 Hohmann

MINUTES OF THE

TEST OBJECTIVES REVIEW BOARD

3 JANUARY 1968 - 2 FEBRUARY 1968

Robert R. Hull
Col. USAF
Chairman

B. A. Hohmann
Aerospace
Co-Chairman

Discussions 3 January 1968

1. Col. Hull, Chairman, formally opened the Test Objectives Review Board (TORB) proceedings with a discussion of the charter given him by General Bleymaier, Deputy Director MOL, to form the Board. The charter directed Col. Hull to convene a small group of Air Force, Aerospace, and MOL contractor personnel to review the Laboratory Vehicle In-Plant Test Programs. Follow-on review of total MOL System and launch site testing may be directed subsequent to this initial review. The following groundrules were set for the Board: (See Atch 1)

   a. Review complete Laboratory Vehicle In-Plant testing program.

   b. Test objectives must be consistant and adequate.

   c. Common standards and philosophy across total system.

   d. Eliminate redundant or excessive testing.

   e. Fill in gaps in testing program.

   f. Review facilities and manpower resource requirements.

   g. Past contractual agreements and management approaches may be modified.

2. Members of the TORB were introduced:

Board Members:	Col. Robert W. Hull	
	Bernhard A. Hohmann	
	Ronald K. Arnold	
	Robert B. Chamberlain	
	Reynold A. Grammer, Jr.	
(Consultant)	Lt. Col. George M. Hrebec	
	Duncan Collins	
	John E. Kent	
	Joseph F. Wambolt	
	Melvin C. Shrader	
	Maj. Leslie Thompson	(Recorder)
	Betty Wilkes	(Secretary)

3. The schedule was discussed and minor modification made.

4. A discussion regarding content of the Integrated Test Briefings resulted in some adjustment to the briefing flows. It was decided to include in the GE segment briefing the test objectives for integrated testing at EK and DAC. Similarly, integrated test objectives at GE and DAC should be included in EK's segment briefing. The overall Integrated Test Briefing would primarily concern DAC effort at Huntington Beach with appropriate support and inputs from GE and EK.

5. A question regarding the level of detail that the TORB will pursue reliability, quality assurance, extended life testing, etc. was discussed. It was decided that the Board is definitely required to review these areas. If the segment briefings did not provide sufficient detail, these areas would become a required part of the In-Plant detailed briefings.

6. The TORB reviewed and discussed the December 1967 baseline test flow.

L-3877
P. 3

MINUTES-TORB Discussions 4 January 1968 (AM)

1. Mr. R. Arnold briefed the Board on the changes to the basic pre-December 1967 program that occurred during the December 1967 schedule review. Attachment 2 extracts pertinent data from a briefing which summarized the December review.

2. Mr. J. Wambolt briefed the draft version of the Ground Test Plan Volume I, Section 4. This document is being prepared by the SPO to provide general guidance and groundrules to be used by contractors when developing their detailed ground test plans. A series of Volume II's to this plan will provide more and unique detail to individual segment contractors. A Volume III (Launch Ops Plan) is also being prepared to cover launch operations groundrules for all contractors.

3. Col. Hull stated that the Board should study methods to assure that the approved test program developed from this review is not violated. This may logically be a responsibility of the System Test Planning Group (currently being chartered).

GENERAL ELECTRIC SEGMENT BRIEFING 4 January 1968 (PM)

1. ATTENDEES:

a. Board Members

b. GE - E. Rhoads
G. M. Roth
E. Urbanek
R. D. Girolamo
R. Harelson

c. AF - Lt. Col. J. Wertz
Maj. G. Racht

d. AS - L. T. Stricker
W. A. Read

2. General Electric presented their Ground Test Program. The following briefers presented noted portions.

a. Test Philosophy and Ground Rules - Ed Rhoads

b. Development/Qualification/Acceptance Test Objectives - Ron Harelson

c. Development Test Plan - G. M. Roth

d. Qualification Test Plan - R. D. Girolamo

L-3877
p. 5

GENERAL ELECTRIC SEGMENT BRIEFING (cont'd) 5 January 1968 (AM)

1. ATTENDEES:

   Sames as 4 January (PM) plus K. Francis (DAC Observer)

2. GE Acceptance Test Plan - Ed Urbanek

3. PROBLEM AREAS - Ed Rhoads

   a. Boreswab Vehicle - Vehicle to precede 1st flight vehicle to Launch Site to check out facility

   b. Lack of early MPSS tests

   c. Fourth GE AVE shipped prior to first manned flight

   d. Potential problem at EK because of limited test equipment in current program.

4. Several Action Items were levied on GE, EK, and DAC to provide more detail during subsequent briefings. Attachment 3, 4 and 5 list these Action Items

NASA APOLLO TEST PROGRAM BRIEFING 9 January 1968

1. ATTENDEES:

   (a) TORB Members

   (b)

A. D. Mardel	Test Division, ASPO
Joe W. Dodson	Test Division, PT-2
S. H. Simpkinson	NASA, MSC ASPO
J. A. Chamberlin	NASA, MSC E & D
Will Hoyler	Reliability & Cert. Office
Col. J. Green	Det 2, AFSCFO, NASA
Capt. I. R. Steinberg	SAMSO, Det 2 (MSC/ZR1)
D. L. Van Ert	Aerospace Corporation

2. D. Collins and Col. Hull reviewed objectives of the TORB and NASA meeting.

3. Mr. Al Mardel presented a brief history of the Apollo Test Program.

4. Mr. Al Mardel presented the Apollo Acceptance Test Program emphasizing the "Re-Acceptance" program that was initiated on manned vehicle equipment subsequent to the Apollo fire accident. His briefing and accompanying discussions covered lessons learned and points that NASA would recommend being considered for the MOL Program.

5. Mr. Mardel presented a brief summary of NASA MSC analysis of the GE study of space vehicle test programs. Their general opinion was that the GE study reached conclusions that are not valid.

6. Mr. Will Hoyler presented the Apollo Qualification Test Program. Particular emphasis was placed on component testing.

7. Copies of this briefing and backup data are available at SAFSL-6B.

L-3877
P.7

MINUTES - TORB Discussions (0830) 10 January 1968

1. Col. Hull confirmed week of 14 January travel schedule. The Board will meet at GE on 15 January 1968 (Bldg A, Room 10A17)

2. Col. Hull requested each Board member list questions and areas that should be considered during this review.

3. J. Kent suggested that additional data regarding Apollo Test flows, vehicles, test objectives of specific test vehicles, and AGE be requested. D. Collins agreed to request such additional data from NASA.

