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REPORT OF APOLLO 204 REVIEW BOARD

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

(NASA-TM-X-70218) REPORT OF APOLLO 204 REVIEW BOARD TO THE ADMINISTRATOR. APPENDIX A: BOARD MINUTES (NASA) 121 p [redacted]

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APPENDIX A

(NASA-TM-84101) REPORT OF APOLLO 204 REVIEW BOARD TO THE ADMINISTRATOR. APPENDIX A: BOARD MINUTES (NASA) 121 p

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APOLLO SPACECRAFT

The spacecraft (S/C) consists of a launch escape system (LES) assembly, command module (C/M), service module (S/M), and the spacecraft/lunar module adapter (SLA). The LES assembly provides the means for rapidly separating the C/M from the S/M during pad or suborbital aborts. The C/M forms the spacecraft control center, contains necessary automatic and manual equipment to control and monitor the spacecraft systems, and contains the required equipment for safety and comfort of the crew. The S/M is a cylindrical structure located between the C/M and the SLA. It contains the propulsion systems for attitude and velocity change maneuvers. Most of the consumables used in the mission are stored in the S/M. The SLA is a truncated cone which connects the S/M to the launch vehicle. It also provides the space wherein the lunar module (LM) is carried on lunar missions.

TEST IN PROGRESS AT TIME OF ACCIDENT

Spacecraft 012 was undergoing a "Plugs Out Integrated Test" at the time of the accident on January 27, 1967. Operational Checkout Procedure, designated OCP FO-K-0021-1 applied to this test. Within this report this procedure is often referred to as OCP-0021.

TESTS AND ANALYSES

Results of tests and analyses not complete at the time of publication of this report will be contained in Appendix G, Addenda and Corrigenda.

CONVERSION OF TIME

Throughout this report, time is stated in Greenwich Mean Time (GMT). To convert GMT to Eastern Standard Time (EST), subtract 17 hours. For example, 23:31 GMT converted is 6:31 p.m. EST.

APPENDIX A

BOARD MINUTES

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APPENDIX A

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

APOLLO 204 REVIEW BOARD

February 8, 1967

IN REPLY REFER TO Chairman, Apollo 204 Review Board

TO: DISTRIBUTION

SUBJECT: Transcripts of Review Board Sessions

1. During the first days of the sessions of the Apollo 204 Review Board, the Board heard discussion, suggestions, extemporaneous remarks by Board members, Advisory Group members and technical experts engaged in studies relevant to the review, and accounts, to be verified, from two on-the-scene witnesses and one individual who was observing the monitors in the blockhouse.

2. In the free and open discussion, in many cases the identity of the speakers was not established and the remarks were not clearly related to the subject under discussion. The result is that the transcript of the proceedings of the first days (other than eye witness accounts) is valuable primarily as background material that provides a useful source for identifying potential review action.

3. In view of the foregoing, the minutes of the Review Board meetings on January 28, 29, and 30 will be utilized only as reference material with limited distribution, with the exception of identifiable eye witness accounts which will be appropriately incorporated in the final report.

Floyd L. Thompson

Dr. Floyd L. Thompson

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CHAIRMAN: I want to make a statement regarding procedure. The meeting is now convened. We are having trouble in wording proceedings of this board. One of the main difficulties is the lack of identity of the speakers. We need less conversation and more statements as far as the record is concerned, with identification of the speakers. In certain cases where we do get into a period of discussion, perhaps the best thing to do is to put it off the record and then come back on the record at such time as we reach an understanding that permits progress with the development of a record. If this is going to be embarrassing to the speaker, remember that it is necessary to require identity. The first subject that we're going to deal with this morning is the finishing up of the business we were dealing with last night...relative to procedures for this assembly.

SIMPKINSON: Before I start reading this plan, I would like to say that this was written quite late last evening and I had hoped to bring in a typewritten copy, I will get it, but I am interested in moving on here and I would like to go ahead and read what I have here. There are no copies at this time. Is that all right?

CHAIRMAN: Go ahead.

SIMPKINSON: This is a debris removal plan which encompasses at the board's request a method for removing a couch or the couches. This will be in detailed steps so I will just read it rather fast and if there are any questions, break in.

