	He Pressure Tank A
SR5002P	He Press Tank B
SR5003P	He Press Tank C
SR5004P	He Press Tank D
SR5065T	Temp Engine Pkg A1
SR5066T	Temp Engine Pkg B1
SR5067T	Temp Engine Pkg C1
SR5068T	Temp Engine Pkg D1
SR5729P	He Manifold Press
SR5733P	Oxidizer Manifold Press
SR5737P	Fuel Manifold Press

5. 6. 10 Continued

Measurement No.	Title
SR5776P	He Manifold Press
SR5784P	Fuel Manifold Press
SR5817P	He Manifold Press
SR5821P	Oxidizer Manifold Press
SR5822P	Fuel Manifold Press
SR5823P	Fuel Manifold Press
SR5830P	He Manifold Press
SR7128T	Temp Inj. Head/Y Eng Syst. B
SR7134T	Temp Inj. Head CCW Eng. Sys.
LS0001V	Q Ball Vector Sum Output
LS0090X	Tower Physical Separation Mon A
LS0091X	Tower Physical Separation Mon B
CS0100X	CM-SM Physical Separation Mon A
CS0101X	CM-SM Physical Separation Mon B
SP0048T	MCR 1451
SP0049T	MCR 1451
SP0045T	MCR 1451
SP0054T	MCR 1451
SP0055T	MCR 1451
SP0057T	MCR 1451
SP0058T	MCR 1451

5.6.10 Continued

Measurement No.	Title
CJ0001J	Imp. Pneumograph Astro 1
CJ0003J	Imp. Pneumograph Astro 2
CJ0004J	Imp. Pneumograph Astro 3
CF0002J	Pneumograph Sel Sw Out Sig
CJ0060J	EKG Axis 1 Astro 1
CJ0061J	EKG Axis 1 Astro 2
CJ0062J	EKG Axis 1 Astro 3
CJ0063J	EKG Axis 2 Astro 1
CJ0064J	EKG Axis 2 Astro 2
CJ0065J	EKG Axis 2 Astro 3
CJ0066J	EKG Axis 1 Sel Sw Out Sig
CJ0067J	EKG Axis 2 Sel Sw Out Sig
CJ0211X	Sel Sw Position Astro 2
CJ0212X	Sel Sw Position Astro 3

5.6.13 Originator R. Roshon/R. Roush NAA-ATO

PROBLEM - Hi Low PCM Rate Switch

It should be noted that the PCM high-low switch alone does not put the PCM in Low bit rate configuration.

RESOLUTION

The UDC relay must also be reset (PNL 19 "UP TLM CMD"). KSC procedures should reflect this.

5.6.14 Originator L. Braquet NASA-KSC

PROBLEM - UDL CTE Update at T_o

The UDL may not be available for update of CTE at exactly T_o, which was the mode of reset verified by testing at Downey.

RESOLUTION

The mission CTE reset time has not been established and KSC must incorporate CTE reset time in UDL tape.

5.6.16 Originator W. T. Armstrong (Flight Crew)

PROBLEM -

During certain portions of S/C 012 testing, instrument calibration data for S/C 008 was used. Future testing should employ the correct calibration data for the vehicle being tested.

RESOLUTION

S/C 008 data not used. S/C 011 Fuel Cell substitution unit cal data was used. These curves are the only data available for fuel cell substitution unit. When flight fuel cells are used, correct cal data will be used.

5.6.19 Originator J. Seigler NASA R&QA

PROBLEM - Temperature Transducer Failures

What is NAA action to upgrade these sensors (silicon sensor).

RESOLUTION

All similar items are being changed to platinum. All instrumentation replaced is of the new type which will reduce the failure rate.

SECTION 6 – REACTION CONTROL SYSTEM

Part A – Action Items

6.6.1 Originator L. Hull NASA-KSC

PROBLEM - SM RCS Propellant Isolation
There is a need to be able to assure the SM RCS propellant isolation valves are open prior to lift-off.

DISCUSSION
Two fixes were proposed:

1. MCR 1615, study only, which has not yet been implemented, will provide propellant isolation valve open position monitoring capability.

2. Wiring indicator switches in parallel gives positive open indication (both valves).

NASA R. Lanzkron agrees to fix number two, which will be approved when requested. This applies to future vehicles.

ACTION REQUIRED J. Gibb NAA-ENG 7-29-66
Implement fix No. 2 immediately. Report status at CARR.

6.6.2 Originator R. Taeuber NASA-MSC

PROBLEM - SM RCS Quantity Gauging System
What effort is required to change the existing SM RCS quantity gaging system to configure for flight? The SC 012 and SC 008 configurations must be identical for thermal test procedures.

DISCUSSION
MCR 1587, EO M464896, 7, 8 change the existing gaging system (Paint tanks). SC 008 configuration for Quad D is not painted but should be the same as SC 012.

ACTION REQUIRED J. Gibb NAA Eng
Revise MCR A 1587. 7-26-66
This revision is not a CSM 012 CARR item.

6.6.3 Originator L. Hull NASA-KSC

PROBLEM - RCS MCR 1599 Box Installation
Refer to MCR 1599 (Installation of RCS switch-over boxes). Can the RCS boxes be installed without removing the aft heat shield? Why is this to be accomplished at the Cape?

DISCUSSION
The boxes will not be available in Downey before shipping the CM. Design and the project office assure that the boxes can be installed with the aft heat shield installed. But this may not be possible.

ACTION REQUIRED R. Larson NAA Eng 7-21-66
Make a mock-up box to assure box can be installed with the aft heat shield in place and report. Initiate corrective action if box can not be installed. Report.

6.6.4 Originator R. Taeuber NASA-MSC

PROBLEM - SM-RCS Valve Signatures
The SM-RCS valve signature traces indicate that either valve may close first but it is impossible to predict which one.

DISCUSSION
The cause is unknown but it is not a detrimental indication. This is documented on EO M421370.

ACTION REQUIRED J. Gibb NAA Eng 7-21-66
Supply rationale supporting EO M421370.

6.6.5 Originator L. Hull NASA-KSC

PROBLEM - PVT Installation
Refer to MCR 1587 (Replacement of Gianini gaging system). When will He tank sensing system be installed on CM and Quads? What is KSC's level of effort required?

DISCUSSION
A definition of task is required. The EO's are currently being collected into kit form and will be incorporated at KSC.

ACTION REQUIRED J. Gibb NAA Eng 7-26-66
Submit complete plan of action.

6.6.6 Originator R. Taeuber NASA-MSC

PROBLEM - H_2 Tank Growth

Justification is needed to show that abnormal growth of helium tank (Quad D) has not caused loosening of the tank thermocouple.

DISCUSSION

Verify that tank history shows no abnormal characteristics and that the C/O (OCP 4175) did not subject it to conditions as severe as DVT or acceptance tests. Tank growth not a shipping constraint, however test data is required for evaluation.

ACTION REQUIRED J. Gibb NAA Eng 7-21-66

DVT and acceptance test information is to be supplied for comparison.

6.6.7 Originator R. Taeuber NASA-MSC

PROBLEM - ACE Monitoring Capability

Engine direct coil ACE monitor capability has not been implemented.

DISCUSSION

It should be accomplished for KSC checkout. Overheating of valves during test would have been prevented if this had been implemented. An RFC No. 12-3-29 was initiated. The study was completed (IL 696-600-040-66-120 dated 4-28-66).

ACTION REQUIRED R. Larson NAA Eng 7-26-66

Insure incorporation at KSC for CSM 012 test. Report status prior to CARR.

6.6.8 Originator W. Manha NAA-ATO

PROBLEM - Quad C

Quad C has not been sold to NASA.

DISCUSSION

The retest of replaced relief valves is in work and buy-off is pending completion.

ACTION REQUIRED C. McKim NAA-ATO 7-21-66

C. McKim is to sell Quad C. Report completion.

6.6.9 PROBLEM - RCS Contamination

Rework has caused excessive contamination.

DISCUSSION

This was documented by Squawk No. 18.

ACTION REQUIRED R. Larson NAA-ATO 7-20-66

Report to R. Lanzkron by 7-20-66 at 1400 hours on existing CSM 012 RCS contamination.

SECTION 6 – REACTION CONTROL SYSTEM

Part B – Historical Information

6.1.1.2 Originator W. D. Manha NAA-ATO

PROBLEM - Additional Phase I Report Information
"CORRECTIVE ACTION" and "DOCUMENTATION" are omitted in the Phase I Report.

RESOLUTION
"CORRECTIVE ACTION" is "The cable was identified at P132 per V16-42D337. Refer to V16-447121."

"DOCUMENTATION" is "Squawk 2, V16-OCP-4171-012 TAIR BOOK."

6.1.10.10 Originator W. T. Armstrong (Flight Crew)

PROBLEM - Oxidizer Isolation Valve Overheating
During OCP 7070, an RCS oxidizer isolation valve was overheated. Has this valve been replaced? If not, what guarantee is there that the mean time failure has not been degraded?

RESOLUTION
The noted discrepancy is acceptable to NAA engr. RCS design engr. indicated a leakage rate of 1 ma at 100 vdc was acceptable. Resistance check to solenoid body showed that there was a leakage rate of 15 megohms at 50 vdc. This is in excess of acceptable level indicated above by 300 times. However, a supplier test of this component demonstrated infinite operation of this unit at 120°F - 140°F temperatures. The valve was subjected to five days of operations at temperatures up to 380°F (3 times spec) without failure.

6.6.10 Originator S. Harvey NASA-RASPO

PROBLEM - Oxidizer Valve Leakage
During an injector valve leak test, it was observed that the -Y Sys B oxidizer valve leaked substantially more than the other valves but was well within tolerance.

6.6.10 Continued

RESOLUTION
The leakage rate of approximately 1.8 cc/hour is acceptable.

6.6.11 Originator W.D. Manha NAA-ATO

PROBLEM - RCS Engine Valves
During flow test on +P sys B replacement engine, the engine (fuel and oxidizer) valves failed to open.

RESOLUTION
The system was trouble shot but no problems could be detected. Failure of valve to open could not be repeated. The no-opening condition is attributed to the hand controller not being held at the hard stops.

6.6.12 Originator W.D. Manha NAA-ATO

PROBLEM - Quad C Pitch Engine
During test there was an indication of no flow through Quad C -Pitch Engine (GR8500). Before the system was trouble shot the Quads were removed. S/C troubleshooting did not reveal any problems. The squawk was transferred from the SC to the Quad C Books. T/S quad C did not reveal any problems.

RESOLUTION
The lack of a flow indication is attributed to the flow sensors or related equipment, which could not be set up to duplicate the original configuration because of the quad being removed. Reverification will be accomplished at KSC.

6.6.13 Originator W.D. Manha NAA-ATO

PROBLEM - RCS Engine Overheat
The normal coils of the CM RCS engines were accidentally energized for a period of time. Four engines exceeded the 200°F maximum operational temperature.

RESOLUTION
Refer to OCP-P-0126 NASA Sqk. No. 5. The four engines (+P and +Y SYS A and B) that exceeded 200°F were removed and replaced. Those engines that did not exceed 200°F were not degraded because the engines are designed to operate in environments up to 200°F.

6.6.14 Originator W. Manha NAA-ATO

PROBLEM - Excess Operating Time on RCS Engines
The direct coils of the CM RCS engines were energized for 26 minutes. The maximum injector valve temperature observed was 184°F.

RESOLUTION
Refer to V16-GEN-Sqk 242, OCP-P-0130-SC 012 (dry run) Seq. 27-082. Since the engines are qualification tested for a 200°F working environment, the condition was accepted by NAA and NASA.

6.6.15 Originator W. T. Armstrong
(Flight Crew)

PROBLEM - Service Module RCS Quantity Gaging System
Additional information is required on the status of the SM/RCS quantity gaging system with respect to accuracy, reliability, and possible effects on scientific experiments.

RESOLUTION
S/M RCS quantity gaging system to be deleted per MCR A 1587. PVT gauging techniques will be used. See item 6.6.5 in Part A.

SECTION 7 – SERVICE PROPULSION SYSTEM

Part A - Action Items

7.6.2 Originator N. Townsend NASA-MSC

PROBLEM - Contamination Check
Cold flow & engine contamination checks have not been completed to reverify engine operation by NASA approved TPS's following rework.

DISCUSSION
Portions of OCP 4131 affected by dismantiling will be reperformed per signed off TPS.

ACTION REQUIRED W. Jepson NAA-ATO 7-29-66
Provide verification that above was accomplished.

7.6.3 Originator N. Townsend NASA-MSC

PROBLEM - Single Point Failure in FCSM
In order to eliminate a single point failure, the FCSM requires a change to the switch and a continuity check.

DISCUSSION
An E.O. has been written to cover this change as requested by the astronauts. Since the basic system has been proven by OCP's it is not necessary to perform or complete systems check again. It is necessary to make a careful electrical continuity check of all new wiring and switches at Downey after completion of work.

ACTION REQUIRED W. Hutchenson NAA-ATO 7-22-66
Provide verification that problem has been corrected.

7.6.4 Originator W. Jepson NAA-ATO

PROBLEM - Damaged FCSM Cable
FCSM calbe is damaged at +z position under locking link shoulder and also kinked severly 4" back from connector as described in Squawk No. 242.

7.6.4 Continued

DISCUSSION
Damage seems to be confined to the cable shield.

ACTION REQUIRED J. Long NAA-QA 7-29-66
Normal MR action is required and problem must be resolved and operation of cable verified before S/C leaves Downey.

7.6.5 Originator N. Townsend NASA-MSC

PROBLEM - Engine Heater Wiring
Existing wire routing to engine heaters is not satisfactory, i.e., attachment technique and stress relief.

DISCUSSION
NAA engineering to provide technical assistance to reconfigure wiring installation. Present heater wiring must be properly protected and drawings or on-the-spot E.O.'s provided, to cover routing, terminations, clamping check out etc. This action will require full time engineering support to assure a timely job is produced.

ACTION REQUIRED J. Lewin NAA Eng 7-22-66
Provide engineering documentation and support to correct the problem.

ACTION REQUIRED W. Jepson NAA-ATO 7-22-66
Installation and a continuity check to be completed at Downey.

7.6.6 Originator N. Townsend NASA-MSC

PROBLEM - Sump tank Installation
Reverification of O_2 and fuel sump tank is required following tank replacement for standpipe fix. During cold flow pretest the welded joints between the fuel and oxidizer sump tanks and the engine should be proof tested to 1.25 times operating pressure as a KSC safety requirement.

DISCUSSION
This will be accomplished during cold flow tests per TPS. Full integrity of any fuel, oxidizer or pressurization lines cut during tank reqork will be verified to 1.25 times operating pressure (approximately 218 psi).

7.6.6 Continued

ACTION REQUIRED W. Jepson NAA-ATO 7-22-66
Provide verification that above was accomplished.

SECTION 7 – SERVICE PROPULSION SYSTEM

Part B - Historical Information

7.6.7 Originator R. Butterworth NASA-KSC

PROBLEM - SPS Heater Checkout and FSCM Checkout
When will the checkout of work on these systems be completed?

RESOLUTION
The SPS Heater mod and MCR 1581 (FCSM) will be completed at Downey. Continuity checkout of the SPS heater temperature monitor modification and FCSM mod will be accomplished in Downey. Complete integrated check will be accomplished at KSC.

SECTION 8 – STABILIZATION AND CONTROL SYSTEM

Part A - Action Items

8.6.1 Originator W. Armstrong (Flight Crew)

PROBLEM - Flight Director Attitude Indicator
During vehicle testing, when rate gyro power is off, reference voltage is removed from the demodulators which causes a continuous and rapid limit cycling of the FDAI rate-gage needles. During testing, this condition was observed to continue for many hours. A means for providing reference voltage to the display must be available during future testing to prevent this from occurring.

DISCUSSION
The problem will occur in flight and is not peculiar to testing. When the "SCS Partial Power" switch is "on" the RGP must be also "on". If it becomes necessary to turn the RGP power "off" the Rate Gyro switches on Panel 8 should be in "BMAG" position.

ACTION REQUIRED R. Larson NAA-ENG 7-29-66
Verify with M-H that no damage occurred to the unit as a result of this cycling.

8.6.2 Originator W. Armstrong (Flight Crew)

PROBLEM - Attitude Controller Isolation
The capability to isolate the attitude controllers must be verified so that malfunctions within the controller cables can be quickly removed from the control electronics loop, and still retain the required flight characteristics.

DISCUSSION
This information was previously requested from engineering.

ACTION REQUIRED R. Larson NAA Eng 7-29-66
Study and report prior to CARR on the SCS loop changes when one controller is removed from the system.

8.6.5 Originator R. Burt/L. Hill NAA-ATO

PROBLEM - Meter Reading Errors
When Rate Needles are in the ±1 deg/sec full scale-mode the following indications are observed -

Roll reads 0.2 degree offset

Yaw reads 0.1 degree offset

Pitch reads 0.0 degree offset

Should read 0 degree offset.

DISCUSSION
There is no resolution to the gage problem at the present time since this scale uses a 140 mv/0.1 degree input to the gage. There is no problem of error in the rate gyros. If there were the system would stabilize about the offset output bias.

ACTION REQUIRED W. Fouts NAA Eng 7-29-66
Verify report that spacecraft hardware functional capability as stated above is acceptable for maneuvering at 0.5 deg/sec and report prior to CARR

8.6.6 Originator W. Armstrong (NAA Pilots)

PROBLEM - RCS capability During Main Bus Failure
Due to the manner in which the S/M RCS engines are apportioned between Main Bus A and Main Bus B, it appears that failure of either bus would prevent the simultaneous achievement of X translation and attitude control.

DISCUSSION
Both are required simultaneously to accomplish SPS thrusting or RCS retro. Can +X translation and attitude control be accomplished if one bus fails?

ACTION REQUIRED R. Larson NAA Eng 7-29-66
Problem will be evaluated and solution reported prior to CARR.

8.6.7 PROBLEM - Hand Controller Cables

Controller Cables have been damaged during CSM testing on all controllers.

DISCUSSION

The cables require additional protection. This may be done with Heat Shrink sleeving or spiral tape.

ACTION REQUIRED R. Larson NAA-ENGR 7-29-66

The handcontrollers will be PRR to Honeywell, to incorporate the sleeving. Engineering will authorize this action.

8.6.8 Originator R. Burt/L. Hill NAA-ATO

PROBLEM - FDAI Harness Checkout

FDAI harness Hipot and Physical Mating Verification (Ref. Squawk No. 249) have not been accomplished.

DISCUSSION

This will be completed prior to shipment.

ACTION REQUIRED N. Casson NAA-ATO 8-4-66

Accomplish by TPS (which is in preparation) and report results.

8.6.9 Originator W. Armstrong (Flight Crew)

PROBLEM - Delta V Counter

During Downey testing, the Delta V Counter was repeatedly driven to the stops where it would chatter for considerable periods of time. What degradation to the display has occurred?

DISCUSSION

This occurred about 5 or 6 times during testing for periods up to 15 min.

ACTION REQUIRED W. Fouts NAA Eng 7-29-66

Determine if any detrimental consequences have or will occur due to the described chatter during past and future testing.

8.6.11 Originator W. Armstrong (Flight Crew)

PROBLEM - No. 1 Translation Controller Color Coding
The original engineering requirement to paint the No. 1 Translation Controller so that it may be identified as the one incorporating the Abort feature is not adequate.

DISCUSSION
During Downey testing, the No. 1 controller cannon plug was connected to the No. 2 vehicle plug and the test team was getting ready to re-lable the vehicle before the error was discovered. The controller, both ends of the connector cable, and the spacecraft connector plug (J167) should all have yellow and black diagonal stripes so that there is no possibility of improper installation by either the test teams or the flight crew. Engineering has provided the documentation to accomplish this on CSM 012.

ACTION REQUIRED N. Casson NAA-ATO
Accomplish the coding and verify. 7-29-66

8.6.13 Originator R. Burt/L. Hill NAA-ATO

PROBLEM - Deadband Requirements
Information concerning propellant consumption in the 0.2 and 0.5 attitude and rate deadband is not available.

ACTION REQUIRED W. Fouts NAA-ENG
7-29-66
Define actual attitude and rate deadbands to be used and provide analysis to verify propellant consumption is not excessive for the planned mission. Report prior to CARR.

8.6.17 Originator W. Armstrong (NAA Pilots)

PROBLEM - FDAI Alignment
When alligning the FDAI with the align pushbutton, releasing the button caused the Roll Attitude Error Needle, the Roll Indice; and the Attitude Ball to jump 4 to 5 degrees away from the desired position and remain there.

DISCUSSION
The 4 to 5 degree jump occurs due to incorrect procedures in the FDAI align sequence.

8.6.17 Continued

The OCP's at Downey have been corrected to prevent this from occurring during future spacecraft testing. The correct procedure is to perform the FDAI align function in backup rate mode or in another mode when the BMAG's are not returned to the AGGV loop upon removal of the FDAI align command.

ACTION REQUIRED W. Fouts NAA-ENG 7-29-66
The operational procedures used by the flight crew are to be changed to overcome this problem.

8.6.18 Originator R. Burl/L. Hill NAA-ATO

PROBLEM - Extraneous SCS Pulses
Extraneous pulses (5 msec) were noted at output of SCS solenoid. PCM data indicated these extraneous 1 bit pulses (Normal pulse is 18 msec).

DISCUSSION
It is not considered to be an SCS problem and it is not considered to have bothered the RCS.

ACTION REQUIRED R. Larson NAA-ENG 7-29-66
Determine probable cause of these pulses and report.

SECTION 8 – STABILIZATION AND CONTROL SYSTEM

Part B - Historical Information

8.1.2.1 Originator F. Brown NAA Eng

PROBLEM -Master Caution Alarm
Master Caution Alarm came on when Pitch Gimbal Drive Motor was activated.

RESOLUTION
This was caused by overcurrent relay transient signal. An engineering prototype filter has been evaluated in the CSM during integrated test. The filter was found to be acceptable and a deliverable unit will be installed in CSM 012 per MCR 1515 RI. The RF filter will be added to the S/C wiring at KSC. Hardware will be available about 8-16-66.

8.6.3 Originator W. Armstrong (Flight Crew)

PROBLEM - BMAG Alignment
What is the effect of activating the BMAG's when they are cold? Does loss of the heaters destroy the backup attitude reference system?

RESOLUTION
The BMAG's may be started cold five times before it becomes necessary to recheck the mass unbalance drift characteristics. No physical damage can be done to the gryo rather wheel preload. However, torque changes due to lower operating temperatures may cause shifts in gyro drifts if numerous cold starts occur. Since the mass unbalance drift characteristics have been checked and 5 starts are currently available on CSM 012.

8.6.4 Originator W. Armstrong (NAA Pilots)

PROBLEM - Translation Controller Force Gradients
Due to the force gradient characteristics, rotating the translation controller from the MTVC (CW) position to the NEUTRAL position results in overshoot to the ABORT (CCW) position. This condition has resulted in many in-test difficulties. Either the force required to rotate the controller from NEUTRAL to the ABORT position should exceed that required to return the controller to NEUTRAL from the

8.6.4 Continued

MTVC position or a removable lock pin should be provided to prevent inadvertent rotation to the ABORT position.

RESOLUTION
For all occasions except during launch the abort switch circuit breakers are open and non-functional. During SPS abort, the only effect of going back into ABORT position after MTVC would be to short the +X direct coil.

8.6.10 Originator W. Armstrong (Flight Crew)

PROBLEM - Minimum Impulse
The flight Crew requires information concerning the minimum impulse firing that could be achieved using manual ignition and shutdown techniqes.

RESOLUTION
The spacecraft minimum impulse firing characteristic are contained on curve 3-7, page 3-29 of SID 65-1702.

8.6.12 Originator W. Armstrong (NAA Pilots)

PROBLEM - No. 1 Attitude Controller
The locking pin for the No. 1 Attitude Controller requires approximately 20 to 25 pounds of pull force to remove it from the handgrip. This magnitude of exertion is unacceptable during zero g operations.

RESOLUTION
This was caused by a mechanical obstruction in the locking pin insert hole (located on the handgrip). Rework of the handgrip proved sufficient.
Note: Both rotation handcontrollers have been replaced.

8.6.14 Originator R. Burt NASA-MSC

PROBLEM - Data Required
Data verification is required for Seq. 19-585 OCP-0130B. (Opposite Roll jets fired, no pitch, correct YAW).

8.6.14 Continued

RESOLUTION
G/N input was Pitch + 1.88 VRMS CG2206

Yaw +7.5 VRMS CG2236

Roll - 7.5 VRMS CG2266

Data was received and found to be correct as stated above.

8.6.15 Originator J. Stilley NASA-KSC

PROBLEM - "THUST ON/OFF/NORMAL" Switch Single Point Failure
A single point failure exists in the SCS Thrust on/off/normal switch as follows: If this switch cannot, or has not been turned to "OFF" prior to CM/SM separation it will cause the pitch and yaw auto control interrupt.

RESOLUTION
This problem is circumvented on unmanned configuration spacecraft by installing circuit interrupters (S/C-009 & 011, 017 & 020). However manned configuration spacecraft, including CSM-012 have no interrupters. If a failure of the "thrust on/off" switch occurs the astronaut has the capability of using the direct RCS coils. This then provides the "Back-up" system for the auto coils.

8.6.16 Originator J. Stilley NASA-KSC

PROBLEM - Retest Requirements
The following SCS interfaces have been or will be invalidated prior to shipment due to removal of equipment.

RESOLUTION
This equipment includes: AGAA, FDAI, G&N, RGP, DECA, SPS engine, rotation controllers and RCS motor switches.

Violation of these interfaces compromises KSC, MSC philosophy of the S/C being delivered in flight ready configuration. NASA/NAA should exercise extra precautions during KSC checkout to insure all interfaces are verified.

SECTION 9 – GUIDANCE AND NAVIGATION SYSTEM

Part A - Action Items

9.3.4.1 Originator S. Snipes NASA-MSC

PROBLEM - IMU - Excessive Drift
IMU S/N-9 in G&N 12/50 exhibited X-IRIG excessive drift, excessive and unstable X-PIPA misalignment about Z, and X-PIPA scale factor.

DISCUSSION
IMU S/N-9 was removed from S/C. Lab tests indicate X-IRIG and X-PIPA failures. Replacement of the IMU will alleviate this condition. During S/C testing the IMU was damaged by sudden loss and reapplication of power to the S/C several times due to incorrect operator procedure.

ACTION REQUIRED J. Kaiser ACED 8-4-66
Replace IMU S/N 9 with IMU S/N 2 which has been repaired.

ACTION REQUIRED R. Larson NAA Eng
Drop-out relay is to be added to GSE. 7-29-66

ACTION REQUIRED N. Casson NAA-ATO 7-29-66
Insure operator procedures are modified to prevent sudden reapplication of power.

9.3.4.3 Originator S. Snipes NASA-MSC

PROBLEM - Qual Testing
The Qualification test program is incomplete for the G&N system.

DISCUSSION
Estimated completion of the program is August, 1966.

ACTION REQUIRED H. Brady ACED 7-29-66 and Before Flight
Qualify G&N system prior to flight e. g., humidity, overstress vibration, earth landing shock, eyepiece stowage units test, etc. Report status prior to CARR. This is a constraint to FRR.

9.3.4.4 Originator W. Armstrong (Flight Crew)

PROBLEM - Astro Sextant Door Modification
The Flight Crew requires information regarding the degree that the Astro Sextant Door Modification will restrict the field of view of the Scanning Telescope and the Astro Sextant.

DISCUSSION
MIT and NAA/S&ID are working on an Interface Control Document which will define this new field of view.

ACTION REQUIRED D. Hoag MIT - NAA 8-5-66
MIT & NAA to prepare Interface Control Document.

9.3.4.5 Originator NASA Flight Crew

PROBLEM - IMU C/B Guard
Guard for IMU heater circuit breakers on MDC panel 22 is requested.

DISCUSSION
A suitable guard with breaker visible for the IMU heater circuit breakers should be provided in order to preclude inadvertent pulling of these breakers. Power applied to the IMU without the heaters being on first damages the IMU. A suitable guard is not available.

ACTION REQUIRED R. Larson NAA-ENG 7-29-66
Paint the breakers red per direction R. Lanzkron, NASA.

9.3.4.6 Originator S. Snipes NASA-MSC

PROBLEM - Parity Fail and TC TRAP
OCP-P-0130B AGE Squawks

Squawk 12 AGC Parity Fail

Squawk 14 AGC TC Trap

DISCUSSION
No reason has yet been determined for these two occurrences.

9. 3. 4. 5 Continued

ACTION REQUIRED J. Kaiser ACED 7-29-66

Perform thorough acceptance test on AGC while it is out of the S/C to verify proper operation to resolve these problems and report.

SECTION 9 – GUIDANCE AND NAVIGATION SYSTEM

Part B - Historical Information

There is no historical information to be documented in this section.

SECTION 10 – SEQUENTIAL SYSTEMS

Part A – Action Items

10.6.1 Originator W. O'Brien NAA-ATO

PROBLEM - Fuse Module
Fuse module reinstallation on V16-540130-101 PCVB (Pyro Continuity Verification Box)

DISCUSSION
The NAA Engineering plan of action IL 693-300-040-66-985 dated 12 July 1966, defines the rework required.

ACTION REQUIRED W. O'Brien NAA-ATO 7-29-66
Pyro res. measurements will have to be reverified on all firing circuits to the PCVB in Downey.

All other connections will be verified during KSC integrated testing.

10.6.2 Originator W. O'Brien NAA-ATO

PROBLEM - RCS Redundant Switch Mod
Reaction control system redundant switch installation per MCR 1599 has not been completed.

DISCUSSION
1. It will be worked in Downey except relay box installation.

2. Continuity test will be done at Downey and reported prior to CARR.

3. Functional testing will be performed during integrated testing at KSC.

ACTION REQUIRED W. O'Brien NAA-ATO 7-29-66
Verify Downey effort is accomplished and document.

10.6.3 Originator W. O'Brien NAA-ATO

PROBLEM - TD Reset
Sixty-one sec time TD reset should be through the flyaway umbilical instead of ACE Carry On as at present.

DISCUSSION
1. It will be worked in Downey.

2. It will be installed and functionally checked in Downey.

3. It will be functionally (integrated) tested at KSC in the mated condition.

ACTION REQUIRED W. O'Brien NAA-ATO 7-29-66
Verify Downey effort is accomplished and document.

10.6.4 Originator W. O'Brien NAA-ATO

PROBLEM - Drag Chute Squibs
The drag chute squibs (A and B systems) on Apex cover will be installed at Downey using KSC procedures.

MCR 1548, EO 429198.

These new circuits are not checked with power on.

DISCUSSION
Resistance check will be done at Downey with functional test at KSC by removing the cover.

ACTION REQUIRED W. O'Brien NAA-ATO
Perform check and report results. 7-29-66

10.6.5 Originator W. O'Brien NAA-ATO

PROBLEM - Single Connector for A and B Initiators
The added Apex cover (Drag) drogue initiator circuits are presently designed to go through a common, existing connector.

This represents a single point failure (Cat I), which in the event of a failure of the connector could also disable the apex drag chutes and could also short the A and B apex cover jettison initiators.

10.6.5 Continued

DISCUSSION

NAA Engineering does not consider this to be a single point failure. NAA reliability considers that connector reliability is high enough to use only a single connector - NASA reliability does not concur. NAA Engineering considers one connector sufficient.

ACTION REQUIRED R. Larson NAA-ENG 7-29-66

Determine method to provide redundant circuitry and initiate paper work. Report status at CARR. NASA considers this to be a constraint.

SECTION 10 – SEQUENTIAL SYSTEMS

Part B – Historical Information

There is no historical information to be documented in this section.

SECTION 11 – EARTH RECOVERY SYSTEMS ORDNANCE

Part A – Action Items

11.6.1 Originator R. West NASA-MSC

PROBLEM - Main Chute Problems
Severe damage was encountered in main chute during Block II Development test 70-3.

DISCUSSION
NAA and Northrup/Ventura are currently investigating the results of this test relative to possible bearing on the Block I systems.

ACTION REQUIRED W. Stote NAA-ENG 7-29-66
Continue investigation to determine if a hardware change is required and report.

11.6.2 Originator W. Simmons NASA-MSC

PROBLEM - Thruster System Performance
Separation velocity requirement of 24 ft/sec for forward heat shield and jettison system has been revised to above 40 ft/sec. Thruster system does not meet this requirement.

DISCUSSION
Pilot mortar has been added. Two system tests have been satisfactorily completed lifting the constraint on CSM 011, two more must be completed to lift the constraint on CSM 012.

ACTION REQUIRED C. Lowry NAA ENG 7-29-66
NAA complete tests (CTR 01205801) and submit results.

11.6.3 Originator R. Langley NASA-MSC

PROBLEM - Flashing Light Power Supply
Qual testing on FLASHING LIGHT POWER SUPPLY failed to subject the assembly (with recent fix) to ALL environments.

11.6.3 Continued

DISCUSSION

NAA Engineering feels that potting fix should not affect qual status. NASA recommends complete testing be performed on a flight configuration article.

ACTION REQUIRED R. Larson NAA Eng 7-29-66

Document all findings and logic used to satisfy the CTR prior to CARR.

SECTION 11 – EARTH RECOVERY SYSTEMS ORDNANCE

Part B – Historical Information

11.6.4 Originator R. Langley NASA-MSC

PROBLEM - Internal Shorting of Flashing Light Components
Inadequate quality control during manufacture of the flashing light equipment has resulted in internal shorting.

RESOLUTION
NAA is presently X-raying all flashing light assemblies to verify proper manufacturing.

11.6.5 Originator W. T. Armstrong (Flight Crew)

PROBLEM - Main Parachute Packing Data
There is no information available to the flight crew to indicate the time before launch at which the main parachute will be packed.

RESOLUTION
The following is a summary of Spacecraft 012 parachute pack life limits, utilizing a one (1) year pack life:

Parachute	Serial Number	Pack Date	1-Year Limit Date
Pilot	193	6/18/66	6/18/67
Pilot	194	6/16/66	6/16/67
Pilot	195	6/15/66	6/15/67
Pilot (Spare)	197	6/22/66	6/22/67
Drogue	153	6/27/66	6/27/67
Drogue	154	6/29/66	6/29/67
Drogue (Spare)	120	4/15/66	4/15/67
Main	138	4/6/66	4/6/67
Main	147	6/27/66	6/27/67
Main	148	6/23/66	6/23/67
Main (Spare)	146	6/30/66	6/30/67

11.6.5 Continued

The present scheduled date for Spacecraft 012 launch is approximately five months prior to the one year pack life limit date.

This information is extracted from IL 696-701-110-66-92 dated 19 July 1966 signed by W. H. Stolz, Supervisor, Earth Landing and Flotation Systems.

See NASA wire No. W5608MA, dated 6/30/66 and NAA letter No. 66MA9403, dated 7/14/66.

11.2.1 Originator W. Simmons NASA-MSC

PROBLEM - APS 264
Electrical Circuit Interrupters, Type I.

Bending guide pin during installation.

RESOLUTION
In addition to use of installation guide lines on the device a procedural change has been made. Unit is pneumatically cycled; then the initial (flight) position of the piston will be gaged with a special tool to verify flight position.

11.2.2 Originator W. Simmons NASA-MSC

PROBLEM - APS 047
Umbilical Disconnect Shock Attenuator (Fwd Heat Shield) Bungee cylinder oil leak.

RESOLUTION
EO M451496 changes O-ring to Buna-N and coats Bungee with white epoxy effective on S/C 012.

11.2.3 Originator W. Simmons NASA-MSC

PROBLEM - APS 410
Linear Shaped Charge (CSM Separation) with booster cap.

Blistering and failure to cut wires during testing at component level.

11.2.3 Continued

RESOLUTION
Charges (in holders) passed temperature cycling to 160°F (total time 336 hr) W/O vacuum. Temperature margin in S/C configuration is at least 20°F, as reported in NAA Sid 66-488, dated 4-26-66. Testing, in-flight configuration, indicated no failures at 140°F, therefore this is not considered to be a problem.

11.2.4 Originator W. Simmons NASA-MSC

PROBLEM - APS 262
Circuit Interrupter, Type I.

Failure to operate in static pressure test.

RESOLUTION
Initial volume is 8cc, final volume is 13cc. ASI puts out 525 psi(min) in 10cc. In all cases where unit failed to operate at 300 psi or greater the sealing washers had been omitted. Current procedure requires visual verification of sealing washers.

Qual Program Results. In qualification testing, 6 units - Type I and 6 units - Type II, were cycled pneumatically 20 times. Each unit was fired using either one or two initiators at completion of qual. All passed OK.

Off Limits Test Results. All 12 Units from the above qual program have been fired with two initiators, refurbished and refired for a total of 5 firings each. All passed OK.

11.2.5 Originator W. Simmons NASA-MSC

PROBLEM - APS 242
Type VI pressure Cartridge (FWD heat shield).

Hangfire.

RESOLUTION
APS resolution is acceptable, however see discussion on item 11.6.2 in Part A.

11.2.6 Originator W. Simmons NASA-MSC

PROBLEM - APS 372
Charge holder assembly (SLA Separation).

Vibration failure.

RESOLUTION
APS resolution is acceptable.

11.2.7 Originator W. Simmons NASA-MSC

PROBLEM - APS 370
Change Holder Assembly (SLA Cross-over Booster)

Premature firing

RESOLUTION

APS explanation acceptable.

11.2.8 Originator W. Simmons NASA-MSC

PROBLEM - APS 201
Explosive train charge, type IV (SLA separation)

Failure to fire.

RESOLUTION

APS explanation acceptable

11.2.9 Originator W. Simmons NASA-MSC

PROBLEM - APS 261
Circuit Interrupter, Type II.

Failure to open in static pressure test.

RESOLUTION

APS explanation acceptable.

SECTION 12 – MECHANICAL SYSTEMS STRUCTURE

Part A – Action Items

12.6.1 Originator: Flight Crew — NASA-Crew

PROBLEM - CM Window Sooting
Provide positive protection against CM window and G&N optics sooting during LES tower jettison and S-IVB separation sequences.

DISCUSSION

Solution of this problem will be contingent on the results of the SC 011 flight. Reference NASA TWX PJ5/71417/U-295. NASA is also working on a possible fix.

ACTION REQUIRED — R. Langley — NAA-MSC — 7-29-66
NASA to instruct NAA regarding disposition of CCA 478 based on results of S/C 011 flight. Resolution of G&N optics sooting is NASA's responsibility per agreements made at time of introduction of the passive system.

12.6.2 Originator: R. Langley — NASA-MSC

PROBLEM - Emergency Release Striker
Need for verification of emergency release striker bar extension on side ablative hatch.

DISCUSSION
Egress procedures cannot be verified until incorporated on S/C 007.

ACTION REQUIRED — R. Langley — NASA-MSC — 7-29-66
NASA to direct incorporation on CSM 007.

12.6.3 Originator: W. Koons — NASA-MSC

PROBLEM - Hatch Decals
Cannot verify incorporation of hatch decals showing direction of rotation and torque limits.

12.6.3 Continued

DISCUSSION
Must be incorporated in S/C 012 prior to egress procedure verification at Downey during crew compartment fit and function. This is a shipping constraint.

ACTION REQUIRED R. Larson NAA-ENG 7-29-66
Provide documentation if required and verify installation.

12.6.5 Originator W. Koons NASA-MSC

PROBLEM - Side Pressure Hatch
Side pressure hatch not qualified for pad egress with positive ΔP.

DISCUSSION
Tests scheduled on S/C 007 about 25 July.

ACTION REQUIRED R. Larson NAA Eng 7-29-66

Report status by CARR.

12.6.6 Originator W. T. Armstrong (Flight Crew)

PROBLEM - Flight Crew Hatch Operation
Satisfactory operation of the flight item Main Crew Hatch and BPC hatch both from inside and outside the C/M has not been satisfactorily verified. CMS 012 egress will be checked at KSC.