MINUTES OF EK SEGMENT BRIEFING 10 January 1968

1. ATTENDEES:

(a) TORB Members

(b) GE R. S. Harrelson

DAC J. E. Genevay

AF L. G. Stange
E. Benschine
J. C. Wertz
G. D. Ankenbrandt

EK A. W. Rich
Lee Peterson
R. G. Whalen

2. Mr. Lee Peterson and Mr. Bob Whalen alternated briefing the following topics:

a) Test Objectives and General Description of Payload System (Peterson)
b) Description of Various Models (Whalen)
c) Thermal Model Test Program (Peterson)
d) Engineering Model Test Program (Whalen)
e) Optical Acceptance Test Program (Peterson)
f) AVE/AVE and AVE/AGE Tests (Whalen)
g) Acceptance Test Sequence (Peterson)
h) Qualification Test Program (Whalen)
i) Lab Module Payload Components Test Flow (Whalen)

3. Mr. Wayne Rich briefed EK Objectives at remote sites.

4. Several action items were given EK to include in their in-plant briefings. (See EK Action Item #3 through 9)

MINUTES - TORB Discussions (1815) 10 January 1968

1. The Board reviewed EK action items 3 - 9.

2. Col. Hull reiterated his request for a list of items for Board consideration.

MINUTES - TORB Discussions (0830) 11 January 1968

1. A general discussion regarding the concurrent Roles and Responsibilities activity and the impact TORB recommendations may have on the test program portion of the R&R activity. Col. Hull stated that the Board will decide if some study of R & R will be done during the current TORB sessions.

L-3877
P. 11

DOUGLAS SEGMENT BRIEFING 11 January 1968

1. ATTENDEES:

(a) TORB Members

(b) D. A. Stewart
N. C. O'Brien
M. T. Petrozzi
G. D. Day
W. R. Moreland
D. C. Wensley
J. T. Martin
W. H. Havlon
R. Lawrence
L. A. Cardenas
Mel Root
A. W. Rich
R. S. Harrelson
Barry Moss
L/C J. C. Wertz
L/C L. G. Stange
Capt. A. S. Lupfer
Capt. F. W. MacNab
Maj. R. J. Krejci

2. Mr. C. Day presented a short overview of the Douglas Ground Test Program.

3. Mr. W. R. Moreland briefed general concepts of subsystem level testing. The definition of subsystem testing includes all testing of components and subsystem up to the point where a subsystem is married to another subsystem. Mr. Moreland also described DAC interpretation of their four categories of testing (development, qualification, acceptance and effectiveness).

4. Mr. N. C. O'Brien presented the Static Structural Test Program.

5. Mr. D. A. Stewart presented the Dynamic Structural Test Program.

6. Mr. M. T. Petrozzi described propulsion and cryogenic testing. Included was a description of the subscale (one pound thruster) plume impingement tests at AEDC and a problem regarding performance verification of cryo tanks before vehicle sell-off at Huntington Beach.

L-3877
P.12

7. Mr. D. C. Wensley described the DAC Flight Control Testing Program.

8. Mr. J. T. Martin briefed subsystem and lower, electrical/electronic testing.

9. Mr. R. Lawrence briefed a general overview of the Crew Systems Test Program and presented a film showing underwater and zero-g testing accomplished to date.

10. Mr. W. H. Havlon briefed in more detail the DAC sponsored underwater simulation testing of crew systems. He stressed that underwater testing is a valuable aid and does help develop procedures that enables better utilization of Zero-g test time. He recommended that the Board consider recommending this technique be included in the MOL Test Program.

11. Mr. L. A. Cardenas briefed the testing program of the Life Support System.

12. Mr. M. Root presented a short briefing on weight and center of gravity management and control. This briefing was in response to DAC action item number 1.

13. Mr. W. R. Moreland briefly summarized the days briefings.

14. Several action items were directed to DAC for inclusion in subsequent briefings. (DAC Action Item # 4, 5, 6)

INTEGRATED TEST BRIEFING (0900) 12 January 1968

1. ATTENDEES:

(a) TORB Members

(b)

N. L. Andrade	DAC
R. J. Fugate	DAC
J. E. Genevay	DAC
R. Duitman	DAC
L. G. Costello	DAC
R. C. Twomey	DAC
J. P. Arroyo	DAC
R. S. Harrelson	GE
W. Rich	EKC
R. J. DeLorenzo	AS
L. T. Stricker	AS
F. P. Fest	AS
Maj. R.J. Krejci	AF
L/Col L. Stange	AF
Capt. A.S. Lupfer	AF
Capt. F.W. MacNab	AF

2. Mr. R. Duitman (DAC) presented an overview of the DAC system level testing program.

3. Mr. R. J. Fugate and Mr. R. Duitman gave a short presentation on System Engineering Documentation and Joint Operating Agreements between DAC and the associate contractor.

4. Mr. L. G. Costello briefed System Level Development Testing. This test program is centered around the Electronic Development and Compatibility Test Unit (EDCTU). There are still problems associated with the capability of GE/EK equipment (DSS-1) to support both DAC and GE/EK requirements. Additional problems regarding facility requirements and scheduling of AGE (CITE) are currently under study.

5. Mr. J. E. Genevay briefed System Level Acceptance Test Program. The feasibility of checking out the GE/EK MPE prior to hooking up with DAC LM equipment was discussed.

L-3877
P. 14

6. Mr. N. L. Andrade briefed AGE and Ground Checkout Software development program. His briefing included ASTEG development/test program as well as software development and the system level tests of ASTEG/DAC AVE through ASTEG/CITE/LV AVE.

7. Mr. J. P. Arroyo briefed LMQTV testing program. The December review has changed associate contractor qualification requirements that will require changes to the LMQTV program. Maj. Krejci (MOL SPO) stated that this test is the only ground test that is incentivized and suggested the TORB consider this feature.

8. Mr. R. C. Twomey briefed EMC testing. This test program assumes components are internally EM compatible and checks only mutual compatibility.

9. Several Action Items were directed to DAC for inclusion in their In-Plant briefing. See DAC Action Items # 7, 8, 9.

TORB Discussions 12 January 1968

1. Col. Hull requested that two copies of each segment briefing be available during in-plant visits.

L-3077
P. 16

BOARD DISCUSSION (AT GE) 15 January 1968

1. Col. Hull reiterated the primary functions of the TORB and stated that the review so far has revealed that component level development testing is quite far downstream for TORB to have much influence.

2. A brief discussion on the Ground Test Plan, Volume II , was held. Lt. Col. Hrebec pointed out that the concept of completing a production type acceptance test of qual articles prior to initiating the qual test sequence is not in the G.T.P. Other similar discrepancies, noted by the board, should be identified so proper corrections to the Ground Test Plan can be made.

3. The board reviewed the Acceptance, Qualification, and Development, and Component test programs and prepared a matrix identifying the various vehicles and testing accomplished at each LV facility. Attachment #6 is the result of this review.