One of the first things we need is to provide good fixed incandescent lighting within the spacecraft. It is very difficult to see in there now. We don't want flourescent because it is bad for color. We will provide a hand held pre-focused spot which a person can move and get good shadows and good lighting on particular things of interest. Then, if we divide each couch in half and have all interested parties examine the top half of the center seat and pick up one layer of debris and place it in a bag, we would immediately photograph all single significant finds. At the minimum, we would photograph after each layer is uncovered. Interested parties would then inspect each significant find at least once per layer and photograph anything of significance. We will repeat this process until the top half of the center seat is cleaned of loose articles. We will then carefully vacuum the cleaned portion using a clean filter at the business end of a vacuum hose, carefully remove the filter with the debris that is caught, and place it in a bag with the picked-up articles and seal the bag. We would mark it for location such as "center couch, top half." Repeat this with both halves of all three couches until we have each completely picked up, free of loose particles and the seats vacuumed. We will repeat this for the leg supports. This is too detailed...I will just read it. I think it is better this way. Remove one leg support and mark the location. Check the underside for additional debris, inspect and photograph and then remove particles by hand and place in a separate bag for the bottom half of the leg support. If you didn't catch it now, we did the top half and put these in six bags; one for each leg support. We will turn them over and put them in separate bags. Mark that as the bottom part and then, as with the seats, we will inspect and photograph any particles as we uncover layers. They will always be photographed until we get down to the bottom, which we will vacuum and put in with the bag of particles. We will seal these bags using a clean filter each

time. We will repeat this procedure for each of the remaining five leg supports, one at a time. We will then transport all the bags of debris and the leg supports and place them on a prepared floor. I'm not prepared at this time to say exactly how it will be prepared, but it will be on a concrete floor in a building. It is in the Pyrotechnic Installation Building which is not in use at the present time and is practically a white room. It will have clean benches installed if necessary, to work with the debris in the bags. We are going to have a floor that I hope is white, smooth, and new, and has no speckles on it to hide anything we might drop. We started painting it this morning. We are painting a double size bulkhead on the floor.

FAGET: Double scale?

SIMPKINSON: Double scale, right, bulkhead.

FAGET: Do you think that is big enough?

CHAIRMAN: I just made a statement, Max, we're trying to establish a record now that will be intelligible and it requires identification. As I said earlier, I think we are going to have to depend on statements rather than conversation. If you want to say something, get it in the record with identification. Go ahead.

SIMPKINSON: The question from Mr. Faget was, "Do we think that it is big enough." We talked about this and felt that is about as big as we can use in this room. With the time we have available, I think we ought to get started. I believe this will allow us to lay out a pattern on the floor of the office with walk-ways in between. I think double scale – that's a 24 foot circle – is pretty big. Outside of that, we must eventually lay a second circle representing the walls of the spacecraft. I think it is big enough. The building is probably 300 ft. by 100 ft. I can't be specific, I haven't been there for some time. We will lay down the couch material which will be to the side of the circle, a second floor, so to speak. We plan to lay it over to the side with a dash line in the big circle representing where the couches were. Then to the side of this, we will have the debris from the couches placed for inspection, and left in the bags. I feel that we must do something specific with that debris. I don't want to just scatter it out as if it were on the seat again for everybody to look at. I think that we need definite tasks to come up with plans to be approved by you people, to process this debris. Now this means that we have the couches clean and we have the debris laid out under proper control. To go on here, the parts like the leg pans, can be taken out of the bag so people can look them over. They are large parts, and can't be lost or moved. Incidentally, only authorized personnel would be allowed in the area. Now we have clean couches. Our next thought varies somewhat between ourselves, however, I think I have the consensus that "complete inspection will now be made of the bulkhead area." Complete as possible by laying on the couches and leaning over so that overall photos will be taken. Also, specific area close-ups will be taken of areas of interest pointed out by anyone, but most assuredly, those the fire experts would determine. A technician will then be sent in to remove the couches, where they would have to stand on the floor. I know that some people in here would prefer, and I'm one of them, that we didn't have to stand on this floor. But we don't see any way in the world after working it for two days not to have to get on the floor. So we're asking that the technicians point out to us...