ACTION REQUIRED R. Larson NAA-ATO 7-29-66
Determine if it is possible to return BPC to Downey to accomplish and what is schedule impact.

12.6.7 Originator H. Dunham for P. Glynn NASA-MSC

PROBLEM - Inner Structural Loading
Failure of S/C 004A Command Module Inner Shell (Sandwich) Structure (inner and outer skins) under main parachute loading condition (1 degree, 3 main, high altitude tumbling abort condition).

12.6.7 Continued

DISCUSSION
The current S/C 012 CM gross weight exceeds its design criteria and the resulting demonstrated factor of safety (which should be 1.5) is now calculated to be approximately 1.3. NASA has promised to grant a waiver.

ACTION REQUIRED R. Larson NAA-ENG 7-29-66
A waiver will be requested to cover this anomaly.

12.6.8 Originator H. Dunham for P. Glynn NASA-MSC

PROBLEM - Structural Safety Factor
NAA has failed to show an adequate (1.5) factor of safety at the station 1010 interface for the Saturn IB lift-off design conditions.

DISCUSSION
The current S/C 012 gross weight increase and change in design criteria to compensate for the unsymmetrical thrust build up measured during the flight of SC 009 have reduced the factor of safety to less than 1.5 (approx. 1.3) for the above design condition.

NASA has promised to grant a waiver.

ACTION REQUIRED R. Larson NAA-ENG 7-29-66
A waiver will be requested to cover this anomaly.

12.6.9 Originator R. Lanzkron NASA-MSC

PROBLEM - Astro Sextant Door Mod
Are covers light enough to prevent damage to the optical system due to overloads which could occur during boost.

DISCUSSION
Is there deterioration in optics accuracy due to launch environment vibration from this overload.

ACTION REQUIRED R. Larson NAA Eng
Study and report. 7-29-66

SECTION 12 – MECHANICAL SYSTEMS STRUCTURE

Part B – Historical Information

12.6.4 Originator W. Koons NASA-MSC

PROBLEM - Qual Testing Not Yet Complete
Uprighting bags, cables, brackets, and operating sequence are not qualified.

DISCUSSION
DVT, qual, and certification tests are scheduled on B/P-29 and S/C-007 at MSC to start 22 July, complete 22 Aug. These are not included in CTR records but are tests of the same category. This is a constraint to the FRR only.

SECTION 13 – DISPLAYS AND CONTROLS

Part A – Action Items

13.6.4 Originator W. Armstrong (Flight Crew)

PROBLEM - AC Indicator Selector
It was possible to vary the AC frequency reading on the crew compartment indicator by manipulating the AC indicator selector rotary switch. These erroneous frequency readings were random in nature.

DISCUSSION

Weston has a "Fix" circuit, but cost and schedule impact must be considered. The possibility of eliminating this measurement entirely or measuring only one phase should be considered. Flight crew recommends retention of meter and fix if not impact.

ACTION REQUIRED L. Troolines NAA-ENG 7-29-66
If a spare is available it will be returned to vendor to incorporate fix. Report at CARR.

13.6.5 Originator W. Armstrong (Flight Crew)

PROBLEM - MDC Displays
The normal operating range on several of the MDC displays is defined by a green band instrument face. These green bands are not useable as they cannot be seen even with higher than desired crew compartment illumination.

DISCUSSION
This condition must be corrected.

ACTION REQUIRED L. Troolines NAA-ENG 7-29-66
Apply additional green band to external surface of meter to improve visibility.

Physical installation to be approved by Apollo Engineering, Displays and Controls Group, and incorporated prior to shipment.

13.6.6 Originator T. Armstrong (Flight Crew)

PROBLEM - Toggle Switches
Switch action is very poor and paddles are not normal to the plane.

DISCUSSION
The "soft" or lack of "positive" feel of the switch design. This characteristic does not make it unsafe for spacecraft flight. There are two basic designs or types of toggle switches used, each having several configurations. Each configuration has its own transfer force requirements, thus accounting for the difference in feel between adjacent switches on the MDC.

The fact that the switch paddles are not normal to the plane of transfer results from a build up of tolerances. The switches are assembled on the panel using a key-in-slot technique for alignment, thus assuring that switches are installed in the proper position.

ACTION REQUIRED R. Larson NASA-Eng 7-29-66
The lateral "slop" (motion normal to the plane of operation) of the switch paddles is also a major concern. Apollo Engineering to evaluate this problem and establish position as to basic reliability of switches. This info to be provided at S/C 012 CARR.

13.6.9 Originator NASA Flight Crew

PROBLEM - Switch Guards
Switch guards on ELS logic (panel No. 8) C/M - S/M Separate (panel 15), and Main Chute Release (panel No. 16) have 1/4" gap from face of panel when in closed position.

ACTION REQUIRED J. Cuzzupoli NAA-ATO 7-29-66
Inspect and replace with guards where required. Investigate whether replacement of guards is ample solution or whether redesign is required. Report results.

13.6.10 Originator W. Armstrong (NAA Pilots)

PROBLEM - CO_2 Partial Pressure Gage

Applying power to Main Bus A caused a large transient in the CO_2 PP Gage. At times, this transient was of sufficient magnitude to trigger the Master Alarm light and the C/M light on MDC panel 11. This condition is unacceptable and has not been explained.

DISCUSSION
Unresolved due to insufficient information. Light trips at 1.2V.

ACTION REQUIRED R. Larson NAA-ENG 7-29-66
Open item - NAA to investigate and present recommended solution prior to S/C 012 CARR.

13.6.14 Originator W. Armstrong (Flight Crew)

PROBLEM - Main Display Console Closeout Panels
There are no closeout panels between MDC panels 6 and 7, nor around the four corners of panel 4.

DISCUSSION
This is a hazard to flight safety to have any area in the crew compartment where foreign objects may enter the area behind first level structure. Opening not sufficiently large to allow large foreign objects to enter area behind panel, even so, all parts including terminals are conformally coated to prevent short circuits.

ACTION REQUIRED L. Troolines NAA-ENG 7-29-66
NAA to investigate actual panel areas in question to determine actual hole sizes and if hazard to flight safety does exist. Present finding prior to CARR.

13.6.16 Originator W. Armstrong (Flight Crew)

PROBLEM - Crew Compartment Floodlights
Due to the number of failures that have occurred and the short mean time between failures, the crew compartment floodlights are not considered to be flight qualified.

13.6.16 Continued

DISCUSSION
Defer to CARR pending additional info to displays and controls group of Apollo Engineering.

ACTION REQUIRED N. Casson NAA-ATO 7-29-66
ATO to provide exact conditions both pre and post failure of the new floodlight to Apollo Engineering. Info required: Installation procedure, mounting conditions, de-mounting, inspection results, cause of failure, etc. Also ATO to establish test procedure to prohibit floodlight operation unless installed per print.

ACTION REQUIRED R. Larson NAA Eng
Evaluate this data and present a firm recommendation concerning this problem.

13.6.18 Originator W. Armstrong (NAA Pilots)

PROBLEM - Crew Compartment Inspection Procedures
There are part numbers, assembly numbers, and inspection stamps in black and white paint all over the Main Display Console and the adjacent circuit breaker panels.

DISCUSSION
These markings must be cleaned off prior to shipment. In addition, this procedure is a hazard to vehicle testing. NAA should establish a policy within their manufacturing, test, and inspection system whereby all controls and displays and crew-compartment areas visible to the flight crew remain free from extraneous marks, stamps, paint, or nomenclature. ATO refurbish prior to shipment. Cleanliness spec available. (Inspection and Manufacturing) Inform men to follow cleanliness procedures.

ACTION REQUIRED N. Casson NAA-ATO 7-29-66
ATO, insure that internal procedures regarding vehicle cleanliness are adhered to. Also, evaluate current cleanliness specification and improve if required. ATO to clean up S/C during refurbishment prior to shipment.

13.6.20 Originator NASA Flight Crew

PROBLEM - Main Display Panel Nomenclature Changes and Numbering

Certain MDC nomenclature is now misleading and/or inaccurate since various system changes have been implemented without associated nomenclature changes.

DISCUSSION

All display and control panels should be numbered to facilitate quick and accurate display or control reference during S/C test and actual flight.

ACTION REQUIRED R. Larson NAA-ENG 7-29-66

Change MDC nomenclature and add display and control panel numbering in accordance with marked up prints. T. Armstrong to deliver print to L. Troolines. This is to be accomplished by Engineering per request by R. Lanzkron, NASA. Report status at CARR.

13.6.21 Originator J. Seigler NASA R&QA

PROBLEM - Toggle Switches Mechanical Link

The AT type switches have an area subject to foreign particles jamming the mechanical actions.

ACTION REQUIRED R. Larson NAA-ENG 7-29-66

Identify all switches having this problem and indicate location to permit cover to preclude this problem.

SECTION 13 – DISPLAYS AND CONTROLS

Part B – Historical Information

13.6.1 Originator NASA Flight Crew

PROBLEM - Fuel Cell Barber Pole Display
Panel 18, Fuel Cell A1 Reactant indicator (C22-2A67056) remained at "barber pole" status instead of indicating "grey" when power was removed.

RESOLUTION
Internally binding. When panel was tapped indicator went to grey. Removed and replaced indicator.

13.6.2 Originator W. Armstrong (Flight Crew)

PROBLEM - Crew Compartment Accelerometer
The installed accelerometer indicates 0.5 g under 1 g conditions.

RESOLUTION
Accelerometer was removed, checked, and found faulty. It had apparently been dropped and damaged. It has been replaced with a new instrument.

New instrument reads correctly.

13.6.3 Originator W. T. Armstrong (Flight Crew)

PROBLEM - Altimeter
The settable "bug" on the altimeter is painted black. Since the face of the instrument is also black, the bug cannot be seen. It is a safety of flight requirement that this bug be painted white.

RESOLUTION
Fixed per EO 477822

13.6.7 Originator W. T. Armstrong (Flight Crew)

PROBLEM - Event Stack Lock/Unlock Switch
The Event Stack lock/unlock switch is rubbing on the left side of the switch guide. This condition is causing excessive actuation force and could result in eventual binding of the control.

RESOLUTION
This problem was caused by the switch head being installed slightly to one side on its supporting shaft. (Improper installation)

Switch head was remounted properly and functioned normally during subsequent checkout.

13.6.8 Originator W. T. Armstrong (Flight Crew)

PROBLEM - Digital Event Timer
When starting or resetting the digital event timer, it will spin rapidly prior to picking up the count.

RESOLUTION
Spinning for reset should occur only when reset is commanded or lift off or abort signals are received. If timer is resetting during start commands then there is a malfunction in the timer or control circuitry.

TPS-OCP-0130-010 completed, unit operated properly, no further action required.

13.6.11 Originator

PROBLEM - C and W Alarm
Caution and Warning Master Alarm came on when Primary Gimbal Motors were turned ON or OFF.

Documentation

TPS OCP 0126-027
V14-GEN-010
V14-000002 Sqk 12

13.6.11 Continued

RESOLUTION
Engineering Test Filter Unit was installed which inhibited Master Alarms for Gimbal motors on and off during OCP-0130B.

Deliverable Filter incorporated in MCR 1515 R1.

TPS-OCP-0126-027 completed, unit operated properly.

Item closed.

13.6.12 Originator W. T. Armstrong (Flight Crew)

PROBLEM - Crew Compartment Floodlight Brightness Controls
Approximately 75 percent of the total travel of the rheostat controls for the crew compartment floodlight brightness is used up before any light emits from the lamp.

RESOLUTION
This conditions exists because rheostats are too large (currently 330 ohms) with only 75 ohms required. Seventy-five ohm is used in Block II. Availability of 75 ohm rheostat for Block I is being investigated but while control operation is not optimum, it is acceptable to crew since full range of brightness is obtained.

13.6.13 Originator W. T. Armstrong (Flight Crew)

PROBLEM - FDAI Brightness Control
The FDAI brightness control adjusts the illumination of the THRUST ON light in addition to the FDAI integral lighting. These two displays should not be on the same control circuit.

RESOLUTION
These two items are the only 5 volt lamp circuit on the MDC. "Thrust On" lamp will not be on continually, only during SPS thrust. If FDAI is dimmed, it is assumed that the crew would not want a bright "Thrust On" light coming on and ruining dark adaptation.

Dimming control not optimum, but is acceptable to crew.

13.6.15 Originator W. T. Armstrong (Flight Crew)

PROBLEM - Flight Combustion Stability Monitor System
On at least two occasions, a "Rough Engine Cutoff" light illuminated when power was applied to the FCSM system.

RESOLUTION
Present circuit has latching relays in circuit. If relays were not "Reset" prior to application of power, light could come on. MCR 1581 R1 has been issued to change relays to non-latching type. Incorporation of MCR 1581 R1, to change latching relays to non-latching type.

13.6.17 Originator NASA Flight Crew

PROBLEM - Cabin Pressure Indicator
Cabin pressure indicator on panel 13 is reading 12 psia; should be reading atmosphere.

RESOLUTION
Cause found to be faulty transducer/signal conditioner.

Corrective action - remove and replace the cabin pressure indicator verified to read 14.5 psia and within tolerance.

Documentation - Squawk 75 of OCP-P-0129 first run TAIR.

13.6.19 Originator NASA Flight Crew

PROBLEM - C&W Light
SPS WALL TEMP HI LIGHT blinks causing Master Caution light to come on because sensor line for SP0020T on engine is not making good contact.

Reference TPS-0129-035, Squawk No. 198 and Squawk No. 63.

The pin "N" in vendor supplied connector and harness recessed.

RESOLUTION
New SPS engine harness is on order and will be changed. Recessed Pin in original harness caused PCM and Caution and Warning to see open circuit and turn on. SPS WALL TEMP Hi light.

New Harness and Connector received and changed subsequent to test. Refer to V16-GEN TAIR. No further action required.

SECTION 14 – CREW EQUIPMENT

Part A - Action Items

14.6.1 Originator J.H. Parker NAA-ATO

PROBLEM - Shortage of GFE Items
Shortage of GFE items for F&F (Def MA0301-0049) 001, 003, 004, 005, 006, 007, 009, 010, 011, 024, 034, 036, 211.

Items required by July 25.

DISCUSSION
Items will be provided to support Crew Compartment Fit and Function (CCFF) except for TSCC sample bags. Existing bags bags on hand will satisfy CCFF objectives.

ACTION REQUIRED J. Goodman NASA-ASPO 7-25-66

NASA to ensure hardware available by July 25.

14.6.2 Originator W. Piszczek NASA-MSC

PROBLEM - CFE Equipment
CFE items currently not available to support CCFF. Required by July 25th.

1. Sandals
2. Vacuum cleaner assembly
3. COAS
4. TV & 16MM mount
5. Sleep restraint. Adj. strap
6. "SCEN A" foam (CCA update for change in sizes)
7. P010 assy bags (CCA update for change in sample bag size)
8. Cobra cables

14.6.2 Continued

9. Adapter cables (ECD 8-1)

10. "T" adapters

11. Water dispenser assy hose

Above items 4, 6, 7, 8 are not currently available due to recent CCA action implementing changes to existing hardware. NAA should expedite changes to make hardware available for CCFF since changes are of a minor nature. NAA will ensure other listed items available on schedule.

ACTION REQUIRED R. Larson NAA Eng 7-25

NAA ensure above listed CFE items are available for CCFF. Items 4, 6, 7, 8 to be ready for altitude chamber tests.

14.6.3 Originator W. Armstrong (Flight Crew)

PROBLEM - Inflight Tool Kit

No satisfactory flight item tool kit has been provided or evaluated to date. This must be accomplished prior to flight.

DISCUSSION

Tool kit is available except on engineering per RFC 014-06-OP-23 to be released 7-22-66 (includes addition of velcro, identification, torque code addition, etc). Reworked items will not be available for CCFF.

ACTION REQUIRED H. Brewer NAA Eng 7-25-66

NAA specify data and provide hardware for Astronaut crew evaluation of production tools.

14.6.4 Originator W. Piszczek NASA-MSC

PROBLEM - Thumbwheel Knob on TV Mount

Request completion of rework on Squawk No. 260 (V16-GEN) thumb wheel knob on TV mount in LEB is stiff to operate.

DISCUSSION

Reference No. 4 OCP 129 prior to CCFF (5.6 effectivity)

ACTION REQUIRED R. Larson NAA-ENG 7-29-66

NAA provide method to cure problem and implement.

14.6.6 Originator J. Goodman NASA-ASPO

PROBLEM - Bump Hat Stowage
CFE bump hat stowage provisions which can be readily deleted from the S/C should be officially deleted (Foam inserts for CFE hats, etc.)

DISCUSSION
NAA should investigate and provide stowage location for GFE communications carrier. MCR 1610 does not include deletion of current CFE stowage provisions.

ACTION REQUIRED R. Larson NAA Eng 7-25-66
NAA implement deletion of stowage provisions described above and resolve GFE bump hat stowage location prior to CCFF.

14.6.8 Originator W. Piszczek NASA-MSC

PROBLEM - Weightless Restraint Sandal
The sandals do not appear to be of adequate strength or provide sufficient ventilation. Ref. RID 014-06-OP-1.

DISCUSSION
NAA stated the prototype sandals evaluated to date are not of the same quality as flight hardware. NASA feels that redesign may be required.

ACTION REQUIRED H. Brewer NAA Eng 7-25-66
An evaluation will be held prior to CCFF with astronaut to determine adequacy of flight sandals for S/C 012 and report results.

14.6.9 Originator W. Piszeczek NASA-MSC

PROBLEM - CAL-FAX and cam lock fasteners Crew Compartment
All EO's on these fasteners must be completed prior to crew compartment fit and function.

14.6.9 Continued

DISCUSSION
Negotiate with mfg to insure compliance.

ACTION REQUIRED J. H. Parker NAA-ATO 7-20-66

Effort to be completed by CCFF and report.

14.6.10 Originator W. Armstrong (NAA Pilots)

PROBLEM - Fecal Bags
As a result, the fecal bag storage area was completely filled after the tenth day of operation due to the increased volume of the bags. Outer ME 901-0736-0001 is the bag which is referenced.

Bags stick closed and therefore preclude manual bleedoff of trapped air. Design investigation required to resolve problem. Possible change in procedures could resolve problem.

ACTION REQUIRED R. Larson NAA Eng 7-20-66

H. Brewer NAA and W. Huffstetter, NASA, to discuss on 7-20. NAA to process any design or procedures changes resulting from this review.

14.6.11 Originator W. Armstrong (NAA Pilots)

PROBLEM - Spacesuit Umbilical Straps
During the ECS Breadboard Test, it was noted that the Velcro straps on the spacesuit umbilicals were too short to adequately attach the electrical umbilicals to the O_2 umbilicals.

DISCUSSION
Restraint design was changed as a result of change in hose contractors. Astronaut crew has not reviewed design approach for acceptability. Astronaut crew has reviewed mockup No. 2 prior to CCFF for S/C 012.

ACTION REQUIRED R. Larson NAA-Eng 7-29-66
Engineering should evaluate to determine if this same condition exists on S/C 012.

14. 6. 12 Originator W. Armstrong NAA Pilots

PROBLEM - LH Equipment Bay Marking
During the ELS Breadboard Test, checkout of Spacecraft 011, and Downey operations with Spacecraft 012 it was discovered that LH Equipment Bay Panel 131 is colored light blue, with white letters on this background used for marking nomenclature. Due to poor contrast nomenclature cannot be seen by crew.

DISCUSSION J. H. Parker NAA-ATO 7-29-66
NASA/NAA/GFE have agreed on standard coloring/lettering on display areas. Panel 131 should be colored gray and have white lettering nomenclature. The white lettering on light blue does not provide sufficient contrast for crew identification.

ACTION REQUIRED J. H. Parker NAA-ATO 7-29-66
NAA change color of panel to gray and ensure other panels are per standard agreed upon coloring specifications/ documentations.

Verify engineering drawings coincide or submit CAR to Engineering.

14. 6. 13 Originator W. Piszczek NASA-MSC

PROBLEM - Umbilical Assy
The ECS suit umbilical exhaust hose cap is needed for use in the CCFF.

DISCUSSION
Insure cap is available for CCFF.

ACTION REQUIRED J. H. Parker NAA-ATO 7-25-66
Investigate hardware available for CCFF and initiate required action to ensure support.

14. 6. 14 Originator Astronaut Scott NASA-MSC

PROBLEM - Cobra Cable PTT Cover
PTT cover failure on Cobra cable assembly. During S/C tests, it was noted that the cover over PTT button on Cobra cable was cracked and peeled easily.

14. 6. 14 Continued

DISCUSSION
This was not a flight unit, but was flight configuration. Flight Cobra cables due at NAA 8-17-66. Rubber boot will be evaluated by crew at that time. NASA/CSO will evaluate Cobra Cable PTT cover utilized in S/C 008 and subsequent T/V testing.

ACTION REQUIRED R. Larson NAA-Eng 7-29-66
Determine if problem exists and report by CARR.

14. 6. 15 Originator D. Moore NASA-MSC

PROBLEM - VHF Recovery Patch Panel
The two(2) TNC VHF recovery antenna connectors are recessed in the control panel and placed such that it is impossible for disconnecting either connector and reconnecting the GFAE radio antenna coax line.

DISCUSSION
Survival radio beacon must be connected to antenna connector after 24 hours on surface or failure of S/C radio beacon.

ACTION REQUIRED R. Berry NASA-MSC 7-29-66
NASA provide separate survival beacon line and connector for astronaut crew checkout of S/C to verify acceptability of GFE antenna S/C connectors. NAA provide for checkout in CCFF.

14. 6. 16 Originator NASA Flight Crew

PROBLEM - TV Power Connector Labeling
Labeling for TV power connectors is not incorporated.

DISCUSSION
The two TV power connectors J194 and J107 in the tunnel area (behind MDC panel 210) into which the TV power cable J209 plugs in order to supply power to the side hatch TV location and the LEB TV locations are not identified or labeled.

ACTION REQUIRED R. Larson NAA Eng 7-25-66
Label and identify these TV power connectors to indicate location where power is applied, Engr issue EO, Implement effort.

14.6.5 Originator W. Piszczek NASA-MSC

PROBLEM - LiOH Cannister Rework

S/C LiOH Cannister storage container have been reworked to preclude difficulty in installation and removal of cannisters in a depressurized condition.

RESOLUTION

NASA requests evaluation of reworked lining by flight crew or ATO pilot to verify adequacy of fix. Crew evaluation will be made during CCFF.

SECTION 15 – EXPERIMENTS

Part A - Action Items

15. 6. 1 Originator O. Smistad NASA-EXPO

PROBLEM - Scientific Medical Data Acquisition System, P/N 511076, (MDAS)

(1) The MDAS does not fit CFE Container "C"

(2) CFE Container "C" does not fit Spacecraft Compartment "C"

DISCUSSION

A fit check on S/C 012 & 014 indicates that an interference problem exists that must be resolved prior to the crew compartment fit and function check to be performed during OCP 5051.

ACTION REQUIRED J. H. Parker NAA-ATO 7-29-66

Rework of CFE Container "C" to accommodate MDAS, and fit Container "C" in Spacecraft compartment "C". This rework must be completed in time to support the crew compartment fit and function checks.

15. 6. 2 Originator O. Smistad NASA-EXPO

PROBLEM - Color Coding

The mockup reviews for S/C 012 & 014 resulted in R. I. D. action to color code the medical data acquistion system (MDAS) and the Octopus Cable (both GFE) and the mating C. F. E. Connector Interfaces.

DISCUSSION

TWX EX34/T-12-BG52-66-933 (7-11-66). NAA direction to color code the MDAS and Octopus Cable concurrent with coding C. F. E. crew compartment equipment.

ACTION REQUIRED J. H. Parker NAA-ATO 7-29-66

Color code the MDAS, P/N 511076, S/N 6720A, now at NAA. In time to support the crew compartment fit and function check. Accomplish work on TPS at Downey. Include information on ICD.

15. 6. 3 Originator O. Smistad NASA-EXPO

PROBLEM - Camera Bracket
The 16mm camera bracket (CFE), P/N V16-753103 experienced a failure during the spacecraft 012 bench check held at NAA on June 24, 1966. The push button stop failed and fell out of the bracket.

DISCUSSION
An E. O. has been issued by NAA to rework this equipment.

ACTION REQUIRED J.H. Parker NAA-ATO 7-29-66
Provide the reworked bracket to support the crew compartment fit and function check.

15. 6. 5 Originator O. Smistad NASA-EXPO

PROBLEM - Bungee Cord Exerciser (M-12)
The M3A experiment hardward (Bungee Cord Exerciser) was incorporated on S/C 012 by CCA 942 of 7-8-66. A stowage location for this exerciser has not yet been determined. It is required that this equipment be unstowed, used and restowed during the crew compartment fit and function checks.

DISCUSSION
A possible stowage location for this bungee could be in the volume left open by selection of one (1) of three (3) U. S. V. M. S. Units on S/C 012, another location could be in the volume left open by deletion of the A1-12 experiment (erogometer) by CCA 942 of 7-8-66.

ACTION REQUIRED A. Vucelic NAA-Eng
NAA to determine stowage location for the M-3A. Provisions to support the S/C 012 crew compartment fit and function checks and storage provisions as soon as possible.

15. 6. 6 Originator O. Smistad NASA-EXPO

PROBLEM - USVMS Unit Deletion (M-5A)
Delete from experiment M-5A one USVMS unit and other associated items.

15. 6. 6 Continued

DISCUSSION
Change quantity from 3 to 2. No constraint to crew comp fit and function.

ACTION REQUIRED O. Smistad NASA-EXPO 7-29-66
NASA to provide NAA a CCA to delete and change certain of experiment M-5A.

15. 6. 7 Originator O. Smistad NASA-EXPO

PROBLEM - Crew Compartment Fit & Function
The crew compartment fit and function (C^2F^2) checkout has not been performed due to non-availability of the spacecraft ECU.

DISCUSSION
This checkout is to be performed by TPS No. V16 GEN-069 during OCP-5051.

NAA will perform C^2F^2 (TPS V16 GEN-069) prior to shipment of spacecraft 012 to KSC.

15. 6. 9 Originator O. Smistad NASA-EXPO

PROBLEM - Acquisition System (MDAS)
The Scientific Medical Data Acquisition Systems (MDAS) has poly-olefin wire used in the bio-med recorder module. This is not an acceptable material for Apollo. This recorder was flown in the Gemini program.

DISCUSSION
A waiver has been requested from the MSC flight safety office since the module is totally enclosed and the insulation covered by teflon sleeves. It is experienced that this waiver will be approved.

ACTION REQUIRED O. Smistad NASA-EXPO 7-29-66
Provide approval.

15. 6. 10 Originator R. L. Schweickart NASA-Crew

PROBLEM - Experiment M-5A
Status of experiment M-5A must be positively defined since it involves the stowage of equipment.

15. 6. 10 Continued

DISCUSSION
There is presently a question on the accuracy of the tritium tagging method and whether or not the experiment should be flown at all.

ACTION REQUIRED O. Smistad NASA-EXPO 7-29-66
NASA to render decision on experiment M-5A. Reply on same CCA as 5. 6. 6.

15 6. 11 Originator O. Smistad NASA-EXPO

PROBLEM - CCA

CARR No.	SCN/RID/ECP No.
15. 5. 5	RID 012-2A-5
	RID 012-5A-3
	(SID 66-142)

DISCUSSIONS
NASA will submit a CCA to cover the NAA experiment implementation plan by July 25, 1966 will not apply to S/C 012.

ACTION REQUIRED O. Smistad NASA-EXPO 7-29-66
NASA will submit CCA to cover the above RID's effectivity will be thru -105 not CSM 012.

15. 6. 4 Originator O. Smistad NASA-EXPO

PROBLEM - "T" Adapter
Lack of availability of electrical "T" adapter (V16-601396 for scientific exper. One (1) "T" adapter is required for each crewman as in final flight configuration requirements. The CFE Part Number is ME-414-0465-0021.

DISCUSSION
Direction to incorporate one (1) unit per crewman was given in CCA 944 dated 7-8-66. Only one unit is now available at NAA. Three flight units will be available for altitude checks at KSC/2 will be available by 5 August.

15. 6. 8 Originator O. Smistad NASA-EXPO

PROBLEM - Bio-med Recorder Case
The Bio-med Recorder Case (part of MDAS S/N 6720A now at NAA) has evidenced paint flaking. This is a GFAE item of equipment.

RESOLUTION
NASA will examine the two other flight-units now at MSC for a similar problem and correct the problem.

15. 6. 12 Originator O. Smistad NASA-EXPO

PROBLEM - CARR Phase I Report-Paragraph 15. 5
Pending Waivers, SCN's and RFC's - Experiments

CARR No.	SCN/RID FCP No.	STATUS
15. 5. 1	SCN 4 (SID 62-1002)	Closed by CCA 923
15. 5. 2	SCN 42 (SID 64-1080)	Closed by NASA TWX No. ex 25/ 4-8-T130/66-BG 52-445

15. 6. 12 Continued

CARR No.	SCN/RID/ECP No.	STATUS
15. 5. 3	SCN 43 (SID 64-1080)	Closed by NASA CCA 942 Dated July 8, 1966
15. 5. 4	SCN 45 (SID 64-1080)	To be closed by NASA CCA to be issued July 19, 1966
15. 5. 6	RID 014-6-EX-2	Closed by NASA CCA 944 Dated July 8, 1966
15. 5. 7	RID 014-06-EX-7	Closed by NAA MCR-A 1570
15. 5. 8	ECP TBD	Closed by MCR-A1609

APPENDIX

LIST OF PARTICIPANTS

The following individuals attended the Systems Assessment Meeting in the capacities indicated and concurred with their group's minutes. (These group minutes were integrated into the overall minutes for the systems assessment meeting contained herein.)

The overall meeting minutes were compiled by:

F. Mohr	NAA
J. Krupa	NASA (GE)

STEERING COMMITTEE

N. H. Casson	NAA-ATO
R. Larson	NAA-Eng
W. W. Petynia	NASA-MSC
R. Chaffee	NASA-Astronaut
W. Day	NAA-Eng
J. F. Parker	NAA-ATO
R. W. Lanzkron	NASA-ASPO
D. L. Nichols	NASA-KSC
B. R. Rawding	NAA-REL-GSE
C. P. Hannon	NAA-TPE-FF
J. B. Lee	NASA-MSC
G. E. Anderson	NASA-RASPO P. E.
W. A. Graham	NASA-RASPO T&E
J. P. Seigler	NASA-ASPO RQ&T
A. D. Mardel	NASA-ASPO
J. Adelstone	NAA-Reliability
O. Smistad	NASA-Expo
J. R. Long	NAA-Q&R. A.
R. A. Gardiner	NASA-MSC G&C
W. T. Armstrong	NAA-Research Pilot
J. W. Cuzzupoli	NAA-ATO
G. Grissom	NASA-Astronaut
E. White	NASA-Astronaut

ELECTRICAL POWER SYSTEM

C. W. Patterson	Eng NASA-KSC
G. R. Read Jr.	NAA Eng
R. Hendrix	NASA-MSC E&D
R. Munford	NASA-MSC E&D
A. J. McCauley	NAA Eng
L. K. Groharing	NAA ATO
R. A. Moses	NASA-MSC-FCSD
W. C. Burton	NASA-
E. M. Vonusa	NASA-RASPO-MSC
D. Kohr	NASA-MSC
R. B. Chaffee	NASA-Crew
N. Arellano	NAA Rel
W. Hutchinson	NAA ATO
W. Schmidt	NAA ATO

FUEL CELL/CRYOGENICS

S. S. Crespin	NAA Rel
D. Bell III	NASA-MSC E&D
H. E. Crawford	NASA-KSC
J. R. Nash	NAA Eng
T. Berrera	NAA Eng
D. R. Forward	NASA-RASPO

W. H. Yahn	NAA ATO
W. L. Shelley	NAA Eng
L. K. Groharing	NAA ATO
J. Burbridge	NAA Eng
R. B. Chaffee	NASA-Crew
W. C. Burton	NASA

ENVIRONMENTAL CONTROL SYSTEM

J. E. Whalen	NASA-MSC-E&D
J. Beaman	NAA ATO
M. Silver	NAA NAA-MSC
J. M. Ross	Eng
E. E. Griffith Jr.	NAA-Cape OPS
E. E. Wright Jr.	NASA-KSC
J. E. Jolley	NAA ATO
W. R. Novitsky	NASA-MSC
M. E. Stelzriede	NAA Eng
R. G. Lascoe	NAA Eng
D. R. Forward	NASA-RASPO

COMMUNICATIONS

J. C. Dallas	NASA-MSC E&D
C. E. Olesen	NASA-RASPO
H. M. Williams	NAA Eng
R. R. Bohlmann	NASA-KSC
D. E. Moore	NASA-MSC-LRD
R. W. Brown	NAA Rel
D. J. Marfice	NAA ATO
R. K. Lee	NAA Eng
G. C. Covington III	NAA Eng
M. B. Luse	NASA-MSC-E&D

INSTRUMENTATION

R. M. Roush	NAA ATO
L. J. Braquet Jr.	NASA-KSC
R. E. Sweet	NASA-GE
F. A. Rotramel	NASA-MSC E&D
J. B. White	NASA-RASPO
R. G. Roshon	NAA ATO
V. Fuller	NAA Rel
C. J. Zemenich	NAA Eng
E. W. Jiblits	NAA Eng
J. R. Wolcott	NAA Eng

R. E. McKann	NASA-ASPO
B. T. Marze	NASA-ASPO

REACTION CONTROL SYSTEM

S. Harvey	NASA-RASPO
L. Hull	NASA-KSC
R. Tauber	NASA-MSC
L. M. Wolff	NAA Eng
J. C. Griffiths	NAA Eng
W. Myers	NAA Eng
R. E. Whitted	NAA Rel
W. D. Manha	NAA ATO

SERVICE PROPULSION SYSTEM

L. V. Ramon	NASA-MSC FCS
J. E. Borches	NASA-MSC
N. A. Townsend	NASA-MSC E&D
R. C. Butterworth	NASA-KSC
D. Freeburn	NASA
W. F. Jepson	NAA ATO

STABILIZATION AND CONTROL SYSTEM

R. Frazer	NASA-RASPO
W. Cavanaugh	NAA Eng
P. Garcia	NAA Eng
J. Stilly	NASA-KSC
R. Burt	NASA-MSC E&D
C. K. Conrad	NASA ATO
L. E. Hill	NAA ATO
W. Fouts	NAA Eng

GUIDANCE AND NAVIGATION

P. R. Tande	NAA Eng
M. H. Kluck	NASA-MSC
M. J. Taylor	NASA-KSC
J. P. Kaiser	ACED
H. D. Hamada	NAA ATO
E. A. Reynolds	NASA-KSC
H. Brady	ACED
C. W. Frasier	NASA-MSC
G. D. Scott	GSE-Apollo
W. T. Gahan	ACED
S. E. Snipes	NASA-MSC E&D

SEQUENTIAL SYSTEMS

W. S. O'Brien	NAA ATO
H. Linder	NASA RASPO
C. W. Patterson	NAA Eng
S. Dawson	NAA Eng
G. E. Dempsey	NAA Rel
R. L. Robinson	NASA
R. Schweikart	NASA Crew
B. Hendrix	NASA-KSC

EARTH RECOVERY SYSTEMS

R. Griggs	NAA ATO
P. H. Young	NAA Eng
R. R. West	NASA MSC E&D
A. L. Hitchen	NAA Eng
E. E. Thomas	NAA Rel
W. Simmonds	NASA MSC E&D
R. D. Langley	NASA MSC E&D

MECHANICAL STRUCTURES

R. D. Langley	NASA MSC E&D
W. E. Koons	NASA-MSC
D. R. Dochen	NASA/GE RQ&T
M. H. Zelon	NAA-Eng
W. H. Brehaut	NAA-Eng
H. J. Dunham	NASA/GE RQ&T
R. P. Johnson	NAA-Reliability
H. C. Shoaf	NASA/KSC
E. C. Flanagan	NASA/CSM RQ&T
F. W. Opdyke	NAA Eng
R. G. Griggs	NAA ATO
L. S. Young	NASA-RASPO

DISPLAY AND CONTROLS

W. T. Armstrong	NAA ATO
R. J. Swint	NASA MSC E&D
L. Troolines	NAA Eng
W. T. Bertrand	NAA Eng
R. Berry	NASA MSC FCSD
J. Woodfill	NASA

CREW EQUIPMENT

J. H. Parker	NAA ATO
W. J. Huffstetler	NASA
W. J. Piszczeic	NASA-FCSD
J. Goodman	NASA MSC
E. J. Nitsch	NASA-CSD
B. D. Smith	NASA-GE-MSC

EXPERIMENTS

R. L. Cox	NASA MSC FCSD
G. C. Hrabal	NASA
O. Smistad	NASA MSC
R. Schweickardt	NASA Crew
E. Hamblett	NASA
M. Vucelic	NAA-Eng
J. R. Howard	NAA Eng
A. Bialecki	NAA Eng
J. Montgomery	NAA Eng
J. H. Parker	NAA ATO

HANDOUTS

The following handouts as defined by the NAA Plan of Action were distributed to the working group meetings:

- Open Item Status Report
  (Recap dated 18 July 1966)

- Critical Life Components
  (CTR Time/Cycles S/C 012)

- Deviation and Waiver Listing
  (Spacecraft 012-Waivers)

- SCN/MCR List
  (S/C 012 MCR's dated 23 June 66)
  (SCN Status Summary dated 15 July 66)

- Single Point Failure Summary
  (Apollo-REL-A-66-3 dated 25 May 66)

In addition, the following handouts were distributed to the working group meetings.