GENERAL ELECTRIC IN-PLANT VISIT 16 January 1968

1. GE briefed the several Action Items that were requested during the Los Angeles Segment Briefing.

   a. Action Item #4 - Roland Mayer and E. J. Urbanick

   b. Action Item #3 - Jerry Roth and J. E. Thompson

   c. Action Item #6 - Herb Horn and R. Girolamo

   d. Action Item #2 - E. J. Urbanick

   e. Action Item #9 - Copeland and Ed Rhodes

2. Kirt Wesley presented an overview of the facility tour. The tour included the following facilities:

   a. Building B

      (1) Bldg A Mockup
      (2) MM Mockup
      (3) Consoles 2 and 8 mockup
      (4) 113T MMFS shell.

   b. Building 4

      (1) Sliding Mask friction test set-up

   c. Thermal Vac Facility

   d. Vibration Facility

   e. Engineering Development Simulator

L-3877
P. 18

GE IN PLANT VISIT

17 January 1968

1. GE completed briefing the Action Items.

   a. Action Item #10 - Ed Rhodes

   b. Action Item # 1 - R. Schmidt and Ron Harrelson

   c. Action Items # 7 & 8 - R. Harrelson and Walt Overstreet

   d. Action Item #5 - Ed Rhodes

2. Ed Rhodes presented a general discussion of the following points in the current test program that are of concern to GE.

   a. Thermal Vac Test of Consoles (under study)
   b. Need for EG 46
   c. EMC tests at EK does not include operating cameras and related equipment.
   d. Identification of test requirements to EK and the associated AGE design.
   e. Implementation of EDCTU support.
   f. EMC not completed until FV #3.
   g. No acoustic or vibration tests of LMQTV
   h. Lack of early CTA verification test
   i. Lack of LM electrical system test prior to assembly into pressure shell
   j. Boreswab Vehicle
   k. Capability to run LM vibration with power on.

3. A discussion regarding the feasibility of having DACO supply Console #1 to GE for mating with Consoles 2 and 8 for subsequent installation, as a unit, into the birdcage. A DACO action item to brief the advantages or disadvantages of this concept.

EASTMAN KODAK IN-PLANT VISIT 18 January 1968

1. Mr. John Sewell, EK Program Director, welcomed the Board.

2. Mr. Lee Peterson discussed the proposed agenda for the EK in-plant visit.

3. Action Item #2 - Lee Peterson

   a. The EK organization is a functional organization. The chart shown during the briefing did not show the manufacturing organization which is on a level with J. Sewell and E. Ksiazek.

   b. Mr. Lee Peterson is Test Manager

   c. Mr. Robert Whalen is Test Planning Manager and is responsible for preparing the "MPS Test Definition Study Report" which is the basic test plan for the EK test program.

   d. Mr. Rey Grammer is System Test Group Manager.

   e. Mr. Wayne Rich is Field Manager.

4. Mr. Don Spooner (Test Direction Group under System Test Group) briefed MPS Roles & Responsibilities of MPS contractors. An initial meeting on 15-16 January at GE to form groundrules for combined GE/EK test work in Rochester. Additional meetings at EK starting 22 January will detail this test program.

5. Action Item #1 - Lee Peterson

6. The Board toured Bldg. 601 and viewed the MM mockup, COA (horsecollar) mockup and scale model of Bldg 101 (Gage Facility).

7. Action Item #3 - Dennis Gliden

8. Action Item #6 - Dennis Gliden

9. Action Item #4 - Lee Peterson

Eastman Kodak Visit (cont'd) 18 January 1968

10. Action Item #5 - Bob Whalen

11. Action Item #7 - Bob Whalen

12. Action Item #8 - Tom Covalis

13. Mr. B. Hohmann asked for some detail on the servos which adjust the alignment of the Ross diagonal and Primary mirrors. EK was requested to provide some detail of failure mode operation, testing and final verification of servo operation.

14. Action Item #9 - Don Spooner

The run time accumulation vs design life is difficult for EK to determine because detail test plans are not complete. They are studying similar programs to see if their experience relates to MOL equipment.

15. Lee Peterson presented a detailed briefing on EK facilities prior to the facility tour. The facilities in Bldg. 101 were toured by the TORB.

16. The following additional EK Action Items were requested by the TORB:

a. Mirror alignment servos failure mode analysis and associate test program.
b. What are EK objectives during EDCTU and LMQTV at DACO?
c. EK areas of concern with current test program and recommendations to improve it.

L-3877
P. 21

EK IN PLANT VISIT

19 January 1968

1. Mr. Peterson stated that the Reliability people did not return from DAC;; therefore, no additional data is available on EK's EDCTU/LMQTV test objectives. Mr. Grammer will obtain data and provide it to the Board next week.

2. Mr. Peterson responded to the Alignment Servo action item by stating that the Reliability Group has studied failure modes and found that approximately 50% of alignment adjustment range would be lost in the worst case single point failure of one servo. (However, a single point failure mode can drastically affect the mission because all servos are controlled by the same black box.)

3. Mr. Don Spooner presented the following EK Test Program Areas of concern:

   a. Reduced MMTS capability - The concern is that GE/EK may be directed to be too simple to adequately perform MM level testing at EK.

   b. The Line of Site Alignment of the Optical System to the TM hub is a potential problem. The lack of definition is this area may impact EK facilities and overall responsibilities of mating the MMAS and MMFS at EK.

4. J. Wambolt requested additional discussion of EK Thermal Vacuum tests. There apparently exists triple redundant and excessive TV tests during the Qual test cycle.

   A GE Action Item was directed to R. Chamberlin to provide some additional detail on GE Qual TV tests to see if their planning sufficiently represents the Acceptance TV time plus 30 days.

5. The mirror contamination problem and methods of checking surfaces was discussed. J. Kent discussed the Sapphire method of checking contamination. EK did not know about this method but are working on several schemes to provide surface contamination information.

L-3877
P. 22

TORB DISCUSSIONS (AT EK) 19 January 1968

1. General discussion of EK facilities and Test Program. The Board decided to request additional information on two areas:

   a. Thermal Vac testing during EK Qual program

   b. Discussion and Re-cap of Test Facilities

2. John Kent briefly discussed the schedule possibilities of shipping MM from EK to GE for mating with a set of consoles and CITE to accomplish a MPS electrical system test prior to subsequent shipment to DAC and LV buildup. This concept will be discussed during the Board deliberations after the DAC in-plant visit.

3. Col. Hull outlined a Plan of Action that would guide Board action through the remainder of the activity. Part A represents the Segment Briefings, Part B, the In-Plant visits and Part C the wrap-up Board discussions.

   a. Review of Test Objectives

   b. How are Test Objectives accomplished?

      1. Type of testing
      2. Facilities

   c. Board discussions and recommendations.

      1. Existing test flows/programs

         a. Consisting between contractors
         b. Holes in test program
         c. Excess testing

      2. Optimum test flow/program

      3. Recommended test flow/program (compromise)

      4. Recommendations for further study.

L-3677
P. 23

TORB Discussions (at EK) cont'd 19 January 1968

4. The Board discussed the "Acceptance Test Philosophy" paper. This paper, prepared by Col. Hull, is for Board guidance only and will not be a part of the final report.

5. The Board discussed the Development, Qualification, Acceptance and Components matrices to see if additional inputs from EK were required. No further requests were made.

DAC IN-PLANT MEETING 22 January 1968

1. Mr. C. Day briefed the proposed agenda for this series of meetings. The facility tour plan was rescheduled to be the first presentation.

2. Facility Tour Plan - C. D. Day

   a. Bldg 45 - Mockup and Development Fixtures
   b. Bldg 22 - S IV B Automatic Checkout Facilities
   c. Bldg 30 - Structural Test Facility
   d. Bldg 31 - Space Simulation Facilities
   e. Santa Monica - Test labs for lower level hardware testing

3. Action Item No. 3 - Component to Subsystem Test Organization

   Mr. C. Day briefed the general sub-system test organization. Mr. W. Moreland detailed the organizations responsible for Subsystem level development and qual tests. Mr. R. Brown briefed the sub-system level testing at the various MSSD labs.