CHAIRMAN: Interruption...the Chair. There is a question from Mr. Mathews.

MATHEWS: What do we do to verify the structural integrity of that floor?

SIMPKINSON: Mr. Jeffs has brought in the men who practically melted the metal down to make this thing and I think they will be of great help to us. We have looked at it with the best people we have. We cannot guarantee it. I believe the most important thing we want to look at in here if flame patterns: I could be wrong. Maybe the spread in the pressure shell is more important – exactly how it is split. That is way over to the right and down front (+Y, -Z). I don't think we'll have to get near it. It is in a honeycombed structure. This kind of thing doesn't tear very easily and it only has to move an inch and a half, it is my understanding, and you're standing on a heat shield. So again, I can't guarantee the integrity; however, there is no problem of safety in my opinion. I don't think we'll destroy any evidence that's worthwhile, and I don't know how in the world to get those couches out without getting on the floor. And no one else does at this point. I know it hasn't been answered yet.

CHAIRMAN: Open for questions.

JEFFS: Mr. Chairman, I have a suggestion, and that would be the following: Prior to the couch removal, we consider a quick explanation of the fracture by the fracture experts who are now on site. From two points of view, one from further damage point of view, the other a safety point of view, and that it be carefully monitored and then followed by a floor clean-up and item photography for position recording and identification, prior to moving off with the couch removal TPS.

CHAIRMAN: Were there further questions?

WHITE: White here. I wonder if consideration should be given to some sort of a walkway, suspended from the sill of the hatch and from a solid point on the opposite side of the spacecraft, grill work or something of this sort (other voices) just above the floor!

CHAIRMAN: (Off the record at this point.)

Off the record discussion.

CHAIRMAN: After discussion, a point of decision was reached. I'll turn it over to Dr. Faget to summarize the decision that has been arrived at on the basis of this discussion. Dr. Faget.

FAGET: The disassembly of the vehicle should proceed to the point where the legs, supports, and head supports are removed from the couch, the couch is cleaned up, and at that point a piece of plywood or other suitable cover will be put on top of the couches that remain. At this point, other tasks will be allowed to be carried out within the vehicle.

CHAIRMAN: Is there agreement with that assessment or does anyone wish to make an addition to it?

BAXTER: I assume these other tasks, will be defined and criticized.

SIMPKINSON That is correct, we will come back with a plan.

WHITE: I guess that it is also assumed that this task takes place after the one we discussed last night for removal of the LES.

SIMPKINSON: That is correct.

CHAIRMAN: We will now go off the record for a continuation of a discussion of future plans.

(Off the record discussion.)

CHAIRMAN: After further discussion, a point of agreement was reached which will be summarized by Mr. Geer. Mr. Geer.

GEER: The TPS2, we'll call it, which covers the removal of the dust and bag from the couch and the placement of the plywood on the couch for a matter of ingress-egress, is a basis for TPS2.

SIMPKINSON: Point of order, Mr. Chairman...We had better avoid numbering TPS's as they already have numbers.

(Off the record discussion.)

CHAIRMAN: I will now attempt to summarize the situation just developed by the discussion relating to the planning of further removal of articles from the spacecraft. A plan for removal of couches will go beyond that agreed upon involving the plywood covered couch and will be developed in detail and brought back to the board before action is taken on the removal.

(Off the record discussion.)

CHAIRMAN: In a further discussion with Mr. Simpkinson, it was agreed that further planning for removal of articles from the vicinity of the spacecraft is underway and will be brought back to the board for approval. Also, as regards the disposal or further disposition of certain exhibits, it was agreed that Dr. Van Dolah would work with Dr. Kelly in arranging for the proper action relative to space suits for exhibit purposes. Also, it was agreed with Mr. Simpkinson who said that he would proceed with certain other actions regarding release of impounded objects. These will later be handled through appropriate panels which are not yet formed. Yesterday I received a memorandum for the Apollo 204 Review Board, signed by Dr. Seamans, which constitutes a written authorization and confirmation of the constitution of this board, and the responsibilities that have been assigned to it. Up until now, we've been operating on verbal instructions, directives, and notes. Each member of the board is being furnished a copy of this statement. I call your attention to the change in title from that I gave you earlier stated in the draft left here by Dr. Seamans last Sunday. If you read this document, you will realize, I think, that this board has extremely broad and serious responsibilities. We are concerned with a matter that involves broad public interests to a degree that is not always associated with accident investigations.