- Open Items for Field
  (Open Item Report for Work not in KSC Plan)

- Integrated Test Report
  (TPE Report OCP-P-0129)
  (TPE Report OCP-P-0129A)
  (TPE Report OCP-P-0130A)
  (TPE Report OCP-P-0130B)

CSM 012

SYSTEM ASSESSMENT ACTION RESPONSES

TABLE OF CONTENTS

Item No.	Dept.	Status	Page No.	Comments
4.6.4	NASA			
4.6.5	ATO	Completed	D-7	
4.6.6	ENG	Resolved	E-12	
4.6.7	ATO	Completed	D-7	
4.6.8	ATO	ECD 8-7	D-7	
5.6.1	ATO	ECD 8-8	D-8, F-13	
5.6.2	ATO	Completed	D-8, F-13	
5.6.6	ENG	Resolved	E-12	
	ATO	ECD Ship	D-8	
5.6.7	ENG	Resolved	E-13, E-14	
5.6.9	ATO	Completed	D-9	
5.6.12	ENG	Resolved	E-14	
	NASA	Resolved	F-18	
5.6.15	ATO	Completed	D-9	
5.6.17	ATO	ECD 8-20	D-9	KSC Action
5.6.18	ATO	Completed	D-10	
5.6.19	ENG	Resolved	F-7	
5.6.21	ATO	ECD Ship	D-10	
6.6.1	ENG	Resolved	E-15	
6.6.2	ENG	Resolved	E-16	
6.6.3	ENG	Resolved	E-16	KSC Action
6.6.4	ENG	Resolved	E17, E-18	
6.6.5	ENG	ECD 8-17	E-19, E-20	KSC Action
6.6.6	ENG	Resolved	E-20	
6.6.7	ENG	Resolved	F-7	KSC Action
6.6.8	ATO	Completed	D-11	
6.6.9	ENG	Resolved	E-21	
7.6.2	ATO	Completed	D-11	
7.6.3	ATO	ECD Ship	D-12	
7.6.4	QA	Resolved	B-2	
7.6.5	ENG	Resolved	E-22	
	ATO	Completed	D-12	
7.6.6	ATO	Completed	D-13	
7.6.7	ATO	Completed	D-13	KSC Action
8.6.1	ENG	Resolved	E-22	
8.6.2	ENG	Resolved	E-23	
8.6.3	ENG	Resolved	E-24	
8.6.5	ENG	Resolved	E-25	
8.6.6	ENG	Resolved	E-26	
8.6.7	ENG	Resolved	E-27	
8.6.8	ATO	Completed	D-14	
8.6.9	ENG	Resolved	E-27	
8.6.10	ENG	Resolved	F-8	
8.6.11	ENG	Resolved	E-28	KSC Action
	ATO	ECD Ship	D-14	KSC Action
8.6.13	ENG	Resolved	E-28	
8.6.17	ENG	Resolved	E-29	KSC Action
8.6.18	ENG	Resolved	E-30	
9.3.4.1	ENG	Resolved	E-31	KSC Action
	ATO	Completed	D-15	
	ACED	ECD 8-6	C-2	

Item No.	Dept.	Status	Page No.	Comments
9.3.4.3	ACED	ECD 8-24	C-2	
9.3.4.4	ENG	Resolved	E-32	
	MIT	Resolved	C-3, F-19	
9.3.4.5	ENG	Resolved	E-33	
9.3.4.6	ACED	Resolved	C-4	
10.6.1	ATO	Completed	D-16	KSC Action
10.6.2	ATO	Completed	D-16	KSC Action
10.6.3	ATO	Completed	D-17	KSC Action
10.6.4	ATO	Completed	D-17	KSC Action
10.6.5	ENG	Resolved	E-34	
11.2.1	ENG	Resolved	E-35	
11.6.1	ENG	Resolved	E-36	
11.6.2	ENG	Resolved	E-36	
11.6.3	ENG	Resolved	E-37	
12.6.1	NASA			
12.6.2	NASA			
12.6.3	ENG, ATO	Completed	E-38, F-14	
12.6.4	ENG	Resolved	E-38	
12.6.5	ENG	Resolved	E-39	
12.6.6	ENG	Resolved	E-40	KSC Action
12.6.7	ENG	Resolved	E-40	
12.6.8	ENG	Resolved	E-41	
12.6.9	MIT	ECD 9-15	C-5	
13.6.4	ENG	Resolved	E-42	
13.6.5	ENG	Resolved	E-42	
13.6.6	ENG	Resolved	E-43	
13.6.9	ENG	Resolved	E-43	
	ATO	ECD Ship	D-18	
13.6.10	ENG	Resolved	E-44	
	NASA			
13.6.14	ENG	Resolved	F-44	
13.6.16	ATO	Completed	D-18, D-19	
	ENG	In work	F-9	
13.6.18	ATO	ECD CCFF	D-20	
13.6.20	ENG	Resolved	E-45	
13.6.21	ENG	Resolved	F-9	
14.6.1	NASA			
14.6.2	ENG	Resolved	F-10	KSC Action
14.6.3	ENG	Resolved	E-46	
14.6.4	ATO	Completed	F-14	
14.6.6	ENG	Resolved	E-46	
14.6.8	ENG	Resolved	E-47	
14.6.9	ATO	Completed	D-21	
14.6.10	ENG	Resolved	E-47	
14.6.11	ENG	Resolved	E-48	
14.6.12	ENG	Resolved	E-48	
	ATO	ECD Ship	D-21	
14.6.13	ENG	Resolved	E-49	
	ATO	Completed	D-21	
14.6.14	ENG	Resolved	E-49	

Item No.	Dept.	Status	Page No.	Comments
14.6.15	NASA			
14.6.16	ENG	Resolved	E-49	
	ATO	ECD 8-11	F-14	
15.6.1	ENG	Resolved	E-50	
	ATO	ECD CCFF	D-22	
15.6.2	ENG	Resolved	E-50	
	ATO	ECD CCFF	D-22	
15.6.3	ATO	ECD CCFF	D-23	
15.6.5	ENG	Resolved	E-51	
15.6.6	NASA			
15.6.7	ENG	Resolved	E-51	
	ATO	ECD Ship	D-23	
15.6.9	NASA			
15.6.10	NASA			
15.6.11	NASA			

ATO-D-TP-66-TD-251

INTERNAL LETTER

North American Aviation, Inc.

Date · 3 August 1966

TO · Those Concerned
Address ·

FROM · J. F. Parker
Address · 642-001, B/6
Downey, FA-16

Phone · 5303

Subject · CARR Systems Assessment Action Responses - CSM 012

Reference: (a) IL ATO-D-TP-66-TD-243, CSM 012 Systems Assessment Meeting Minutes and Action Assignments

The enclosed action responses are submitted to formally document the NAA resolution of actions assigned at the CSM 012 CARR Systems Assessment meeting as defined by Reference (a). All action responses were submitted through and are approved by the appropriate departmental CARR Administrator, and are arranged by department. Unless noted on attachment 1, all action items are considered closed.

The action responses are arranged numerically within each departmental response package as assigned in the Systems Assessment minutes. Action items having an incomplete response include the estimated completion date (ECD). These items will be transmitted under separate cover at a later date.

This package constitutes the second section of the Phase II CARR Report. Reference (a) transmitted the first section.

Note to Contracts: Transmit this information to NASA; include CARR Administrators on distribution list.

J. F. Parker
Technical Assistant
Apollo Test and Operations

TWT/cdw

Attachment: (1)

ARPE 66-7-69

INTERNAL LETTER
North American Aviation, Inc.

Date · July 27, 1966

TO · J. F. Parker
Address · D/642-001
FA02

FROM · J. Adelstone
Address · D/692-340
FB54

Phone · 1580

Subject · Resolution of CSM 012 Systems Assessment Meeting Action Items Assigned to Reliability

Reference: IL ATO-D-TP-66-TD-243 dated July 21, 1966, titled CSM 012 Systems Assessment Meeting Minutes.

The enclosure (1) shows the responses to the referenced action items assigned NAA-692 from the CSM 012 Systems Assessment Meeting held July 19, 1966.

The status as of July 27, 1966 for Reliability action items is as follows:

Paragraph No.

2.6.10 Item Complete

J. Adelstone
Departmental CARR Administrator
CSM 012

/bjr
Enc.

SECTION 2 - FUEL CELL/CRYO

2.6.10 PROBLEM Excessive Operating Time on O_2 Tanks

Total amount of operating time accumulated under operating pressure is 417.3 hours. Sqk 207 Reference O_2 Tank No. 1 P/N ME282-0026-0060 Rev. "L" S/N 1002$_4$E620413 sheet 40 of Data Pack. Spec MA0201-0077 "E" states earth replacement required after 150 hours operating time.

DISCUSSION/RESOLUTION

The supplier guarantees 400 hours of operating life after delivery of the tank. The functional items such as fans and heaters were refurbished prior to shipment to assure that the tank would achieve its requirements. Time accumulated on the pressure vessel does not degrade it.

EO M386136 has been released, therefore, against MA0201-0077E, the operating time specification, changing the tank requirements to 400 hours after delivery. EO M512350, against MA201-0766, the Block I Cryogenic System Checkout process specification incorporates the same requirement. Both specifications also incorporate a change from 382.5 psi to 865 psi as the pressure at which operating time should be recorded. The 382.5 psi was based on the maximum pressure at which the tanks could be operated in Building 290. Since the higher pressure of 865 psi is not degrading to the tank it is not necessary to record time when the tanks are subjected to lesser pressures.

PROBLEM RESOLVED

INTERNAL LETTER
North American Aviation, Inc.

Date · July 28, 1966

TO · J. F. Parker
Address · D/642, B/6
41 FA02

FROM · J. R. Long
Address · D/147, B/290
41 FB15

Phone · 4291 (H. Wilson)

Subject · Resolution of CSM 012 Systems Assessment Meeting Action Items Assigned to Q&RA

Reference: IL ATO-D-TP-66-TD-243, dated July 21, 1966, titled CSM 012 Systems Assessment Meeting Minutes

The enclosure (1) shows the responses to the referenced action items assigned NAA-147 from the CSM 012 Systems Assessment Meeting held July 19, 1966.

The status as of July 28, 1966, for Q & RA action items is as follows:

Paragraph No.	
7.6.4	Item Complete

J. R. Long, Chief
Apollo Product Inspection

SECTION 7 - SERVICE PROPULSION SYSTEM

7.6.4 PROBLEM - Damaged FCSM Cable

FCSM cable is damaged at +z position under locking link shoulder and also kinked severely 4 inches back from connector as described in squawk No. 242.

DISCUSSION/RESOLUTION

Engine, S/N 001890000031, has been removed from S/C 012 and will be replaced with engine, S/N 001890000030. Squawk No. 242 has been transferred with engine, S/N 001890000031, via shortage report No. 203545. The engine will be returned to Aerojet General, and the cable will be replaced. Engine, S/N 001890000030 will be installed on S/C 012.

PROBLEM RESOLVED

INTERNAL LETTER
North American Aviation, Inc.

Date .3 August 1966

TO J. F. Parker
Address 642-001, B/6
Downey, FA-02

FROM J. P. Kaiser
Address FB55

Phone .1830

Subject Resolution of CSM 12 Systems Assessment Meeting Action items Assigned to AC Electronics Div.

Reference IL ATO-D-TP-243 dated 21 July 1966, titles CSM 012 Systems Assessment Meeting Minutes.

The enclosure (1) shows the responses to the referenced action items assigned NAA-(department) from the CSM 012 Systems Assessment Meeting held 19 July 1966.

The status as of 1 August 1966 for the action items is as follows:

Paragraph No.	
9.3.4.1	See Attachment from AC Electronics
9.3.4.3	See Attachment from AC Electronics
9.3.4.4	See Attachment from MIT/IL.
9.3.4.6	See Attachment from AC Electronics.
12.6.9	See Attachment from MIT/IL

J. P. Kaiser, Site Manager
AC Electronics Div., GMC
NAA/Downey

9.3.4.1 Replacement of IMU. IMU, S/N 9 is being replaced now with another IMU. The expected completion of recalibration is 6 August, barring any problems.

9.3.4.3 Report on Qual Testing Progress
The Qual Test program for the G&N system is complete except for the following:

Item	Expected Completion
Eyepiece Stowage Unit	
Overstress Thermal Vacuum	12 August
Earth Landing Shock	16 August
Main DSKY	
Humidity O_2 and Salt Fog	14 August
Design Level Thermal Vacuum	24 August
Nav DSKY	
Z_{cm} Vibration	4 August
Humidity O_2 and Salt Fog	14 August
Design Level Thermal Vacuum	24 August

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS
INSTRUMENTATION LABORATORY
CAMBRIDGE, MASS. 02139

C. S. DRAPER
DIRECTOR

AG-NAA 202-66
29 July 1966

AC Electronics Div., GMC
c/o NAA, Inc., S&ID
12214 Lakewood Boulevard
Downey, California 90241

Attention: Mr. J. P. Kaiser
Site Manager

Subject: CARR Item 9.3.4.4

Gentlemen:

Problem: To provide a field of view for the G&N optical unit after modification of the Astrosextant doors.

Discussion: MIT is in process of defining this field of view with MSC and will have it available by August 5th.

Resolution: None

Very truly yours,

Massachusetts Institute of Technology
Instrumentation Laboratory

Thomas A. Hemker

Thomas A. Hemker
Test & Operations Director at NAA
MIT/IL Apollo Guidance and Navigation

TAH/bj

cc: J. H. Brown
D. A. Koso
J. E. Miller
W. A. Stameris
A. L. Zeitlin

9.3.4.6 The computer from Spacecraft 12 (P/N 1003700-051 S/N 11) was in the Operations Console for Computer Subsystem testing to investigate the TC Trap and Parity Fail conditions which had occurred during spacecraft testing.

Field Verification Procedures (written for Block II GSE) were performed and CSS JDCs (written for Block I-100 GSE) which were compatable with Block II GSE were performed. In addition high-low voltage margin test was run (ETR-072) as well as over 500 iterations of Self Test No. 2. The only problems encountered were as follows:

No flight hardware problems were located and no hardware cause could be correlated to have caused the TC Trap and Parity Fail. A problem was found with GSE interface circuitry but this is unrelated and acceptable for flight use.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS
INSTRUMENTATION LABORATORY
CAMBRIDGE, MASS. 02139

C. S. DRAPER
DIRECTOR

AG-NAA 205-66
2 August 1966

AC Electronics Div., GMC
c/o NAA, Inc., S&ID
12214 Lakewood Boulevard
Downey, California 90241

Attention: Mr. J. P. Kaiser
Site Manager

Subject: CARR Item 12.6.9

Gentlemen:

Problem: Are covers light enough to prevent damage to Optics System due to overloads which could occur during boost.

Discussion: MIT/AC has programmed a design evaluation of this mod on G&N #7. This test will include a prototype cover to be provided by MSC. Anticipated date of completion is 15 September.

Resolution: None

Very truly yours,

Massachusetts Institute of Technology
Instrumentation Laboratory

Thomas A. Hemker

Thomas A. Hemker
Test & Operations Director at NAA
MIT/IL Apollo Guidance and Navigation

TAH/bj

dc: J. H. Brown
D. A. Koso
J. E. Miller
W. A. Stameris
A. L. Zeitlin

ATO-D-TP-66-TD-259

INTERNAL LETTER
North American Aviation, Inc.

Date · 3 August 1966

TO · J. F. Parker
Address · 642-001, B/6
Downey, FA-02

FROM · J. W. Cussupoli
Address · 642-030, B/6
Downey, FA-08

Phone · 2571

Subject · Resolution of CSM 012 Systems Assessment Meeting Action Items Assigned to ATO

Reference: IL ATO-D-TP-66-TD-243 dated 21 July 1966, Subject: CSM 012 Systems Assessment Meeting Minutes

Enclosure (2) shows the responses to the referenced action items assigned NAA ATO from the CSM 012 Systems Assessment Meeting held 19 July 1966.

The status as of 28 July 1966 for the ATO action items is shown on enclosure (1).

J. W. Cussupoli
Departmental CARR Administrator

TWT/odw

ACTION RESPONSE STATUS

Paragraph No.		
1.6.2	In Work	ECD 8-8-6
1.6.3	In Work	ECD 8-8-6
2.6.12	In Work	
3.6.3	In Work	ECD 8-7-6
3.6.10	In Work	ECD 8-3-6
3.6.11	Complete	
3.6.12	Complete	
3.6.14	In Work	ECD-ECS C/O
3.6.15	Complete	
3.6.16	Complete	
3.6.17	Complete	
4.6.5	Complete	
4.6.7	Complete	
4.6.8	In Work	ECD 8-7-6
5.6.1	In Work	ECD 8-5-6
5.6.2	In Work	ECD 8-5-6
5.6.6	Prior to Ship	
5.6.9	Complete	
5.6.15	Complete	
5.6.17	In Work	ECS 8-20-6
5.6.18	Complete	
5.6.21	In Work	ECD 8-5-6
6.6.8	Complete	
7.6.2	Complete	
7.6.3	Prior to Ship	
7.6.5	Complete	
7.6.6	Complete	
7.6.7	In Work	ECD CCFF
8.6.8	Complete	
8.6.11	In Work	ECD Ship
9.3.4.1	Complete	
10.6.1	Complete	
10.6.2	Complete	
10.6.3	Complete	
10.6.4	Complete	
13.6.9	In Work	ECD Ship
13.6.16	Complete	
13.6.18	In Work	ECD CCFF
14.6.9	Complete	
14.6.12	ECD Prior to Ship	
14.6.13	Complete	
15.6.1	In Work	ECD CCFF
15.6.2	In Work	ECD CCFF
15.6.3	In Work	ECD CCFF
15.6.7	In Work	ECD Ship

1.6.2 PROBLEM - Dead Face Verification

Dead face verification was first accomplished in OCP 0129A - SC 012. Circuit interrupter C15A1 did not open due to improper pressure (200 psi) and switch M3 in the SK 231 did not operate.

DISCUSSION W. Hutchinson

TPS is in work to run tests as soon as the ECU has been serviced with water glycol. Testing at Downey for verification that the dead face relay open circuits as required. ECD 8 August 1966.

1.6.3 PROBLEM - Noise on AC Bus 1

Modulation on AC Bus 1 and AC Bus 2 during OCP 0129-SC 012 was observed to be 1.5 per cent.

DISCUSSION W. Hutchinson

TPS in work to run tests as soon as the ECU has been serviced with water glycol. Retest of busses will be performed to observe per cent of modulation and report results. ECD 8-8-66.

3.6.3 PROBLEM - ECS Checkout Requirements

Additional test requirements to ECS functional - OCP-5051 are listed below:

1. Provide system readiness verification prior to crew ingress
2. Service suit heat exchanger wicks
3. Verify suit loop temp control functions during manned run
4. Post landing valve checks and blower and attitude switch C/O
5. Suit gas analysis prior to crew insertion
6. Suit loop integrity check
7. CO_2 sensor check - response only

PROBLEM CORRECTION PLAN J. Hill

These tests will be accomplished during performance of OCP-P-5051 now scheduled for 7 August 1966.

3.6.10 PROBLEM - Retest of O_2 Supply System

Proof pressure and leak check of C/M O_2 supply system (high pressure side) is required after rework.

DISCUSSION J. Jolley

OCP-P-5049 now being performed to proof and leak check these lines. Rework complete. ECD 8-3-66.

3.6.11 PROBLEM - OCP 5017 Supplemental H_2O System

GN_2 tank pressure regulator relief function of valve has not been checked.

DISCUSSION J. Jolley

ATO is unable to verify function of GN_2 relief valve because of the design and installation of the relief valve.

Item completed.

3.6.12 PROBLEM - SM W/G Q/D Leak Check
SM W/G quick disconnect valves are not leak checked at Downey.

DISCUSSION
OCP 5049/5017 and process specifications do not call out a requirement to leak check valves.

PROBLEM RESOLVED J. Jolley
Quick disconnect leak check was performed with no problems per TPS V17-GEN-143. Item completed.

3.6.14 PROBLEM - ECS Instrumentation
Flight qualification instrumentation on ECS not operating properly.

CF0050 W/G Delta P Branch 2
CF0481 W/G Temp to Coldplate
CF0327 Waste H_2O Pressure
CF0245 O_2 Reg.

DISCUSSION
Measurement problems have been corrected. Verification is pending completion of ECS tests.

3.6.15 PROBLEM - Manual Control of Glycol Water Supply
Manual control of the water supply to the glycol evaporator should be provided.

DISCUSSION
Fix incorporated in MCR 1534.

PROBLEM RESOLVED J. Jolley
Manual bypass valve has been installed per MCR 1534. Item completed.

3.6.16 PROBLEM - Waste Management System Venting
Venting the fecal cannister into the suit loop is unacceptable. The fecal cannister must be vented overboard.

DISCUSSION
Fix in work per MCR 1516.

PROBLEM RESOLVED J. Jolley
That portion of MCR 1516 which changes fecal cannister venting to overboard has been accomplished. Item completed.

3.6.17 PROBLEM - Pressure Suit Ventilation

The ECS Breadboard Test has indicated that pressure suit ventilation is inadequate. The capability to operate both suit loop fans simultaneously must be provided.

DISCUSSION J. Jolley

MCR 1547 to provide simultaneous operation of both suit loop fans will be accomplished in the field.

Item completed (Downey portion).

4.1.4 OCP-P-8077-A-SC-012 - Antenna Systems Functional Verification

SCOPE

This test was performed to functionally verify the Spacecraft antennas with respect to VSWR measurements, as specified in Process Specification MA0205-0494, using fixed system frequencies.

RESULTS

Sequences covering the VHF Recovery, the VHF/S-Band Scimitar Antennas and C-Band No. 4 Antenna were completed before integrated Systems Tests. These antennas were used during plugs out integrated tests. C-Band Antennas 1, 2 and 3, which are in the Aft H/S, were checked after Aft H/S installation. All VSWR valves were well within limit. There were no significant problems encountered during this test.

4.6.5 PROBLEM - No TV Video

During OCP-P-0129 Seq. 19-192, were unable to obtain a TV picture at this time.

Ref. OCP-P-0129 Squawk #2
TPS 0129-040 T/S
V16-GEN Squawk #160

DISCUSSION

Connector J195, which connects to TV camera at LEB position, had broken wire at Pin 10. Wire at Connector J195 was repaired and subsequent TV checks were good. Probable cause was moveable TV braket interfacing with cable. Ref. squawk No. 193 in EDR book to reroute the cable and clear TV bracket.

PROBLEM RESOLVED R. G. Roshon

Squawk No. 193 in EDR book has been complied with. Item closed.

4.6.7 PROBLEM - MDC Panel 19 Replacement (V16-771349)

DISCUSSION

This panel has the following COM functions and controls: 1. UP TLM CMD RESET 2. S-BAND AGC METER 3. LEM recorder TAPE MOTION. This panel should be retested.

LEM recorder Tape Motion Monitor will be checked during LEM recorder checkout. S-Band AGC meter and UP TLM CMD reset function can be checked during the TV checkout period.

PROBLEM RESOLVED R. G. Roshon

Panel was replaced and tested to TPS V16-GEN-262 and V16-GEN-208 with no apparent problems. Item closed.

4.6.8 PROBLEM - TV Camera Checkout

TV camera operation has not been checked under worst lighting conditions; that is, looking at CCC with all couch floodlights turned to maximum brightness.

PROBLEM CORRECTION PLAN R. G. Roshon

It is presently planned to check the TV camera operation under these conditions after installation of crew couches and floodlights. ECD 7 August 1966.

5.6.1 PROBLEM - Bad Transducer
(CFO550P), diff. press. CP No. 2 branch. Signal conditioner outputs 5.5 vdc with no pressure on ECS lines. S/B 0 vdc. T/X TPS V16-GEN-105 Sqk. No. 180.

DISCUSSION
TPS V16-GEN-175 removes and replaces CFO550P. Meas. verif. to be made during c/o of ECU.

PROBLEM CORRECTION PLAN R. G. Roshon
Measurement operation to be verified during OCP-P-5051. ECD 8-5-66.

5.6.2 PROBLEM - Bad Transducer
(CFO481), reads 99.9 per cent, should be approximately 23 per cent. (CP inlet temp.) T/S TPS V16-GEN-074, COM Sqk. No. 337.

DISCUSSION
TPS V16-GEN-101 replaces CFO481T. Meas. verif. to be made during c/o of EC.

PROBLEM CORRECTION PLAN R. G. Roshon
Measurement to be verified during OCP-P-5051. ECD 8-5-66.

5.6.6 PROBLEM - (CTO012X), Tape Motion Monitor, Lamp Stays on When Tape Stops
T/S TPS OCP-0129-059 Squawk No. 76.
DSE converter circuit treatment of 51.2 kc clock, and NRZ data from PCM is such that a feedback or leakage voltage of +2.5 and 0.5 vdc is placed on the B+ and B- (+12 and -5 vdc) lines respectively, of the tape motion sensor module when the normal B+ and B- voltages are cut off. A resultant signal of 1.8 vdc is present on the output line of this module. The PCM counts this 1.8 vdc as a binary "one" and outputs the event thus giving a false tape motion "on" indication.

DISCUSSION
EO M521317 changes tape motion sensor module output to reduce the present value of residual voltage (1.8 vdc) to a value below the binary "one" threshold level (1.2 vdc) of the PCM.

This is a DSE design problem.

PROBLEM CORRECTION PLAN J. W. Cuzzupoli
Upon receipt of E.O. the mod will be accomplished. It is planned to accomplish this prior to ship.

5.6.9 PROBLEM - Heat Shield Instrumentation

The aft shield instrumentation has not been tested while connected to the spacecraft.

DISCUSSION

This test will be conducted when the heat shield is electrically mated to CM while in the heat shield fixture at Downey.

PROBLEM RESOLVED R. G. Roshon

Checkout of the aft heat shield instrumentation was performed by TPS V16-GEN-196 and checkout was satisfactorily accomplished. Item completed.

5.6.15 PROBLEM - Panel Replacement

Rework of Panel 19 and retest is required.

DISCUSSION

Checkout Flight Qualification Recorder Switch after panel installation with mission equipment for proper operation.

PROBLEM RESOLVED R. G. Roshon

TPS V16-GEN-262 was performed verifying satisfactory operation of the UP TIME CMD switch and S-Band antenna meter. The Flight Qualification Recorder Operation was verified by TPS-GEN-197. Item complete.

5.6.17 PROBLEM - Calibration Curves

Need calibration curves for CSM panel meters.

DISCUSSION R. Parsons

Provide calibration curves for CSM meters and TM data. Information to go to Astronauts at KSC.

PROBLEM CORRECTION PLAN

The data is currently being processed by computer to obtain single end-to-end calibration curves for each measurement. ECD 8-20-66.

5.6.18 PROBLEM - CTE Mod on CSM 011
Is this mod to be accomplished on CSM 012?
(This is an input filter).

DISCUSSION
Mod is being accomplished on CSM 011 at the present time. NAA Engineering recommends that this mod be accomplished on a non-interference basis. Do not modify CSM 014 until CSM 014 Systems Assessment.

PROBLEM RESOLUTION R. G. Roshon
The filter modification was completed on 7-28-66. The CTE verification was performed during ECU checkout, ref. deviation sheet OCP-5049-034T, Item 3 and 4. Item closed.

5.6.21 PROBLEM - LEM Recorder Checkout
The LEM recorder functional checkout has not yet been accomplished per MA0203-0402.

DISCUSSION
It is presently planned to perform the LEM recorder functional checkout with CSM in the heat shield fixture. GFE equipment not yet available.

PROBLEM CORRECTION PLAN R. G. Roshon
The LEM recorder functional checkout was performed by TPS V16-GEN-208. Post test data indicates possible malfunction in tape operation on off control. Additional information will be available at a later date.

6.6.8 PROBLEM - Quad C

Quad C has not been sold to NASA.

DISCUSSION

The retest of replaced relief valves is in work and buy-off is pending completion.

PROBLEM RESOLVED C. McKim

Testing on Quad C completed on 16 July 1966 with no significant problems encountered. Item completed.

7.6.2 PROBLEM - Contamination Check

Cold flow and engine contamination checks have not been completed to verify engine operation by NASA approved TPS's following rework.

DISCUSSION

Verify that the retesting required by portions of OCP-P-4131 affected by removing the SPS engine from the S/M have been accomplished.

PROBLEM RESOLVED J. E. Jolley

SPS Cold Flow Proof and Leak Test was run satisfactorily by TPS V17-GEN-128.

The flushing sequence was performed several times to obtain a satisfactory sample demonstrating a satisfactory cleanliness level. Item complete.

7.6.3 PROBLEM - Single Point Failure in FCSM

In order to eliminate single point failure, the FCSM requires a change to the switch and a continuity check.

DISCUSSION

EO's and TPS's have been generated to eliminate the problem of FCSM single point failure.

PROBLEM CORRECTION PLAN W. Hutchinson

The following EO's and TPS's have been generated to eliminate this problem: EO's M-520657, M-520658 on TPS V16-GEN-182, EO M-520659 on TPS V17-GEN-126, EO's M-520660, M-520661 on TPS V17-GEN-123 and EO's M-508225, M-477747 on TPS V16-GEN-255. The work will include continuity checks of installed switches and wiring. Effort will be completed prior to ship.

7.6.5 PROBLEM - Engine Heater Wiring

Existing wire routing to engine heaters is not satisfactory, i.e., attachment technique and stress relief.

DISCUSSION

NAA engineering to provide technical assistance to reconfigure wiring installation. Present heater wiring must be properly protected and drawings or on-the-spot E.O.'s provided, to cover routing, terminations, clamping check out etc. This action will require full time engineering support to assure a timely job is produced.

PROBLEM RESOLVED J. E. Jolley

E.O. 532811 (V17-880033) has been accomplished correcting above noted rework. Item complete.

7.6.6 PROBLEM - Sump tank Installation

Reverification of O_2 and fuel sump tank is required following tank replacement for standpipe fix. During cold flow pretest, the welded joints between the fuel and oxidizer sump tanks and the engine should be proof tested to 1.25 times operating pressure as a KSC safety requirement.

DISCUSSION

This will be accomplished during cold flow tests per TPS. Full integrity of any fuel, oxidizer or pressurization lines cut during tank rework will be verified to 1.25 times operating pressure (approximately 218 psi).

PROBLEM RESOLVED J. E. Jolley

Modification and installation have been completed on sump tank and leak test satisfactorily completed using 1.25 times operating pressure per TPS V17-GEN-128. Item completed.

7.6.7 PROBLEM - SPS Heater Checkout and FCSM Checkout

When will the checkout of work on these systems be completed?

DISCUSSION

The SPS Heater Mod and MCR-1581 (FCSM) will be completed at Downey. Continuity checkout of the SPS heater temperature monitor modification and FCSM mod will be accomplished in Downey. Complete integrated check will be accomplished at KSC.

PROBLEM CORRECTION PLAN J. E. Jolley

Due to engine change, checkout of the FSCM system will involve re-running considerable portions of OCP's 0126 and 4128. Therefore, this checkout will be accomplished at KSC. Since C/M will not be restacked, all heater circuitry will be continuity checked at Downey prior to CCFF.

8.6.8 PROBLEM - FDAI Harness Checkout

FDAI harness hipot and physical mating verification (Ref. squawk No. 249) have not been accomplished.

DISCUSSION

This will be completed prior to shipment.

PROBLEM RESOLVED

Harness continuity, megger test, and continuity through the FDAI connector were accomplished satisfactorily by TPS-GEN-217.

Item complete.

8.6.11 PROBLEM - No. 1 Translation Controller Color Coding
The original engineering requirement to paint the No. 1 Translation Controller so that it may be identified as the one incorporating the Abort feature is not adequate.

DISCUSSION
During Downey testing, the No. 1 controller cannon plug was connected to the No. 2 vehicle plug and the test team was getting ready to re-lable the vehicle before the error was discovered. The controller, both ends of the connector cable, and the spacecraft connector plug (J167) should all have yellow and black diagonal stripes so that there is no possibility of improper installation by either the test teams or the flight crew. Engineering has provided the documentation to accomplish this on CSM 012.

PROBLEM CORRECTION PLAN W. Hutchinson
Color coding of hand controller will be accomplished per E.O. 490312 and will be performed at KSC upon receipt of controller from Minneapolis-Honeywell. Coding of receptacle (J167) will be accomplished per print V16-000011 prior to shipment.

9.3.4.1 PROBLEM - IMU - Excessive Drift

IMU S/N-9 in G&N 12/50 exhibited X-IRIG excessive drift, excessive and unstable X-PIPA misalignment about Z, and X-PIPA scale factor.

DISCUSSION

IMU S/N-9 was removed from S/C. Lab tests indicate X-IRIG and X-PIPA failures. Replacement of the IMU will alleviate this condition. During subsequent S/C testing, the IMU was damaged by sudden loss and reapplication of power to the S/C several times due to incorrect operator procedure.

PROBLEM RESOLVED N. Casson

Operator procedures modified to prevent sudden reapplication of power to the IMU due to incorrect operator procedure by the addition of special instructions in section I-6 of all OCP's which require G&N system operation as follows:

In the event that spacecraft electrical power is lost during operation of the G&N system, insure that the IMU circuit breakers Main A and Main B, Panel 22, are pulled to "OFF" before DC power is reapplied to spacecraft busses.

Item closed.

10.6.1 PROBLEM - Fuse Module

A mating problem was found to exist between the fuse module (V16-540135) and the Pyro Continuity Verification Box (PCVB V16-540130-101).

DISCUSSION

The NAA Engineering plan of action IL 693-300-040-66-985 dated 12 July 1966 defines the rework required.

PROBLEM RESOLVED W. Hutchinson

SC 012's PCVB was replaced with PCVB (V16-540130-301) S/N 10174, EO 21568. Resistance checks were made to verify the box interface and circuit integrity. Work was done by TPS-V16-GEN-207, and TPS V16-GEN-266. Relay action was checked at the bench level. Installed tests will be made at KSC. Item complete.

10.6.2 PROBLEM - RCS Redundant Switch Mod

Reaction Control System redundant switch installation per MCR 1599 has not been completed.

DISCUSSION

1. It will be worked in Downey except relay box installation.
2. Continuity test will be done in Downey and reported prior to CARR.
3. Functional testing will be performed during integrated testing at KSC.

PROBLEM RESOLVED W. Hutchinson

EO's M-520689, M-525173, M-520662, M-520668, M-521322 on TPS V16-GEN-178 were accomplished to incorporate the MCR 1599 Mod. A continuity check was performed per TPS V16-GEN-179. Functional testing remains to be performed at KSC.

Item completed.

10.6.3 PROBLEM - TD Reset

Sixty-one sec time TD reset should be through the flyaway umbilical instead of ACE carry-on as at present.

DISCUSSION

1. It will be worked at Downey
2. It will be installed and functionally checked in Downey
3. It will be functionally (integrated) tested at KSC in the mated condition

PROBLEM RESOLVED W. Hutchinson

The change was accomplished in accordance with the following EO's and TPS's: EO M-520693 on TPS V16-GEN-125, EO's M-520720, M-525173 on TPS V16-GEN-178. Circuit continuity was verified per TPS V16-GEN-179.

Item completed.

10.6.4 PROBLEM - Drag Chute Squibs
Drag chute squibs were not provided for SC 012.

DISCUSSION
Resistance check to be made at Downey with functional test at KSC.

PROBLEM RESOLVED W. Hutchinson
MCR 1548 was released to add these squibs. EO's were written and worked to implement the MCR. EO's 429898, 485261, 485262 for TPS's V16-GEN-207, TPS V16-GEN-092 and TPS V16-GEN-232. The resistance of the added circuits was checked per TPS V16-GEN-207. Item complete.

13.6.9 PROBLEM - Switch Guards

Switch guards on ELS logic (panel No. 8) CM - SM separate (panel 15) and main chute release (panel No. 16) have ¼" gap from face of panel when in closed position.

DISCUSSION

Investigation will be conducted to determine whether replacement of guards is an ample solution or whether redesign is required.

PROBLEM CORRECTION PLAN W. Hutchinson

All switch guard installations were investigated with the resulting decision to change the spring assemblies in each cover. Work will be accomplished by the following E.O.'s and TPS. E.O. M-521379, M-521380, M-521382 and M-526837 for TPS V16-GEN-275 prior to ship.

13.6.16 PROBLEM - Crew Compartment Floodlights

Due to the number of failures that have occurred and the short mean time between failures, the crew compartment floodlights are not considered to be flight qualified.

DISCUSSION

Defer to CARR pending additional info to displays and controls group of Apollo Engineering.

PROBLEM RESOLVED W. Hutchinson

ATO has provided pre and post failure conditions to L. Troolines D/692 per IL ATO-D-2C-66-310, dated 25 July 1966, in order that engineering may complete the action required to present a firm recommendation concerning this problem. A copy of the IL is attached. See Engineering discussion. ATO action completed.

INTERNAL LETTER
North American Aviation, Inc.

ATO-D-2C-66-310

Date · July 25, 1966

TO · L. Trocolines
Address · 41-692-407
HA23, Downey

FROM · W. R. Hutchinson
Address · 41-642-033
FA07, Downey

Phone · 1786

Subject · Floodlight Failures.

During the test phase of SC 012, two floodlight failures have been experienced. The following information is submitted to fulfill the request of SC 012 Systems Assessment Board.

Failure No. 1 Date: 6-22-66 ME434-0045-0002 Floodlight Assembly

Discussion: Unit was mounted in a temporary fashion utilizing heavy duty cord. This was done since the crew couches were not available at the time. Electrical mating was proper and connected per V16-771328 installation drawing. The Rheostat had been set to full bright and kept at this level in order to support TV testing. The lamp was reported to have flickered and to extinguish accompanied by some smoke in the Command Module. Later investigation disclosed the floodlight had been previously damaged and also had a damaged seal. The associated circuitry had been subsequently checked on TPS 0129-027 and was found to be acceptable. Unit was returned on PRR M 119648.

Failure No. 2 Date: 7-2-66 ME434-0045-0004

Discussion: Floodlight was installed in position in Command Module per TPS-GEN-100. Mounting screws were not torqued. While attempting to operate floodlight in primary mode it flickered during "turn on" and extinguished. Secondary mode was tried with same results. Connector was verified to be properly mated. A second floodlight was operated in same position using same receptacle, lamp operated for approximately 21 minutes with no malfunction. Unit was returned on PRR M 74002.

If any questions arise please contact Mr. W. G. Schmidt, D/642, ext. 1786.

W. R. Hutchinson, Supervisor
Electrical Power System, SC 012
Apollo Test and Operations

WRH:rq

cc: R. Pedigo 697 FB23
N. Casson 642 FA07

13.6.18 PROBLEM - Crew Compartment Inspection Procedures

There are part numbers, assembly numbers, and inspection stamps in black and white paint all over the Main Display Console and the adjacent circuit breaker panels.

DISCUSSION

These markings must be cleaned off prior to shipment. In addition, this procedure is a hazard to vehicle testing. NAA should establish a policy within their manufacturing, test, and inspection system whereby all controls and displays and crew-compartment areas visible to the flight crew remain free from extraneous marks, stamps, paint, or nomenclature. ATO refurbish prior to shipment. Cleanliness spec available. (Inspection and Manufacturing) Inform men to follow cleanliness procedures.

PROBLEM CORRECTION PLAN J. E. Jolley

TPS V16-GEN-271 has been written to remove extraneous marks, stamps and nomenclature from control and display panels and areas visible to the flight crew and work will be completed prior to CCFF.

14.6.9 PROBLEM - CAL-FAX and cam lock fasteners Crew Compartment

All E.O.'s on these fasteners must be completed prior to crew compartment fit and function.

DISCUSSION

Negotiate with Mfg. to insure compliance.

PROBLEM RESOLVED J. E. Jolley

All fasteners were reworked by TPS's 033, 034, 038 and 066; E.O. 406090. Item completed.

14.6.12 PROBLEM - LH Equipment Bay Marking

During the ELS Breadboard Test, checkout of Spacecraft 011, and Downey operations with Spacecraft 012, it was discovered that LH Equipment Bay Panel 131 is colored light blue with white letters on this background used for marking nomenclature. Due to the poor contrast, nomenclature cannot be seen by crew.

DISCUSSION J. H. Parker

Squawk has been entered in EDR Book. Work to be accomplished by incorporation of decal pending authorization by Engineering prior to ship.

14.6.13 PROBLEM - Umbilical Assy

The ECS suit umbilical exhaust hose cap is needed for use in the CCFF.

DISCUSSION

Insure cap is available for CCFF.

PROBLEM RESOLVED J. E. Jolley

Umbilical Cap Assembly, P/N V16-601212 is complete and available to support CCFF. Item complete.

15.6.1 PROBLEM - Scientific Medical Data Acquisition System P/N 511076. (MDAS)

(1) The MDAS does not fit CFE Container "C"

(2) CFE Container "C" does not fit Spacecraft Compartment "C"

DISCUSSION

A fit check on S/C 012 and 014 indicates that an interference problem exists that must be resolved prior to the crew compartment fit and function check to be performed during OCP 5051.

PROBLEM RESOLVED J. E. Jolley

E.O.'s 509917, 464243 and 516698 authorized rework - will be accomplished prior to CCFF.

15.6.2 PROBLEM - Color Coding

The mockup reviews for S/C 012 and 014 resulted in R.I.D. action to color code the medical data acquisition system (MDAS) and the Octopus Cable (both GFE) and the mating C.F.E. Connector Interfaces.

DISCUSSION

TWX EX34/T-12-BG52-66-933 (7-11-66). NAA direction to color code the MDAS and Octopus Cable concurrent with coding C.F.E. crew compartment equipment.

PROBLEM CORRECTION PLAN J. E. Jolley

TPS will be written to match color code on cable to MDAS. Work will be accomplished prior to CCFF.

15.6.3 PROBLEM - Camera Bracket

The 16mm camera bracket (CFE), P/N V16-753103 experienced a failure during the Spacecraft 012 bench check held at NAA on June 24, 1966. The push button stop failed and fell out of the bracket.