4. Action Item No. 8 - N. C. O'Brien

   DAC stated that no provisions are planned (or under contract) for integrated testing of DTS (modal and shock) with associate contractors. DAC will perform their testing requirements but, so far, have had no cross talk with or requirements from associates. DAC has requested, via STWG, for associate requirements but have not yet received any specific replies. Any replies must be transmitted formally via the SPO. A problem evidently exists in that the IFS/ICO system is not transmitting requirements between contractors.

5. Action Item No. 11 - N. C. O'Brien

   N. O'Brien discussed the structure static load tests. The meteroid shield is not installed, however, the 59 points that transmit loads from the shield to the pressure shell are loaded during the shell tests.

6. Action Item No. 15

   The question regarding DAC unpressurized compartment ascent venting test plan was discussed by N. C. O'Brien. Although this test is in current plans, DAC is studying the problem to see if sufficient vent capacity is in the design to remove the requirement for this test.

L-3877
P. 25

7. Action Item No. 12 - N. O'Brien

Mr. O'Brien stated that current plans for testing LM end hatch operations will be in ambient conditions only. Detail test plans are not yet completed.

8. Action Item No. 9 - N. O'Brien

Mr. O'Brien kicked off a series of presentations that described the various levels of development and qual testing.

a. Structure - N. C. O'Brien
Action Item #14 was requested by J. Kent

b. ACTS - M. T. Petrozzi

c. ACTS Flight Controls - Dave Wensley

d. Electrical/Electronics - Jim Martin

e. Crew System - Bob Lawrence

f. Life Support Testing - Lee Cardenas

9. Action Item No. 5 - Mike Petrozzi

Mike Petrozzi briefed Huntington Beach tests for the Cryo tank performance verification. No actual loading of cryos will be done at Huntington Beach.

10. Col. Hull observed that the EDCTU is an extremely valuable part of the total test program and stated that Board members should take special note to recommend appropriate associate contractor support.

L-3877
P. 26

BOARD DISCUSSIONS - 0830

23 January 1968

1. The Board decided to schedule a short tour of the DAC Santa Monica test facilities on 24 January 1968.

2. The Board decided to schedule the Aerospace proposed alignment briefing at 11:00 24 January 1968 at the McCulloch Building.

3. The Board decided to schedule the Aerospace briefing regarding component testing levels. J. Kent will arrange this briefing.

L-3877
P. 27

DAC IN-PLANT BRIEFINGS 23 January 1968

1. Mr. R. Duitman presented an overview and agenda of the System level testing Action Item that would be briefed.

2. Action Item No. 3 (System Level Test Organization) J. Genovay

3. Action Item No. 4 - Mr. W. W. McCalla

   Mr. McCalla presented a detailed explanation of the proposed Manufacturing Assembly Sequence (Alternate Plan) with special emphasis on testing accomplished at various positions. Each position is 9 days for FV 3 and shorten, on a learning curve, to about 6 days for FV 5.

4. Action Item No. 2 - G. B. Moore

5. Action Item No. 6 - John Genovay

   A memorandum detailing DAC extended life operating policy and a chart of MOL Wearout Items are included in the TORB briefing material.

6. Action Item No. 7 - G. B. Moore

7. Action Item No. 14 - Duke O'Brien

   The Birdcage static tests will require GE bays to be installed but DAC does not plan to instrument them. Therefore, the DAC bays will be qualified for static loads during this test but not GE bays.

8. Action Item No. 16 - R. Duitman

   The following comments were presented in response to the Action Item:

   a. DAC sees no large gaps or concern in segment level tests program
   b. DAC is studying need for LM Vibration testing.
   c. Test spans for all testing is included in the current schedule but detailed plans are not complete.
   d. There are many gaps in integrated test area.
   e. An LMQTV meeting of associate contractor is scheduled 19 March.

L-3877
P. 28

f. JOA's and IFS's are not answer to solve integrated test problems. Need small groups (subgroups of STWG) to get to heart of specific problems.

g. DAC is looking forward to Test Board recommendations.

9. DAC will pickup the Board members for the Santa Monica facility tour at the McCulloch Building (0830) 24 January 1968.

DAC IN-PLANT VISIT

24 January 1968 a.m.

1. Mr. Chuck Day and H. L. De La Puente (Tour Guide) escorted the TORB through the DAC Santa Monica facility. The following labs were visited:

a.	Microwave Lab	T. A. Kiklas
b.	Vibration Lab	M. V. Velazquez
c.	Mechanical Lab	D. R. Walker
d.	Acoustic Lab	M. V. Velazquez
e.	Electrical Lab	J. Sparks
f.	ESAR Facility (Earth Simulation and Rendezvous)	J. Sparks

L-3877
P. 30

BOARD DISCUSSION

24 January 1968 p.m.

1. Mr. Bert Ferger, Aerospace, briefed the TORB on a proposed alignment concept that utilizes mechanical fixtures to measure alignment of LM or MM equipment to the LM/MM interface rather than the current concept of using an optical tooling dock.

2. Board members individually reviewed notes and briefings.

L-3877
P. 31

BOARD DISCUSSION - 1530 24 January 1968

1. The Board discussed the objectives, schedule and proposed final briefing content.

A. Original Objectives of the Board

1) Examine Complete Test Program for LV
2) Validate Objectives for Testing
3) Develop a Logical Testing Sequence for LV (System Engineering Basis)
4) Validate Facilities (and Manpower*) to support Development Test Sequence. *Deleted from Board Consideration.

B. Definitions of the Following are Needed:

1) Development Testing
2) Qualification Testing
3) Acceptance Testing

C. Board Needs to Develop:

1) By Contractor

a) Existing Test Objectives
b) Existing Test Flow

2) For Lab Vehicle

a) Consolidated Test Objectives
b) Consolidated Test Flow

3) Optimize Minimum Test Program

4) Comparison of Consolidated Test Program

a) Consistency Between Contractors
b) Holes in Program
c) Excesses in Program

5) Develop Compromise Test Program

6) Develop New Test Flow

7) Evaluate Facilities to Support New Test Objectives & Flow.

L-3877
P. 32

8) Identify Shortcomings Associated With New Test Program

9) Recommendations for Further Study

10) Comparison of Test Objectives Between Contractors and GTP

D. Other Action by TORB

1) Overall MOL Test Philosophy (Vol. I, Sect IV, GTP)

2) Level of Detail Evaluation by Board

E. Briefing Scope

0 Board Approach

- o Objectives
- o Level of Detail

0 Discussions

- o Test Objectives Comparison
  - Between Contractors
  - With GTP
- o Test Flow/Program
  - Development
  - Qualification
  - Acceptance

  } Thermal/Vac, Structural, AVE System, EMC
- o Facilities vs Utilization
- o Contractual (?)

0 Board Findings

- o Objectives
- o Test Flow/Program
- o Facilities
- o Contractual

0 Board Recommendations

- o Test Program
  - Objectives

L-3877
P. 33

- Test Flow/Program
- Facilities

o Other
- Contractual
- Further Studies/etc.