DR. LONG: A small point. One of the items from Dr. Seamans' letter says that the final reports will not be released without his approval. I ask only that, or rather I suggest to you, that perhaps you may wish to ask whether that means it will, in fact, be classified because this rather sounds as if it is or likely to be unclassified

and ultimately released after his approval, and it seems to me the question remains of interest to us.

CHAIRMAN: I think that we'll have to fall back on the decision of the Administrator as to how he desires to handle it. That's what this statement says to me and at this time we cannot clarify beyond the statement given here. Just what will happen on that is a matter that will be decided by the Administrator and I certainly am not in a position to go beyond that. I don't know that we will gain anything by discussing that point any further at this time, although we agree that the statement made by Dr. Long is an important one.

YARDLEY: Mr. Chairman. The thing I think that we have to decide right now, especially when we're getting ready to say – print a hundred documents of 20 some odd pages which give some idea of what the board is doing, – is what sort of temporary classification we want to establish for this sort of thing. We have about 100 people involved on these panels and they're going to be generating data. We have to give them some guidance as to what they should put on their data to restrict its distribution. We need a temporary classification of some sort.

CHAIRMAN: We're getting involved in a matter that's not entirely clear as to all the details involved. We're using "treatment as confidential" as a guide to handle material at this time. We need to clarify the detailed procedures involved, but we are not prepared to do it at this time.

(Off the record discussion.)

CHAIRMAN: The Chair is asking for a report from Mr. Williams, regarding the activities of the ad hoc working group that he has headed relative to implementation of the plan for putting into work status all the panels that are proposed by the plan discussed in earlier meetings. I'll ask Mr. Williams to make a report.

WILLIAMS: We have gone over it and corrected several areas, typographical errors and so forth. The plan was completed last night and distributed for review by various people. Corrected sheets are in typing now. Is this correct?

YARDLEY: That's correct.

WILLIAMS: It shouldn't be distributed until we get the special cover that identifies the need for special handling. Who is going to take the action required to devise the special cover?

CHAIRMAN: I will.

(Off the record discussion.)

CHAIRMAN: Relative to the question of the special cover, a discussion just entailed about how to handle all this material in a discreet manner appropriate to the purpose of this entire investigation. The current plan that I think we will agree upon is that a special cover and identification of all material relative to this investigation will be worked out without using the formal classification machinery that is not applicable in this case. I will take on this subject as an action item so that we may release this material as quickly as possible.

(Off the record discussion.)

CHAIRMAN: Discussion resulted in an understanding that the material required would be in hand so as to permit the working group to meet at about 3 o'clock.

We have just learned that there is another reported accident at Brooks Air Force Base in a pressure cabin simulating space operations. Col. Strang will make the the necessary follow up for the board regarding the relationship of that accident to our investigation, as well as taking care of any appropriate action on the other incident he reported.

I would like to ask Mr. Williams to go back to the subject that we interrupted regarding the action of his working group relative to recommendations to the board.

WILLIAMS: We suggested that the group, of which I am chairman, get together and call in the panel chairmen and let the board explain to them and put down on paper a work statement what we expect to come out of their activity and let them in turn go down and get in contact with their panel personnel and start appropriate action.

CHAIRMAN: I am asking for verification. You mean the Chairmen will come before the board?

WILLIAMS: That's correct.

VOICE: Before the board or before the working group?

WILLIAMS: No, not the Review Board, before the working group.

CHAIRMAN: You are referring just to operation of your group.

WILLIAMS: That's right.

CHAIRMAN: Let me ask Mr. Williams. Do you think that the action of your group in preparation of the proposed work statements and the comments that you have just received, puts you in a position to proceed with the implementation of the plan under your group's direction, subject only to some minor corrections from board members that will be taken up with you individually?