DISCUSSION

An E.O. has been issued by NAA to rework this equipment.

PROBLEM RESOLVED J. E. Jolley

M-9A camera bracket rework was completed per E.O. M-227384. Bracket will be installed prior to CCFF.

15.6.7 PROBLEM - Crew Compartment Fit & Function

The crew compartment fit and function (C^2F^2) checkout has not been performed due to non-availability of the spacecraft ECU.

PROBLEM CORRECTION PLAN J. Jolley

This checkout is to be performed by TPS No. V16 GEN-069 during OCP-5051 prior to shipment of Spacecraft 012 to KSC.

693-300-040-66-1000

INTERNAL LETTER

NORTH AMERICAN AVIATION, INC.

DATE . August 3, 1966

TO . J. F. Parker
ADDRESS . 642-001
(Show Dept., Group, Div. & Location) FA02

FROM . W. E. Day
ADDRESS . 693-300
FB40

PHONE . 5732, 3439

SUBJECT . Resolution of CSM 012 System Assessment Meeting Action Items Assigned to Engineering

REFERENCE IL ATO-D-T8-66-243 dated 21 July 1966, Titled: CSM 012 System Assessment Meeting Minutes and Action Assignments

ENCLOSURE Action Items Assigned at the System Assessment Meeting (by Paragraph Number)

The enclosure shows the Engineering response to the referenced action items.

The following responses are included in the enclosure and are identified by paragraph number:

1.6.3	3.6.18	8.6.3	11.6.2	[redacted]
2.6.2	4.2.1	8.6.5	11.6.3	14.6.3
2.6.3	4.6.6	8.6.6	12.6.3	14.6.6
2.6.4	5.6.6	8.6.7	12.6.4	14.6.8
[redacted]	5.6.7	8.6.9	12.6.5	14.6.10
2.6.9	5.6.12	8.6.11	12.6.6	14.6.11
2.6.10	6.6.2	8.6.13	12.6.7	14.6.12
[redacted]	6.6.3	8.6.17	12.6.8	14.6.13
3.6.3	6.6.4	8.6.18	13.6.4	14.6.14
3.6.4	6.6.5	9.3.4.1	13.6.5	14.6.16
3.6.5	6.6.6	9.3.4.4	13.6.6	15.6.1
3.6.9	6.6.9	9.3.4.5	13.6.9	15.6.2
3.6.11	7.6.5	10.6.5	13.6.10	15.6.5
3.6.12	8.6.1	11.2.1	13.6.14	15.6.7
3.6.17	8.6.2	11.6.1	13.6.20	3.6.2
6.6.1	[redacted]			

W. E. Day
Engineering CARR Administrator

WED:vo

1.6.3 PROBLEM - Noise on AC Buss 1

Modulation on AC Buss 1 and AC Buss 2 during OCP-0129, S/C 012, varied from 1.2 percent to 2.95 percent, with an average of 2.0 percent.

DISCUSSION/RESOLUTION

The inverters have been qualified and meet the requirements of 0.5 percent modulation from half load to full load at 25 volts and 30 volts dc input. The S-Band communication equipment is known to be susceptible to modulation greater than 0.7 percent, which is also below 1000 cycles per second in frequency. Frequency data was not obtained during the original S/C 012 test. Since the S-Band functioned properly, it is necessary to obtain additional test data to analyze the characteristics, cause and significance of the modulation. This additional data will be obtained by testing of S/C 012 and S/C 014.

Further monitoring of the busses during ECS check-out on S/C 012 has been planned and will be accomplished to determine the characteristics of the modulation. A measurement of the modulation with no AC loads will also be obtained. The S-Band will not be operated during the ECS test.

During the performance of OCP-0129 on S/C 014, the effects of spacecraft AC loads on modulation will be determined. During this test, S-Band will be closely monitored for proper operation.

SECTION 2 - FUEL CELL/CRYO

2.6.2 PROBLEM REACTANT SHUTOFF VALVE

MCR 1542 (Reactant Shutoff Valve Holding Circuit) is not released in system.

DISCUSSION/RESOLUTION

See Modification Kit Listing - MCR 1542.

PROBLEM RESOLVED

2.6.3 PROBLEM - Oxygen System Contamination

Oxygen system contamination level is out of specification.

DISCUSSION/RESOLUTION

A meeting chaired by Dr. Lanzkron of NASA was held on July 20, 1966 in which EPS Design Engineering, Project Engineering, and NASA personnel reviewed the problem of suspected contamination in the S/C 012 oxygen system lines and the corrective action that would be required if this condition prevailed. It was concluded that the test analysis of the oxygen line under investigation was not conclusive in a quantitative way and that there was no reliable way of determining the true cleanliness of a system after it has proceeded past the final closeout. It was further concluded that disassembly of the system to measure contamination would actually introduce additional particles. The procedures for assembly and removal and replacement of component parts of the system were checked and found to be acceptable. These procedures were used as evidenced by NAA and NASA Q.C. sign-off.

An investigation into the possibility of using a liquid fluid flush or a gas flush for a final cleaning cycle of the cryogenic system after system closeout disclosed the following:

1) A fluid flush is impractical from a standpoint that the fluid will carry particles into the valve module cavities and leave them at that point. Subsequent operation of valves showed high leakage rates. This was also true for a gas flush. Both methods were attempted on BP-14 and resulted in high leakage rates on fuel cell reactant valves.

2) Due to the inherent CGSS characteristics, i.e., extremely low flow rates with low delta P's, it is virtually impossible to carry particles through the lines up to the filters and have them clog filters at that point. Particulates of many times the size and the count currently allowed by the system specification were experienced on S/C 001 and during the MSC minimum power down tests. The design group is currently investigating the use of clean out ports with mechanical closures. Investigations made by the Materials and Producibilities Group showed that the use of mechanical closures as flushing ports would tend to induce more contaminants than could possibly be removed.

As a result of these conclusions, the squawks written against S/C 012 were dispositioned as being acceptable as is.

PROBLEM RESOLVED.

2.6.4 PROBLEM - Vac-ion Pump Checkout

Checkout has not been completed (oxygen tanks).

DISCUSSION/RESOLUTION

EPS Engineering will prepare a checkout procedure that will establish both the proper operation of the vac-ion pump and the degree of vacuum in the oxygen tanks annulus prior to lift-off.

The circuit operation of the vac-ion pump will be checked at Downey in Bldg. 260 or Bldg. 290 prior to shipment of the vehicle to the Cape. Oxygen tank vacuum level will be checked in the MSOB at KSC. The checkout of the vac-ion pump will be performed using a microammeter connected in series with the DC-DC converter and vac-ion pump. The microammeter will indicate current which corresponds directly to vacuum level in the tank annulus. A current reading greater than 4.2 milliamps indicates a short circuit in the pump. Inability to obtain a current reading would indicate a malfunction of the power converter. This test will be performed using a piece of GSE equipment which is currently being procured from Beech Aircraft Corporation (BAC).

It has been shown by tanks that have been produced by BAC that once the integrity of the vacuum has been established, i.e., no leaks, the only other loss of vacuum which can be experienced would be due to outgassing of the materials within the vacuum annulus. Outgassing of materials at this vacuum (10^{-6}) level is prolonged.

The rationale behind not performing a checkout of the vac-ion pump while the vehicle is on the stack is based on the following: The fact that the vacuum level is checked at BAC prior to delivery, is again checked at Downey after installation of the tank in the spacecraft, and is again checked in the MSOB at the Cape, these checks over a period of approximately five months, will give satisfactory indication of tank integrity and vacuum retention.

PROBLEM RESOLVED.

2.6.9 PROBLEM - Fuel Cell Reactant Shut-off Valve

Due to reactant shut-off valve failures in S/C 008 and S/C 011, NASA wants to know if there is a problem either with design, method of operation, ACE compatibility or other parameters.

DISCUSSION/RESOLUTION

The attached failure history of these valves shows a prevailing ACE control problem that has been instrumental in causing the valve coil burn out. The complexity of the S/C ACE control operations is the primary cause for valve failure modes and not their basic design. Corrective action at present involves four phases:

a) ACE procedural corrective action
b) ACE patching corrective action
c) ACE computer programming corrective action
d) ACE hardware corrective action

PROBLEM UNRESOLVED in one instance.

1. The cause of the failure of the valve modules in S/C 011 at KSC has not been determined. Investigation is continuing in this area. A representative from Reliability has been sent to the Cape to review all procedures, operating techniques, and spacecraft installation.

2. Problems with reactant shutoff valve failures on S/C 008 at MSC have been resolved by isolating control circuits from the ACE hookup. (However, primary cause of initial malfunction has not been resolved.)

2.6.10 PROBLEM - Excess Operating Time on Oxygen Tank

Reference: Oxygen Tank #1 P/N ME282-0026-0060 Rev. L S/N 1002AE620413 Sheet 40 of Data Package. Total operating time under operating pressure is 417.3 hours. Specification MA0201-0077"E" states earth replacement is required after 150 hours operating time.

DISCUSSION/RESOLUTION

System Life Justification. The Beech Aircraft Corp. (BAC) Cryogenic Gas Storage System is capable of 400 hours of life after being delivered from BAC to NAA. The rationale is as follows:

The pressure vessel, the quantity gage, the outer shells of the pressure vessel, the coil housing, the insulation, the electrical heaters, and the thermal switch all have life expectancies in excess of 1000 hours. This has been verified by BAC during testing of the LO-3 tank which accumulated over 786 hours and by the tanks from S/C 001 which after having been used for White Sands tests were transferred to MSC for fuel cell minimum power tests and for the manual management tests. During the above tests, programs in excess of 600 hours of operation have been accumulated to date.

The only dynamic components located inside the tank are the fan motors. The average run time during a 14-day mission is 100-150 hours. At BAC fan motors averaged 20-25 hours of operation prior to shipment to NAA. The life of these units have been established as being in excess of 400 hours and tests have been conducted at both BAC and MSC in which the units were run for 1000 hours and longer.

Based on the above, the 400 hour life after delivery from BAC to NAA is justified.

The procurement specification for CGSS tanks is being clarified to reflect the operating time of the tank assembly as 400 hours after acceptance test.

PROBLEM RESOLVED.

SECTION 3 - ENVIRONMENTAL CONTROL SYSTEM

3.6.2 PROBLEM GLYCOL EVAPORATOR WICK TEMPERATURE

A crew compartment indication of glycol evaporator wick temperature should be provided.

DISCUSSION/RESOLUTION

MCR 1534 authorizes the provision of a plug-in module to allow readout of the glycol evaporator wick temperature. The design of the module is in work and a mockup will be provided 8-1-66.

PROBLEM RESOLVED

3.6.3 PROBLEM ECS CHECKOUT REQUIREMENTS

Additional test requirements to ECS functional OCP5051 were established during a review of the OCP.

DISCUSSION/RESOLUTION

NAA agreed to incorporate the requested tests. The OCPs and the ECS checkout process specifications are being revised and the tests are being conducted prior to S/C 012 delivery.

PROBLEM RESOLVED

3.6.4 PROBLEM URINE DUMP NOZZLE FREEZE-UP

It is not felt that the capability of the urine dump system to operate on a 14-day mission without freezing has been demonstrated.

DISCUSSION/RESOLUTION

A meeting was held with R. Lanzkron and other NASA and NAA personnel on 7-20-66, to continue the discussion of this problem. It was resolved that the satisfactory completion of the qualification test to the procedure previously approved by NASA would fulfill the NAA responsibility. NASA had reviewed the preliminary qualification test report and given tentative approval. A copy of the final report was supplied to NASA for further review.

PROBLEM RESOLVED

SECTION 3 - ENVIRONMENTAL CONTROL SYSTEM

3.6.5 PROBLEM URINE DUMP NOZZLE HEATER

Electrical wiring diagram of the urine dump nozzle heater indicates that a short in this heater would also cause the loss of both steam duct heaters.

DISCUSSION/RESOLUTION

Two problems were discussed relative to the urine dump nozzle heater, namely: (1) an open circuit failure in the heater resulting in possible urine nozzle freezing and (2) a shorted heater which would also cause the loss of both steam duct heaters.

The loss of urine dumping capability is not a critical problem as on-board collection and storage of urine is possible. Fecal storage bags have been considered; however, NASA is developing larger bags for this purpose which will be used on S/C 012.

The second failure mode was considered unacceptable and a solution was presented to R. Lanzkron on 7-20-66. This solution deleted one of the redundant power supplies to the nozzle heater by cutting or removing the wiring between the nozzle heater and the No. 2 steam duct heater. This provides completely independent power supplies to the two steam duct heaters with the nozzle heater connected to the No. 1 steam duct heater only. This was accepted by NASA and NAA and is being implemented.

PROBLEM RESOLVED

3.6.9 PROBLEM QUICK DISCONNECT VALVES

S/M water glycol disconnects have not been leak checked at Downey.

DISCUSSION/RESOLUTION

ECS checkout process specifications and OCPs are being revised to incorporate this leak check requirement. S/C 012 will be tested prior to shipment.

PROBLEM RESOLVED

SECTION 3 - ENVIRONMENTAL CONTROL SYSTEM

3.6.11 PROBLEM OCP5017 SUPPLEMENTAL H_2O SYSTEM

GN_2 tank pressure regulator relief valves have not been checked.

DISCUSSION/RESOLUTION

A procedure for performing this check has been established and the ECS checkout process specification is being revised. The OCP is being revised to allow this checkout to be performed prior to S/C 012 shipment.

PROBLEM RESOLVED

3.6.12 PROBLEM S/M W/G Q/D LEAK CHECK

Same as 3.6.9

3.6.17 PROBLEM PRESSURE SUIT VENTILATION

The ECS Breadboard Test indicated that pressure suit ventilation is inadequate. The capability to operate both suit fans simultaneously must be provided.

DISCUSSION/RESOLUTION

See Modification Kit Listing - MCR 1547.

PROBLEM RESOLVED

3.6.18 REVISED ECS TEST PLAN

Same as 3.6.3

SECTION 4 - COMMUNICATIONS

4.2.1 PROBLEM HF Recovery Antenna

The HF Recovery Antenna ME481-0049-0004 occasionally did not interleave properly on deployment.

DISCUSSION/RESOLUTION

1. The vendor (DeHavilland Aircraft) has conducted over 155 deployments leading to a ME481-0049-0007 configuration.

2. NAA intends to replace the ME481-0049-0004 antenna on S/C 012 and subs with a ME481-0049-0007 antenna.

3. The ME481-0044-0007 configuration has been subjected to a series of confidence tests including:

   (a) Six sample deployments

   (b) 48 hour wave motion test

PROBLEM RESOLVED

Anticipated installation date of ME481-0049-0007 antenna: August 18 at KSC.

SECTION 4 - COMMUNICATIONS

4.6.6 PROBLEM Audio Center VOX Release Time

Audio Center VOX release time is now adjusted based on verbal request.
DDC. TPS V16-GEN 126
TPS OCP-P-0130A-008
V16-GEN Squawk #218

DISCUSSION/RESOLUTION

1. TPS V16-GEN-176 was issued to document the setting of VOX release time of Audio Centers from 2 seconds to 1 seconds.

2. Audio Center functional checkout procedure, MA0205-0959, was change by E.O. M487941, dated July 26, 1966, to revise the release time limits to enable setting of 1 second.

PROBLEM RESOLVED

SECTION 5 - INSTRUMENTATION SYSTEM

5.6.6 PROBLEM (CT0012X), Tape Motion Monitor Lamp

DISCUSSION/RESOLUTION

EO M521317 was released for proper light indication on the tape motion sensor.

PROBLEM RESOLVED

SECTION 5 - INSTRUMENTATION SYSTEMS

5.6.7 PROBLEM Battery Charger Outputs Display

Present signal conditioner will not provide measurement (CC0215), battery charger currents, for telemetry. Output displays 0.01 amps on CRT when C/M meter display indicates greater than 1 amp charging current through battery shunt R4. When a difference voltage of 100 MV was applied to Differential Amplifier across shunt R4 (with 0 VDC common mode voltage) the CRT display was normal, indicating 5 amps. When common mode voltage on shunt was increased to 13 VDC, CRT display dropped to 0.01 amps.

DISCUSSION/RESOLUTION

Engineering has investigated the problem using the following approaches:

1. Moving current shunt R4 from the positive to the return lead of the circuit.

2. Modify the differential amplifier to obtain compatibility with the system.

3. Rescale the differential amplifiers used to monitor measurements CC0222, CC0223, and CC0224 to provide a charging current indication.

4. Delete the measurement as PCM data.

Investigations produced the following conclusions:

Item 1. cannot be implemented since the current reading is not indicative of the charge current. This erroneous indication is the result of other fuel cell currents in the system.

Item 2. is technically feasible. The amplifier is of the "plug in" type which facilitates replacement in the field as a retrofit. This solution is not applicable to S/C 012 since a hardware change is involved. Measurement resolution will be achieved within $\pm$ 2% in the -3 to 0 amp range.

Item (3) is the engineering recommendation as a resolution for S/C 012. This change results in a software change only. Amplifiers used to monitor measurements CC0222, CC0223 and CC0224 would be scaled from -3 to 100 amps (negative refers to current flow in the opposite direction due to charging) in lieu of the present 0 to 100 amps. Resolution in reading the PCM output is approximately ± 20% in the -3 to 0 amp range.

Item 4. is not acceptable to the NASA subsystem manager.

PROBLEM RESOLVED

Problem has been resolved for S/C 012 by rescaling the battery load current shunt measurements (CC0222, CC0223 and CC0224). The signal conditioner amplifier will be modified to meet performance requirements on S/C 014 when installed to monitor the battery charger current (shunt R4).

5.6.12 PROBLEM Q-BALL VECTOR DISPLAY

NASA questions the compatibility of the GFE Q-Ball sensor with the panel meter and PCM. A loading problem had occurred on S/C 009.

DISCUSSION/RESOLUTION

Design documents have been reviewed. The panel meter circuit is compatible with the ICD interface requirement. No further NAA action is required.
NOTE: There was no panel meter on S/C 009.

PROBLEM RESOLVED

SECTION 6 - REACTION CONTROL SYSTEM

6.6.1 PROBLEM SM RCS Propellant Isolation

There is a need to be able to assure that SM RCS propellant isolation valves are open prior to lift-off.

DISCUSSION/RESOLUTION

CCA 964 directed implementing necessary action to assure that SM RCS propellant isolation valves in each quad were positively open. Although the subject problem dealt only with the SM RCS, the CCA included the Command Module.

For Block I and resolution of this action item MCR A1615 calls for the necessary change from series to parallel hook-up in the CSM propellant isolation valve switch position indicating circuitry. This will provide positive knowledge on the Main Display Console that the valves are open, complying with the CCA requirement. With this change, it now cannot be determined, when valve actuation to the closed position is made, whether both valves are closed.

PROBLEM RESOLVED

SECTION 6 - REACTION CONTROL SYSTEM

6.6.2 PROBLEM SM RCS Quantity Gaging System

What effort is required to change existing SM RCS QGS to configure for flight? The S/C 012 and S/C 008 configurations must be identical for thermal test procedures. (Quad D only)

DISCUSSION/RESOLUTION

MCR A1587 implemented the deletion of QGS. EO M464896, 7, 8 initiated the changes for S/C 012. Copies of the EO's were datafaxed to MSC and KSC. Field Site EO's were required to initiate the change on S/C 011 and 008. Engineering revised MCR A1587 so that S/C 008 Quad D and 012 had the same configuration callout.

Thermal paint required was available at MSC. Necessary process specifications were supplied R. J. Taeuber of NASA for application.

It has been learned that the S/C 008 Quad D propellant tanks were not painted before testing started.

PROBLEM RESOLVED

6.6.3 PROBLEM RCS MCR 1599 Box Installation

Refer to MCR 1599 (Installation of RCS switch-over boxes). Can the RCS boxes be installed without removing the aft heat shield? Why is this to be accomplished at KSC?

DISCUSSION/RESOLUTION

It was determined in the SAR that the "Boxes" could not be completed in time to install at Downey. A mock-up of the box was constructed and proved that installation could be made without removing the aft heat shield.

See Modification Kit Listing (MCR A-1599).

PROBLEM RESOLVED

SECTION 6 - REACTION CONTROL SYSTEM

6.6.4 PROBLEM SM RCS VALVE SIGNATURES

The S/M RCS engine valve signatures indicate either valve closing first and is unpredictable. "The randomness is documented in EO M421370" which changes system checkout to permit a direct coil drop out time of 55±25 milliseconds for both valves. The limits had been 40±10 milliseconds for the oxidizer valve and 65±15 milliseconds for the fuel valve. The rationale supporting this change are presented below.

DISCUSSION/RESOLUTION

When the engines are installed in the spacecraft and operated in the direct mode four engine characteristics change the basic engine parameters due to the characteristics of the automatic and direct coils S/C electrical circuitry. The opening time is increased by about 5 milliseconds, the fuel lead increases about 5 milliseconds, the dropout time of the first valve increases from a nominal of 8 milliseconds to a nominal of 55 milliseconds, and the mismatch is amplified from a maximum of 16 milliseconds to a maximum of 50 milliseconds. These shifts have been analyzed for deleterious effects on the engine.

In the following discussion it should be noted that the changed characteristics apply only to direct coil operation and that direct coil operation is employed as the third order method of control only after the malfunctions of both automatic mode, and proportional ha e control.

1. Delayed opening time - no effect
2. Increased fuel lead - lower performance (not significant)
3. Delay in first valve closing - Increases total impulse for a given electrical signal (not significant)
4. Magnified valve mismatch

   a. Fuel log

      1. Lower performance - (not significant)
      2. Cools chamber - no problem (min. pulse results in net increase)
      3. "goop" - (no known effect from fuel lag)
      4. "Zots" - (no known effect from fuel lag)
      5. Restart before valve closes - Similar to fuel lead - no problem

6.6.4 DISCUSSION/RESOLUTION (cont'd)

b. Oxidizer Log

1. Lower performance (not significant)
2. Cools chamber - no problem (min. pulse results in net increase)
3. Goop - (Previous tests indicate softer start)
4. "Zots" - (no known effect from ox lag)
5. Restart before valve closes - effect similar to pre-ignition - results in softer start.

Conclusion - No known problem created by direct coil valve response characteristics.

PROBLEM RESOLVED

6.6.5 PROBLEM PVT INSTALLATION

Establishment of a definitive plan of action for implementing the changes/modifications required to gage the SM RCS propellants by the PVT method. What is KSC's required level of effort?

DISCUSSION/RESOLUTION

The following E.O.'s delete the Giannini gaging system from SC 012 and 014; these E.O.'s were transmitted by datafax to B. M. Boykin, D/633-060, Clear Lake Facility on July 14, 1966 and to M. V. Bravo, D/820, KSC on July 25, 1966.

EO M464896 - release date 7-20-66	Specifies thermal coating of SM RCS propellant tanks required because of removal of Giannini sensor assemblies.
EO M464897 - release date 7-20-66	Specifies removal of Giannini sensor assemblies and strap assemblies from Quad.
EO M464898 - release date 7-20-66	Deletes the installation of the Giannini computer and sensor from the SM.

The following tasks outline the effort in process for implementing the PVT gaging system. The schedules shown are preliminary and have not been approved by the Schedule Board.

Task 1 - Add one ME 431-0068-7051 helium temperature measurement system to each SM RCS quad. Transducer is to be located on the outer helium tank surface. Measurement numbers, title, ranges and PCM channels are as follows:

Quad	Meas.No.	Title	PCM Channel	Range
A	SR 5013T	Helium Temperature Tank A	3	0 to 150°F
B	SR 5014T	Helium Temperature Tank B	4	0 to 150°F
C	SR 5015T	Helium Temperature Tank C	6	0 to 150°F
D	SR 5016T	Helium Temperature Tank D	175	0 to 150°F

Drawing release 8-5-66; hardware kit assembled complete 8-15-66; arrival at KSC 8-17-66.

SECTION 6 - REACTION CONTROL SYSTEM

6.6.5 DISCUSSION/RESOLUTION (cont'd)

Task 2 - Provide necessary wiring to route added temperature measurement on each quad to the PCM, normal data mode only and through an existing switch on MDC Panel No. 12 for display on an existing meter. Drawing release 8-5-66; hardware kit assembled complete 8-15-66; arrival at KSC 8-17-66.

Task 3 - Provide necessary Nomographs for astronaut usage to determine remaining SM RCS quad propellant quantities.

Arrival at KSC:

16 percent accuracy Nomograph	8/5/66
12 percent accuracy Nomograph	9/1/66
10 percent accuracy Nomograph	10/15/66

6.6.6 PROBLEM - HELIUM TANK GROWTH

Justification is needed to show that abnormal growth of helium tank (Quad D) did not cause loosening of the tank thermocouple.

DISCUSSION/RESOLUTION

Subsequent to the SAR, acceptance test data of all S/C 012 SM RCS helium tanks were reviewed and no discrepancy was found. Quad D helium tank exhibited the same characteristics as the other quads. The OCP4175 C/O data were evaluated against testing conducted during DVT, and it was concluded that DVT was much more severe. Loosening of the thermocouple was attributed to causes unknown, but not tank growth, and the item closed by telecon on 7/25/66 with R. Taeuber.

PROBLEM RESOLVED

SECTION 6 - REACTION CONTROL SYSTEM

6.6.9 PROBLEM - RCS CONTAMINATION

Rework has caused excessive contamination.

DISCUSSION/RESOLUTION

This action item was closed on 7/20/66 in a meeting with R. Lanzkron of NASA and R. Errington representing RCS.

PROBLEM RESOLVED

SECTION 7 - SERVICE PROPULSION SYSTEM

7.6.5 Originator - N. Townsend, NASA

PROBLEM - Engine Heater Wiring

Existing wire routing to engine heaters is not satisfactory, i.e., attachment techniques and stress relief.

DISCUSSION/RESOLUTION

E.O.'s 532811-1, -2, and -3 have been released to provide additional wiring support for both SC 012 and SC 014 engine heater installations.

PROBLEM RESOLVED.

SECTION 8 - STABILIZATION AND CONTROL SYSTEM

8.6.1 PROBLEM Flight Director Attitude Indicator

During vehicle testing, when rate gyro power is off, reference voltage is removed from the demodulators which causes a continuous and rapid limit cycling of the FDAI rate-gage needles. During testing, this condition was observed to continue for many hours. This type of treatment of the displays in a manned vehicle is unacceptable. A means for providing reference voltage to the display must be available during future testing.

DISCUSSION/RESOLUTION

The above stated response not only occurs during test, but can also occur in flight if the SCS Partial Power is positioned to AC 1 or AC 2 and the Rate Gyro Power Switch is "OFF".

The SCS was designed to withstand this condition as it could occur in flight due to modified procedures resulting from system failures. Although this performance is acceptable it will be prevented in future testing by corrections to Operational Checkout Procedures.

PROBLEM RESOLVED

8.6.2 PROBLEM Attitude Controller Isolation

The capability to isolate the attitude controllers must be verified so that malfunctions within the controller cables can be quickly removed from the control electronics loop, and still retain the required flight characteristics.

DISCUSSION/RESOLUTION

The capability to isolate the attitude controllers electrically has been previously discussed with the flight crew.

Isolation of the stick proportional transducers may be achieved by switching off the AC power to the attitude controllers. This will permit the use of the direct RCS control modes for entry and midcourse maneuvering without physically disconnecting the faulty controller. Electrical isolation of the controllers will not permit the use of MTVC.

The requirement to remove an attitude controller physically has not been established since it involves multiple failures. However, assuming that an attitude controller is physically removed the gain on the stick transducers would double. This effectively results in doubled stick authority (vehicle rate command) in the various control modes using the stick. The impact of this on the various control modes is:

MTVC - A simulation study conducted in February 1965 has verified this situation to be tolerable with relatively little change in system performance.

ENTRY - It is expected that the flight crew will adapt quite readily to the increased stick authority. Through recognition of the problem appropriate reductions in stick deflection can be made and no appreciable degradation in handling qualities or RCS propellant consumption is expected. However, the feasibility of changing controllers during entry is questioned.

MIDCOURSE - The doubled stick authority will result in a small increase in SM RCS propellant consumption per manual proportional-rate attitude maneuver.

The effect of the increased hand controller gain can easily be simulated as part of the ME 012 simulation in August if it is desirable to precisely verify the ramification of the gain increase on flying qualities and propellant consumption.

PROBLEM RESOLVED

Paragraph 8.6.3 of the Historical section is incorrect and should be rewritten as follows:

8.6.3 Originator W. Armstrong (Flight Crew)

PROBLEM - RMAG "Cold Starts"

What is the effect of activating the RMAG's when they are cold? Does loss of the heaters destroy the backup attitude reference system?

RESOLUTION

The RMAG's may be started cold five times before it becomes necessary to recheck the mass unbalance drift characteristics. No physical damage can be done to the gyro. However, the mass unbalance drift characteristics may shift slightly if numerous "cold starts" occur. The possible shift in mass unbalance drifts would be caused by spin motor bearing preload changes resulting from lower operating temperatures. Since the mass unbalance drift characteristics were rechecked at Downey in the RME after two "cold starts", 5 cold starts are currently available for S/C 012 checkout at Florida.

8.6.5 PROBLEM Meter Reading Errors

When rate needles are in the ± 1 deg/sec full scale-mode the following indications are observed:

Roll reads 0.2 degree/offset

Yaw reads 0.1 degree offset

Pitch reads 0.0 degree offset

Should read 0 degree offset.

DISCUSSION/RESOLUTION

The problem as stated is incorrect as the offset should be degrees/second rather than degrees. The ability to physically adjust the meter null offset has been denied in previous CDR's. This rate needle scaling is appropriate only to SM midcourse maneuvers. The offset will have no effect on the attitude hold and translational control modes. The readings as stated above are within the test and checkout tolerances of 0 ± 0.3 degrees/second.

Numerous methods can be employed for the astronaut to establish the actual value of the null offset in flight in order to establish compensation. This null offset estimate can then be used to mentally bias the rate needle readings and achieve more precise rate maneuver control. However, this is not a requirement as mission propellant profiles have considered these offsets

PROBLEM RESOLVED

8.6.6 PROBLEM RCS Capability During Main Bus Failure

Due to the manner in which the S/M RCS engines are apportioned between Main Bus A and Main Bus B, it appears that failure of either bus would prevent the simultaneous achievement of +X translation and attitude control.

DISCUSSION/RESOLUTION

The problem as stated is incorrect. The automatic S/M RCS engines are apportioned such that achievement of +X translation and roll, pitch and yaw attitude control is still achieved with two jets in the case of translation and one jet in the case of attitude control. This will provide the capability to perform the following RCS control modes; minimum impulse control, attitude maneuvers, attitude hold and ullage. The two jet +X translation for the purpose of deorbit is not sufficient during most mission phases due to insufficient propellant in the two quads being used. Since this particular situation requires multiple failures it is not a design requirement. However, the following two methods may be applicable to this problem although no firm procedures have been defined or analized.

1. RCS deorbit can possibly be accomplished by direct ullage with roll spin stabilization. Even though a main buss has failed, a four jet direct ullage can be achieved by properly conditioning the SECS and commanding ABORT.

2. RCS deorbit can possibly be accomplished by using first, +X translation with the two +X jets functioning from the unfailed DC buss and the two applicable quads, then rotating the spacecraft 180 degrees to use the two -X jets being fed by tankage from the other two quads.

PROBLEM RESOLVED

8.6.7 PROBLEM Hand Controller Cables

Controller Cables have been damaged during CSM testing on all controllers.

DISCUSSION/RESOLUTION

The cables require additional protection. All Rotational and Translational Hand Controllers shall be returned to Honeywell for the addition of a protective sheath per E.O. 462767.

PROBLEM RESOLVED

8.6.9 PROBLEM Delta V Counter

During Downey testing, the Delta V Counter was repeatedly driven to the stops where it would chatter for considerable periods of time. What degradation to the display has occurred?

DISCUSSION/RESOLUTION

The described chatter has not caused a degradation of the display and no detrimental consequences are to be expected.

Honeywell Engineering concurs that this condition does not subtract abnormally from the life expectancy of the Velocity Change Indicator display panel.

The condition can be corrected by cycling the TVC #1 Power switch momentarily to the "OFF" position. Corrections to the Operational Checkout Procedures for S/C 014 shall be made to minimize the chatter during testing.

PROBLEM RESOLVED

8.6.11 PROBLEM No. 1 Translation Controller Color Coding

The original engineering requirement to paint the No. 1 Translation Controller so that it may be identified as the one incorporating the Abort feature is not adequate.

DISCUSSION/RESOLUTION

The possibility of installing the #1 Translation Controller connector to the #2 vehicle bulkhead receptacle (J167) became a reality during SC-012 Downey testing. To preclude this possibility happening in the future, the Translation Controller #1 connector shall be identified by painting with yellow and black diagonal stripes.

The #1 Translation Controller is identified by installation of a yellow and black diagonal striped plate. The #1 T/C connector shall be painted with black and yellow strips per E.O. 490312. The Florida Facility shall paint the #1 T/C connector per E.O. 490312.

PROBLEM RESOLVED

8.6.13 PROBLEM Deadband Requirements

Information concerning propellant consumption in the 0.2 and 0.5 attitude and rate deadband is not available.

DISCUSSION/RESOLUTION

Information concerning propellant consumption in the minimum deadband, attitude control modes has been published and discussed with the NASA in previous contacts including the SC 012 Delta CDR. The current RCS propellant budgeting is based on the minimum attitude deadband of $\pm$ 0.2 degrees and a rate deadband of $\pm$ 0.2 degrees per second. These values were used in the propellant consumption profiles submitted to the NASA for the mission reference trajectory of November 5, 1965 (reference MSC NOTE 65-FM-134).

PROBLEM RESOLVED

8.6.17 PROBLEM FDAI Alignment

When aligning the FDAI with the align pushbutton, releasing the button caused the Roll Attitude Error Needle, the Roll Indice; and the Attitude Ball to jump 4 to 5 degrees away from the desired position and remain there.

DISCUSSION/RESOLUTION

The described conditions will occur when incorrect procedures are followed during an align sequence. The Operational Checkout Procedures shall be corrected for future testing by placing the Pitch, Yaw and Roll Rate switches to BMAG during an FDAI align or selection of SCS Attitude, SCS Delta V or G&N Delta V Mode while an FDAI alignment is being performed.

The G&C Data Book (SID65-1702) shall be modified to reflect correct operational procedures. The Apollo Operations Handbook (SID65-1317) shall be corrected to reflect these same procedural changes. Flight crews should use the G&C Data Book (SID65-1702) interim corrections, pending its revised future release, to insure correct flight operational procedures.

PROBLEM RESOLVED

8.6.18 PROBLEM Extraneous Pulses on RCS Solenoid Measurements

PCM Measurements show occasional RCS engine "on" signals when the engines are not actuated.

DISCUSSION/RESOLUTION

Since the sampling rate for these signals is 200 per second, the time between samples is approximately 5 milliseconds. Since actuation of the solenoids requires greater than 10 milliseconds of power application, an isolated, single sample which shows the valve in the "on" condition would not represent an actual valve operation. Hence, it is concluded that the extraneous PCM indications represent some type of transient voltage rather than an actual valve actuation. Such erroneous indications are undesirable even though they are not believed to represent functional problems, and can be identified thru analysis of PCM data.

It is suspected that the transients may be related to the use of the SK 231 umbilical separation simulator during S/C 012 integrated tests. The affected measurements will be monitored closely during the 0129 test on S/C 014 to determine whether the problem remains when the improved SK 231 is used. If the problem persists, trouble shooting will be accomplished to determine and demonstrate changes to eliminate the extraneous pulses.

PROBLEM RESOLVED

9.3.4.1 PROBLEM IMU Excessive Drift

IMU S/N 9 in G&N 12/50 exhibited X-IRIG excessive drift, excessive and unstable X-PIPA misalignment about Z, and X-PIPA scale factor.

DISCUSSION/RESOLUTION

During S/C testing the IMU was damaged by sudden loss and reapplication of power to the S/C.

The following action is being taken to provide a drop-out capability for the Downey and MSC ground power supplies (C14-418-101) in the event of loss or interruption of facility power during checkout operations.

EO M502830 will be prepared to remove two patch wires from C14-418-101 S/N's 4, 6, 8, 9, and 11 to disarm the ACE "ON" command for each power supply. This will produce the required drop-out capability. However, it will restrict the turn-on of the power supply to a local manual operation (this will be effected by revision to the appropriate G&N operating procedures and OCP). The local/remote turn-off, DC "ON," and voltage adjust capabilities will not be affected.

Notification will be sent the NAA GSE Project Office at KSC for possible incorporation of this change into the C14-481 at KSC.

PROBLEM RESOLVED

9.3.4.4 PROBLEM - Astro Sextant Modification

The Flight Crew requires information as to what degree the Astro Sextant Door Modification will restrict the field of view of the Scanning Telescope and the Astro Sextant.

DISCUSSION/RESOLUTION

Installation of the NASA kits to the G&N Optics, as part of the Optics Passive Thermal protection, changes the limitations to the installed optics field-of-view. With kits installed, the field-of-view is now an inherent property of the total optics assembly. No part of the spacecraft infringes into the optics field. The only other masking will be that of a docked LEM vehicle, which is properly defined on ICD MH01-01315-416. The new optics field-of-view interface should be MIT-NASA or MIT-ACED, but not MIT-NAA. Jon Brown, NASA RASPO Downey, R&E, has concurred and the problem is considered resolved.

PROBLEM RESOLVED

9.3.4.5 PROBLEM IMU Heater Circuit Breakers

The IMU can be damaged if power is applied without the heaters being on. This can occur if the heater breakers are inadvertently pulled when it is intended to pull the adjacent IMU breakers.

DISCUSSION/RESOLUTION

The confusion occurs because of proximity of the breakers to each other and nomenclature similarity between them (one pair is marked "IMU," the other "IMU HTR"). Physical guards were discussed, but no existing design is available. NASA (Dr. Lanzkron) directed at the Systems Assessment Meeting that the handles be painted red for visual distinction. NAA concurs with painting but recommends yellow rather than red for better visibility.

PROBLEM RESOLVED

10.6.5 PROBLEM Single Connector for A and B Initiators

The added apex cover (Drag) drogue initiator circuits are presently designed to go through a common, existing connector.

This represents a single point failure (Cat. I), which in the event of a failure of the connector could also disable the apex drag chutes and could also short the A and B apex cover jettison initiators.

DISCUSSION/RESOLUTION

CCA 961 directs addition of a connector to separate the A and B apex cover (Drag) drogue initiator circuits. Engineering has released E.O. M485261 and E.O. M485262 on 7/23/66 to add a separate connector to provide redundant circuitry. The required work for S/C 012 will be completed prior to the S/C 012 CARR meeting.

PROBLEM RESOLVED

11.2.1 PROBLEM APS 264

Electrical Circuit Interrupters, Type I and Type II

Bending of the guide pins have been encountered during installation of the circuit interrupters. This could result in improper mating of the interrupters.

DISCUSSION/RESOLUTION

The guide pins will be removed from the pin insert side of the interrupters since this is the side on which all problems have occurred. To preclude mismating of the harness plug to the interrupter, which becomes possible with the keying pin removed, a guide line will be placed on each plug in line with the keyway so that a visual check will verify proper mating.

The following E.O.'s have been initiated for release to accomplish removal of the guide pin, adding guide lines, changing part numbers and providing proper checkout.

EO M466392
EO M466393
EO M491485
EO M533113
EO M533114
EO M533115
EO M533118

PROBLEM RESOLVED

11.6.1 PROBLEM - Main Chute Problems

Severe damage to the main chute has been encountered during Block II development test 70-3.