F. Schedule

Wednesday	24 January	
	1530	Discuss Report
	1600	Review Data
Thursday	25 January	
	0830	Review data
	1330	Submit Major Observations to Board for Consideration
		Board Discusses Items
	1600	Executive Session
Friday	26 January	
	0830	Teamwork on Matrices
	1330	Components Briefing
	1400	Teamwork on Detail Areas (2 men)
Monday	29 January	
	0830	Consolidate Matrices
	1330	Discuss Consolidations
	1600	Executive Session
Tuesday	30 January	
	0830	Board Findings and Recommendations
Wednesday	31 January	
	Start Final Report	

L-3877
P. 34

BOARD DISCUSSION - 25 JANUARY 1968

1) During the morning session Board members individually reviewed their notes and briefings and prepared their observations and comments for subsequent full Board deliberation.

2) The Board discussed proposed definition of Development, Qualification, Effectiveness and Acceptance Testing. M. Shrader will prepare another version of Qual Testing and present it to the Board on 26 January 1968.

3) The Board briefly discussed Volume I, Section IV of the Ground Test Plan. Additional discussion was scheduled 26 January 1968.

4) The Board reviewed the Development Test matrix, prepared by J. Kent, and agreed that the format would be satisfactory for other testing matrices.

BOARD DISCUSSION - 26 JANUARY 1968

1) Colonel Hull met with General Bleymaier to discuss Board progress and to schedule final briefing. The briefing was tentatively scheduled for 1 or 2 February 1968.

2) The Board reviewed the Qual and Acceptance Test matrices. Comments will be incorporated into following iterations of the matrices.

3) J. Kent presented a proposed format for General Problems:

   A) Discussion

   B) Statement of Problem

   C) Recommendation(s)

4) Mr. Zinn and R. Van Ert presented a briefing on "OV Component Environmental Testing". The briefing included data on Gemini B and Lab Vehicle vibration levels and duration and Thermal Vacuum testing. A copy of this briefing is included in the briefing package.

5) Board members individually prepared general problems and comments for subsequent full Board discussion.

6) J. Wambolt chaired a side session to review the GTP and, in particular, to solicit comments from the contractor Board representatives.

L-3877
P. 36

BOARD DISCUSSION - 29 JANUARY 1968

1) The Board reviewed the Development, Qual and Acceptance matrices and decided on a second draft version of "Meatball" and general questions.

2) Teams were established to categorize questions and statements into a form workable by the Board.

a) General: Colonel Hull, B. A. Hohmann, Major Thompson

b) Development: R. Grammer, Lt. Colonel Hrebec

c) Qualification: R. Arnold, M. Shrader

d) Acceptance: D. Chamberlin, J. Wambolt

e) Flow Charts: J. Kent, D. Collins

3) The above teams worked their assigned tasks during the major part of the afternoon session.

4) R. Grammer and G. Hrebec presented the Development Test matrix and associated questions to the Board. Some changes were recommended for inclusion in subsequent drafts.

5) R. Arnold and M. Shrader presented the Qual Test matrix to the Board. Some changes were recommended.

L-3877
P. 37

BOARD DISCUSSION - 30 JANUARY 1968

1) R. Chamberlin and J. Wambolt presented the Acceptance Test matrix and associated questions to the Board. Changes were recommended for inclusion in subsequent drafts.

2) Colonel Hull presented General Questions. The Board discussed the questions and assigned them to specific areas - Development, Qualification, Acceptance or General.

3) The Teams re-worked matrices and questions to incorporate recommendations made during above reviews.

4) The Executive Board reviewed the following matrices:

   a) Facilities

   b) Development Testing

   c) Qualification Testing

      (1) O_1 - This problem is part of the MMTS overall problem and will be included in the General portion of the briefing.

      (2) O_2 - A discussion regarding the necessity of acoustic vibration qualification of the LM involved the requirement for either or acoustic facility at DAC or major AGE (ASTEG, CITE, Etc.) movement to EK or other acoustic facility. A backup position to test only the unpressurized "critical" portion of the LM (similar to the position taken in Development Testing) was decided.

      (3) O_3 - The narrative and problem part of this chart was agreed upon but discussion on the recommendation was continued to the morning of 31 January 1968.

L-3877
P. 38

BOARD DISCUSSION

31 January 1968

1. The Board reviewed the format for the final briefing.

2. Board members were assigned responsibility for preparing the following flow charts and detail viewgraphs:

   a. LMQTV/FV #3 - J. Kent

   b. Vib/Acoustic Development Flow - J. Wambolt

   c. T/V Qual Flow (MMAS preceding MM) J. Kent

   d. Vib Acceptance Flow - J. Wambolt

   e. Functional Acceptance Flow - J. Kent

   f. Functional Development Flow leading to EDCTU - M. Shrader

3. The Consultants were requested to review "Test Objectives" and to group them into Development, Qualification, Acceptance and General Categories.

4. The Executive Board continued their review of the Qualification and Acceptance Matrices and observations.

5. The Board reworked matrices and special test flow charts.

BOARD DISCUSSION

1 February 1968

1. The final draft of the briefing was collated and reviewed by the Board.

2. The Executive Board reviewed and approved the "Test Objectives."

L-3877
p. 40

BOARD DISCUSSION

2 February 1968

1. The Board completed final review of the briefing and prepared viewgraphs and copies.

2. The final briefing was presented to General Bleymaier and staff at 1500, 2 February 1968.

a. Attendees:

Board Members
General J. S. Bleymaier
Col. O. C. Ledford
Col. L. S. Norman
Col. W. H. Brassfield
Col. B. F. Knolle
Col. C. L. Gandy
Col. R. V. Wheeler
Lt. Col. L. D. Paige
Maj. C. Fox
Dr. W. C. Williams
Mr. B. Moss
Mr. L. C. Lidstrom
Mr. G. D. McGhee

b. General Bleymaier commended the Board for their efforts and requested that a letter detailing and separating the Board recommendations into contractual, technical and schedule problem areas.

c. Col. Norman asked if SPO segments should implement Board recommendations and Gen. Bleymaier replied that formal SPO review and approval should precede this step.

d. Gen. Bleymaier asked thatthe Board also list the recommendations by priority so the SPO could work them properly.

3. The Test Objectives Review Board formally disbanded at 1700, 2 February 1968.

L-3877
P. 41

~~SECRET~~ SPECIAL HANDLING

19 1967

SUBJ: Test Objectives Review Board

TO:

1. I intend to convene the Test Objectives Review Board at 0830, 3 Jan 68 in Room 820, McCullock Building, Los Angeles, Calif.

2. The attached outline is for your planning purposes.

[redacted]

ROBERT R. HULL, Colonel, USAF
Chairman

Cy to:

2-3877
P. 42

~~SECRET~~ SPECIAL HANDLING

Atch 1
Pg. 1

TEST OBJECTIVES REVIEW BOARD

Board Members:

AF - Col R. R. Hull - Chairman

Aeros - Mr. B. A. Hohmann - Co-Chairman

Contr - Mr. R. G. Arnold

Contr - Mr. W. L. Chamberlain

Contr - ~~Mr. R. Grammer~~ Mr. R. Grammer

Consultants:

AF - Lt Col G. M. Hrebec

- Mr. D. R. Collins

Aeros - Mr. J. E. Kent

- Mr. J. F. Wambolt

- Mr. M. C. Shrader

Recorder:

AF - Maj L. G. Thompson

L-3877
p. 43

Atch 1
Pg. 2

PURPOSE:

1. Look at complete test program for the Laboratory Vehicle.

   a. Fat vs lean areas of testing.

   b. Are there any holes.