WILLIAMS: This is correct. We have a board member as a contact for each panel chairman. If there are changes necessary after we implement this system, then the board members can take it up with the working group.

CHAIRMAN: Does the board agree that we can implement this action by assigning this working group the responsibility for going ahead in accordance with our understanding as was provided by these papers that we have had a chance to review. The consensus is yes.

WILLIAMS: Then I propose that the group that was just appointed meet in my office and we'll set up a meeting with the panel chairmen.

CHAIRMAN: Proceed with that understanding.

WILLIAMS: We'll try to get the board monitors and the panel chairmen together.

FAGET: I think you ought to consider a little bit of time between the time our group meets with these people. It would seem that the panel members ought to have a little time to look at the assignments.

YARDLEY: This is just an introductory meeting.

CHAIRMAN: Let me interrupt again. I think our understanding is good enough so that we can consider this issue closed at this point and turn over to the custody of this group for action all these and other matters that can be taken up privately until we reach the stage where the board needs to consider the whole thing again.

(Off the record discussion.)

CHAIRMAN: In summation of the results of the foregoing discussion, Mr. Yardley will make a statement regarding an additional panel that is being put into the action plan. Mr. Yardley.

YARDLEY: We have added Panel #20 which is entitled "Safety of Investigation Operations," with the task of taking the responsibility for reviewing all operations performed during the investigation to assure that all personnel safety requirements are adequately maintained. John Atkins of KSC is Chairman. Lt. Col. Baxter is proposed as the board monitor.

CHAIRMAN: The board agrees with the addition of this panel. The board now plans to adjourn. I am going to ask the members to make themselves available for a possible meet- at some other time today and I would like to at this time establish the time. I'll go off the record for a moment.

(Off the record discussion.)

CHAIRMAN: We will now adjourn until 3:30 this afternoon.

SECOND SESSION:

CHAIR: The system spacecraft data work that is going on is under the direction of Dr. Joe Shea. Presentation will be by Mr. Abbey, but first of all, let me call your attention to the sheet of paper that our secretary has up there, which is the means by which this work will be designated, at least to start off with. Read the title please.

SWIEDA: "For the Use of Apollo 204 Board Investigation Only."

CHAIRMAN: Thank you. Do you want to say anything further on it?

We have a substantial quantity that will be available in the secretary pool area and I will distribute these here.

Could I ask a question of the secretary? What progress are you making in getting transcripts of some of the witness statements and so on? I think a number of us are beginning to feel a little rusty that we haven't seen some of these things to go over firsthand.

SWIEDA: At the present time I believe we have a 20-hour lag in transcription. We have all of Saturday's and Sunday's transcribed at this point. I am not certain about the status of Monday's events.

CHAIRMAN: And distribution lags the transcription by how much?

SWIEDA: The distribution of this material...the mode for this distribution has not been developed yet. A procedure is in process now and will be presented to the chairman today or early tomorrow morning.

YARDLEY: It might be appropriate to tell everybody when they are going to get the printed copies of this task definition. I think we have a little slip in that, haven't we?

CHAIRMAN: We are on the record now. Do you want to report on the status of that?

SWIEDA: I can report on that, sir. We are in the process. We got a lot of material typed. It is ready to go to the printing plant and with your approval, we will do this... send it over to the printing plant and have it ready in the morning. We have to print up some 4000 sheets of paper, collate them, and staple them together.

WILLIAMS: We have some changes to make in some of the names. Are you typing the mats now?

SWIEDA: The mats have been completed.

WILLIAMS: Have you started printing it?

SWIEDA: No sir.

WILLIAMS: Well, we would like to hold the mats. As we reviewed each one of these panels, there were some name changes.

YARDLEY: Can you get that in so they can go ahead with it?

CHAIRMAN: If we are going to get in a discussion of this matter, let's go off the record.

(Off the record discussion.)

CHAIRMAN: The work statements will be signed out for printing very shortly after the meeting. We asked Dr. Joe Shea, Director, Apollo Spacecraft Program Office, here...to present his discussion of a program that we have under way.