DISCUSSION/RESOLUTION

Investigations have been made that determine a hardware change is required for SC 012 and subsequent vehicles. MCR A5059 has been released on 26 July 1966 to initiate the required changes. EO M525772 and EO M525776 have been initiated for release to accomplish the necessary changes. These changes include correcting strength discrepancies of the main chute as determined from analysis of the Block II development test 70-3 failure.

In addition, one supplemental drop test will be conducted to prove structural adequacy under the previous failure conditions. Two additional tests will be conducted to explore ultimate chute capability. All three tests will be complete by the end of August 1966.

PROBLEM RESOLVED.

11.6.2 PROBLEM Thruster System Performance

Separation velocity requirement of 24 ft/sec for forward heat shield and jettison system has been revised to above 40 ft/sec.

DISCUSSION/RESOLUTION

CCA 895 directs the addition of a pilot chute mortar to assure positive separation. Two system tests have been satisfactorily completed, lifting the constraint on CSM 011. Two additional system tests are scheduled to be completed in the first week of August 1966 to lift the constraint on CSM 012. Results of the two additional tests will be documented by CTR 01205801.

PROBLEM RESOLVED

SECTION 11 - EARTH LANDING SYSTEM - ORDNANCE

11.6.3 PROBLEM - Flashing Light Power Supply

The flashing light power supply failed qualification tests during the immersion tests. The unit has subsequently passed the immersion test after a proper potting fix. The modified unit was not resubjected to all environment tests that were satisfactorily completed prior to the immersion test.

DISCUSSION/RESOLUTION

It is the NAA position that the flashing light power supply successfully completed qualification testing under all anticipated environments.

The unit with the potting fix is considered qualified by satisfactory completion of one hour of a vacuum/high temperature test followed by immersion portion of the qualification test, and upon the basis of similarity to the satisfactory performance portions of the previous qualification test results of the unmodified unit. Apollo test history on connectors of this type encapsulated in potting indicates that vibration and shock as well as the complete vacuum/temperature test would have no effect on the satisfactory performance of the connector/power supply assembly. A report (SID 66-1316, entitled "Spacecraft 012 CARR Flashing Light Subassembly, Flight Qualification Analysis", dated July 28, 1966) documents the rationale for considering the Qual Tests requirements have been satisfied.

PROBLEM RESOLVED

12.6.3 PROBLEM - Hatch Decals

Cannot verify incorporation of hatch decals showing direction of rotation and torque limits.

DISCUSSION/RESOLUTION

EO 534702 revising V16-550152 placard was released 15 July 1966. ATO will verify installation.

PROBLEM RESOLVED

12.6.4 PROBLEM Qual Testing Not Yet Complete

Uprighting bags, cables, brackets, and operating sequence are not qualified.

DISCUSSION/RESOLUTION

DVT, qual, and certification tests for the above system will be qualified by S/C 007 tests at MSC. These tests that are to be conducted by the NASA are scheduled to be completed by 22 August 1966. System performance has been satisfactorily demonstrated by B/P 29 development test at sea on 22 July 1966. No problems are anticipated to be encountered in the S/C 007 tests.

PROBLEM RESOLVED

12.6.5 PROBLEM - Side Pressure Hatch

The side pressure hatch is not qualified for pad egress with a positive delta P.

DISCUSSION/RESOLUTION

The side pressure hatch is not designed to be opened with a positive delta P. A positive delta P of 5 psig is utilized to insure positive sealing. It is NAA's opinion that the hatch could be opened with a positive delta P of .1 psig. The NASA test (about 25 July 1966) utilizing S/C 007 will pressurize the Command Module to a positive delta P of .1 psig, .2 psig, and .3 psig to verify at what positive delta P the hatch can be removed. As the only time the Command Module is pressurized with the crew on board is the cabin leak check and purge cycle of the countdown (T-75 to T-40), and assuming a worst case pressure differential (positive delta P of 6 psig), the time to vent the cabin thru the cabin pressure relief valve is 35 seconds. This can be reduced an additional 5 to 7 seconds by utilizing the 5/8 diameter pressurization fitting on the hatch as a vent. If the tests verify hatch operation at a positive delta P of .3 psig, an additional reduction of 3 seconds will be realized.

It is NAA's opinion that if the NASA tests verify hatch opening with a positive delta P of .1 psig or greater, the egress time of 90 seconds as specified in SID 63-313, paragraph 3.4.1.1.2(e) 1 will be met. As outside help is available (test crew) at this time, it is suggested that they might be used to aid the crew and expedite egress time.

PROBLEM RESOLVED

12.6.6 PROBLEM - Flight Crew Hatch Operation

Satisfactory operation of the flight item side pressure hatch, side ablative hatch and the boost protective cover (BPC) hatch both from inside and outside the CM has not been satisfactorily verified. Determine if it is possible to return the BPC to Downey to accomplish verification testing.

DISCUSSION/RESOLUTION

A meeting was held at S&ID on 21 July 1966; participating were:

Dr. M. W. Lanzkron	NASA-ASPO
R. F. Larson	NAA-Project Office
P. J. Hanifin	NAA-CSM Design
G. Thies	NAA-CSM Design
J. A. Roebuck	NAA-Crew Requirements
E. R. Smith	NAA-Ground Operations Reqmts.

It was determined that the test to be valid requires a complete CM with BPC and with the Access Arm in place. This test could only be accomplished at the field site.

The GORP will be changed to reflect the performance of this test at CDDT approximately two (2) weeks prior to launch.

PROBLEM RESOLVED

12.6.7 PROBLEM - Inner Structural Loading

The Command Module has a demonstrated factor of safety of 1.5 for main parachute loads (1 drogue, 3 main, high altitude tumbling abort) for an 11,000 lb. CM. Current estimates for the weight exceed 11,000 lbs. which result in higher chute loads.

DISCUSSION/RESOLUTION

NAA will submit an SCN to cover the effects of the increase in CM weight on the structural safety factors.

PROBLEM RESOLVED on approval of the SCN.

SECTION 12 - MECHANICAL SYSTEMS STRUCTURE

12.6.8 PROBLEM - Structural Safety Factor

Failure to show a 1.5 factor of safety at the Sta. 1010 interface for Saturn 1B lift-off.

DISCUSSION/RESOLUTION

Considering the current predictions for CM gross weight which are over the control weight, a reduction in safety factor is required at this interface. At the request of NASA a study was run on the effects of a criteria change in the parameters to be considered in calculating lift-off loads, ie. including the effects of unsymmetrical thrust build-up. Acceptance of this criteria change would result in a further decrease in factor of safety.

The criteria which has been used in calculating lift-off loads has not varied since the beginning of the Apollo Program. It is a combination of worst on worst conditions and inclusion of the unsymmetrical thrust would add still another worst. NAA does not feel the change is justified and will not change the criteria unless directed to do so.

NAA will submit an SCN to cover the effects of the increase in CM weight on the structural safety factor. No action will be taken relative to the change in criteria.

PROBLEM RESOLVED on approval of the SCN.

13.6.4 PROBLEM AC Indicator Selector (Frequency Meter)

Incorrect frequency readings are obtained when switching the AC indicators from phase to phase. The error occurs randomly.

DISCUSSION/RESOLUTION

Circuitry within the frequency meter is susceptible to transients as would be caused by rapid input switching. The problem can be minimized by switching slowly. Since it is desirable, but not mandatory, to have the meter, NAA recommends use as is.

PROBLEM RESOLVED

13.6.5 PROBLEM MDC Displays (Meter Bands)

Visibility of green bands on meter faces, defining normal operating range, is too low for proper usage.

DISCUSSION/RESOLUTION

The standard instrument green color is of too low reflectance to produce adequate contrast against the black scale background. Scales are within the sealed cases and are inaccessible. External green bands of larger area can be applied to meter bezel, window, or both. There is no acceptable paint for this purpose, but an acceptable pressure-sensitive colored tape is available. Visibility of the external bands appears to be adequate in normal illumination.

PROBLEM RESOLVED

13.6.6 PROBLEM Toggle Switches (Poor Action)

Switches are said to lack positive "feel," operating handles are not normal to the operating plane, and there is lateral "slop" in the levers.

DISCUSSION/RESOLUTION

These characteristics are caused by manufacturing tolerance buildups within the switch and in the attachment of switches to the panel. Apollo Reliability has conducted an analysis of the mechanism and finds that these tolerance buildups do not degrade the basic functional reliability of the switch. NAA's position is not to change these switches.

PROBLEM RESOLVED

13.6.9 PROBLEM Switch Guards

Several hinged cover-type guards for toggle switches do not close completely.

DISCUSSION/RESOLUTION

EO released. Work complete.

PROBLEM RESOLVED

SECTION 13 - DISPLAYS & CONTROLS

13.6.10 PROBLEM CO_2 Partial Pressure Gage

Application of DC power causes a large transient in the CO_2 partial pressure meter reading. The transient is sometimes of sufficient magnitude to trigger the Caution & Warning alarm.

DISCUSSION/RESOLUTION

Investigation discloses that the transient magnitude is frequently large enough to slam the meter pointer against the upper stop. This could cause meter damage. The transient originates in the GFE CO_2 Sensor.

NASA ACTION REQUIRED

13.6.14 PROBLEM Main Display Console Closeout Panels

In the flight control group (Commander's station, L.H. couch), there are recesses around some of the SCS boxes that are not closed out. Concern is expressed that foreign objects may enter the volume behind the panel.

DISCUSSION/RESOLUTION

Investigation shows that in most cases recesses are closed at the back by structure or box mounting ears. However, at the lower corners of the FDAI (Panel 4), structure does not extend back to the box attachment plane. Here there are two openings which would pass objects on the order of ½" dia.

NAA POSITION

These holes will be closed using tape or other suitable material.

PROBLEM RESOLVED

13.6.20 PROBLEM Panel Nomenclature and Numbering

NASA desires specific changes, additions, and deletions to panel nomenclature. Marked prints have been provided to NAA.

DISCUSSION/RESOLUTION

The changes consist of two groups of items.

(1) Clarification of control functions and updating of obsolete nomenclature. NAA concurs, provided that the marked prints reflect a unified NASA position for Block I spacecraft.

(2) Addition of reference numbers to NAA and MIT panels and other items. Generally, NAA concurs. However, in a few cases, there is a conflict between the numbers suggested and established, widely documented reference designators. For these cases, NAA recommends use of present numbers.

The Apollo Operations Handbook and OCP's will be made consistent with the above numbering system.

PROBLEM RESOLVED

14.6.3 PROBLEM - Inflight Tool Kit

Satisfactory flight items of the Inflight Tool Kit are required for fit and function check prior to flight of S/C 012.

DISCUSSION/RESOLUTION

The SC 012 torque wrench was delivered to NAA July 29. Rework fabrication of tool set per MCR 1565 is to be completed and delivered to ATO August 3, available for CCFF. These will include the rework changes which previously were not expected to be implemented in time to support SC 012 CCFF.

PROBLEM RESOLVED

14.6.6 PROBLEM - Bump Hat Stowage

CFE bump hat stowage provisions which can be readily deleted from the SC should be officially deleted (foam inserts for CFE hats, etc.).

DISCUSSION/RESOLUTION

The foam fillers have been deleted from the three (3) stowage locations. (EO's 509908 and 507880).

It is NAA's recommendation that the GFE communication carriers be stowed in the PGA helmet stowage bags. The helmet stowage ICD should be revised to reflect this change and include the stowage requirements for the GFE communications carriers.

PROBLEM RESOLVED

SECTION 14 - CREW EQUIPMENT

14.6.8 PROBLEM - Weightless Restraint Sandal

The sandals demonstrated in SC 014 Storage Review, May 17 and 18 were unsatisfactory regarding quality of material and construction. RID No. 014-06-OP-1. NASA feels that redesign may be required.

DISCUSSION/RESOLUTION -

NAA stated that the stowage mockup sandals evaluated were not of the same quality as flight hardware. The first production sandals were delivered to NAA July 20. These sandals have successfully passed qualification testing, including material load test in which four (4) sandals were loaded to a force in excess of 200 lbs. each without failure. There were no seams or material ruptures experienced. Five (5) sandals were subjected to a life cycle test equivalent to walking one-quarter mile on velcro without any signs of peeling of velcro from sandal or cracking of the Royalite material. NAA proposes to fit the SC 012 flight crews with their individual sandals and verify sandal acceptability prior to CCFF.

PROBLEM RESOLVED

14.6.10 PROBLEM - Fecal Bags -

The outer fecal bags as used in the ECS Breadboard 14-day Test were stowed with an excessive amount of entraped air. As a result, the fecal bag storage area was completely filled after the tenth day of operation.

DISCUSSION/RESOLUTION

Concern was expressed that perhaps the adhesive around the opening inadvertantly sealed when the bag was being folded precluding manual bleedoff of trapped air.

H. Brewer, NAA and W. Huffstetler, NASA discussed this problem on July 30, at which time the responsible engineer demonstrated with production type bags the proper procedure for eliminating the entrapment of excessive air when sealing and folding the filled bag for storage.

NAA and NASA were satisfied that the air entrapment problem will not occur when the proper procedure is used and that a design change is not required. It was agreed that a demonstration of this procedure would be conducted for the SC 012 flight crew at Downey prior to CCFF.

The proper procedure will be defined in the Apollo Operations Handbook.

PROBLEM RESOLVED

14.6.11 PROBLEM Spacesuit Umbilical Straps

During the ECS Breadboard Test, it was noted that the Velcro straps on the spacesuit umbilicals were too short to adequately attach the electrical umbilicals to the O_2 umbilicals.

DISCUSSION/RESOLUTION

Restraint design has been changed as a result of change in hose contractors (Space-Arro to Darling.) Current design is considered adequate to correct previously stated problem. Astronaut crew shall verify design fix in S/C 012 at CCFF.

PROBLEM RESOLVED

14.6.12 PROBLEM - LH Equipment Bay Marking

During the ELS Breadboard Test, checkout of Spacecraft 011, and Downey operations with Spacecraft 012 it was discovered that LH Equipment Bay Panel 131 is colored light blue, with white letters on this background used for marking nomenclature. Due to poor contrast nomenclature cannot be seen by crew.

DISCUSSION/RESOLUTION

Engineering will be released July 29, 1966 to add a decal with the proper color contrast to panel 131.

PROBLEM SOLVED

14.6.13 PROBLEM - Umbilical Assembly Hose Cap

A new item of equipment, the spacesuit umbilical return hose cap (V16-601212) is needed for use in the CCFF.

DISCUSSION/RESOLUTION

Engineering drawings of hose cap were released July 13 (EO 502045). Fabrication of SC 012 hose caps was completed July 29 for use in SC 012 CCFF.

PROBLEM RESOLVED

14.6.14 PROBLEM Cobra Cable PTT Cover

The cover over PTT button on Cobra cable which was displayed in the S/C 014 Stowage Review May 17 and 18 was cracked and peeled easily.

DISCUSSION/RESOLUTION

The failure of this item was due to improper fabrication of the silicone cover. The flight hardware Cobra cables fabrication procedure has been corrected to preclude such a failure.

PROBLEM RESOLVED

14.6.16 PROBLEM TV Power Connector Labeling

Labeling for TV power connectors is not incorporated.

DISCUSSION/RESOLUTION

E.O. 292920, dated June 18,1966, was released to add markings to connectors J194 and J107.

PROBLEM RESOLVED

SECTION 15 - EXPERIMENTS

15.6.1 PROBLEM Scientific - Medical Data Acquisition System, P/N 511076, (MDAS)

(1) The MDAS does not fit CFE Container "C"

(2) CFE Container "C" does not fit Spacecraft Compartment "C"

DISCUSSION/RESOLUTION

PROBLEM (1) The center 4 holes of an 8 hole mounting pattern were misaligned by .25 inches

PROBLEM RESOLVED Two new mounting pads made and installed in correct position. Drill hole pattern in correct position per EO M464243.

PROBLEM (2) The 4 mounting pads in the bottom of container, held in place by countersunk rivets one side only. The upset head of these interfered with wire though in LEB structure.

PROBLEM RESOLVED Countersink rivets both sides per EO M464243. Release date 7-16-66.

15.6.2 PROBLEM Color Coding

The mockup reviews for S/C 012 and 014 resulted in R.I.D. action to color code the Medical Data Acquisition System (MDAS) and the Octopus Cable (both GFE) and the mating C.F.E. Connector Interfaces.

DISCUSSION/RESOLUTION

PROBLEM Per PTD60-633 NAA directed to color code the CFE and GFE plugs associated with the MDAS and Octopus Cable.

PROBLEM RESOLVED NAA Engineering see no apparent problem. Incorporation of this requirement to be accomplished per EO M501656 under MCR-A-1647.

SECTION 15 - EXPERIMENTS

15.6.5 PROBLEM Bungee Cord Exerciser (M-12)

The M3A experiment hardware (Bungee Cord Exerciser) was incorporated on S/C 012 by CCA 942 of 7-8-66. A stowage location for this exerciser has not yet been determined. It is required that this equipment be unstowed, used and restowed, during the Crew Compartment Fit and Function (CCFF) checks (OCP 5051).

DISCUSSION/RESOLUTION

PROBLEM To define configuration and stowage location of Bungee cord.

PROBLEM RESOLVED NAA Engineering resolved problem with NASA Engineering. Bungee Cord to be supplied in a cloth bag with Velrco on one surface per envelope ICD MH01-12115-116 ready for NASA sign by August 15, 1966. Storage location is on the side of the L_4OH cannister next to the RHEB per ICD MH01-12116-116 NAA Engineering per EO M501657 approximate date of release 9-16-66.

15.6.7 PROBLEM - Crew Compartment Fit and Function

The crew compartment fit and function (C^2F^2) checkout has not been performed due to non-availability of the spacecraft ECU.

DISCUSSION/RESOLUTION

The crew compartment fit and function test will be conducted on 3 and 4 August 1966. GFE and CFE equipment will be installed in the spacecraft prior to the fit and function operations. The ECU is installed in the spacecraft and OCP 5051 will be conducted during the fit and function operations.

PROBLEM RESOLVED

ATO-D-TP-66-TD-272

INTERNAL LETTER
North American Aviation, Inc.

Date · 5 August 1966

TO Address · Those Concerned

FROM Address · J. F. Parker
642-001, B/6
Downey, FA-16

Phone · 5303

Subject · CARR Systems Assessment Action Responses
Supplement - CSM 012

Reference: (a) IL ATO-D-TP-66-TD-243, CSM 012 Systems Assessment Meeting Minutes and Action Assignments
(b) IL ATO-D-TP-66-TD-251, CARR Systems Assesament Action Responses - CSM 012

The enclosed supplemental action responses are submitted to formally document the NAA resolution of actions assigned at the CSM 012 CARR Systems Assessment meeting as defined by Reference (a) not included in Reference (b). All action responses were submitted through and are approved by the appropriate departmental CARR Administrator, and are arranged by department. Unless noted on attachment 1, all action items are considered closed.

The action responses are arranged numerically within each departmental response package as assigned in the Systems Assessment minutes. Action items having an incomplete response include the estimated completion date (ECD). This will be the final submittal of action responses. Updated information will be included in the CARR meeting minutes.

This package constitutes the balance of the second section (Reference b) of the Phase II CARR Report. Reference (a) transmitted the first section.

Note to Contracts: Transmit this information to NASA; include CARR Administrators on distribution list.

J. F. Parker
Technical Assistant
Apollo Test and Operations

TWT/cdw

693-300-040-66-1001

INTERNAL LETTER

North American Aviation, Inc.

Date · 4 August 1966

TO · J. F. Parker
Address · 642-001
FA02

FROM · W. E. Day
Address · 693-300
FB40

Phone · 5732, 3439

Subject · Resolution to SCM 012 System Assessment Meeting
Action Items Assigned to Engineering

REFERENCE: IL 693-300-040-66-1000, Same Subject.

ENCLOSURE: Action Items Assigned at the System Assesament Meeting
(by Paragraph Number)

The enclosure completes the Engineering response to the subject action items.

The following responses are included in the enclosure and are identified by paragraph number:

2.6.5
2.6.7
2.6.8
3.6.1
5.6.19
6.6.7
8.6.10
13.6.16
13.6.21
14.6.2

W. E. Day
Engineering CARR Administrator

wh

2.6.5 PROBLEM Tank Fan Operation Checkout

There is no existing procedure to determine that both fans are operating.

DISCUSSION/RESOLUTION

Present checkout of fan motor operation is being implemented as follows:

1. Fan Motor rundown voltage is picked up by C14-484 External Signal Conditioning Unit.
2. The C14-240 Service Equipment ACE-SC Adapter Unit samples the C14-484 conditioned signal at a rate of 1 SPS.
3. Analysis of the signal is to be performed using an analog recorder in the control room. The analog recorder is to reconstruct the Fan Motor rundown voltage.

PROBLEM

Since the oxygen motors run down in approximately 2 to 4 seconds, the sampling rate of the C14-240 is not sufficient to reproduce the wave shape of the motor's rundown voltage on an analog recorder in the ACE Control Room.

TESTS AND ACTION TAKEN

A series of tests were performed on one oxygen and one hydrogen tank using ANC 130 signal conditioners. Liquid oxygen and liquid hydrogen were used. These tests indicated that the signal conditioners will reproduce a varying dc waveform which will indicate if modulation exists in the AC Fan Motor rundown voltage. Modulation of the rundown voltage is the only positive means of determining whether one or two motors are operating.

An EDC 85-1901 is presently being processed which proposes to increase the sampling rate from 1 to a minimum of 50 SPS.

S/C 012 WORK AROUND

Assuming that the above EDC cannot be implemented in time to support S/C 012 checkout, a possible work around would be to patch into the C14-484 unit at the AGCS room and monitor the AC input signal using an oscilloscope. AGCS (Auto Ground Control Station) is located at the base of Pad 34.

2.6.7 PROBLEM - Hydrogen Venting in Flight

Hydrogen/water vapor may freeze during fuel cell venting to space.

DISCUSSION/RESOLUTION

Engineering calculations, based on hydrogen purge discharge pressure differentials and purge flow rates, show that this problem should not exist. In SC 008 Fuel Cell operation, H_2 and H_2O vapor venting to vacuum environments under controlled temperature conditions will be observed and results noted. (It is questionable, however, that this test will provide a valid simulation of space conditions since the H_2 and H_2O purges are through GSE and vacuum is not maintained).

Purging is scheduled at 14-hour intervals; however, timing is not critical and therefore permits purging while on illuminated side of the earth.

Freezing did occur in SC 008 during deep space environment run at low power. There is evidence that this occurred in the GSE lines outside the SC.

NAA's position is that the timely H_2 purging of the fuel cells will avoid any possible H_2O vapor freezing in the venting line.

PROBLEM RESOLVED.

2.6.8 PROBLEM Flow Meter Inaccuracy

Hydrogen and oxygen flow meter accuracy is out of limits. It has also caused the Master Caution and Warning (C&W) to trip.

DISCUSSION/RESOLUTION

1. Readout discrepancies between S/C 012 fuel cell flow meter panel readings and PCM signal values can be attricuted to incompatibilities between meter scale factors and redefined flow transducer calibration curves. Corrective action is in progress to establish compatible meter scale factors for Block I vehicles and to provide meter corrections using overlay techniques on face of glass.

2. The C&W trip requirements presently in effect for fuel cell reactant flows involve both high and low flow warning levels. The low flow level was established to warn the astronauts of a possible unbalance in the fuel cell load sharing that would prevail at low sustained loads. The possibility of low load sharing unbalance has been eliminated by the addition of "in-line heaters" and controls that automatically load a fuel cell if a fuel cell stack temperature falls below a minimum reaction sustaining value. Because of the planned minimum power operation in the S/C 012 mission and the calibration discrepancies described in (1) above, the C&W system will light up under normal flow conditions. The C&W lower alarm limit will therefore be reduced to a value which will not trigger with the present transducer at planned minimum power levels, but will trigger if reactant flow is cut off completely.

PROBLEM RESOLVED

SECTION 3 - ENVIRONMENTAL CONTROL SYSTEM

3.6.1 PROBLEM SUIT HEAT EXCHANGER EVAPORATOR

Define the in-flight use of the suit heat exchange evaporator.

DISCUSSION/RESOLUTION

NAA recommends that the suit heat exchanger evaporator not be used on S/C 012 except in the case of emergency. NAA is confident the evaporator will perform satisfactorily; however, this recommendation is based on the lack of experience of controlled water boiling and controlled water feed in "zero g" and the results of "one g" testing, where some water carryover was experienced. Water carryover could result in freezing of the steam duct which would prevent glycol evaporator operation and cabin repressurization during entry.

In case of emergency the suit evaporator would be restricted to evaporator only operation by placing the suit heat exchanger switch in the EVAP position. This would preclude high heat load transients on the evaporator which could contribute to water carryover.

The suit exchanger evaporator is subjected to component response, leak and continuity checks during sea level checkout at Downey and KSC. During the manned altitude chamber run at KSC, the evaporator will be operationally checked.

PROBLEM RESOLVED

5.6.19 PROBLEM Temperature Transducer Failures

What is NAA action to upgrade these sensors (silicon sensor)?

DISCUSSION/RESOLUTION

The failures of the temperature transducer ME449-0030-XXXX have been varied and fall into several definable categories. In each category the problem has been resolved and corrective action implemented. The categories are:

1. Calibration Repeatability and Hysteresis out of Tolerance - Corrected by replacing silicon sensing unit with platinum and rescaling the signal conditioner.

2. Calibration End Points out of Tolerance - Reworking the unit with higher accuracy trim resistor and the vendor applying selective component sampling.

3. Cable and Connector Damage - Corrected by repotting connectors, use of heavier cable sleeving, and strengthening cable terminations.

4. Calibration Insulation Resistance out of Tolerance - Correct calibration procedures.

These units were reworked on an individual failed basis. Sensor units that successfully pass the calibration screening test are considered flight worthy and are installed in assigned spacecraft.

System test typified by SM RCS pressure test, SPS pressurization test, and vehicle checkout operations validate the stability and reliability of installed sensors. The RCS and SPS test data show a 2 to 3 percent overall data system accuracy. Additionally, the KSC failures were reviewed and determined to be primarily wiring and human error.

5.6.19 DISCUSSION/RESOLUTION (Cont'd)

The failures reported after installation show no trend of component instability or component catastrophic failure.

NAA POSITION

The temperature transducer ME449-0030-XXXX is satisfactory for S/C 012 mission.

PROBLEM RESOLVED

SECTION 6 - REACTION CONTROL SYSTEM

6.6.7 PROBLEM ACE Monitoring Capability

Engine direct coil ACE monitoring has not been implemented.

DISCUSSION/RESOLUTION

An EDC/ICA (No. 43-2757) is being initiated.

RCS direct valve indication (ON/OFF) will be monitored in the ACE Control Room via event (light) readout. Existing temperature monitoring of (6) CM RCS valves will continue to be monitored as during S/C 012 checkout in Downey.

PROBLEM RESOLVED

8.6.10 PROBLEM SPS Minimum Impulse

The flight crew requires information concerning the minimum impulse firing that could be achieved using manual ignition and shutdown techniques.

DISCUSSION/RESOLUTION

During vehicle integrated testing in B/290, no realistic presentation of the SPS firing is practical.

1. Chamber pressure indications are not available which normally indicate on the PC gage.

2. Display of valve position is not indicated because of manufacturer's dry-cycle limitations on Ball Valve.

While in flight, various levels of SPS minimum impulse are achieved in open-loop operation by "on signal" deviations defined by curve drawn from the following:

5,000 lb/sec. = 0.40 sec.
12,000 lb/sec. = 0.61 sec.
23,000 lb/sec. = 1.0 sec.

Minimum impulse "on time" below 0.4 seconds should not be attempted because of unpredictable ignition characteristics.

During manual ignition and shutdown, firing via the Direct Thrust-On Switch, 0.33 seconds is the approximate lag time prior to actual engine thrusting and 0.25 seconds is the lag preceding the initial thrust decay.

PROBLEM RESOLVED

13.6.16 PROBLEM Crew Compartment Floodlights

A number of failures have occurred in crew compartment floodlights. It is considered unlikely that the lights would survive a mission without additional failures.

DISCUSSION/RESOLUTION

Failures are due to anomalies in electronic circuitry which drives the fluorescent lamps. Failure cause assessment is in process; exact cause or causes have not been pin-pointed.

This is being handled as a critical problem, with two approaches being pursued:

1. NAA is working with the supplier (Microdot) to determine what fix can be applied to the existing circuitry to prevent occurrence of the failure mode. Input filters and starting delay networks are being investigated. Testing of several modified configurations is under way.

2. As a backup, adapt a suitable DC to AC converter circuit to drive the lamps and provide dimming control, replacing existing circuitry.

In either approach, the fix or exchange will be incorporated within the floodlight assembly without change to wiring or other interfaces.

RESOLUTION IN PROCESS

13.6.21 PROBLEM Toggle Switch Mechanical Linkage

AT-type (low-current) toggle switches have an operating mechanism which is exposed to the volume behind the panels and is susceptible to jamming by foreign objects.

DISCUSSION/RESOLUTION

NAA is taking action to enclose the subject switches by means of Mylar sheet and pressure-sensitive tape. The enclosures will breathe freely, but will prevent entry of debris of sufficient size to jam the switches. This is accomplished on a panel-by-panel basis, while the panels are removed during S/C 012 tumble and clean operations at Downey.

PROBLEM RESOLVED

14.6.2 PROBLEM CFE Equipment

CFE items currently not available to support CCFF.

DISCUSSION/RESOLUTION

NAA has taken action to ensure that the items listed will be available in time to support CCFF and/or the KSC altitude chamber testing.

Item	Nomenclature	Hardware Will Support: CCFF	KSC
1.	Sandals	Yes	Yes
2.	Vacuum Cleaner Assembly	Unresolved	Yes
3.	COAS	Yes	Yes
4.	TV and 16 MM Camera Mounts	Mockup Mounts	Yes
5.	Sleep Restraint with Adjustable Straps	Prototype	Yes
6.	"SCEN A" Foam	Unresolved	Yes
7.	Bio Assay Bags	No	Yes
8.	Cobra Cables	Prototype	Yes
9.	Adapter Cables	Prototype	Yes
10.	Tee Adapter Cables	Prototype	Yes
11.	Water Dispenser Assembly Hose	Yes	Yes

PROBLEM RESOLVED

ATO-D-TP-66-TD-273

INTERNAL LETTER

North American Aviation, Inc.

Date · 5 August 1966

TO · J. F. Parker
Address · 642-001, B/6
Downey, FA-02

FROM · J. W. Cuzzupoli
Address · 642-030, B/6
Downey, FA-08

Phone · 2571

Subject · Resolution of CSM 012 Systems Assessment Meeting Action Items Assigned to ATO

Reference: (a) IL ATO-D-TP-66-TD-243 dated 21 July 1966, Subject: CSM 012 Systems Assessment Meeting Minutes
(b) IL ATO-D-TP-66-TD-259

This IL shows the enclosures to the additional responses not included in reference (b) and responses which have additional information available due to completion of test, etc. This package completes the ATO responses available prior to CARR.

The following responses are included in the enclosure and are identified by paragraph number:

2.6.12
3.6.10
5.6.1
5.6.2
12.6.3
14.6.4
14.6.16

J. W. Cuzzupoli
Departmental CARR Administrator

TWT/cdw

2.6.12 PROBLEM - Fuel Interface Connections

The fuel cell reactant tubing and water glycol tubing that interface with the fuel cell are not supported and aligned in the proper position prior to fuel cell installation.

DISCUSSION

During fuel cell installation, these lines are bent into place causing possible stresses and strains and leakage problems. Also, fuel cell installation is difficult because of improper alignment of eight hand lines, "B" nuts and voi-shan washers associated with each fuel cell.

PROBLEM CORRECTION PLAN J. F. Parker

NAA Manufacturing Engineering is developing a set of SMD equipment for each spacecraft to support these fluid lines and protect them from damage when fuel cells are not installed. Manufacturing assembly shops, ATO test stations at Downey and field sites will be instructed to use this equipment whenever fuel cells are not installed (IL ATO-D-66-048).

3.6.10 PROBLEM - Retest of O_2 Supply System

Proof pressure and leak check of C/M O_2 Supply System (high pressure side) is required after rework.

DISCUSSION

Some high press aluminum O_2 lines have been replaced with stainless steel lines. Proof pressure and leak check of these lines is required after installation in CSM 012 at Downey.

PROBLEM CORRECTION PLAN J. Jolley

Retest at Downey. ECD 8-8-66.

5.6.1 PROBLEM - Bad Transducer
(CFO550P), diff. pressure CP No. 2 branch. Signal conditioner outputs 5.5 vdc with no pressure on ECS lines. S/B 0 vdc. T/X TPS V16-GEN-105, Sqk. No. 180.

DISCUSSION
TPS V16-GEN-175 removes and replaces CFO550P. Measurement verification to be made during checkout of ECU.

PROBLEM CORRECTION PLAN R. G. Roshon
Measurement operation to be verified during run of OCP-P-5051. ECD 8-8-66.

5.6.2 PROBLEM - Bad Transducer
(CFO481, reads 99.9 per cent, should be approximately 23 per cent. (CP inlet temp.) T/S TPS V16-GEN-074, COM sqk. No. 337.

DISCUSSION
TPS V16-GEN-101 replaces CFO481T. Measurement verification to be made during C/O of ECU.

PROBLEM RESOLVED R. G. Roshon
Measurement verified during run of OCP-P-5049. No problems encountered. Deviation sheet 038T, Item No. 4. Item completed.

12.6.3 PROBLEM - Hatch Decals
Cannot verify incorporation of hatch decals showing direction of rotation and torque limits.

DISCUSSION
Must be incorporated in SC 012 prior to egress procedure verification at Downey during crew compartment fit and function. This is a shipping constraint.

PROBLEM CORRECTION PLAN J. Jolley
To be accomplished during crew compartment fit and function. ECD 8-10-66.

14.6.4 PROBLEM - Thumbwheel Knob on TV Mount
Request completion of rework on Squawk No. 260 (V16-GEN) thumb wheel knob on TV mount in LEB is stiff to operate.

DISCUSSION
Reference No. 4, OCP 129, prior to CCFF (5.6 effectivity)

PROBLEM RESOLVED J. Jolley
EDB squawks No. 218, 219 worked. Item completed.

14.6.16 PROBLEM - TV Power Connector Labeling
Labeling for TV power connectors is not incorporated.

DISCUSSION
The two TV power connectors J194 and J107 in the tunnel area (behind MDC panel 210) into which the TV power cable J209 plugs in order to supply power to the side hatch TV location and the LEB TV locations are not identified or labeled.

ACTION REQUIRED J. Jolley
Label and identify these TV power connectors to indicate location where power is applied, Engr. issue EO, implement effort. Installation ECD 8-11-66.

TO :J. F. Parker
642-001, B/6
Downey, FA-16

DATE: 28 July 1966

FROM: W. W. Petynia

SUBJECT :Resolution of CSM 012 Systems Assessment Meeting Action Items Assigned to NASA

REFERENCE: IL ATO-D-TP-66-TD-243 dated 21 July 1966, Subject: CSM 012 Systems Assessment Meeting Minutes

The Enclosures show the responses to the referenced action items assigned to NASA from the CSM 012 Systems Assessment Meeting held 19 July 1966. The status as of 5 August 1966 for the action items is as follows:

Paragraph No.

1.6.4

2.6.6

5.6.12

1.6.4 PROBLEM - Unpotted Connectors/Loose Pins

Loose pins and unpotted connectors behind RH and LB C/B panels were reported.

DISCUSSION

One pin found to be recessed has been repaired. These connectors are of a type using moisture seals and do not require potting per NAA Specification MC414-014A. These connectors have been qualified.

PROBLEM RESOLVED J. Seigler

Item resolved per IL PR6/M66-100 dated 29 July 1966 attached.

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27

5010-107

UNITED STATES GOVERNMENT

Memorandum

TO : PF/Chief, C&SM Project Engineering & Checkout Division
Attn: W. Petynia

DATE: JUL 29 1966
PR6/M66-100

FROM : PR/Chief, Reliability, Quality and Test Division

SUBJECT: Qualification of the Rectangular Connector Used on SC 012

Reference is made to the CSM 012 Systems Assessment Meeting conducted July 19, 1966, wherein a question was posed as to the necessity of conformally coating the Rectangular Connectors, used behind the Right and Left Hand Circuit Breaker Panels on the CM. This memo is in response to an action to comment on this point.

Qualification Testing

The Rectangular Connector was tested to the requirements of CTR 00925312, copy attached. Reference to the Qualification Test results indicates the connector was tested satisfactorily per the CTR but failures were incurred in mating and unmating, thermal shock, and corrosion testing.

A subsequent review of these failures with R. Gibb of NAA Engineering, indicates satisfactory resolution verified by retest. Testing was completed in October 1965. No subsequent failures have been reported against this connector in its usage on CSM 009 and 008 and in testing of CSM 011 and 012.

Conclusion

The Rectangular Connector is satisfactory for use on SC 012 and does not require conformal coating for such use. It should be noted that R. E. Munford, E&D Subsystem Manager of EPS Distribution, participated in the qualification test review and subsequent discussions and concurs with the stated conclusion.

William M. Bland, Jr.

Enclosure

cc:
EE4/REMunford

PR6/JPSeigler/jo 7/28/66

2.6.6 PROBLEM - Hydrogen Gas in Potable Water

Hydrogen Gas is introduced gradually into the Potable Water by the fuel cells during operation.

DISCUSSION

It is felt that this is not a problem but further investigation should be made to verify that the hydrogen in the potable water is not detrimental. Concern was expressed over possible adverse effects caused by H_2 content in potable water used for food reconstitution.

PROBLEM RESOLVED

Reference NAA letter 66MA5373 dated 18 April 1966 to NASA, NAA does not consider the amount of H_2 indicated as a food reconstitution problem mechanically, physiologically, or in taste. NAA does not consider the indicated reduction in potable water storage capacity a problem, and the indicated presence of H_2 in the cabin is not an explosive hazard.

5.6.12 PROBLEM Q-BALL VECTOR DISPLAY

NASA questions the compatibility of the GFE Q-Ball sensor with the panel meter and PCM. A loading problem had occurred on S/C 009.

DISCUSSION/RESOLUTION

Design documents hav e been reviewed. The panel meter circuit is compatible with the ICD interface requirement. No further NAA action is required.
NOTE: There was no panel meter on S/C 009.

PROBLEM RESOLVED - F. Rotramel

Investigation results reported in letter from EE to PF dated July 25, 1966 states, Interface Control Document exists and that the KSC statement was based on the case of S/C 009 which carried no meter. This problem should not occur on S/C 012 since a meter is installed.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS
INSTRUMENTATION LABORATORY
CAMBRIDGE, MASS. 02139

C. S. DRAPER
DIRECTOR

AG-NAA 210-66
5 August 1966

AC Electronics Div., GMC
c/o NAA, Inc., S&ID
12214 Lakewood Boulevard
Downey, California

Attention: Mr. J. P. Kaiser
Site Manager

Subject: CARR Item 9.3.4.4

Enclosure: AG 581-66, 12 July 1966, MIT to MSC

Gentlemen:

Problem

Flight crew requires information as to what degree the Astrosextant Door modification will restrict the field of view of the Scanning Telescope and the Sextant.

Discussion/Resolution

MIT has submitted the field of view change to NASA per AG 581-66 dated 12 July 1966.

Action Required

Approval of this change by NASA.

Very truly yours,

Massachusetts Institute of Technology
Instrumentation Laboratory

Thomas A. Hemker
Test & Operations Director at NAA
MIT/IL Apollo Guidance and Navigation

TAH/bj
dc: W/O Enclosure
J. H. Brown
D. A. Koso
J. E. Miller
W. A. Stameris
A. L. Zeitlin

ATO-D-TP-66-TD-275

INTERNAL LETTER

North American Aviation, Inc.