2. Validate objectives for tests - dev., qual., accept.

   a. Define and justify the objectives for each segment system.

   b. Define and justify the objectives for integrated segment systems, e.g., MTE -> MM -> LV.

3. Determine, on a laboratory vehicle system engineering basis, a logical testing sequence that satisfies the validated objectives.

   a. What tests/facilities are required to support this sequence.

   b. What is the manpower required to support this sequence in-plant and at remote sites.

   c. Existing contractual requirements will not be justification alone - contracts will be changed to meet objectives.

4. End result will be a report to Gen Bleymaier containing the top level test flow with major hardware exchange milestones identified. The report will indicate the facilities and manpower required to support the test flow.

APPROACH:

1. The 13-14 Dec 67 baseline will be used for technical content of program. This baseline will be discussed by the Board at the first meeting.

2. Each contractor will define and justify the objectives for their segment peculiar basis for hardware testing. An overview of facilities required to support these objectives will be discussed.

L-3877
P. 44

3. The contractors will define and justify the objectives for integrated testing up to LV level. An overview of facilities required to support integrated testing will be discussed.

4. The Board will, from a laboratory vehicle system engineering standpoint, determine a logical testing sequence.

5. This testing sequence will be examined to remove any redundant testing or add testing in areas of insufficient testing. Hardware exchange milestones may be changed if required.

6. Each contractor's plant will be visited.

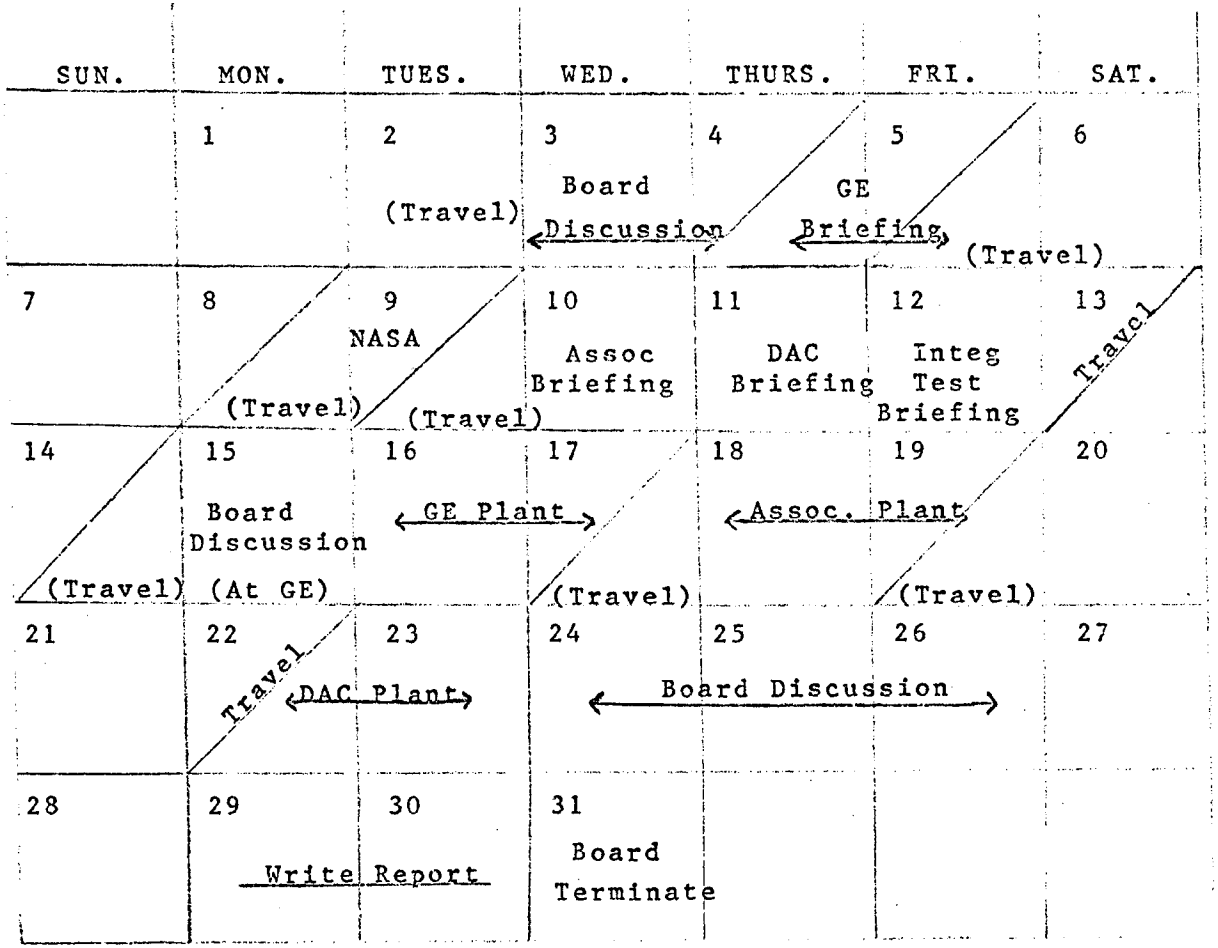
a. In plant and remote site test facilities and manpower will be discussed and justified.

b. Integrated segment/system testing and how/where it should be accomplished will be discussed.

7. Examine testing sequence to determine if any conflicts can be eliminated by adjusting launch dates slightly.

8. Validate facility and manpower requirements to support the adjusted LV test flow.

9. Determine what, if any, contract changes are required to support the recommended test flow.



Revised 3 January 1968

FIRST ROUND PROGRAM DECISIONS

- Replace 114E - Upgrade 113T
- SM Efforts minimum Jan through June, 1968
- No performance testing in 100% O_2
- One CITE Plus TV Support at Huntington Beach
- Modal Surveys on DTS and No. 6 Only
- No LMQTV Acoustic Qualification
- Combine EK 30-Day Qualification with LMQTV
- Two-Position Sliding Mask
- Use ULE; Suspend Louver Design; Polish One Cervit
- Refurbish Test Articles for No. 7 Main Optics
- Eliminate Thrust Termination Tests on 120-Inch Motors
- Incorporate Low Level Vibration Test on Each LM
- Reduce Combined GE/EK Testing at EK
- Eliminate One ATS From 114
- No Arbitrary Reduction of Telemetry Points
- Do Not Incorporate Roll-Rate Bias
- Simplify Heart Rate Recorder
- Make EK Dynamic Test a Type Test Only
- Eliminate EK LM Dynamic Disturbance Simulator
- Delete Redundant MMTS Operations & Inspection
- Delete EK Dynamic Test Camera
- Eliminate GE Development & Qualification Base Shake Tests
- Eliminate System Engineering Data From GBQ
- Use Present Configuration Management Plan for Gemini B Procedure Simulator

L-3877
P. 47

FIRST-ROUND PROGRAM DECISIONS (CONT'D)

- Assemble LV at Huntington Beach
- Put VAFB Operations on 5-Day Week
- Install Most AGE at VAFB Before Flight No. 1
- Utilize EDCTU for LV Software Validation
- Redefine Flow Times
  - MM at EK
  - LV at Huntington Beach
- Delete Redundant Mission Module Ground-Conditioning Tests

SECOND-ROUND PROGRAM DECISIONS

- Change Flight No. 2 Requirement
- Reduce 10010 by 1/2
- Shift LMQTV
- AF Gemini Training
- Reduce ATS Resolution 10%
- Adjust Schedule
- Manageable Adjustment

ITEMS YIELDING POSSIBLE FUTURE SAVINGS

- On-Pad Buildup of Laboratory Vehicle
- CDRL Reductions
- Delete Blast Shield
- AGE to Non-CEI Items
- Mission Simulator Simplifications

L-3877
P. 48

ITEMS YIELDING POSSIBLE FUTURE SAVINGS (CONT'D)

- System Effectiveness Scrub
- EMI Testing Requirements Reduction (AGE Only)
- VAFB Air Conditioning Requirements Reduction
- Use Dynamic Test Structure for LM/MM Static Tests

L-3877
p. 49

GENERAL ELECTRIC ACTION ITEMS

4-5 January 1968

ACTION ITEM

1. What does GE expect to accomplish during integrated testing at EK and DAC under the new December Ground Rules? (R. Hull)

2. What is the estimated number of hours/cycles accumulated on GE AVE during production testing and the relationship of these times to design life? Component (Vendor and in-house) subsystem, system and at all field locations where possible. (J. Kent)

3. Detailed look at Development Qualification Acceptance program for GE Lab Module AVE equipment. (J. Kent) See attached format.

4. In some detail, will GE describe test setup for vibration acceptance of MMFS. Include vibration levels expected on the various components within the structure. (D. Collins)

5. More detail and visibility into what cannot be checked on MMFS (FV-3) in assoc. TV chamber if test was not done at GE. (D. Collins)

6. The following items should be combined into a 20 minute briefing: (D. Collins)

   a. Based on experience in other programs, what is GE's position on component qual and acceptance vibration levels?

   b. Available information, if any, on comparison of component qualification vibration levels and what was measured in flight on past GE programs.

   c. In justifying flight segment acceptance test (vibration, Thermal Vacuum and EMC) what flight failures on past programs can be blamed on not conducting these tests?

7. What functional performance is demonstrated in the Bay 2 & 8 only tests at Huntington Beach? (J. Kent)

8. What functional performance is demonstrated in the LM integrated test at Huntington Beach? (J. Kent)

4-3877
P. 50

~~SECRET~~ SPECIAL HANDLING

Atch 3, P. 1

General Electric Action Items (cont'd) Page 2

ACTION ITEM

9. Prepare exploded, color coded, pictorial view of contractor's AVE hardware flow for each type of test program (development, qualification, and acceptance) through your plant.

Color Code - DAC - Green
GE - Blue
Assoc - Red

10. Provide General Electric, MOL Dept. organizational chart. (Stress Test Organization)

11. Summary of weaknesses in current test program that GE has identified and suggested improvements. (R. Hull)

12. Additional information regarding GE Qual T/V tests to see if their planning sufficiently represents the Acceptance TV time plus 30 days. (J. Wambolt)

L-3877
P. 51

GE LM AVE TEST REVIEW (Ref GE Action Item #3)

I. CONFIGURATION

- A. Physical Layout
- B. Functional Description
- C. Mechanical and Electrical Interfaces

II. SYSTEM LEVEL TEST PROGRAM

- A. Development
  - 1. Dynamics
    - a. Modes
    - b. Loads
    - c. Acceleration
    - d. Vibration (above 60 cycles)
  - 2. Thermal/Vacuum and Atmosphere
  - 3. Mechanical
  - 4. Electrical
- B. Qualification

  Same as Development
- C. Acceptance

III. SUB/SYSTEM AND COMPONENT TEST PROGRAM

IV. SUMMARY OF DEFICIENCIES AND CORRECTIONS

L-3877
P. 52

~~FOR~~ SPECIAL HANDLING

EK ACTION ITEMS

5 January 1968

ACTION ITEM

1. Prepare exploded, color coded, pictorial view of contractor's AVE hardware flow for each type of test program (development, qualification, and acceptance) through your plant.

   Color Code - DAC - Green
   GE - Blue
   Assoc - Red

2. Provide EK, MOL Dept. organizational chart. (Stress Test Organization)

L-3877
P. 53

EASTMAN KODAK ACTION ITEMS

10 January 1968

ACTION ITEM

3. Detailed description of qualification and acceptance vibration levels for MM and LM EKC components/sub-assys. Include rational for selection of levels. (D. Collins)

4. Describe the difference between the OA and MM level venting tests and reasons why all objectives cannot be met by a single MM level test. (D. Collins)

5. Where in the Ground Test Program does EK insure that EK black boxes can be checked out and problems isolated by CITE? (J. Kent)

6. Request brief description of qualification and acceptance vibration test conducted on primary mirror or on its installation in the OA structure. (D. Collins)

7. EK present preliminary reaction to DACO plan to test DACO LM hardware as an entity before mating the GE/DACO electrical interface. The implication here is that it further delays in time the demonstration of EK/GE production LM hardware compatibility.

8. Show the schedule relationship of the acceptance activity for flight vehicle number 3 processing qual model and engineering model, and comments by EK on the feasibility of these relationships.

9. What is the estimated number of hours/cycles accumulated on EK AVE during production testing and the relationship of these times to design life? Component (Vendor and in-house) subsystem, system and at all field locations where possible. (J. Kent)

L-3877
P. 54

EASTMAN KODAK ACTION ITEMS

10 January 1968

ACTION ITEM

10. Mirror alignment servos failure modes and test program. (B. Hohmann)

11. EK objectives during EDCTU/LMQTV testing at DACO. (R. Hull)

12. EK areas of concern. (R. Hull)

13. Thermal Vac. testing during EK qual program. (J. Wambolt)

14. Discussion and recapitulation of test facilities.

L-3877
P. 55

DAC ACTION ITEMS

5 January 1968

ACTION ITEM

1. DAC shall include in their segment briefing a discussion of weight and center of gravity management. The briefing should include methods of (1) bookkeeping/inputs from associate; (2) method of allocation/control; (3) methods of reporting; (4) methods of measurements. (J. Wambolt)

2. Prepare exploded, color coded, pictorial view of contractor's AVE hardware flow for each type of test program (development, qualification, and acceptance) through your plant.