Date · 22 August 1966

TO Address · Those Concerned

FROM Address · J. F. Parker
642-001, B/6
Downey, FA-16

Phone · 5303

Subject · CSM 012 CARR Meeting Minutes and Action Assignments

The attached minutes of the CSM 012 CARR Meeting were prepared from the discussion as presented to the CARR Board on 19 August 1966 and the CARR Board decisions on that date.

Information contained in the minutes is organized to correlate directly with the paragraph numbers of the CARR report. Each section of the minutes is divided in two parts. Part A contains all the open action items. Part B contains historical information related to discussion item resolutions and added CARR report information. This package constitutes the third section of the Phase II CARR Report.

It is mandatory that all action items be completed on or before their indicated completion dates. Action item responses are to be documented in a format similar to the CARR report, indicating paragraph number, action taken, documentation, who implemented action, and completion date. (See IL ATO-D-TP-66-TD-227).

The CSM 012 CARR Administrators are responsible for collecting, editing, typing on white bond, and compiling all action items assigned individuals within their department. All responses are to be accompanied by a cover letter transmitting the information formally to J. F. Parker, D/642-001, B/6 Downey, FA-16, (CARR Project Administrator) and hand carried to F. Mohr, D/642-063, Building 6, S101-E36 (2) Downey, for insertion into the response package.

Note to Contracts: Transmit this information to NASA; include CARR Administrators on distribution list.

J. F. Parker
Technical Assistant
Apollo Test and Operations

TWT/cdw

Attachment: CARR Meeting Minutes

CSM 012

APPROVED CARR MEETING MINUTES

The CARR Meeting for CSM 012 was held on 19 August 1966 in the Assembly Room, Building 1, Downey. The meeting was called to order at 0900 hours, and was concluded at approximately 1530 hours the same day.

The minutes of the CSM 012 CARR Meeting, contained herein, represent the combined National Aeronautics and Space Administration and North American Aviation, Inc., evaluation of CSM 012 acceptability for shipment to the Kennedy Space Center (KSC) for scheduled launch preparations. This performance evaluation is supplemented by the CSM 012 Phase I CARR Report, the Systems Assessment Meeting Minutes, and the Systems Assessment Action Responses.

Formal statements with joint NASA and NAA signature approval covering the following will be submitted under separate cover upon completion of negotiations.

1. MSR performance
2. CSM readiness date
3. CSM acceptance statement
4. CSM to L/V electrical mate date

The formal acceptance statement, when signed, will state that the CSM was accepted by the CARR Board for shipment based upon accomplishment of constraining items identified herein.

Joint approval of these minutes is in accordance with NASA CARR plan of action per letter No. PD2/L1504/66-377 and NAA Apollo Implementing Instruction (AII) J-7, revised.

R.H. Ridnour, Manager
Resident Apollo Spacecraft Program Office
National Aeronautics and Space Adm.

J.P. Proctor, Director, ATO
Space and Information Systems Div.
North American Aviation, Inc.

CSM 012

CARR MEETING MINUTES

TABLE OF CONTENTS

SUMMARY/CONCLUSION STATEMENTS

NAA

NAA - ATO - N. Casson

Spacecraft 012 Service Module was turned over to Apollo Test and Operations on 31 January 1966 and was moved into the Pressure Pit, Building 260, on 5 February 1966. Pressure testing of the Service Module systems was completed on 2 March 1966, and the Service Module was returned to Building 290 and entered a modification period on that day.

ATO received SC 012 Command Module on 3 March 1966. Pressure testing was conducted in Building 1 Test Cell until 4 April 1966. The Command Module also entered a modification period followed by installation of black boxes and panels.

The Command and Service Modules were mated in Station 2C, ACE and GSE hooked up, and individual systems checkout commenced on 29 April 1966. Individual system tests were followed by a system compatibility test which was performed during the period of 6 June through 13 June 1966. From that day until 19 June, shop work and preparation for integrated tests were performed.

The two integrated tests were first performed for engineering evaluation ("dry runs") during the period from 20 June through 10 July 1966. The "sell runs" were performed from 11 July through 14 July 1966, and the spacecraft was demated on July 15. The Service Module underwent additional pressure tests in the Building 260 Test Cell from 20 July through 29 July 1966, and the SPS was given a cold flow check after engine removal. The Service Module was shipped to KSC on 9 August 1966.

During the period since integrated testing, the Environmental Control Systems in the Command Module have been tested, the crew has conducted the initial suit-loop checks, and an evaluation of crew equipment has been made. The most significant departures from the published test plan were as follows:

a. SPS cold flow (added)

b. A complete top deck build-up (added)

c. ECS C/O after integrated test (due to ECU availability)

d. Crew systems equipment installation, fit and functional checks (added)

With these exceptions, Downey test coverage was completed as planned.

NAA - Reliability - L. Gray

There are some areas requiring further analysis such as the items from CSM 008 test debriefing and the problems with the C&W system. There are no Reliability problems remaining that would constrain shipment to the Cape.

NAA – Q and RA – J. L. Gault

NAA Quality Control has verified that the structure and configuration of all systems contained within Spacecraft 012 are in conformance with applicable drawing and specification requirements. Items which do not meet drawing or specification requirements are documented in inspection squawks of which 81 squawks are outstanding at this time. We have also verified the acceptable completion of all system and integrated OCP's less non-conformances which are reflected in OCP squawks. A total of 28 OCP squawks are outstanding at this time. All panels and systems that have been removed since integrated checkout will be physically inspected and verified upon re-installation. Additional verification of these panels is required upon retesting at KSC.

Charts depicting any visual damage for Receiving Inspection at Florida are included with the command and service modules to document discrepancies that have been dispositioned. Discrepancies and unsatisfactory conditions that have been reported on S/C 011 have been investigated in detail and evaluated. Spacecraft 012 and subsequent hardware have been examined for similar conditions and unsatisfactory conditions have been corrected. Corrective action such as the development and use of pre-shipment check lists, the use of additional protective covers, control of materials brought into and out of the command module and identification of temporary installed equipment have been initiated to improve the quality of deliverable hardware. This has been demonstrated in Receiving Inspection of the S/M at Florida. Testing of the SM quads at Florida point out problems in plumbing systems that are being investigated and corrected at both Downey and KSC.

Operating times of time significant items have been documented and presented. The updated Critical Life Component listing is included herein. No problems are indicated.

Apollo Q&RA is of the opinion that Spacecraft 012 is ready for delivery to Florida.

Integrated Test Report – W. Hutchinson, NAA-ATO

OCP-P-0129 consists of a pad abort, low altitude abort, and a high altitude abort followed by a mission sequence normal mission profile (plugs-in) through CM-SM separation, using an external DC primary power source. The flight umbilicals are not disconnected during this test.

OCP-P-0129 "dry run" was performed in Building 290, Checkout Station 2C and ACE Control and Computer Rooms No. 1, from 20 June to 29 June 1966. The first four sequences were performed during the morning of 19 June in order to activate basic spacecraft systems to checkout several hardware changes which had been incorporated the previous few days during which time the spacecraft was powered down. These tests included DC sensor checkout, RCS valve signatures, gimbal motor switch checkout, verification of the Yaw 1 gimbal actuator, GPI check and frequency response test and reruns of portions of OCP 0126 to verify the Stabilization Control System. After these checks were completed, it was decided that the spacecraft was in suitable configuration to proceed with OCP-P-0129. Test commenced late on the afternoon of 22 June and completed on 29 June 1966. The significant problems encountered were the FDAI failure to drive in pitch axis, cabling to SK231 deadface simulator and determination of problems of EMI affecting G&N.

On 5 July 1966, OCP 0130-A-SC 012 began. This test was performed as an engineering evaluation. There were not problems of any consequence except for the troubleshooting and resolution of the EMI problem. The OCP was completed on 11 July 1966.

It was decided to leave all systems activated and proceed directly into the "sell" run of OCP 0129-A-SC 012 starting with the abort modes. The test was successfully completed on 12 July 1966. Since no serious problems were encountered, the agreement was made not to power down and proceed directly into the OCP 0130B-SC 012. Here again, the test began with the abort modes of operation.

All test objectives were met. With the exception of explainable minor GSE problems (such as the SK231 cabling EMI), the five abort sequences were performed with no discrepancies. The normal mission profile test was performed successfully, and none of the problems encountered appear to be of a nature serious enough to prevent the successful completion of the actual mission.

It is concluded that the mission sequence run (MSR) was successfully completed on the first attempt with no functional discrepancies during this test.

Acceptance Recommendation – J.F. Shea

The meeting was concluded with a summary of prominent action items discussed; these items have been included herein.

The acceptance of SC 012 will be dependent upon the successful completion of the action items noted in these minutes as being contraints to ship from Downey.

CSM 008 Items Affecting CSM 012

It should be noted that certain anomalies have occurred during CSM 008 testing which may affect CSM 012. The most significant of these items are noted within these minutes. However final resolution and action required for CSM 012 will not be known until a detailed review of the CSM 008 data can be completed. This review is to be completed by approximately 26 August 1966.

SECTION 1 – ELECTRICAL POWER SYSTEM

Part A – Action Items

1.7.1 PROBLEM – Power Losses on CSM

Power was lost on 8-18-66. Possible inverter failure.

DISCUSSION

The cause is not known at this time since other testing which was in progress, precluded troubleshooting prior to CARR.

ACTION REQUIRED W. Hutchinson NAA ATO Before Ship

Determine cause of the power loss prior to ship. This is a constraint to shipment.

SECTION 1 – ELECTRICAL POWER SYSTEM

Part B – Historical Information

1.6.3 PROBLEM – Noise on AC Bus 1

Modulation on AC Bus 1 and 2, during OCP 0129, was observed to be 1.5 percent. Reference item 1.6.3 in the Systems Assessment Minutes and Responses.

RESOLUTION

The busses were retested with all systems powered up except the ECU (did not have glycol pumps and suit compressors on) and the observed modulation was 0.34 percent. Ref. TPS V16 GEN 322. The S-Band which normally drops out at 0.7 percent modulation did not drop out, giving additional verification that there were no problems of excessive modulation on the bus.

In the future a more rigorous definition of what constitutes an anomaly of this type in the electrical system must be defined.

The CSM buses will be monitored at KSC during testing to ensure that there is no abnormal noise in the electrical system.

KSC Action Item.

SECTION 2 – FUEL CELL/CRYOGENIC SYSTEM

Part A – Action Items

2.6.8 PROBLEM-Flow Meter Inaccuracy

Minimum limits in actual spacecraft are such that the C&W is triggered when no problem exists due to actual limits which are different than calculated limit.

DISCUSSION

1. Reduce the threshold on the hydrogen/oxygen flowrate to a point midway between no flow and low flow. Recalibrate the meter face to provide more accurate flow indication.

2. The O_2 high flow warning during cyclic accumulator operation will be modified to prevent triggering.

ACTION REQUIRED R. Larson NAA Eng

Complete the necessary engineering documentation to permit accomplishment of the effort at KSC.

KSC Action Item

SECTION 2 – FUEL CELL/CRYOGENIC SYSTEM

Part B – Historical Information

2.6.4 PROBLEM VAC-ION Pump Checkout

Checkout of the VAC-ION Pump has not been completed. Reference item 1.6.3 in the systems assessment minutes and responses.

RESOLUTION

Normally the pump will be checked out at Downey prior to ship and at KSC during normal checkout. However the VAC-ION Pump for CSM 012 will be checked out only at KSC.

KSC Action Item.

2.6.5 PROBLEM – Checkout of O_2 Cryo Fans

How will the checkout, to verify that both fans are operating, be accomplished at KSC.

RESOLUTION

The possible checkout alternatives were presented in Item 2.6.5 of the CSM 012 Systems Assessment minutes and responses. The method to be used at KSC is as follows:

1. The back-EMF of the fans will be monitored via the ACE C14-484 and monitored on an oscilloscope. This can be accomplished up to T-6.
2. Test Equipment availability will support KSC testing in MSOB.

KSC Action Item.

2.6.7 PROBLEM – Hydrogen Vent Freeze Up

Hydrogen/water vapor may freeze during fuel cell venting to space.

RESOLUTION

A CCA is in house to install an in-line heater. Installation and checkout will be completed at KSC.

KSC Action Item.

2.6.9 PROBLEM – Repetitive Failure of F/C Reactant Shut-Off Valves.

Due to reactant shut-off valve failures in S/C 008 and S/C 011, NASA wants to know if there is a problem either with design, method of operation, ACE compatibility or other parameters. Ref. item 2.6.9 in the Systems Assessment minutes and responses.

RESOLUTION

The ACE uplink circuits have been holding the valves open too long causing failure from overheating. Modification will be made so that the ACE circuits will no longer be used to control these valves. Control will be from the command module using manual switches.

KSC Information Item.

2.7.1 PROBLEM – H_2 and O_2 Purge Valve Leakage

CSM 008 has had purge valve leakage problems.

RESOLUTION

During testing, it has been determined that several manual actuations made the valves reseat and reduce leakage. Testing during vacuum tests should cause the valves to seat better. This should be observed during KSC altitude chamber testing to verify. This is not considered to be a repetitive failure. The cause of valve failure during CSM 008 testing will be determined during refurbishment.

KSC Information Item
CSM 008 Action Item

SECTION 3 – ENVIRONMENTAL CONTROL SYSTEMS

Part A – Action Items

3.6.14 PROBLEM – Flight Qual Instrumentation Status

Four transducers are not operating properly. Reference item 3.6.14 in the Systems Assessment Minutes and Responses (CF0550, CF0481, CF0327, CF0245).

DISCUSSION

These sensors must be replaced.

ACTION REQUIRED	J. Jolley	NAA ATO	Before Ship

Replace at Downey prior to ship. This is a constraint to shipment.

3.7.1 PROBLEM – Suit Loop Leakage

Leakage noted during OCP 5051 was greater than the specification allows.

DISCUSSION

ATO was aware of leakage problem prior to entering the suit loop test; the problem will be corrected.

ACTION REQUIRED	J. Jolley	NAA ATO	Before Ship

Resolve and correct at Downey; this is a constraint to shipment.

3.7.2 PROBLEM – Demand Regulator Failure

The demand regulator is inoperative.

DISCUSSION

This may have been bumped during crew couch installation.

ACTION REQUIRED	R. Larson	NAA Eng	Before
	J. Jolley	NAA ATO	Ship

An analysis of the cause of failure is required. Replace and retest at Downey; retest during OCP 5051. The replacement is a constraint to shipment.

3.7.3 PROBLEM – Water Cyclic Accumulator Failure

The unit is not working.

DISCUSSION

Cause of problem was not known at CARR meeting time.

ACTION REQUIRED	R. Larson	NAA Eng	Before
	J. Jolley	NAA ATO	Ship

NAA engineering must evaluate the problem if due to equipment failure. The problem must be corrected. This is a constraint to shipment.

3.7.5 PROBLEM – Moisture Between Window Panes

On CSM 008, moisture appeared between the two window panes.

RESOLUTION

Dry nitrogen at 0.5 psi is cycled 3 times to purge this sealed unit. The cause of the problem is not known and must be determined. It may be caused by "wet" nitrogen used for purge or by leaking seals on the windows.

ACTION REQUIRED	R. Larson	NAA Eng

Continue evaluation of post flight data from SC 008 tests and perform additional tests on spare windows to determine cause of leakage and report findings. This is a CSM 008 action item.

A determination should be made regarding the feasibility of applying a cold patch to the windows on SC 012 to investigate this problem.

3.7.9 PROBLEM – Moisture in Aft H/S on CSM 008

Excessive moisture and condensation occurred during CSM 008 testing.

DISCUSSION

A14-011 was not fully employed during CSM 008 testing. It is planned to purge the Aft H/S on CSM 012 using this unit. This will keep a positive flow of warm air throughout the structure and behind all panels.

ACTION REQUIRED R. Larson NAA Eng

Brief A. Morse (NASA-KSC) regarding this procedure.

3.7.10 PROBLEM – OCP 5051, Suit Loop Checks

Check out per OCP 5051 is not complete at this time (CARR meeting).

ACTION REQUIRED	J. Jolley	NAA ATO	Before Ship

Complete C/O prior to ship. This is a constraint to shipment.

SECTION 3 – ENVIRONMENTAL CONTROL SYSTEMS

Part B – Historical Information

3.6.1 PROBLEM – Suit Loop Evaporator-Flight Operation Mode

The operational mode to be used during flight was questioned. Reference item 3.6.1 in the Systems Assessment Minutes and Responses.

RESOLUTION

The suit loop evaporator will be used only as backup during flight. The evaporator system will be functionally checked out at KSC in the altitude chamber. It will also be checked out during rerun of SC 008 at MSC to explain anomalies which have occurred. KSC Information item. CSM 008 Action Item.

3.7.4 PROBLEM – Water Glycol Pump Failure

During ECU checkout, the pump output pressure was below spec. requirements.

RESOLUTION

The plastic seal on the rotor was found to be fractured and permitted water glycol to enter the motor housing. Microscopic analysis and pressure check on the replacement unit shows satisfactory performance and no evidence of insipient failure. The vendor is to continue the failure analysis to determine cause of seal fracture.

3.7.6 PROBLEM – Emergency In-Flow Regulator

Out of spec. condition existed on SC 008.

RESOLUTION

Leakage of regulator was excessive on CSM 008. The SC 008 data will be investigated. CSM 008 action item.

3.7.7 PROBLEM – Odor Removal

The odor which has occurred on CSM 008 was excessive.

RESOLUTION

The odor level increased to an unsatisfactory level before cannister replacement (about 22 hours). On CSM 012, which is unlike CSM 008, the gases are dumped overboard, not returned to the suit circuit. The feasibility of changing charcoal quantity and chemical balance is being investigated, and additional checkout will be accomplished on CSM 008.
CSM 008 action item.

3.7.8 PROBLEM – ECU Harness – Special Tests

Evaluation of the suitability of materials used on the ECU harness.

RESOLUTION

In order to satisfy all questions pertaining to be ability of Block I ECS Environmental Control Unit (ECU) cable assemblies to withstand anticipated worst case exposures. The status of tests performed on one cable assembly in accordance with the NASA request is:

1 hr of O_2 100%; humidity 95% at 5 psia

8 hrs of O_2 100% 0-3% humidity at 5.37 MMHg

15 hrs of O_2 100% and humidity 100% at 5 psia

Some wires carried 1 amp 28 vdc.

Some wires carried 1.5 amp 200 vac 60

Leakage was tested continuously.

Resistance was checked every one (1) hour

12:15 PM - 8/15/66 - Start

12:15 PM - 8/16/66 - Successful completion

There was no pin degradation. The insulation resistance on all pins started out and remained at greater than 1000 megohms.

Resolved, pending completion of testing being done.

Reference: EDL Lab Report 3385.

SECTION 4 – COMMUNICATIONS SYSTEM

Part A – Action Items

4.6.8 Originator R. Roshon NAA ATO

PROBLEM – TV Camera Checkout – Picture Distortion

The TV image distortion was excessive during checkout subsequent to systems assessment. Reference item 4.6.8 in the systems assessment minutes and responses.

DISCUSSION

The test was performed during CCFF on 8-18-66. The major problem was that the TV image was distorted during CCFF at range on 2-3 feet and was deemed unsatisfactory by crew. The switch was in ALC position. In addition, the picture was too bright with the CCC floodlights turned to maximum brightness.

ACTION REQUIRED	H. Roshon	NAA ATO	Before
	W. Day	NAA Eng	ship
			9-19-66

This will be investigated further with troubleshooting at Downey. NASA must have a complete status on the acceptability of TV camera performance.

4.7.1 PROBLEM – CSM Intercom Problems

Due to problems associated with the CSM intercom system, corrective action must be completed.

DISCUSSION

The configuration of SC 012 and 014 communication is being implemented to allow the following functions:

1. VOX operation of Intercom only - selectable over PTT operation by panel switch.

2. PTT operation (cobra cable) of Intercom only - selectable by toggle switch on cobra cable (independent of panel switch to select VOX-PTT operation).

3. PTT operation (cobra cable) of Intercomm and Transmit - selectable by toggle switch on cobra cable (and appropriate selection of transmitter T/R switches).

4. "Hot Mike" operation of audio center - usable by affixing "mechanical actuator" on cobra cable (to hold down PTT switch). Selection of intercomm only or intercomm/transmit to be done with cobra cable toggle switch.

5. LM Voice Recorder (DSEA) is operable by:

   a. VOX operation, if the recorder enable switch (HF T/R) is on.

   b. PTT operation (either), if the recorder enable switch (HF T/R) is on.

   c. HF T/R switch, if the "Hot Mike" capability (No. 4 above) is being utilized.

6. "Sleep Switch" - a switch on the cobra or adapter cable to disable the alarm signal from the Caution and Warning Equipment. This eliminates crosstalk between audio centers.

7. PTT switches on hand controllers provide PTT Intercomm/Transmit functions, independent of toggle switches on cobra cables.

The following actions must still be accomplished to have the above actually represent the SC 012 and 014 configuration:

1. Submit RECP concerning items 4 and 6 above to CSM CCP by Monday, 15 August, 1966.

2. Submit RECP concerning item 5a above to CSM CCP by Monday, 15 August 1966, to fix incompatibility of CSM audio center and LM recorder.

ACTION REQUIRED M. Luse NASA

NAA and NASA to agree on proper CCA direction to incorporate these fixes on SC 012. The possibility of providing storage capability for one or two extra cobra cables should be considered.

4.7.2 PROBLEM – LEM Voice Recorder

The LEM Recorder will not turn off after actuation by PTT switch on cobra cable.

DISCUSSION

The LEM recorder circuit has a latching relay which will not drop out on release of PTT switch.

ACTION REQUIRED M. Luse NASA

Authorization will be given to add the circuitry and relay to achieve proper operation.

SECTION 4 – COMMUNICATIONS SYSTEM

Part B – Historical Information

4.7.3 ORIGINATOR Flight Crew NASA

PROBLEM – Noise Filter

A filter is requested to eliminate the noise resulting from elimination of the VOX.

RESOLUTION

Spacecraft noise during flight due to continuous operation of intercom system may be excessive to the astronauts (background noise). Until a firm determination of requirement can be made, decision will be deferred. Decision is deferred until altitude chamber tests at KSC.

KSC Information.

SECTION 5 – INSTRUMENTATION SYSTEM

Part A – Action Items

5.6.17 ORIGINATOR Flight Crew NASA

PROBLEM – Calibration Curves

When will the Flight Crew receive the meter calibration curves ?

ACTION REQUIRED R. Parsons ATO 8-19-66

The calibration curves are available and are to be transmitted to J. McDivitt on 8-19-66.

5.7.1 PROBLEM – Failure of ECS Measurements

WIG pump package inlet pressure measurement CF0025P has been found defective and must be replaced since it is required to monitor flow. The temperature cold plate branch 2 outlet measurement CF0484T will also be replaced.

ACTION REQUIRED J. Jolley ATO Before Ship

Replace the sensors at Downey, check at KSC.

This is a constraint to ship.

SECTION 5 – INSTRUMENTATION SYSTEM

Part B – Historical Information

5.6.1 PROBLEM – Bad Transducer

(CF0550P), Diff. Press. CP No. 2 Branch. Signal Conditioner outputs 5.5 VDC with no pressure on ECS lines. S/B 0 VDC. T/X TPS V16-GEN-105 Sqk. No. 180.

RESOLUTION

TPS V16-GEN-175 removed and replaced CF0550P. Measurement operation was verified during OCP 5049, Deviation No. 046T. See item No. 3.6.14 in these minutes.

5.6.7 ORIGINATOR R. Roshon

PROBLEM – Battery Charger Output Display

Measurement CC0215 - Reference Item 5.6.7 in the Systems Assessment Minutes and Responses.

RESOLUTION

NAA will change calibration of the on-board signal conditioner (this is a software change) to support the battery charging monitoring. This will be done at KSC prior to altitude chamber testing. The ground station readout will be within 20 percent accurate.

KSC Action Item.

5.7.2 ORIGINATOR R. Roshon

PROBLEM – Instrumentation Retest Reqts at KSC

Certain instrumentation has not been functionally checked.

RESOLUTION

For example, V17 GEN196 performed continuity check only.

All instrumentation will be functionally verified at KSC.

KSC Action Item.

5.7.3 ORIGINATOR R. W. Lanzkron NASA

PROBLEM – SPS Engine Skirt Temp. Measurement

On SC 011, 4 Flight Qual measurements were improperly grounded.

RESOLUTION

The grounding straps are removed. This condition does not exist on CSM 012 since CSM 012 has only one measurement which will be properly grounded when installed at KSC.

KSC Information.

SECTION 6 – REACTION CONTROL SYSTEM

Part A – Action Items

6.6.5 ORIGINATOR Flight Crew

PROBLEM – PVT Calibration

Calibration curves for the RCS Quads and appropriate CM RCS are required. Reference item 6.6.5 in the Systems Assessment minutes and action responses.

DISCUSSION

The first curves will be available (nomograms) 8-26 and will be periodically improved with respect to accuracy until about October. The final data will also include a math model. Curves will be transmitted to R. Rose, NASA MSC FOD.

ACTION REQUIRED R. Larson NAA Engr 8-26-66

NAA Engineering to supply data to NASA as soon as available, with first data prior to 8-26-66.

KSC Information Item.

6.7.1 PROBLEM – RCS Engine Failures

RCS Engine failures have been experienced during qual test.

DISCUSSION

There is a possibility that these failures are occuring during mid-range temperatures as well as high temperature ranges during qual testing.

ACTION REQUIRED R. Larson NAA Engr

This is a design problem and must be analyzed and evaluated as soon as possible.

SECTION 6 – REACTION CONTROL SYSTEM

Part B – Historical Information

6.7.2 PROBLEM – CSM 008 RCS Heater Bonding Problem

The bonded heater element separated during CSM 008 test.

DISCUSSION

The quad is being returned to Downey to investigate the cause of failure and a full report will be made upon completion of that investigation.

CSM 008 action required.

SECTION 7 – SERVICE PROPULSION SYSTEM

Part A – Action Items

7.7.2 ORIGINATOR Flight Crew

PROBLEM – Calibration Curve Data

Curves are required to determine the helium pressure versus quantity of helium remaining to give an approximate estimate of propellant remaining.

DISCUSSION R. Larson NAA Eng

The information was forwarded to NASA, however, an additional set of data will be provided to R. Rose, NASA

7.7.4 ORIGINATOR R. Burt

PROBLEM – Mod I Gimbal Actuator Qual Testing

The Qual program is not completed for Lunar Mission. In addition, the CTR was changed to cover SC 012 and SC 014 missions.

DISCUSSION

The actuator test data from Aerojet must be evaluated related to the covering the CTR for SC 012 and SC 014 missions.

ACTION REQUIRED R. Burt NASA 8-24-66

Review data and revised CTR's; determine that the revised CTR requirements have been met.

SECTION 7 – SERVICE PROPULSION SYSTEM

Part B – Historical Information

7.7.1 PROBLEM – Nozzle Extension Leak Tests

Engine/nozzle interface leaks were detected during Downey C/O.

RESOLUTION

A substitute unit was used at Downey to ensure that the leakage had been cured by proper nozzle fit. The flight nozzles at KSC must be refurbished, fitted and retested at KSC.

KSC Action Item.

7.7.3 ORIGINATOR Flight Crew NASA

PROBLEM – Gimbal Actuator C&W Indications on CSM 008

C&W Indications on CSM 008 indicate possible overload or other problems.

RESOLUTION

MCR 1515 deactivates the over/under current sensor on the backup mode of the gimbal actuators for CSM 012 to prevent C&W triggering by starting spikes. This was not done on CSM 008. The CSM 008 problem remains to be resolved. Retest will be done on CSM 008 during rerun to insure that there are no subtil anomalies.

CSM 008 Action Item.

7.7.5 PROBLEM – SPS Heater Problems on CSM 008

Only 4 of 12 heaters were operating at the time the fuel line froze.

RESOLUTION

There is no action required on CSM 012 to evaluate further at this time.

CSM 008 Action Item

7.7.6 PROBLEM – Pitch Gimbal Clutch Brush Jump

The gimbal clutch brushes "jump" or chatter during operation.

RESOLUTION

This was first noted on SC 011 and it is considered normal to have some noise from this source. It is noted on the voltage trace and not on the current trace.

NAA feels that this is not a problem during flight.

7.7.7 PROBLEM – Pitch Gimbal Clutch Brush Float

During test two Mod I actuators have failed due to brush "float" or lift off. One of the actuators in CSM 012 has exhibited preliminary indications of this characteristic in the differential current trace.

RESOLUTION

It was recommended and agreed that the pitch actuator which has had this type of data will be replaced with a spare now at KSC. Retest will include frequency response in stack on pad. The replacement will continue to be monitored for further exhibitions of this type of occurrence.

The installed and replacement actuator characteristics will both be recorded for comparison and historical purposes.

KSC Action Item.

SECTION 8 – STABILIZATION AND CONTROL SYSTEM

Part A – Action Items

8.7.1 PROBLEM – Pitch ECA Failure

The pitch ECA failure on SC 011 disclosed that the extended and retract clutches were being energized simultaneously.

DISCUSSION

The failure has been isolated at Minneapolis-Honeywell but the cause of failure has not been deteremined. NASA stated that they were aware of the problem and surveillance for this condition on SC 012 would be made.

ACTION REQUIRED R. Larson NAA Eng

Report on the failure analysis and resolution.

KSC Information Item.

SECTION 8 – STABILIZATION AND CONTROL SYSTEM

Part B – Historical Information

8.6.2 PROBLEM – Attitude Controller Isolation

The capability of disconnecting the controller by the crew during flight must be verified. Reference Item 8.6.2 in the Systems Assessment minutes and action responses.

DISCUSSION

This was accomplished by the crew during CCFF on 8-18-66, and satisfactorily demonstrated.

8.6.5 PROBLEM – Meter Reading Errors

The offset bias presented to the flight crew on the flight director attitude indicator of up to 0.2 deg/sec causes a 20 percent error on 1 deg/sec scale. Reference Item 8.6.5 in the Systems Assessment minutes and action responses.

RESOLUTION

This offset is predictable and can be specified prior to flight. Correction of this would require the addition of a nulling device. A RID to do this was cancelled by NASA after the delta CDR on CSM 012.

This is considered an unsatisfactory condition but was accepted as is by the flight crew. It will not be corrected on CSM 012 or other Block I vehicles, but the condition will be re-evaluated for Block II.

KSC Information Item.

SECTION 9 – GUIDANCE AND NAVIGATION SYSTEM

Part A – Action Items

9.7.2 ORIGINATOR S. Snipes NASA-MSC

PROBLEM – Inverter Noise of G&N PCM Meas.

The G&N measurements via PCM have inverter noise riding on them.

DISCUSSION

MIT has evaluated the problem and has determined a fix for SC 012. The fix for SC 012 has to be verified on SC 014 first. If and when SC 012 will be fixed is unknown.

ACTION REQUIRED NASA-FOD

NASA/FOD is to evaluate the problem and recommend if fix is actually warranted or if FOD can accept the problem as is.

KSC Information Item.

9.7.3 PROBLEM – System C/O Status

DISCUSSION S. E. Snipes NASA-MSC

Prior to integrated testing it was decided that the IMU in SC 012 was a reliability risk and should be replaced. During integrated testing the IMU failed after integrated testing the G&N system was removed from the SC and the IMU was replaced. The system has now been reinstalled but no subsequent testing has been performed on it in the SC.

During integrated testing the guidance computer experienced an unexplained Parity Fail and a TC trap. When the G&N system was removed after integrated testing the computer was thoroughly tested in the AC Electronics laboratory with no evidence of problems. It was then sent to Raytheon where it experienced a Parity Fail during vibration at 0.04 g^2/cps. Subsequent thermal cycling caused recurrence of the parity

fail. The eraseable memory was replaced and testing on the computer and the removed modules is now in progress.

The main DSKY was returned to Raytheon where it successfully passed vibration testing at 0.04 g^2/cps.

Mr. Hugh Brady of AC Electronics stated that there was a basic problem with contamination in the relays used in the DSKY's and proposed vibration screening of relay modules used in the DSKY's to avoid this problem.

Mr. S.E. Snipes of NASA then stated that a problem exists in regard to the G&N system outputs for telemetry due to a variable bias appearing on the lines caused by coupling from the spacecraft inverters causing ripple on the lines between the G&N signal conditioner and the PCM equipment. A fix for this problem has been devised and will be tried on SC 014 as soon as possible to verify that it works. This fix involves adding a capacitor to the G&N signal conditioner.

The G&N system is considered to be highly critical and will require additional information and solution of problems before it can be considered acceptable for use in CSM 012.

ACTION REQUIRED C. Duncan NASA

A team will be formed to review the entire G&N hardware qual test program to determine its suitability for the CSM 012 flight. NAA will participate in this review; particularly in the areas of identifying CM vibration levels as related to the G&N qual testing and the G&N hardware reliability review. R. Gardner and C. Duncan of NASA will head this team consisting of NASA, ACED, MIT, and NAA. The NAA participants will be identified by G. W. Jeffs.

SECTION 9 – GUIDANCE AND NAVIGATION SYSTEM

Part B – Historical Information

9.3.4.1 PROBLEM – IMU Replacements

What is the status on IMU performance as experienced on SC 012.

RESOLUTION

IMU performance report - S.E. Snipes - NASA. The history of IMU's in SC 012 G&N system is as follows:

S/N 2 Z IRIG failed in AC lab

S/N 7 Temperature padding resistor shifted while in AC lab

S/N 9 X PIPA and X IRIG failed in SC

S/N 2 Z IRIG failed in AC lab

S/N 11 Y IRIG ADIA shift in AC lab

S/N 10 Now in the SC

Mr. John Miller of MIT/IL stated that IMU S/N 10 looks good based on test data to date. He went on to say that IRIG failures were traced back to two lots of bearing retainers of which none are in any SC except for one in the SC 017 G&N system. It should be noted that G&N reverification will be required at KSC since in effect the whole G&N system has been removed.

KSC Information Item

9.3.4.3 PROBLEM – G&N Qual Program Status

G&N system qualification testing status - S.E. Snipes - NASA. The qualification test program for the Block I G&N systems has been completed with the following exceptions:

1. DSKY EL - expected to be completed by 8-21-66.

2. Optics unit assembly - due to be completed by 9-15-66.

3. Effect of ablative cover addition to optics due to astro-sextant door modification.

4. Navigation DSKY vibration.

9.7.1 ORIGINATOR S. Snipes

PROBLEM – Booster Hold Signal

Lift off guidance reference release will be used in lieu of present reference.

RESOLUTION

The present Guidance Reference Release (GRR) signal to the G&N will not be used. The GRR signal is to be removed. Guidance system release will be done by the lift off signal.

KSC Information Item.

SECTION 10 – SEQUENTIAL SYSTEMS

Part A – Action Items

There were no items presented for CSM 012 action on this system.

SECTION 10 – SEQUENTIAL SYSTEMS

Part B – Historical Information

10.7.1 PROBLEM – MESC Relay Failures on CSM 014

What is the status on the MESC relay failures experienced on SC 014?

RESOLUTION

The relays which failed on CSM 014 are from a different lot than those which are on CSM 012. SC 012 has not experienced any similar failures.

10.7.2 PROBLEM – CSM 008 CM/SM Separation Operation

During CSM 008 testing, the CM/SM separation switch was accidentally thrown, but its intended function did not occur.

RESOLUTION

Determine the mode of switching that was present on CSM 008 at that instant of time and the reason why the intended function did not occur when the switch was inadvertently thrown.

CSM 008 action required.

SECTION 11 – EARTH RECOVERY SYSTEMS – ORDNANCE

Part A – Action Items

There were no items presented for CSM 012 action on this system.

SECTION 11 – EARTH RECOVERY SYSTEMS – ORDNANCE

Part B – Historical Information

11.7.1 PROBLEM – Qual Test on Chutes

Report of Qualification Test Results

RESOLUTION

The following 3 qual test drops have been completed:

1. Test revalidation of a previous test that failed - operated satisfactorily.

2. 1.35 safety factor test - satisfactorily accomplished.

3. 1.5 safety factor test - failure occurred at 1.46 axial load condition - one chute split.

Additional post test evaluation will be conducted to determine the cause of failure since the results give some cause for concern.

SECTION 12 – MECHANICAL SYSTEMS – STRUCTURES

Part A – Action Items

12.6.3 PROBLEM – Hatch Decals

Installation of torque limit decals has not been completed.

DISCUSSION

The Engineering is released and the decals are available.

ACTION REQUIRED J. Jolley NAA-ATO Before Ship

This will be accomplished at Downey prior to ship.

This is a constraint to shipment.

12.7.1 PROBLEM – Tunnel Egress Hatch Operation

The crew cannot apply sufficient torque to seal the hatch water tight or remove the hatch.

DISCUSSION

A new design is not completed but this change must be incorporated into SC 012. This change consists of modifying the hatch locking mechanism. The existing lock will be replaced by the new design. The seal is not affected.

ACTION REQUIRED W. Day NAA Eng 8-26-66

A firm date for completion of design documentation is 8-26-66. In addition the extent of testing to be performed on CSM 007 must be determined.

Perform Qual test on AFRM 007.

KSC Information.

CSM 007 Action required.

12.7.2 PROBLEM – Insulation (Mylar) on SM

The insulation on CSM 011 was damaged during purging operations.

DISCUSSION

On CSM 012 and subsequent spacecraft the purge nitrogen velocity is to be reduced using a plenum chamber to prevent shredding of Mylar. The plenum chamber will become a part of the CSM. This is a Mod Kit which will be incorporated without demating the CSM 012.

ACTION REQUIRED W. Day NAA Engr

Complete Mod Kit documentation and fabrication. KSC Information.

12.7.3 ORIGINATOR W. Bland

PROBLEM – Possible Couch Attenuation Due to Launch Vibration

The CSM 009 flight report indicates vibration limits that would prevent the crew from reading flight instruments during portions of the launch boost.

DISCUSSION

No crew couches were installed during the 009 flight. During subsequent random vibration testing of the crew couches no problems have been detected, although amplification at certain sinusoidal frequencies (7 cps) was noted.

ACTION REQUIRED W. Bland NASA

Review results of information from the CTN and determine action, if any.

SECTION 12 – MECHANICAL SYSTEMS – STRUCTURES

Part B – Historical Information

There is no historical information to be presented on this system.

SECTION 13 – DISPLAYS AND CONTROLS

Part A – Action Items

13.6.10 PROBLEM – CO_2 Partial Press Gage

When power is turned on, this gage pegs which, in turn, triggers the caution and warning. Reference item 13.6.10 in the System Assessment minutes and action responses.

DISCUSSION

The gage requires approximately 7 seconds warm up. C&W has only been triggered during initial turn on and not after continuous operation.

ACTION REQUIRED J. Jolley ATO Before Ship

→ CO_2 Partial Pressure Transducer will be checked during CCFF at Downey, by a qualitative test only.

→ Remove and recalibrate the transducer at KSC.

KSC Action Required.

ACTION REQUIRED F. Rotramel NASA

NASA will certify that the method of $PPCO_2$ operation and calibration will give satisfactory operation.

13.7.1 ORIGINATOR Flight Crew

PROBLEM – Rheostat Failure – Floodlights

The floodlights had on-off capability only; not rheostat adjustment as designed.

DISCUSSION

There is a possible hardware anomaly.

ACTION REQUIRED W. Hutchinson ATO Before Ship

This will be checked at Downey and the cause of failure determined prior to ship.

This is a constraint to shipment.

13.7.2 PROBLEM – Evaporator Steam Backpressure C&W Indication

The Caution and Warning System triggers with no visible indication when the glycol evaporator steam back pressure is operated.

DISCUSSION

This has not been troubleshot at the present time.

ACTION REQUIRED J. Jolley NAA ATO Before Ship

The cause of the glycol evaporator steam back pressure triggering of the C&W system will be resolved. This is a constraint to ship.

13.7.4 PROBLEM – C&W System Anomalies

DISCUSSION

Anomalies associated with this system have generally been resolved and no further changes will be made to the system except some minor conditions which will be cleared prior to shipment.

ACTION REQUIRED R. Williams NASA

Review Block II C&W design and operations concept.

SECTION 13 – DISPLAYS AND CONTROLS

Part B – Historical Information

13.6.16 PROBLEM – CC Flood Light Failures

There have been excessive flood light failures. Reference item 13.6.16 in the systems assessment minutes and responses.

RESOLUTION

Microdot has developed a fix and initial testing indicates the fix is acceptable. The modified lights will be available for chamber testing at KSC.

KSC Information Item.

13.6.20 ORIGINATOR Flight Crew

PROBLEM – CM Panel – Nomenclature Changes

Certain nomenclature and numbering have been requested. Reference item 13.6.20 in the systems assessment minutes and responses.

RESOLUTION

Satisfactory resolution of all changes has been worked out. CSM 012, the Operational Handbooks and simulators will be modified accordingly.

KSC Information Item.

13.7.3 ORIGINATOR R. Gardiner

PROBLEM—Spares—FDAI's and Hand Controllers

Are there spares for the FDAI and controllers available if replacement is required at KSC.

RESOLUTION

There are spares, location unknown. A spares inventory check is required.

KSC Information Item.

SECTION 14 – CREW EQUIPMENT

Part A – Action Items

14.7.1 ORIGINATOR J. Jolley ATO

PROBLEM – Partial CCFF Summary

Fifty squawks were picked up on 8-19-66 during CCFF. These were primarily in the areas of Velcro fasteners and storage containers.

DISCUSSION

This condition existed due to the vehicle not being entirely ready for the CCFF at this time.

ACTION REQUIRED J. Jolley ATO Before Ship

Complete CCFF and resolve all problems prior to ship.

This item is a constraint to shipment.

14.7.2 ORIGINATOR W. Bland NASA MSC

PROBLEM – Flammable Materials in SC 012

The use of Velcro and other materials in the CM is not considered desirable and is unsatisfactory for flight.

DISCUSSION

The wire bundle chaffing straps of nylon and Velcro are dangerous for flight due to intimate contact with wires that could possibly heat up, due to overloads or severance. NAA considers the VELCRO straps acceptable due to ability to meet flammability requirements (VELCRO is used extensively in the CM interior).

ACTION REQUIRED	W. Bland R. Larson	NASA R&QM NAA Eng	Before Ship

A NASA and NAA team will perform a "walk-through" of the CM and identify specifically those flammable items which should be considered for replacement. These changes if any will be completed prior to start of KSC testing.

The investigation is a constraint to shipment.

NASA is to determine the basic criteria for any changes which are desired and submit this information to NAA.

It should be noted that this is a problem of quantity and location of these materials with respect to ignition rather than a specific material problem.

SECTION 14 – CREW EQUIPMENT

Part B – Historical Information

There was no historical information discussed on this system.

SECTION 15 – EXPERIMENTS

Part A – Action Items

15.7.1 PROBLEM – MDAS Checkout

The MDAS was not checked out during CCFF.

DISCUSSION

This could not be accomplished because the circuit breaker was tripped. It is thought that a problem exists in the Octopus Cable which is currently being investigated (8-19-66).

ACTION REQUIRED	J. Jolley	NAA-ATO	Before ship

The problem will be resolved and the MDAS will be checked out prior to ship.

This is a constraint to shipment.

15.7.2 PROBLEM – 16mm Camera Operation

The camera is not currently operable.

DISCUSSION

It is very desirable to NASA to have this item resolved prior to shipment from Downey.

ACTION REQUIRED	J. Jolley	NAA-ATO

Determine cause of problem.

SECTION 15 – EXPERIMENTS

Part B – Historical Information

There was no new historical information discussed on this system.

CRITICAL LIFE COMPONENTS – NAA QC

This section includes a duplicate reproduction of the CARR Critical Life Components Handout.

The time/cycle accumulation for items identified herein is per process specification MA0201-0077 Revision E. The information is current through 3 Aug. 1966.

1. Operating Time - Electrical Power System - C/M - S/M S/C 012

The following tabulation of items have operating time or cycle restrictions per MA0201-0077 "E" Revision. Documented "Total Time" represents total time accumulated at the vendor plus system run time applied at S&ID.

PART NUMBER	DESCRIPTION	SERIAL NO. OF ASSEMBLY	WHERE USED IN SYSTEM	REPLACEMENT TIME/CYCLES	VENDOR PRIOR TIME/CYCLES	TOTAL TEST TIME/CYCLE
ME453-0010-0001	Elect. Circuit Interrupter	053501A00034	Lower R.H.Equip. Bay C/M	21 cy	N/A (1)	3cy (1)
ME453-0010-0003	Elect. Circuit Interrupter	053502A00030	Lower R.H.Equip. Bay C/M	21 cy	N/A (1)	3cy (1)
ME453-0010-1001	Elect. Circuit Interrupter	053501B00013	Lower R.H.Equip. Bay C/M	21 cy	N/A (1)	3cy (1)
ME453-0010-1003	Elect. Circuit Interrupter	053502B00010	Lower R.H.Equip. Bay C/M	21 cy	N/A (1)	3cy (1)
ME453-0010-0003	Elect. Circuit Interrupter	053502A00027	Top Deck S/M Above Sector 4	21 cy	N/A (1)	5cy (1)
ME453-0010-1003	Elect. Circuit Interuupter	053502B00009	Top Deck S/M Above Sector 4	21 cy	N/A (1)	1cy (1)

(1) NAA Test Time is recorded at Downey only per MA0201-0077

NAA QUALITY CONTROL

NAA ATO SYSTEMS ENGINEER

NASA R&QA INSPECTION 1/31/6

2. Operating Time - Fuel Cell/Cryogenics S/M S/C 012

The following tabulation of items have operating time or cycle restrictions per MA0201-0077 "E" Revision. Documented "Total Time" represents total time accumulated at the vendor plus system run time applied at S&ID.

PART NUMBER	DESCRIPTION	SERIAL NO. OF ASSEMBLY	WHERE USED IN SYSTEM	REPLACEMENT TIME/CYCLES	VENDOR PRIOR TIME/CYCLES	TOTAL TEST TIME/CYCLE
ME282-0027-0070	Hydrogen Tank	10024E410187	Sector I S/M	50 hrs.	N/A (2)(1)	03:51:00(2)(1)
ME282-0027-0070	Hydrogen Tank	10024K520552	Sector I S/M	50 hrs.	N/A (2)(1)	03:58:00(2)(1)
ME282-0026-0060	Oxygen Tank	10024E620413	Sector I S/M	50 hrs.	N/A (3)(1)	02:34:00(3)(1)
ME282-0026 0060	Oxygen Tank	10024F620042	Sector I S/M	50 hrs.	N/A (3)(1)	01:29:00(3)(1)
ME464-0007-0001	Fuel Cell	06763P650731	Sector 4 S/M	54 hrs.	N/A (1)	None (1)
ME464-0007-0001	Fuel Cell	06763P650732	Sector 4 S/M	54 hrs.	N/A (1)	None (1)
ME464-0007-0001	Fuel Cell	06763P650733	Sector 4 S/M	54 hrs.	N/A (1)	None (1)

(1) NAA test time recorded at Downey only per MA0201-0077 "E" E.O. 386136.

(2) Record press., no of cycles, and length of time when pressure is 230 psia and above.

(3) Record press., no. of cycles and length of time when pressure is 865 psia and above.

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NAA ATO SYSTEM ENGINEER

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3. Operating Time - Environmental Control System S/C 012

There are no time critical components in this section as required by MA0201-0077 specification.

4. Operating Time - Communication System S/C 012

There are no time critical components in this section as required by MA0201-0077 specification.

5. Operating Time - Instrumentation System

The following tabulatinn of items have operating time or cycle restrictions per MAG201-0077 "E" Revision. Documented "Total Time" represents total time accumulated at the vendor plus system run time applied at S&ID.

PART NUMBER	DESCRIPTION	SERIAL NO. OF ASSEMBLY	WHERE USED IN SYSTEM	REPLACEMENT TIME/CYCLES	VENDOR PRIOR TIME/CYCLES	TOTAL TEST TIME/CYCLE
ME453-0013-0035	Data Storage Equip.	053330150014	Lower Equip Bay C/M	924 hrs.	109 hrs.	ETI 175 Hours
ME453-0026-0002	Flight Qual Recorder	FL#12	Lower Equip. Bay C/M	200 hrs.	125 hrs.	ETI 133 Hours .

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NAA ATO SYSTEMS ENGINEER

NASA R&QA INSPECTION 9/3/6

6. Operating Time - Reaction Control System - C/M S/M S/C 012

The following tabulation of items have operating time or cycle restrictions per MA0201-0077 "E" Revision. Documented "Total Time" represents total time accumulated at the vendor plus system run time applied at S&ID.

PART NUMBER	DESCRIPTION	SERIAL NO. OF ASSEMBLY	WHERE USED IN SYSTEM	REPLACEMENT TIME/CYCLES	VENDOR PRIOR TIME/CYCLES	TOTAL TEST TIME/CYCLE
ME282-0006-0001	Oxidizer Tank	100311540012	C/M Aft. Crew Compartment	2364 cy. Wet Dry	N/A (1)	1 cy (1) (4) Wet Dry
	Oxid. Tank Bladder			19 cy 36 cy	N/A (1)	2 cy 0 cv (1) (5)
ME282-0006-0001	Oxidizer Tank	100311540017	C/M Aft. Crew Compartment	2364 cy. Wet Dry	N/A (1)	1 cy (1) (4) Wet Dry
	Oxid. Tank Bladder			19 cy 36 cy	N/A (1)	2 cy 0 cy (1) (5)
ME282-0007-0001	Fuel Tank	100311530009	C/M Aft. Crew Compartment	2364 cy Wet Dry	N/A (1)	1 cy (1) (4) Wet Dry
	Fuel Tank. Bladder			19 cy 36 cy	N/A (1)	2 cy 0 cy (1) (5)
ME282-0007-0001	Fuel Tank	100311530017	C/M Aft. Crew Compartment	2364 cy Wet Dry	N/A (1)	1 cy (1) (4) Wet Dry
	Fuel Tank Bladder			19 cy 36 cy	N/A (1)	2 cy 0 cy (1) (5)
ME282-0002-0001	Helium Tank	10048ME00028	C/M Aft Crew Compartment	2700 cy	N/A (1)	1 cy (1) (6)
ME282-0002-0001	Helium Tank	10048ME00069	C/M Aft. Crew Compartment	2700 cy	N/A (1)	1 cy (1) (6)
ME901-0067-0012	Rocket Engine	063600850133	Neg. YAW "A"	N/A	N/A	N/A
410376	Oxidizer Valve	8826936	C/M	200 cy	N/A (1)	33 cy (1)
410377	Fuel Valve	8824765		200 cy	N/A (1)	33 cy (1)
ME901-0067-0011	Rocket Engine	063600950152	Pos. YAW "A"	N/A	N/A	N/A
410376	Oxidizer Valve	8827116	C/M	200 cy	N/A (1)	27 cy (1)
410377	Fuel Valve	9436703		200 cy	N/A (1)	27 cy (1)
ME901-0067-0011	Rocket Engine	063600950157	Pos. Pitch "A"	N/A	N/A	N/A
410376	Oxidizer Valve	9433632	C/M	200 cy	N/A (1)	32 cy (1)
410377	Fuel Valve	8854033		200 cy	N/A (1)	32 cy (1)

(1) NAA Test time is recorded at Downey only per MA0201-0077. E.O. M386129
(4) Record cycle and pressure each time pressure reaches 280 psia & above.
(5) A bladder cycle is complete with 95% expulsion of liquids, propellants or cleaning fluid.
(6) Record cycle & pressure each time pressure reaches 2000 psia & above.

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NAA ATO SYSTEMS ENGINEER

Robert L. Cumett 6/3/16
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6. Operating Time - Reaction Control System - C/M, S/M S/C 012 (Continued)

PART NUMBER	DESCRIPTION	SERIAL NO. OF ASSEMBLY	WHERE USED IN SYSTEM	REPLACEMENT TIME/CYCLES	VENDOR PRIOR TIME/CYCLES	TOTAL TEST TIME/CYCLE
ME901-0067-0012	Rocket Engine	063600850134	Neg. YAW "B"	N/A	N/A	N/A
410376	Oxidizer Valve	8823937	C/M	200 cy	N/A (1)	31 cy (1)
410377	Fuel Valve	8827144		200 cy	N/A (1)	31 cy (1)
ME901-0067-0011	Rocket Engine	063600950155	Pos. YAW "B"	N/A	N/A	N/A
410376	Oxidizer Valve	8168831	C/M	200 cy	N/A (1)	31 cy (1)
410377	Fuel Valve	8854031		200 cy	N/A (1)	31 cy (1)
ME901-0067-0011	Rocket Engine	063600950162	Pos. Pitch "B"	N/A	N/A	N/A
410376	Oxidizer Valve	9433635		200 cy	N/A (1)	38 cy (1)
410377	Fuel Valve	9449776		200 cy	N/A (1)	38 cy (1)
ME901-0067-0012	Rocket Engine	063600850108	Neg. Pitch "B"	N/A	N/A	N/A
410376	Oxidizer Valve	8826149	C/M	200 cy	N/A (1)	29 cy (1)
410377	Fuel Valve	8823403		200 cy	N/A (1)	29 cy (1)
ME901-0067-0012	Rocket Engine	063600850137	Neg. Pitch "A"	N/A	N/A	N/A
410376	Oxidizer Valve	8826935	C/M	200 cy	N/A (1)	28 cy (1)
410377	Fuel Valve	8824759		200 cy	N/A (1)	28 cy (1)
ME901-0067-0011	Rocket Engine	063600950104	CCW Roll "A"	N/A	N/A	N/A
410376	Oxidizer Valve	8823927	C/M	200 cy	N/A (1)	28 cy (1)
410377	Fuel Valve	8824761		200 cy	N/A (1)	28 cy (1)
ME901-0067-0011	Rocket Engine	063600950105	CW Roll "A"	N/A	N/A	N/A
410376	Oxidizer Valve	8174022	C/M	200 cy	N/A (1)	36 cy (1)
410377	Fuel Valve	8174019		200 cy	N/A (1)	36 cy (1)
ME901-0067-0011	Rocket Engine	063600950102	CW Roll "B"	N/A	N/A	N/A
410376	Oxidizer Valve	8827123	C/M	200 cy	N/A (1)	36 cy (1)
410377	Fuel Valve	8824762		200 cy	N/A (1)	36 cy (1)
ME901-0067-0011	Rocket Engine	063600950108	CCW Roll "B"	N/A	N/A	N/A
410376	Oxidizer Valve	8827112	C/M	200 cy	N/A (1)	29 cy (1)
410377	Fuel Valve	8827134		200 cy	N/A (1)	29 cy (1)

(1) NAA Test Time recorded at Downey only per MA0201-0077 E. E.O. M386129

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NAA ATO SYSTEMS ENGINEER

NASA R&QA INSPECTION 6/3/6

6. Operating Time - Reaction Control System - C/M, S/M, SC 012 (Continued)

PART NUMBER	DESCRIPTION	SERIAL NO. OF ASSEMBLY	WHERE USED IN SYSTEM	REPLACEMENT TIME/CYCLES	VENDOR PRIOR TIME/CYCLES	TOTAL TEST TIME/CYCLE
ME251-0005-0001	Burst Disc Assy	10046NG01011	C/M Aft Crew Compt	790 cy	N/A (1)	2 cy (9)(1)
	Filter & Burst Diaphram			40 cy	N/A (1)	None(10)(1)
ME251-0005-0001	Burst Disc Assy	100464G01006	C/M Aft Crew Compt	790 cy	N/A (1)	2 cy (9)(1)
	Filter & Burst Diaphram			40 cy	N/A (1)	None(10)(1)
ME251-0005-0011	Burst Disc Assy	10046KB02019	C/M Aft Crew Compt	790 cy	N/A (1)	2 cy (9)(1)
	Filter & Burst Diaphram			40 cy	N/A (1)	None(10)(1)
ME251-0005-0011	Burst Disc Assy	10046KB02014	C/M Aft Crew Compt	790 cy	N/A (1)	2 cy (9)(1)
	Filter & Burst Diaphram			40 cy	N/A (1)	None(10)(1)

(1) NAA test time recorded at Downey only per MA0201-0077E, EO M386129

(9) Record cycles and press each time pressure reaches 200 psia and above

(10) The filter and burst diaphram are removed. They will be installed in Florida Facilities.

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6. Operating Time - Reaction Control System - C/M S/M - S/C 012 (Continued)

PART NUMBER	DESCRIPTION	SERIAL NO. OF ASSEMBLY	WHERE USED IN SYSTEM	REPLACEMENT TIME/CYCLES	VENDOR PRIOR TIME/CYCLES	TOTAL TEST TIME/CYCLES
ME282-0004-0001	Oxidizer Tank	100311520016	Quad "A" S/M	2364 cy.	N/A (1)	7cy (7) (1)
	Oxid, Tank Bladder			W 5 cy D 18 cy	N/A (1)	W. Ocy D 2 cy (5) (1)
ME282-0004-0001	Oxidizer Tank	100311520017	Quad "B" S/M	2364 cy.	N/A (1)	10 cy (7) (1)
	Oxid. Tank Bladder			W 5 cy D 18 cy	N/A (1)	W Ocy D 2cy (7) (1)
ME282-0004-0001	Oxidizer Tank	100311520023	Quad "C" S/M	2364 cy	N/A (1)	14 cy (7) (1)
	Oxid. Tank Bladder			W 5 cy D 18 cy	N/A (1)	W Ocy D 4cy (5) (1)
ME282-0004-0001	Oxidizer Tank	100311520019	Quad "D" S/M	2364 cy	N/A (1)	8 cy (7) (1)
	Oxid. Tank Bladder			W 5 cy D 18 cy	N/A (1)	W Ocy D Ocy (5) (1)
ME282-0008-0001	Fuel Tank	100311510020	Quad "A" S/M	2364 cy	N/A (1)	7 cy (7) (1)
	Fuel Tank Bladder			W 19 cy D 36 cy	N/A (1)	W Ocy D 1cy (5) (1)
ME282-0008-0001	Fuel Tank	100311510017	Quad "B" S/M	2364 cy	N/A (1)	10 cy (7) (1)
	Fuel Tank Bladder			W 19 cy D 36 cy	N/A (1)	W Ocy D 4cy (5) (1)
ME282-0008-0001	Fuel Tank	100311510019	Quad "C" S/M	2364 cy	N/A (1)	14 cy (7) (1)
	Fuel Tank Bladder			W 19 cy D 36 cy	N/A (1)	W O cy D 4cy (5) (1)
ME282-0008-0001	Fuel Tank	100311510016	Quad "D" S/M	2364 cy	N/A (1)	8 cy (7) (1)
	Fuel Tank Bladder			W 19 cy D 36 cy	N/A (1)	W Ocy D O cy (5) (1)
ME282-0002-0001	Helium Tank	10048ME00067	Quad "A" S/M	2700 cy	N/A (1)	3 cy (6) (1)
ME282-0002-0001	Helium Tank	10048ME00033	Quad "B" S/M	2700 cy	N/A (1)	6 cy (6) (1)
ME282-0002-0001	Helium Tank	10048ME00034	Quad "C" S/M	2700 cy	N/A (1)	7 cy (6) (1)
ME282-0002-0001	Helium Tank	10048ME00071	Quad "D" S/M	2700 cy	N/A (1)	5 cy (6) (1)

(1) NAA Test Time recorded at Downey only per MAC201-0077 E. E.O. M386129
(5) A bladder cycle is complete with 95% explusion of liquids, propellants or cleanning fluid are (Wet cy), or when bladder is collapsed (dry cy) using Gas.
(6) Record cycle and pressure each time pressure reaches 2000 psia & above
(7) Record cycle and pressure each time pressure reaches 160 psia & above

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6. Operating Time - Reaction Control System C/M, S/M S/C 012 (Continued)

PART NUMBER	DESCRIPTION	SERIAL NO. OF ASSEMBLY	WHERE USED IN SYSTEM	REPLACEMENT TIME/CYCLES	VENDOR PRIOR TIME/CYCLES	TOTAL TEST TIME/CYCLES
ME901-0004-0201	Rocket Engine	055860000274	Quad "A" + P	N/A	N/A	N/A
228683	Fuel Valve	084	S/M	200 cy	N/A (1)	20 cy (1)
228684	Oxidizer Valve	065		200 cy	N/A (1)	20 cy (1)
ME901-0004-0201	Rocket Engine	055860000194	Quad "A" CCW	N/A	N/A	N/A
228683	Fuel Valve	099	S/M	200 cy	N/A (1)	15 cy (1)
228684	Oxidizer Valve	102		200 cy	N/A (1)	15 cy (1)
ME901-0004-0201	Rocket Engine	055860000205	Quad "A" - P	N/A	N/A	N/A
228683	Fuel Valve	087	S/M	200 cy	N/A (1)	15 cy (1)
228684	Oxidizer Valve	087		200 cy	N/A (1)	15 cy (1)
ME901-0004-0201	Rocket Engine	055860000202	Quad "A" CW	N/A	N/A	N/A
228683	Fuel Valve	051	S/M	200 cy	N/A (1)	18 cy (1)
228684	Oxidizer Valve	046		200 cy	N/A (1)	18 cy (1)
ME901-0004-0201	Rocket Engine	055860000198	Quad "B" - Y	N/A	N/A	N/A
228683	Fuel Valve	060	S/M	200 cy	N/A (1)	19 cy (1)
228684	Oxidizer Valve	062		200 cy	N/A (1)	19 cy (1)
ME901-0004-0201	Rocket Engine	055860000280	Quad "B" CW	N/A	N/A	N/A
228683	Fuel Valve	097	S/M	200 cy	N/A (1)	18 cy (1)
228684	Oxidizer Valve	085		200 cy	N/A (1)	18 cy (1)
ME901-0004-0201	Rocket Engine	055860000272	Quad "B" + Y	N/A	N/A	N/A
228683	Fuel Valve	092	S/M	200 cy	N/A (1)	21 cy (1)
228684	Oxidizer Valve	082		200 cy	N/A (1)	21 cy (1)
ME901-0004-0201	Rocket Engine	055860000300	Quad "B" CCW	N/A	N/A	N/A
228683	Fuel Valve	055	S/M	200 cy	N/A (1)	17 cy (1)
228684	Oxidizer Valve	084		200 cy	N/A (1)	17 cy (1)
ME901-0004-0201	Rocket Engine	055860000278	Quad "C" - P	N/A	N/A	N/A
228683	Fuel Valve	074	S/M	200 cy	N/A (1)	19 cy (1)
228684	Oxidizer Valve	083		200 cy	N/A (1)	19 cy (1)
ME901-0004-0201	Rocket Engine	055860000285	Quad "C" CCW	N/A	N/A	N/A
228683	Fuel Valve	072	S/M	200 cy	N/A (1)	15 cy (1)
228684	Oxidizer Valve	056		200 cy	N/A (1)	15 cy (1)

(1) NAA Test Time is recorded at Downey per MAC201-0077 E. E.O. M386129

NAA QUALITY CONTROL

NAA ATO SYSTEMS ENGINEER

NASA R&QA INSPECTION 7/3/6

6. Operating Time - Reaction Control System C/M, S/M - S/C 012 (Continued)

PART NUMBER	DESCRIPTION	SERIAL NO. OF ASSEMBLY	WHERE USED IN SYSTEM	REPLACEMENT TIME/CYCLES	VENDOR PRIOR TIME/CYCLES	TOTAL TEST TIME/CYCLE
ME901-0004-0201	Rocket Engine	055860000286	Quad "C" +P	N/A	N/A	N/A
228683	Fuel Valve	064	S/M	200 cy	N/A (1)	17 cy (1)
228684	Oxidizer Valve	088		200 cy	N/A (1)	17 cy (1)
ME901-0004-0201	Rocket Engine	055860000275	Quad "C" CW	N/A	N/A	N/A
228683	Fuel Valve	024	S/M	200 cy	N/A (1)	18 cy (1)
228684	Oxidizer Valve	004		200 cy	N/A (1)	18 cy (1)
ME901-0004-0201	Rocket Engine	055860000203	Quad "D" +Y	N/A	N/A	N/A
228683	Fuel Valve	063	S/M	200 cy	N/A (1)	23 cy (1)
228684	Oxidizer Valve	063		200 cy	N/A (1)	23 cy (1)
ME901-0004-0201	Rocket Engine	055860000199	Quad "D" CW	N/A	N/A	N/A
228683	Fuel Valve	059	S/M	200 cy	N/A (1)	18 cy (1)
228684	Oxidizer Valve	042		200 cy	N/A (1)	18 cy (1)
ME901-0004-0001	Rocket Engine	055860000273	Quad "D" - Y	N/A	N/A	N/A
228683	Fuel Valve	091	S/M	200 cy	N/A (1)	15 cy (1)
228684	Oxidizer Valve	073		200 cy	N/A (1)	15 cy (1)
ME901-0004-0201	Rocket Engine	055860000288	Quad "D" CCW	N/A	N/A	N/A
228683	Fuel Valve	094	S/M	200 cy	N/A (1)	15 cy (1)
228684	Oxidizer Valve	096		200 cy	N/A (1)	15 cy (1)

(1) NAA Test time is recorded at Downey per MA0201-0077E. E.O. M386129

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7. Operating Time - Service Propulsion System - S/M S/C 012

The following tabulation of items have operating time or cycle restrictions per MA0201-0077 "E" Revision. Documented "Total Time" represents total time accumulated at the vendor plus system run time applied at S&ID.

PART NUMBER	DESCRIPTION	SERIAL NO. OF ASSEMBLY	WHERE USED IN SYSTEM	REPLACEMENT TIME/CYCLES	VENDOR PRIOR TIME/CYCLES	TOTAL TEST TIME/CYCLE
ME901-0484-0002	Engine SPS	001890000030	S/M Center Well	190 Sec.	118.3 sec.	None
ME901-0484 (AGC 1118931)	Ball Valve Propellant	001890000113	Above S/M SPS Engine	W 250 cy D150 cy	N/A (1)	W 0 cy D 5 cy (1)
ME901-0615-0015	Gimbal Actuator Elect. Mech, Linear Pitch	001890000030	Mounted on side of SPS Engine	5 hrs per chan	Chan 1 - 3:32:10 Chan 2 - 3:35:42	
ME901-0615-0016	Gimbal Actuator Elect. Mech. Linear, YAW	001890000030	Mounted on side of SPS Engine	5 hrs per chan.	Chan 1 - 2:44:17 Chan 2 - 2:21:20	
V17-343051	Propellant Tank	100384300020	Sector 3 S/M	1325 cy	N/A (1) (8)	8 cy (1) (8)
V17-343051	Propellant Tank	100384300021	Sector 6 S/M	1325 cy	N/A (1) (8)	8 cy (1) (8)
V17-342051	Propellant Tank	100384200019	Sector 2 S/M	1325 cy	N/A (1) (8)	5 cy (1) (8)
V17-342051	Propellant Tank	100384200022	Sector 5 S/M	1325 cy	N/A (1) (8)	5 cy (1) (8)
V17-347102	Helium Tank	00407ACX0022	Center Well S/M	1325 cy	N/A (1) (6)	7 cy (1) (6)
V17-347102	Helium Tank	00407ACX0017	Center Well S/M	1325 cy	N/A (1) (6)	7 cy (1) (6)
ME901-0191 (71018)	Thrust Chamber	001890000259	Mounted on SPS Engine	90 sec	None	None

(1) NAA Test time is recorded at Downey only per MA0201-0077E. E.O. M386129
(6) Record cycle and pressure each time pressure reaches 2000 psia & above.
(8) Record cycle and pressure each time pressure reaches 100 psia & above.

J. R. Long
NAA QUALITY CONTROL

E J Connell
NAA ATO SYSTEMS ENGINEER

Robert L. Cannell 2/3/6
NASA R&QA INSPECTION

8. Operating Time - Stabilization and Control System - C/M - S/C 012

The following tabulation of items have operating time or cycle restrictions per MA0201-0077 "E" Revision. Documented "Total Time" represents total time accumulated at the vendor plus system run time applied at S&ID.

PART NUMBER	DESCRIPTION	SERIAL NO. OF ASSEMBLY	WHERE USED IN SYSTEM	REPLACEMENT TIME/CYCLES	VENDOR PRIOR TIME/CYCLES	TOTAL TEST TIME/CYCLE
ME493-0005-0314	Gyro Assy. Rate	10028EAB1018	Lower Equip Bay C/M	1914 hrs	149 hrs.	ETI (20m1) 715 hrs.
ME493-0006-0314	Attitude Gyro Accelerometer Assy.	10028EAC1017	Lower Equip Bay C/M	1914 hrs	174 hrs	ETI (21m1) 600 hrs. (21m2) 749 hrs.

16-13

NAA QUALITY CONTROL

NAA ATO SYSTEMS ENGINEER

NASA R&QA INSPECTION 5/3/6

9. Operating Time - Guidance and Navigation System - S/M, C/M - S/C 012

All G&N inputs are supplied by ACED.

10. Operating Time - Sequential Systems S/M, C/M - S/C 012

There are no time critical components in this section as required by MA0201-0077 Specification.

11. Operating Time - Earth Recovery/Ordnance System - S/M, C/M - S/C 012

The following tabulation of items have operating time or cycle restrictions per MA0201-0077 "E" Revision. Documented "Total Time" represents total time accumulated at the vendor plus system run time applied at S&ID.

PART NUMBER	DESCRIPTION	SERIAL NO. OF ASSEMBLY	WHERE USED IN SYSTEM	REPLACEMENT TIME/CYCLES	VENDOR PRIOR TIME/CYCLES	TOTAL TEST TIME/CYCLE
ME281-0020-0002	Compressor Motor	01544000006U	C/M Aft Crew Compt	3 hrs	N/A (1)	00:16:00(1)
ME281-0020-0002	Compressor Motor	01544000008U	C/M Aft Crew Compt	3 hrs	N/A (1)	00:16:00(1)
ME464-0095-0002	Power Supply	304	C/M Top Deck	2 hrs	N/A (1)	00:12:00(1)

(1) NAA Test time is recorded at Downey only per MA0201-0077 E, E.O. M386129

NAA QUALITY CONTROL

NAA ATO SYSTEMS ENGINEER

NASA R&QA INSPECTION 5/3/6

12. Operating Time - Mechanical System/Structures - S/M, C/M - S/C 012

There are no time critical components in this section as required by MA0201-0077 Specification

13. Operating Time - Displays and Controls

There are no time critical components in this section as required by MA0201-0077 Specification

14. Operating Time - Crew Equipment

There are no time critical components in this section as required by MA0201-0077 Specification

15. Operating Time - Experiments

There are no time critical components in this section as required by MA0201-0077 Specification

OPEN ITEMS FOR DOWNEY – N. Casson

As of today at 0500, 19 August 1966, there are 132 open items; 74 of which are EO's. Prior to shipping to KSC, it is planned to close out all FAIR books, shortages and squawks with the exception of those squawks that were written at the request of the TPE to alert the KSC team of retest requirements. These squawks (No. 32 through 39 in the V14 GEN Book) were generated as a result of Downey working some of KSC kits; and, as per agreement at the Systems Assessment Meeting, the retest requirements are to be established and performed by KSC.

- MCR's yet to be worked at Downey are:

  1547 Suit Gas Flow Elect. Chg. on Panel 21
  1344 TV Mount and Optical Sight Mounting Bracket
  1145 Block II Urine Dump

- The schedule of events between CARR and shipment is planned as follows:

  a. Complete the manned suit loop check and crew compartment fit and function

  b. Tumble and clean, 20 August

  c. Prepare CSM for shipment, 20 and 21 August

  d. Ship, 22 August.

  Note: Due to the problems encountered during ECS checkout, actual work is a few hours behind this schedule.

- Open hardware and paper items will be cleared in parallel with these tasks.

- The data pack will be shipped with the spacecraft.

OPEN ITEMS FOR FIELD – B. Haight

The following is a summary of the effort to be accomplished at KSC not specifically designated in the KSC AS204 Flow Plan dated 15 August 1966.

A. MCR's to be Incorporated

Item No. 1

1344/EO509929, 509929, 509928, 509927, 534902

Title:	In-Flight Mount for TV Camera
Kit/Parts Status:	Parts available 9-9-66
Scheduled Phasing:	Mounting holes completed. Installation to be completed prior to altitude chamber test OCP 0034.
Scheduled Time:	8 hours parallel mechanical installation time inside C/M

Item No. 2

1439/EO485260

Title:	Thermal Protection for LES During High Altitude Abort
Kit/Parts Status:	Parts available
Scheduled Phasing:	To be accomplished after thrust Vector Alignment. Canard to be removed and returned to Downey for rework. After rework canard to be installed on LES at KSC and wire harness potting forward of the LEM to be completed.
Scheduled Time:	6 days parallel effort with CSM schedule

Item No. 3

1453/EO491478

Title:	Wiring for Event Timer (Panel 5) - Ref. MCR 1100 which has been completed.

Kit/Parts Status:	No parts required
Scheduled Phasing:	Six wires to be installed between Panel 5 and 11 prior to power-up for OCP 0035.
Scheduled Time:	2 days serial time inside CM. Work parallel with MCR 1591.

Item No. 4 (CARR 8.1.2.1)

1515/EO479890, 521303, 553844, 553845, 553843, 479866 SM (Ref. MCR 1542)

Title:	70 Amp C/B Panel
Kit/Parts Status:	Work complete except for SM wiring per EO479890 and 5 other open EO's.
Scheduled Phasing:	KSC installation prior to CSM mate and retest during OCP 0035
Scheduled Time:	Work in parallel with OCP 4074. 2 days total serial time added to 4074 to accomplish MCR 1515, 1542, 1599, 1631, and 1587. No impact on CSM schedule.

Item No. 6

1580

Title:	ECA Package Noise Filters
Kit/Parts Status:	Engineering not released. Study only
Scheduled Phasing:	Remove ECA and rework at KSC prior to OCP 0035 and retest during OCP 0035.
Scheduled Time:	Rework in BME area in parallel with MCR's 1587 and 1547. Removal and replacement of ECA is only work inside CM.

Item No. 7 (CARR 6.6.2, 6.6.5, and 6.6.15)

1587/EO290746 SM and 477825 292916 CM

Title:	PVT SM RCS Gaging
Kit/Parts Status:	Transducer available
Scheduled Phasing:	Wiring in Quad and SM to be completed prior to CSM mate. CM installation to be completed prior to OCP 0035. Test during OCP 0035.
Scheduled Time:	3 days serial time inside CM. Quad and SM installations can be parallel effort with OCP 4074.

Item No. 8

1591/EO504017, 504019, 495052 CM

Title:	SCS Inverter Phase Synchronizer
Kit/Parts Status:	
Scheduled Phasing:	KSC installation prior to OCP 0035 and test during 0035.
Scheduled Time:	4 days serial time inside CM. Work in parallel with MCR's 1453, 1547, 1657, and 1344.

Item No. 9 (CARR 6.6.3 and 10.6.2)

1599/EO467044 SM & 485258 CM

Title:	Provide RCS XFer Backup (Downey effort is complete)
Kit/Parts Status:	No parts required
Scheduled Phasing:	Install wire in SM prior to CSM mate test during OCP 0035.
Scheduled Time:	Work in parallel with OCP 4074. No impact on CSM schedule.

Item No. 10

1631/EO504014 SM 491495 & 521325 CM

Title:	Instrument Power Wiring (CM change is complete except for 2 EO's)
Kit/Parts Status:	No parts required
Scheduled Phasing:	Install two wires in SM prior to CSM mate. CM wiring to be installed prior to 0035. Test during OCP 0035.
Scheduled Time:	Work SM in parallel with OCP 4074. Work CM wiring during MCR 1587 (16 hrs). No impact on CSM schedule.

Item No. 11

1659

Title:	Raise temp range of SM RCS thermal control system
Kit/Parts Status:	Engineering release 8-20, thermostat available 9-20
Scheduled Phasing:	Install after altitude chamber test and test during OCP 0005
Scheduled Time:	Parallel effort, duration unknown

Item No. 12

1645

Title:	Thermal Insulation for SPS PUGS Unit
Kit/Parts Status:	Unknown - Need Date Oct. 10, 1966
Scheduled Phasing:	Install prior to OCP 0005 and retest during 0005.
Scheduled Time:	No impact on CSM schedule

Item No. 13

1630 EO292948 CM

Title:	CM Aft HS Thermal Patch
Kit/Parts Status:	Engineering not released
Scheduled Phasing:	KSC install during mate to SLA
Scheduled Time:	No additional time required

Item No. 14

1657

Title:	Pyro Battery Back-up
Kit/Parts Status:	No parts required
Scheduled Phasing:	On Panel 9 relocate 7 jumper wires and add 4 jumper wires on C/B's. Accomplish in BME area prior to OCP 0035 and retest during 0035.
Scheduled Time:	Work in parallel with MCR 1587.