   Color Code - DAC - Green
   GE - Blue
   Assoc - Red

3. Provide DAC, MOL Dept. organizational chart. (Stress Test Organization)

L-3877
P. 56

DOUGLAS ACTION ITEMS

11 January 1968

ACTION ITEM

4. Detailed build-up of the Laboratory Module and tests that are associated with this during build-up. (J. Kent)

5. How will DAC verify cryo tank performance before sell off of vehicle at Huntington Beach? (D. Collins)

6. What is the estimated number of hours/cycles accumulated on DAC AVE during production testing and the relationship of these times to design life? Component (Vendor and in-house) subsystem, system and at all field locations where possible. (J. Kent)

DOUGLAS ACTION ITEMS

12 January 1968

ACTION ITEM

7. Describe configuration of LM acceptance vibration test. What levels are expected on components and interfaces which have not previously been subjected to acceptance level testing. (D. Collins)

8. Present level of integrated test presently planned by by DAC on the DTS (Modal and Shock) with the associates:

   a. Objectives

   b. Requirements

   c. Equipment

   d. Data

9. Present a general matrix of DAC subsystems versus level of hardware tested for Development and Qualification.

   Examples:

   Data Subsystem

   Components - All 50% Subsystem - Vendor All - EDCTU

10. What changes and impact on test flow would occur if DAC would ship Consol #1 to GE to mate mechanically/ electrically with 2 and 8 for subsequent installation into birdcage as a unit? (D. Collins/B. Hohmann)

L-3877
P. 58

DOUGLAS ACTION ITEMS

12 January 1968

ACTION ITEM

11. Meteoroid shield testing during static load testing. (D. Collins)

12. Tunnel hatch closing tests during Acceptance Test Program. (B. Hohmann)

13. Tunnel to Dome Acceptance Test - where, how and when. (G. Hrebec)

14. Detail of birdcage tests with expected inputs from Associates. (J. Kent)

15. What are test plans for forward unpressurized compartment ascent venting. (B. Hohmann)

16. Summary of weaknesses in current test program that DAC has identified and suggested improvements. (R. Hull)

		GE - RADNOR	EK - ROCHESTER	DAC - HUNTINGTON BEAC
Thermal		113T	Thermal Mod	ECLS (1)
Dynamics	Modes	113D	COA (Three Point Mount) Transmissability MM & EM	STV Ascent & Orbit
	Acoustic	NONE	SDM	DTS
AVE Development		DSS-1	MM EM (2)	EDCTU
Sys Compatibility		114	MM (EM)	EDCTU
Shock		113D		DTS
EMC/I		114 and DSS-1	EM	EDTCU

Atch 6, P. 1

DEVELOPMENT

QUESTIONS:

1. Consider feasibility, advantages, disadvantages of conducting ECLS development (and some qual) testing in boilerplate vehicle outside of altitude chamger instead of current plan. Radiator performance would be conducted in chamber and results applied to boilerplate test. (D. Collins) (Consideration #10)

2. How will DAC verify cryo tank performance before sell-off of vehicle at Huntington Beach? (D. Collins) (EK Action Item #5)

3. When is EDCTU suppose to be torn down? Do we want to make a recommendation to keep the EDCTU by maintaining components failure analysis and procedure proving? (R. Grammer)

L-3877
P. 61

~~SECRET~~ SPECIAL HANDLING

~~SECRET~~ SPECIAL HANDLING

VEHICLE QUALIFICATION PRODUCTION

QT are to be performed to verify the capability of the design as produced to operat under its specified environ. with a specified margin.

	GE-RADNOR	EK-ROCHESTER	DAC-HUNTINGTON BEACH
Thermal Vacuum Vehicle Level	MMFS (115)	MMAS - Thermal Optics 30 sim. mission MMAS + 115 (T/V)	LMQTV Provide Qual for LM/MPE
(3) (4) (5) Vibration	Accept. Level Vib. MMFS, Consoles	MMAS + 115 Acoustic Qual Levels	NONE
EMC	GE AVE (115) (Consoles)	NONE	LV-3
Shock (Pyro)	115 (Star Tracker Hatches)	NONE	LMQTV - No DTS - Yes
Ground Cond.	NONE	MM (Thm)	LMQTV
Ascent Venting (6) (7)	NONE	MM (Thm and QM)	LMQTV (8) (9)
Transportation	Transportability 115	MM Non Operating Temp QM	???? (10) (11)
Structural	113D	(12)	LM Shell - STV Bird Cage

QUALIFICATION

QUESTIONS:

1. Review the philosophy of the Thermal Vacuum Flow Tests performed and discuss the relationship of the of the total vacuum exposure of the qual hardware to design life requirements and to the acceptance exposure.

2. The additional tests on MMFS 115 at EK after it has been qualified at GE was questioned. (D. Collins)

3. Consider feasibility of eliminating acoustical qual tests on mission module from a risk stand point. This would result in tests being compatible between the Lab Module and Mission Module. (D. Collins)

4. Evaluate the risk of not having acoustical qual tests on both. (D. Collins)

5. Considering Program Managers decision to minimize electrical checkout capability at Rochester, evaluate the acoustical qual on MMAS hardware only. (J. Kent)

6. Request brief description of qualification and acceptance vibration test conducted on primary mirror or on its installation in the OA structure. (D. Collins) (Action Item #6 - EK)

7. Air Conditioning door should be evaluated for mal-function mode of door staying open. (B. Hohmann)

8. How is the ascent venting qualified for the Lab Module? (J. Kent)

9. Investigate the qualification of the tunnel hatch on LMQTV. (B. Hohmann)

10. What is the mode of transportation from Huntington Beach to VAFB?

11. What is the qualification on the transporter?

12. What is the structural qualification for the lab module structure assembly? (J. Kent)

VEHICLE
ACCEPTANCE
PRODUCTION
FLIGHT, ETC.

A | B | LM (C / d) | MMFS C | MMAS D | E

	GE-RADNOR	EK-ROCHESTER	DAC-HUNTINGTON BEACH
Thermal Vacuum Vehicle Level	c(118) with C (1) (2)	C, D (2)	B, cd (2)
Vibration (3)	C single & random c single & random (shaker) (Powered Exercise) (4)	C, D (Acoustic) (Limited Monitoring?) (AGE & Time)	B, c d Random Power Off (4)
EMC (5)	C, c Critical Points (No D d)	C, D? (AGE Config?) d (Critical Points)	B, C, D, c d (Flt Veh. #3)
Functional Performance	C, c	C, D ? d	(1) c (7) (2) B c d (3) LV
Alignment	C	C, D? (8)	B, C, D
Acceptance Buy-Off	Repeated Data (10)	? (10)	? (10)

Acceptance Testing is t performance to detect discrepancies in workma ship and manufacturing to demonstrate that har ware and/or software me acceptance spec require ments.

ACCEPTANCE

TORB MEETING 15 January 1968

QUESTIONS:

1. The validity of Thermal Acceptance was questioned at GE, Assoc., and DAC. (D. Collins)

2. How is Thermal testing applied at GE, Associate, and Huntington Beach? (J. Kent)

3. What is the validity of Vibration testing? (D. Collins)

4. Disagreement on the vibration shaker approach on MOL size vehicle. (J. Kent)

5. EMC Acceptance Testing should be part of the normal acceptance checkout at all times. (B. Hohmann)

6. GE/EK LM equipments constitute the most significant electrical interface. (J. Kent)

7. Establishes functional compatibility of the LM before the Bird Cage is installed in the shell. (D. Collins)

8. How is acceptance alignment done at EK, GE, and Huntington Beach? (R. Hull)

9. EK should have subaperature tests when FS simulated structure is attached (during full aperature tests) to form baseline for subsequent subaperature tests after FS is attached. (B. Hohmann)

10. Is there repeatable data that can be used as a baseline for tests at VAFB, and can it be looked at again? (R. Hull)