Item No. 15

1615

Title:	SM RCS Isolation Valve Position (Downey effort is complete)
Kit/Parts Status:	Need shorting plug J4 and J8
Scheduled Phasing:	Rewire Quad to parallel valve contacts prior to OCP 0005
Scheduled Time:	No additional time required

B. Tasks not listed against MCR's

1. EO 490312 Color Code Hand Controller
2. Monitor Fan Motor Operation 0 CARR 2.6.5
3. Readjust Alarm on MC&W - CARR 2.6.8
4. RCS Direct Coil Indicator - CARR 6.6.7 and 6.6.8
5. EO 466393 and 533113, 533114, 533115 and 491485 Index Circuit Interrupters
6. Install Measurement on Flight Batteries
7. Connect SPS Nozzle Thermocouples
8. Conformal Coat - Specified areas left open on request.
9. EO 491536 & 491537 V16-441124 Revise Hand Controller Wire Stowage
10. EO 502086 - V16-600005 Velcro Installation
    EO 534870
11. Adjust mirrors (MCR 1567) EO's 502100, 534569, 534580, 534589, 534590, 534595 & 534599
12. EO 422995 Install Wt & Bal targets
13. EO 509527 Supercedes 525729 Fwd Deck tube routing
14. EO 509526 Supercedes 525730 Fwd Deck tube routing
15. Install Cobra cables, hand controllers, computer, CDU, main DSKY, and NAV DSKY.
16. EO 501941 Install Velcro on cables

C. Integrated testing transferred from Downey due to rework accomplished after Downey Integrated Tests.

No.	Title	Remarks
1.	MCR 1100 Digital Event Time	During OCP 0035
2.	MCR 1145 Block II Urine Dump	During OCP 0035
3.	MCR 1216 Block II ECU	During OCP 0035
4.	MCR 1345 Utility Plug	During OCP 0035
5.	MCR 1395 ECS Rad Temp Display	During OCP 0035
6.	MCR 1397 LEM Voice Recorders EO 491917 & 491910	During OCP 0035
7.	MCR 1451 SPS Heater Mod	During OCP 0035
8.	MCR 1461 ECS Outlet Temp Indicator	During OCP 0035
9.	MCR 1491 Astro Sextant Door Mod	During OCP 0035
10.	MCR 1525 SPS Standpipe Mod	During OCP 0035
11.	MCR 1542 F/C Reactant Shutoff	During OCP 0035
12.	MCR 1543 Reset Signal for RCS Time Delay	During OCP 0035
13.	MCR 1548 Fwd H/S Separation Chute EO 536682	During OCP 0035
14.	MCR 1576 Isolate CGSS Heater Inputs	Test During OCP 0034
15.	MCR 1579 EDS Wiring	Test During OCP 0035
16.	MCR 1581 FCSM Single Point Failure	Test During OCP 0035
17.	MCR 1605 Delete Pyro Meas	Test During OCP 0035
18.	MCR 1612 Delete Vib Meas SM	Test During OCP 0035
19.	MCR 1626 Add Capacitor to CTE	Test During OCP 0035
20.	MCR 1627 Push to Talk EO534865	Test During OCP 0035
21.	G&N Components Removal	Test During OCP 0035
22.	PCUB Removal and Replaced	Test During OCP 0005
23.	Panels Removed (3, 8, 11, 13, 15, 16, 18, 19 20, 21, 22, 23, 24, 25)	Test During OCP 0035
24.	SCS Components Removed (R.G.P., A.G.A.A., DECA FDAI AND Hand Controllers)	Test During OCP 0035
25.	Single Point Failure of Urine Dump (CARR 3.6.5)	Test During OCP 0035
26.	Recheck Relief Valve Reseat Press. (CARR 3.6.13)	Test During OCP 0034
27.	Recheck S-Band PRN Delay Time (CARR 4.6.10)	Test During OCP 0035
28.	Recheck SPS Wall Temp (CARR 5.6.5)	Test During OCP 0035
29.	End to End Check Meas (CARR 5.6.10)	Test During OCP 0035
30.	MCR 1547 Suit Gas Flow	Test During OCP 0035

D. Fit or Operational Check in Launch Configuration Required

No.	Item	Remarks
1.	Boost Protective Cover (Ref. MCR519)	During CDDT
2.	CSM Umbilical Guillotine (Ref. MCR935) EO 364351	During OCP4079
3.	Frangible Nut for LES Separation (Ref. MCR1164) EO 463649	During LES Mate
4.	Block II CSM Tension Tie Ordnance (Ref. MCR1192)	During OCP4617
* 5.	Block Box for Wick Temp (Ref. MCR1534)	During OCP0035
6.	Tape on Fecal Bag (Ref. MCR1629)	During OCP8240
7.	Crew Floodlight Change (CARR 13.6.16) EO 549113	When available
* 8.	Crew Hatch Operation (CARR 12.6.6)	During CDDT
9.	Provide 3 T Adapters (MCR 1569)	During 0035
10.	Remove Elapsed Time Meters and Install Cover (Ref. MCR 1385)	During 0007
*11.	Vac Ion Pump Operation (Beech GSE)	When available
12.	Stowage for M-3A (MCR 1669)	During 8240
13.	Stowage for GFE Dew Point Sensor (MCR 1668)	During 8240
14.	Replace Stowage for Helmet (MCR 1660)	During 8240
15.	Foot Restraint Handle Redesign (MCR 1649)	During 8240
16.	Color Code CFE and GFE (MCR 1647)	During 8240
17.	Add Spare Bulbs (MCR 1568)	During 8240

*This is the first time this type of test has been performed

No.	Item	Remarks
18.	Install New RCS Burst Discs EO 464899 and 464900	During 0038
19.	Modify Block I WMS EO 534563, 526001, 524707 and 502035	
20.	"D" Ring Installation EO 423000 and 534598	
21.	Debris Trap (MCR 3180) EO 501919 and 534881	
22.	Soft Cover for Astro Door EO 487134	
23.	Ordanance Installation EO 450588, 450589, and 450592	
24.	Ablator Plugs EO 447553 and 447596	
25.	Marks on Camera Lens EO 433088	
26.	Stowage of Sea Water Pump EO 447412	
27.	Cover for Plugs EO491482	

CARR ATTENDEES – NAA

J. Adelstone
N. Arellano

E. Blount
C. P. Boumon

R. N. Cadick
N. H. Casson
C. K. Conrad
~~C. K. Conrad~~
R. G. Corrigan
R. A. Corsino
J. W. Cuzzupoli

W. E. Day

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T. Edziak
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W. B. Fouts

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J. Giglio
L. B. Gray
G. Gresham

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C. C. Harshbarger
A. W. Hebert
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W. R. Hutchinson
B. M. Hyde

T. F. Iwasaki

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R. F. Johnson
J. Jolley

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E. D. Knowles

G. L. Kozak
L. Krupp
R. Kurtz

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R. G. Lascoe
D. Levine
J. E. Lewin

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G. B. Merrick
D. D. Myers

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N. H. Nelson
R. F. Nicholas

J. F. Parker
H. Pinkham
J. P. Proctor

B. R. Rawding
R. Roshon
J. Ross

G. D. Scott
E. R. Smith
G. Smith

A. E. Toelken

M. Vucelic

L. J. Walker
L. Walkover
H. F. Wilson
L. M. Wolff

C. Yee

C. Zeminick

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G. W. Abbey
J. Adams
A. D. Aldrich
L. D. Allen
G. E. Anderson
A. Asaro

H. M. Baker
J. L. Baker
R. V. Batty
J. A. Beetham
D. Bell
H. Brady
J. H. Brown
R. P. Burt

R. B. Chaffee
P. T. Chaput
C. A. Chauvin
R. L. Connell
R. L. Cox
J. W. Craig
C. L. Creech
R. W. Cunningham

D. R. Dochen

C. Edminston
F. J. Edwards
D. F. Eisele
D. D. Ewart

M. E. Fisher
E. C. Flanagan
C. W. Frasier
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J. R. Goodman
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J. P. Kaiser
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M. H. Kluck
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G. C. White
J. B. White

N. T. Yunk

D. A. Ziemer

The NASA CARR Board and the NASA Astronauts present on 19 August 1966 to review CSM 012 for acceptance are listed below:

CARR Board

Chairman - J. F. Shea - ASPO
R. W. Lanzkvon - CSM Proj. Engr. & C/O
W. M. Bland, Jr. - R & QA
M. A. Faget - Engr. & Dev.
R. A. Gardiner - Guidance & Control
R. O. Piland - Experiments
T. J. Edwards - Flight Safety
D. K. Slayton - Flight Crew
C. C. Kraft - Flight Operations
C. A. Chavvin - KSC
A. E. Morse, Jr. - KSC
R. H. Ridnour - RASPO/Downey

Astronauts

V. I. Grissom - CSM 012 Crew
R. B. Chaffee - CSM 012 Crew
E. H. White - CSM 012 Crew
R. L. Schweickart - CSM Crew
J. A. McDivitt - CSM Crew
D. R. Scott - CSM Crew
W. M. Schirra
R. W. Cunningham

Cinelle ?

ACTION RESPONSES

CSM 012

Distribution

Department		Responsibility	Dept./Grp.	Mail	Phone
		CARR Administration			
Project		J. F. Parker	642-001	FA16	X5303
NAA Coordinator		F. Mohr	642-063	FB93	4333
ATO	(8)	J. W. Cuzzupoli	642-030	FA08	2571
Engineering	(25)	W. E. Day	693-300	FB40	5732
Reliability	(8)	A. E. Toelken (J. Adelstone)	692-340	FB54	2422
QC	(2)	J. R. Long	147-200	FB11	5992
G&N	(10)	W. T. Gahan (J. P. Kaiser)	ACED	FB55	1830
Experiments	(2)	R. L. Cox (G. Hrabel)	NASA EXPO	FA98	3203
		CARR Support			
Field Site	(10)	B. R. Haight (W. G. Lale)	642-001	FB98	6231
Configuration		J. P. Harrington	690	AC76	5737
Contracts	(2)	R. F. Johnson	607-242	AC64	1751
Incentives		V. G. Emrich	642-001	FA16	5181
SOS		B. S. Keyes (A. Flores)	642-038	FA86	3288
Pilot Technology	(2)	W. T. Armstrong	642-005	FA16	2554
Advance Planning		R. W. Johnson	642-063	FB93	4333
		NASA			
NASA CARR Coordinator	(80)	W. W. Petynia	ASPO	PD2	HU 35311 (490
Program Manager	(2)	J. F. Shea (A. D. Mardel)	ASPO	AA36	5066
Downey Manager	(2)	R. H. Ridnour	RASPO	AA36	5071
E & T	(6)	G. W. Briggs	RASPO	FA05	4535
Proj. Engr.	(3)	F. L. Miller	RASPO	FA98	1271
GSE		D. G. Phillips	RASPO	AA36	6107
R & QA	(2)	D. D. Ewart	RASPO	AA36	6791
Plans & Prog.	(3)	A. S. Zehra	RASPO	AA36	3080
		Information			
Program Manager		D. D. Myers	001	AC90	5831
Deputy Program Mgr.		C. H. Feltz	601-330	AC90	2940
Chief Engineer		G. W. Jeffs	695-100	HA96	2415
Director, ATO		J. P. Proctor	642-001	FA26	2252
Mgr., Reliability		C. O. Baker	692-300	HC28	5354
Director, Q & RA		C. E. Kindelberger	147-010	EB59	6440
Flight Operations		L. W. Blair (P. Barranger)	692-408	HB88	4693
Assoc. Contr. Adm.		E. E. Lane (H. Anaya)	612	AC38	6971
Tech. Integration	(2)	E. J. Earl	140-020	AD39	6851
Plans & Programs		W. A. Perkins	603	AC51	4424
Incentive Review		W. R. Overman	693-300	HB36	3036
Post Flt. Analysis		D. M. Cole	692-405	HB99	5327
		M. L. Sheeren	642-060	FC02	5310
		E. R. Ohm	642-063	FB93	4333

ATO-D-TP-66-TD-307

INTERNAL LETTER
North American Aviation, Inc.

Date . 26 September 1966

TO . Those Concerned
Address .

FROM . J. F. Parker
Address . 642-001, B/6
Downey, FA-16

Phone . 5303

Subject . CARR Action Responses - CSM 012

Reference: (a) ATO-D-TP-66-TD-275, CSM 012 CARR Meeting Minutes and Action Assignments

The enclosed action responses are submitted to formally document the NAA resolution of actions assigned at the CSM 012 CARR meeting as defined by Reference (a). All action responses were submitted through and are approved by the appropriate departmental CARR Administrator.

The action responses are arranged numerically as assigned in the CARR minutes. Unless noted on the response, all action items are considered closed. Action items having an incomplete response include the estimated completion date (ECD).

This package constitutes the fourth and final section of the Phase II CARR Report for CSM 012. The sections have been transmitted as follows:

I Systems Assessment Meeting Minutes and Action Assignments; NAA II. ATO-D-TP-66-TD-243 dated 21 July 1966, and transmittal letter 66MA9802 dated 28 July 1966

II Systems Assessment Action Responses; NAA IL ATO-D-TP-66-TD-251 dated 3 August 1966, and transmittal letter

III CARR Meeting Minutes and Action Assignments; NAA IL ATO-D-TP-66-TD-275 dated 22 August 1966, and transmittal letter 66MA11182 dated 29 August 1966

IV CARR Action Responses; NAA IL ATO-D-TP-66-TD-307 dated 26 September, which is transmitted herewith

Note to Contracts: Transmit this information to NASA; include CARR Administrators on distribution list.

W. E. Day
NAA Engineering

J. F. Parker
NAA CARR Project Administrator

FM/cdw

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M 111-R-1 REV. 2-65

TABLE OF CONTENTS

1.7.1

PROBLEM - Power Loss on CSM - Inverter

AC power was lost on both AC Busses due to Inverter #1 failure.

RESOLUTION W. Hutchinson, ATO/C. O. Baker, Rel.

Inverter No. 1 was checked, and was found to have failed. A replacement unit was installed in the CM and verified by TPS. The original cause of this failure was considered to be GSE cabling which was chaffed and shorted.

The Static Inverter, P.N. ME 495-0001-0004, S/N 35, has been returned to Westinghouse for failure analysis. The DC inverter input was shorted which has been the symptom of a shorted booster transistor (65 AMP). Coolant flow to Inverter was reported to be normal at the time of failure. The AC short in a ground cable (SK 9106-1) which was detected may be related.

Westinghouse has determined that one of a pair of 65 AMP moly-block transistors failed. This is the first failure of this type (short between emitter and collector). A final report will be available 30 September 1966.

2.6.7 PROBLEM - Hydrogen Vent Freeze Up
Hydrogen/water vapor may freeze during fuel cell venting to space.

RESOLUTION N. H. Nelson, Eng.
CCA 1014 has been received. A four watt heater will be added at the service module mold line. Engineering drawings have been released, and mod kits are being installed at KSC.

2.6.8 PROBLEM - Flow Meter Inaccuracy
Minimum limits in actual spacecraft are such that the C&W is triggered when no problem exists.

RESOLUTION R. E. Sexton/N. E. Nelson, Eng.

1. The threshold on the oxygen/hydrogen flow rate will be reduced to a point midway between no flow and low flow. The meter face will be recalibrated to provide more accurate flow indication.

   Final drawing release covering the meter decal will be completed 9 September 1966. The C&W modification kit for Florida installation was available 22 August 1966.

2. The O_2 high flow warning during cyclic accumulator operation will be modified to prevent triggering. A time delay will be added into the wiring installation on SC 012 and 014. Advance prints were forwarded to FF 31 August 1966. Hardware is available for this modification and will be released under MCR A1688.

   The above is in work or has been performed at KSC.

   Item closed.

2.6.9 PROBLEM - F/C Reactant Shut-Off Valve Failures
The ACE uplink circuits have been holding the F/C reactant shut-off valves too long causing failure from overheating.

RESOLUTION T. F. Edziak, Eng.
Modification has been made to change the ACE circuits. ACE will no longer control the reactant shut-off valves. Control will be from the command module using manual switches. Engineering release was completed 31 August 1966.

Item closed.

3.6.14 PROBLEM - Flight Qual Instrumentation

Four transducers were not operating properly. Reference item 3.6.14 in the Systems Assessment Minutes and Responses (CF0550, CF0481, CF0327, CF0245). This was a constraint to shipment.

RESOLUTION R. G. Roshon, ATO

Measurement CF 0550 was replaced by TPS V16-GEN-175 and was reverified in OCP 5051, Seq. 02-020. Measurement CF0481T was replaced by V16-GEN-101 and was verified in 5049, Dev. 38T. Measurement CF0327 was inoperative because of a broken splice, ref. T/S TPS V16-GEN-190, which was repaired and was reverified in 5049, Dev. 38T. Measurement CF0245 was replaced by TPS V16-GEN-267 and was verified by 5049, Dev. 38T.

Item closed.

3.7.1 PROBLEM - Suit Loop Leakage

Leakage noted during OCP 5051 was greater than the specification allows.

DISCUSSION

Excessive suit loop leakage is attributed to leakage through suit umbilical connector valves. The manned suit loop checks (with valves open) were completed with no indication of excessive suit loop leakage.

RESOLUTION

Verify suit loop leakage at KSC prior to altitude chamber run which is part of normal checkout at KSC.

Item closed.

3.7.2 PROBLEM - Demand Regulator Failure

The demand regulator is inoperative when placed in pressurization mode.

DISCUSSION/RESOLUTION J. E. Jolley, ATO/R. F. Sexton, Eng.

The demand regulator was replaced and given leak and functional checks including astronaut suit loop. The failure was due to a defective "O" ring in the suit test selector. The LCC did hit the regulator lever during installation, but this is not considered to be the cause of failure. Reference Squawk 21 and TPS 5051-007.

Failure analysis of the faulty unit showed the problem to be wrinkling of teflon shims in the valve selector assembly, permitting cocking of the selector plate and partial extrusion of "O" rings causing internal leakage.

The demand regulator design will be modified to replace the teflon shims with steel shims and sandwich the new shims so that wrinkling cannot occur.

3.7.2 (Continued)

The new design of the demand regulator has been installed at the KSC.

Item closed.

3.7.3 PROBLEM - Water-Cyclic Accumulator Failure
External Leakage of oxygen and water was detected during checkout.

DISCUSSION J. E. Jolley, ATO/R. E. Sexton, Eng.
Two different units were installed before the W/C accumulator would pass checkout. The unit currently installed is operational and has been checked with astronauts in the loop.

Failure analysis of both units were traced to the rubber diaphragm which serves as the assembly for separating the water and oxygen sides of the accumulator. Improper care of this Viton A diaphragm was the cause of this anomaly.

Subsequent pressure tests on the accumulator at KSC during the week of 19 September 1966 disclosed no leakage.

This item is being further investigated by NAA/Airesearch/NASA.

3.7.5 PROBLEM - Moisture Between Window Panes
On CSM 008, moisture appeared between the two window panes.

3.7.9 PROBLEM - Mositure in Aft Heat Shield on CSM 008
Excessive moisture and condensation occurred during CSM 008 testing.

DISCUSSION/RESOLUTION J. R. Cole, Eng.
After the heat shield is installed at NAA and until the spacecraft lift-off, any moisture condensation from the air in the cavity between the heat shield and pressure shell will drip into the heat shield insulation. During checkout and testing of the ECS in the CM, cold water glycol is circulated from the S14-053 (GSE) through the umbilical connecting lines, a portion of the aft equipment bay and then inside the CM. The portion of the water glycol lines in the aft equipment bay condenses moisture from the air and drips down into the heat shield insulation. In addition, during checkout of the RCS system, the helium bottles cool down and moisture condenses on them which also drips down into the heat shield insulation. The moisture is absorbed by the insulation. An air purge will be provided to remove this moisture from SC 012 and subsequent. A duct will divert a portion of the cooling air supplied by the A14-011 air conditioner to purge the heat shield cavity. The duct will be inserted through attached to a rigid plate fitted into the access opening where the water glycol lines enter the crew compartment. All other access openings will have flexible covers, thus providing a small positive pressure and access to installed equipment. When the permanent access doors are installed, a plug with

3.7.9 (Continued)

a GN_2 connection will be inserted in the crew compartment air vent. A GN_2 purge will continue to the time of removal of the service platform and closing out of boost protective cover.

The removal of moisture will eliminate the fogging of the windows previously experienced on SC 008.

Further investigation indicates 3.7.5 and 3.7.9 to be related problems.

Cold patch tests on SC 008 rendezvous and hatch windows disclosed no moisture between inner structure window panes.

Apparently, the observed moisture was from a source external to the inner structure window panes.

Items closed.

3.7.10 PROBLEM - OCP-P-5051 - Suit Loop Checks
Checkout per OCP 5051 was not complete prior to the CARR meeting.

RESOLUTION J. Jolley, ATO
The suit loop checks per OCP-P-5051 were completed on 21 August 1966 in Building 290 Checkout Station 2C and ACE Control Room #1.

After the first two sequences were performed on 6 August, the OCP was placed in a hold to remove the ECU and replace a malfunctioning Water Glycol Pump Assembly. See Problem 1 below. It was then necessary to rerun the activation and functional checkout of the water glycol subsystem on 7 August.

Sequence 03, Suitloop Functional Checkout - Unmanned, was deleted at NASA's request and the prime spacecraft crew was inserted for the manned Suitloop Checkout. The test was unsuccessful because during the first run of Sequence 04 it was necessary to replace the O_2 Demand Regulator, the Water Accumulator Solenoid Valve #1 and the Cyclic Accumulator #1 (twice). During the sequence rerun, it was found that both Post Landing Valves were defective. These valves were also replaced.

After correction of the problems, the back-up crew was inserted on 20 August, and the rerun of sequence 04 was successful.

The functional checkout of the installed Environmental Control System was performed satisfactorily in accordance with the requirements of Process Specification MA0201-00530. The significant problems encountered during test are tabulated below:

3.7.10 (Continued)

1. PROBLEM - Water Glycol Pump Failure
During Seq. 02 - 07, the #1 W/G Pump discharge was very low, and the pump was barely audible. Reference Squawk 7. See problem No. 3.7.4 in the CARR meeting minutes.

2. PROBLEM - EPS Excessive Spikes
During Seq. 02-057 and 059, it was found that the W/G Pump actuation causes excessive spikes in spacecraft power. Reference Squawk 8.

RESOLUTION
The cause was found to be a faulty switch. Switch ME452-0049-1007 on Panel 21 was replaced. This switch was not retested on S.S. M243067-S and was transferred as Squawk #60.

3. PROBLEM - Malfunctioning Instrumentation
Measurements CF0025P, CF0484T and CF0135R were reading incorrectly. See problem No. 5.7.1 in the CARR action responses.

4. PROBLEM - Demand Regulator Failure
During Seq. 04-042, a leak in O_2 demand regulator was found. See problem No. 3.7.2 in the CARR action responses.

5. PROBLEM - Cyclic Accumulator Solenoid Valve
The cyclic accumulator solenoid valve #1 was sticking in the full open position. Reference problem No. 3.7.3. See problem No. 3.7.3 in the CARR action responses.

6. PROBLEM - Cyclic Accumulator Leaking
Flange on the #1 Cyclic Accumulator was found to be leaking water and O_2. See problem No. 3.7.3 in the CARR action responses.

7. PROBLEM - O_2 Umbilical Connector Color Coding
The O_2 umbilical connectors were improperly color coded.

RESOLUTION
The umbilicals were color coded to agree with color coding on PGA connectors. Reference squawk 32 and V16 GEN 907.

8. PROBLEM - "T" Adapter Connection Interference
The "T" Adapter could not be connected at the CCG and CCR positions.

RESOLUTION
This was due to interference from the umbilical lines. Reference Squawk 34 and V16 GEN 908. As a temporary expedient, the cobra and suit adapter cables were connected. Additional effort is required to resolve the problem. The interference at the Downey C/O was due to using non-flight type adapters. Will be rechecked at KSC using flight hardware.

3.7.10 (Continued)

9. PROBLEM - Measurement CJ021DX Inoperative
Measurement CJ021OX (PF4-W65) bits 7 and 8 were 1 and should be 0.

RESOLUTION
The cause was found to be a broken wire at J850 - H24A wire #TR41A22. Wire TR41B24 was cut and married to the broken wire. Reference Squawk 35, V16 GEN 861 for MR on spliced wire.

10. PROBLEM - Post Landing Vent Fan
Post landing vent fan operates at slow speed even when switch is set to the high position. Reference Squawk 36, V14 GEN 57.

RESOLUTION
An open circuit exists between P465 and J169-5. The trouble-shooting is incomplete and has been transferred as Squawk 63 on S.S. M237867-S. Further troubleshooting is required.

11. PROBLEM - PLV Valve Operation
PLV valves did not close properly. Reference Squawk 37, TPS V16 GEN 395.

RESOLUTION
The valves were apparently warped and rubbing. They were replaced and functionally checked with acceptable results.

12. PROBLEM - LiOH Cannister Removal
The LiOH cannister could not be removed. Reference Squawk 38, TPS 012.

RESOLUTION
Cannister had expanded due to moisture while in container for approximately 48 hours. The swelling is normal under such conditions. The cannister was removed with difficulty.

SECTION 4 - COMMUNICATIONS SYSTEM

4.6.8 PROBLEM - TV Camera Checkout - Picture Distortion

The TV image distortion was excessive during checkout subsequent to systems assessment. Reference item 4.6.8 in the systems assessment minutes and responses and astronaut squawk No. 2.

RESOLUTION R. Roshon, ATO

The test was performed during CCFF on 8-18-66. The major problem was that the TV image was distorted during CCFF at range on 2-3 feet and was deemed unsatisfactory by crew. The switch was in ALC position. In addition, the picture was too bright with the CCC floodlights turned to maximum brightness.

A recheck of the TV image (V16-CEN-315) showed the picture to be within acceptable limits as witnessed by NASA. (W. W. Petynia and R. W. Lanzkron) In addition, the camera was checked under worst lighting conditions with the floodlights turned to maximum brightness. Camera operation was satisfactory.

Item closed.

4.7.1 PROBLEM - CSM Intercom Problems/Cobra Cable Storage

CSM intercommunications system configuration.

RESOLUTION P. J. Hannifin, Eng.

CCA 1018 was reviewed and implimented by NAA to satisfy NASA system requirements. One or two extra cobra cables can be stowed in Compartment 39, the right hand equipment bay along with the crewman electrical adapter cables.

NASA to provide contractor direction if extra cables are to be provided.

4.7.2 PROBLEM - LEM Voice Recorder/PTT Operation

The LEM recorder will not turn off after actuation by the PTT switch on the cobra cable.

RESOLUTION R. L. Kurtz, Eng.

A relay will be added in the control circuitry to provide correct operation of the recorder in accordance with CCA 1018 and MCR 1682. This will be incorporated prior to altitude chamber run at KSC.

5.6.7 PROBLEM - Battery Charger Output Display
The present signal conditioner will not provide measurement of the battery charger current for telemetry.

RESOLUTION R. L. Kurtz, Eng.
The calibration of the on-board signal conditioner to support the battery charging monitoring will be changed. The engineering order was released 2 September 1966.

To be incorporated prior to altitude chamber run at KSC.

5.6.17 PROBLEM - Calibration Curves
The flight crew requires the meter calibration curves.

RESOLUTION R. L. Parsons, ATO
The calibration curves are available and were transmitted to J. McDivitt.

Item closed.

5.7.1 PROBLEM - Failure of ECS Measurements
The W/G pump package inlet pressure measurement CF0025P was found to be defective.

RESOLUTION J. E. Jolley, ATO
In addition, measurements CF0484T and CF0135R were reading incorrectly. Reference squawks 15 and 33, V16 GEN 376, Deviation 1006P-1, TPS OCP 5051-0009, V16 GEN 386.

The cause was found to be defective transducers. Transducers for measurements CF0484T and CF0135 were replaced and reverified.

On measurement CF0025P which is a cold plate branch two outlet, temperature waiver CSM 30001 dated 24 August has been approved since it is impossible to replace this sensor without removal of the ECU.

Item closed.

SECTION 6 - REACTION CONTROL SYSTEM

6.6.5 PROBLEM - PVT Calibration

Calibration curves for RCS quads and appropriate CM RCS are required.

DISCUSSION/RESOLUTION J. W. Gibb, Eng.

Appropriate curves and equations for ground computation have been transmitted to Mr. G. E. Anderson, NASA-RASPO.

Item closed.

6.7.1 PROBLEM - RCS Engine Failures

RCS engine failures have been experienced in test subsequent to qualification.

DISCUSSION J. W. Gibb, Eng.

Testing is continuing, and further data analysis is necessary to conclude a satisfactory solution.

This item remains open pending NASA/NAA decision on propellant usage.

6.7.2 PROBLEM - SM RCS Heater Bonding

The results of the Thermal Vacuum Test of SC 008 at MSC indicate a heater malfunction occurred on the RCS Quad D.

DISCUSSION J. W. Gibb, Eng.

This quad has been removed and is in Downey for investigation and repair. A plan of action has been established through IL 693-430-040-66-1013, 26 August 1966, R. F. Larson to Those Effected. Results of the investigation indicated the necessity for a mechanical bond. This change was released on MCR 1659 and will be incorporated prior to altitude chamber tests at KSC.

Item closed.

7.7.2 PROBLEM - Calibration Curve Data
Curves are required to determine the helium pressure versus the quantity of helium remaining to give an approximate estimate of propellant remaining.

RESOLUTION R. E. Field, Eng.
The information was forwarded to the NASA prior to the CARR; however, an additional set of data was supplied to Mr. N. Townsend, NASA Subsystem Manager, for transmittal to R. Rose, NASA.

Item closed.

7.7.3 PROBLEM - Gimbal Actuator C&W

Indications on CSM 008
C&W indications on CSM 008 indicate possible overload or other problems.

RESOLUTION R. E. Field, Eng.
All SC 008 gimbal data available at Downey to date which included several test periods when C&W indications were evidenced, showed completely normal gimbal actuator characteristics. The electrical configuration tested did not include a spacecraft wiring revision to prevent gimbal deactivation in case of overload operation on the secondary channel. Such overload occurs when the engine is manually gimballed into the stops. Although the gimbal actuator units installed in SC 008 are of an early pre-qual configuration, actuator performance appears to be excellent. SC 012 and 014 have a filter circuit, and C&W is not triggered during actuator operation.

Item closed.

7.7.4 PROBLEM - Mod 1 Gimbal Actuator Qual Testing
The CTR requirements have been revised for CSM 012 and 014.

DISCUSSION
The NAA rationale relative to the successful completion of the Block 1 Actuator qualification test program is unacceptable to the NASA. The qual program as defined by the CTR is based upon the full lunar mission requirements. NAA considered the portion applicable to the SC 012 and SC 014 missions to be successfully completed with certain actuator failures experienced during the qual program to be attributable to the more stringent lunar mission requirements. However, NASA requested a revised CTR outlining only the SC 012 and 014 qualification requirements accompanied by an analysis oriented to this lesser requirement. NAA complied with the above and presented the revised CTR and final AGC qualification report to NASA.

7.7.4 (Continued)

RESOLUTION R. E. Field, Eng.
A tentative agreement has been reached between NAA/NASA. NASA has requested NAA to provide a supplementary Engineering Analysis Report on the final Aerojet Qualification Report on the SPS gimbal actuators. Approval is pending receipt of this report by NASA. NAA to submit by 30 September 1966.

7.7.5 PROBLEM - SPS Heater Problems on CSM 008
Analysis of SC 008 SPS thermal data indicate the SPS thermal control system which was operable performed essentially as designed. However, only 4 of the 12 SPS engine heaters were energized through the NASA installed test stand wiring. In addition, the redundant heater circuits were energized simultaneously rather than independently as designed.

RESOLUTION R. E. Field, Eng.
Analytical corrections for these operational errors result in the conclusion that the SC 012 engine line heaters will have the capability of maintaining temperatures at a satisfactory level.

It is noted that additional tests are scheduled utilizing a properly energized engine heater system as well as some additional SC line heaters now installed in SC 012.

Item closed.

7.7.7 PROBLEM - Pitch Gimbal Clutch Brush Float
During test, two Mod 1 actuators have failed due to brush "float" on lift off. One of the actuators in CSM 012 has exhibited preliminary indications of this characteristic in the differential current trace during vehicle checkout at Downey.

DISCUSSION
Based on the above, a joint decision was made to replace the actuator in SC 012 with a unit which by special test had demonstrated to be free of the unsatisfactory condition.

RESOLUTION R. E. Field, Eng.
Subsequent to these agreements, further study of the SC 012 gimbal data revealed that the indicated anomaly was caused by a mechanical feed back through the engine gimbal ring which occurred coincident with energizing the yaw actuator. All SC gimbal data has been reviewed in detail and all available data support the conclusion that the gimbal actuators currently installed in SC 012 meet all requirements and are acceptable for manned flight.

Item closed.

SECTION 8 - STABILIZATION AND CONTROL SUBSYSTEM

8.7.1 PROBLEM - Pitch ECA Failure/SPS Servo Amp

During KSC checkout of SC 011 (Block J), a simultaneous application of extend and retract currents of about 1 amp was observed. Subsequent investigation revealed that the failure was due to degradation of the arc suppression capacitor that is utilized for protection of the servo amp output transistor. The NASA required that the "K" Block SCS servo amps also be investigated for this type of failure since identical capacitors are used on Block J and Block K.

DISCUSSION/RESOLUTION W. B. Fouts, Eng.

The subject capacitors are polarized tantalum, 43 MFD, 100 VDC working volts, identified by Honeywell P.N 955056. Tests at Honeywell disclosed a lower forward breakdown voltage in the range of 40 to 80 VDC which is 20-60 per cent lower than the required working voltage. This breakdown was recorded in 10 out of 28 Block J capacitors. Identical testing of 8 Block K capacitors provided data of forward leakage being above the required 100 VDC.

Analyses and circuit tests at Honeywell have revealed the probable cause of the tantalum capacitor failure to be caused by reverse currents in the failed capacitor.

A "sneak-path" is provided on Block J SCS when the following conditions are present:

1. SCS Power ON
2. SCS ΔV Power OFF
3. SCS ΔV, G&N ΔV or SPS Engine Hold from the MCP.

This configuration can provide reverse current through either the extend or retract tantalum capacitors. This "sneak" path could occur in both the primary and secondary servo loops depending on the state of the primary gimbal motor fail signal. This reverse current would result in predictable capacitor degradation as a function of how long the above condition was allowed to exist.

This "sneak" circuit is obtained in the Block J SCS since the ΔV power switch does not remove total power from the TVC preamp.

The described failure is not considered a problem on Block K SCS systems since the preamp power amp voltages are controlled from one switch which removes total power simultaneously. This factor precludes the undesirable Block J configuration which caused the tantalum capacitor failures.

8.7.1 (Cont.) Honeywell is continuing to test the Block K hardware to insure that no additional "sneak" paths are present which could cause tantalum capacitor failure.

Item closed.

9.7.2 PROBLEM - Inverter Noise on G&N PCM Measurement
NASA-FOD is to evaluate the problem and determine if a fix is required or if the problem is acceptable as is.

NASA response required.

9.7.3 PROBLEM - System C/O Status Evaluation
A team will be formed to review the entire G&N system. NAA will participate in this effort.

RESOLUTION G. W. Jeffs, Eng.
Mr. R. Hepple was named as the NAA representative on the G&N review team.

11.7.2 PROBLEM - Pyro Arm Lock Keys

Safekeeping of the Pyro Arm Lock keys are required.

RESOLUTION N. H. Casson, ATO

The keys to SC 012 Switch Guard Pyro Arm Lock per drawing FO1-100436 with E.O. 494931 incorporated were delivered to B. R. Haight, Test Project Engineer, SC 012, FF, Apollo Test and Operations, NAA; and V. I. Grissom, Lt. Col. USAF, CB/ Chief, Apollo Flight Branch, NASA.

Item closed.

SECTION 12 - MECHANICAL SYSTEMS - STRUCTURES

12.6.3 PROBLEM - Hatch Decals
Installation of torque limit decals has not been completed.

RESOLUTION J. E. Jolley, ATO
Decals to be installed at KSC.

12.7.1 PROBLEM - Tunnel Egress Hatch Operation
The crew cannot apply sufficient torque to seal the hatch water tight or remove the hatch.

DISCUSSION/RESOLUTION P. J. Hannifin, Eng.
The hatch can be installed from inside the Command Module by following the proper installation instructions (Process Specification MA0406-0016). However, the seals tend to seize when the hatch is installed for any period of time, and necessitate the requirement for the addition of a mechanical system to provide the crew with the capability of opening the hatch for emergency egress.

A screw-jack mechanism to provide this capability has been designed and was released on 2 September for installation on SC 007, 012 and 014.

The extent of testing on SC 007 has not been determined. At present, it appears that only a functional test would be required to verify satisfactory operation.

Item closed.

12.7.2 PROBLEM - Insulation (Mylar) on SM
The mylar insulation on CSM 011 was damaged during purging operations.

DISCUSSION
On CSM 012 and subsequent spacecraft, the purge nitrogen velocity is to be reduced by using a plenum chamber which will prevent shredding of Mylar. The plenum chamber will become a part of the CSM. This is a Mod Kit which will be incorporated without demating the CSM 012.

RESOLUTION P. J. Hannifin, Eng.
A duct and plenum chamber will be provided to direct the gas flow from the flyaway umbilical into Sector II. The diffuser will expand the gas and reduce its velocity before it is released into the CSM cavity. A design verification test was conducted utilizing prototype parts. The test was satisfactorily completed.

Engineering documentation was released 9 September 1966 with hardware available 15 September 1966.

Item closed.

13.6.10 PROBLEM - CO_2 Partial Pressure Gage
When power is turned on, this gage pegs which, in turn, triggers the caution and warning. Reference item 13.6.10 in the System Assessment minutes and action responses.

DISCUSSION J. E. Jolley, ATO
The gage requires approximately 7 seconds warm up. C&W has only been triggered during initial turn on and not after continuous operation. Additional checkout of the CO_2 Partial Pressure Transducer CCFF at Downey, by a qualitative test, indicated that the CSM gage operation is satisfactory although ACE readouts do not correspond. CO_2 partial pressure sensor performed satisfactorily during manned suit loop checks.

RESOLUTION
Perform calibration of sensor at KSC prior to altitude chamber run.

13.6.16 PROBLEM - CC Floodlight Failures
There have been excessive floodlight failures.

RESOLUTION N. H. Nelson, Eng.
Microdot has developed a fix for the floodlights. Development testing is completed, and the light is now considered qualifiable. The modified floodlights were available for SC 012 12 September 1966. Qualification testing of the lights will be performed in parallel with SC 012 and SC 014 checkout. Modified floodlight system has been installed on SC 012 at KSC.

Item closed.

13.7.1 PROBLEM - Rheostat Failure - Floodlights
The rheostat failed to provide a smooth linear resistance change with shaft rotation. It provided only an on-off capability.

DISCUSSION W. Hutchinson, ATO/C. O. Baker, Rel.
The rheostat is used to adjust the floodlight brightness. The part has been replaced on Spacecraft 012, and satisfactory operation was verified.

The faulty part was taken to the Quality Assurance Laboratory for verification and is now on its way to the supplier (MEMCOR) for failure analysis. Supplier's analysis will be returned within two weeks after he receives the part. Expected completion of analysis 9-30-66. Reference PAR #28573.

13.7.3 PROBLEM - Evaporator Steam Backpressure C&W Indication
The Caution and Warning System triggers with no visible indication when the glycol evaporator steam back pressure is operated.

RESOLUTION J. Jolley, ATO
The glycol evaporator steam back pressure triggering of the C&W system was found to be a defective switch. Switch No. S-24 on panel 13 was replaced, and the problem was corrected. Reliability analysis of defective switch required.

13.7.4 PROBLEM - C&W System Anomalies
Anomalies associated with this system have generally been resolved, and no further changes will be made to the system. However, the Block II C&W design and operations concept should be reviewed. R. Williams, NASA-MSC, has responded that no design change is required for Block I or Block II.

Item closed.

SECTION 14 - CREW EQUIPMENT

14.7.1 PROBLEM - Partial CCFF Summary

Fifty squawks were picked up on 8-19-66 during CCFF. These were primarily in the areas of Velcro fasteners and storage containers.

RESOLUTION J. E. Jolley, ATO

This condition existed due to the vehicle not being entirely ready for the CCFF at the time. The CCFF was performed in accordance with TPS-V16-GEN-069.

CCFF review was conducted on 9-13-66. All items were reviewed and action disposition assigned. Thirteen items transferred as open work to KSC. Three items required further astronaut definition. These three items (Squawks 9, 26 and 59) have been reviewed and dispositioned as open work for KSC pending astronaut review during altitude chamber checkout. All other items are recorded as closed.

14.7.2 PROBLEM - Flammable Materials in CM

The use of Velcro and other materials in CM is not considered desirable and is unsatisfactory for flight.

"Walk through" inspection of the SC 012 crew compartment was performed. The results of the inspection are documented in NAA IL 693-300-040-66-1009, dated 22 August 1966. Copies have been supplied to the noted team members and Mr. W. Petynia, NASA-ASPO. Specific NASA direction (CCA) on the findings must be made to NAA.

RESOLUTION

The NASA and NAA team consisted of:

Mr. J. K. Dietz, NASA (G.E.) MSC
Mr. J. A. Davison, NASA-RASPO, Downey
Mr. H. M. Clancy, NAA - M&P
Mr. R. F. Larson, NAA - Project Engineering

Flammable material has been replaced on wire harnesses per NASA direction.

SECTION 15 - EXPERIMENTS

15.7.1 PROBLEM - MDAS Checkout

The MDAS was not checked out during CCFF.

DISCUSSION J. E. Jolley, ATO

This could not be accomplished because the circuit breaker was tripped. It was thought that the problem existed in the Octopus Cable. Ref. T/S TPS 5051 #006. The spacecraft tee adapter, octopus cable and MDAS were verified for proper configuration. It was noted that octopus cable has two connectors which are identical. If these connectors are reversed, 28 vdc is connected to ground. The MDAS system was reconnected and checkout of system was performed satisfactorily during OCP 5051, deviation 2004T, Sheet 10, Item 45.

Item closed.

15.7.2 PROBLEM - 16mm Camera Operation

The camera is not currently operable.

DISCUSSION

Troubleshooting found that the main C/B feeding the S/C utility power connector was not closed. Camera operation was satisfactory during second run of OCP-P-5051 and CCFF.

RESOLUTION

During test, the appropriate circuit breaker was not closed. The breaker was closed and the camera operation verified.