SHEA: Perhaps it would be of interest to the board to do two things. I will try to do it very quickly. One is to tell you what we are doing in the overall program, in effect, independent of this investigation and problem; and secondly, the things that we are doing specifically associated with this investigation here, and some of the actions that we have taken to hopefully make the problem of the board a bit simpler in terms of the availability of information and things like that. I would like to preface the first part of the discussion by saying that we have a very large program which is in existence. We've got 150,000 people all over the country that up until last Friday at 6:30 worked on going to the moon. We can't send them all on vacation. We can't stop the program. And, we are worried about this mass confusion in the overall organization. So we have had them make a series of programmatic decisions as to what we intend to do. Obviously, the board recommendations can change this plan but let me tell you what we are doing now so that if you hear anything coming back you will understand. We have had a series of missions planned. The next missions which were coming up in sequence. The

mission called 501 which was a Block 1 command service module unmanned flight on top of the Saturn V. It was intended to be a heat shield test primarily. It's the time when we were going to qualify the heat shield at lunar return speed. We really see no inter-action of the problem that we have here with that activity except possible for the method of closing out the unmanned spacecraft. That spacecraft is stored down at the VAB at the present time and we said go ahead with that and get ready to fly that mission in 2nd Quarter 1967. The first of the lunar modules which was also intended to be an unmanned mission is in the latter stages of checkout at Grumman. It was intended to fly on Saturn IB-206. It would be again an unmanned mission. Its primary purpose was not to test environmental systems but rather to test things related to the propulsion system and what we considered up to that time to be the safety of flight items. We are delivering the spacecraft. We would expect to bring it down here. We would expect to start the checkout process down here with a target date of that mission by 2nd Quarter 1967. Now the first perturbation in the program plan comes with the next scheduled mission. It was to be a mission called 258 and was going to be the first of the manned Block II command service modules and a LEM lunar module. The mission involved launching the CSM into earth orbit, launching the LEM on the second one, joining the two of them together. The CSM comes in to rendezvous and then going on with simulation for the lunar mission. We feel that in light of the fact that we have not achieved the 204 objectives and because the dual mission is a somewhat complex mission, we can't imagine coming back without a tremendous reconcentration on this first flight -- that that next mission will be a CSM mission only. The only spacecraft we have to do it on that we think makes any sense at all is the first Block I spacecraft called 101. Excuse me, Block II spacecraft the number is 101 and it's in checkout at Downey and is presently due to be delivered around the end of March and we always have uncertainty in our delivery dates so that might stretch out to be sometime in April. We have not introduced any changes at the present time under the checkout procedure or into the spacecraft. We would expect obviously to have to contain any design changes in the overall system but we are still targeting at this point in time for a launch of that spacecraft around the first part of August. Whether that happens or not of course there's a lot of things behind this. There is one more Block I spacecraft and that's to get delivered out of Downey. That's the spacecraft for 502. It's also an unmanned version 502 being a repeat mission of 501. We are proceeding with that.

The first combined mission and if this turns out to be the program plan, would occur some ten weeks after this 101 mission and that would be the 102 spacecraft and LEM 2 and whether that flies on Saturn V or a dual launch on Saturn IB really is a function of when we fly it and where the Saturn V is at that point in time since it's been having some difficulties. This then is an operating plan which represents essentially no perturbation in activities that are going on at the present time. In addition, we got two ground test spacecraft, a thermo-vacuum spacecraft, 2TV-1, a command service module that goes into one of our chambers at Houston. A second spacecraft LEM test article which goes into another chamber at Houston. We are proceeding with those with the intent of getting them into the Chamber in the unmanned and manned altitude testing essentially on the schedules we had before. In addition, we are doing things like reconfiguring the Mission Control Center all the block II's and LEM's – and the trainer down here for example, which had been held in the Block I configuration because of the mission that we were doing – we need to get the scheduled time for the conversion to Block II so we are in the process of breaking that down and converting it to

Block II. So, my point is, the program is going on as usual. Whatever comes out of here and I think that's just what we have to do. We talked to our people in Houston and told them this and told them that we don't want them to do too much volunteering and going off by themselves but to compensate for the problem, we and the board have. We have a series of directed actions going on and we'll tell them anything that needs to get done. Similarly, we are calling in all the contractors Friday at Houston to give them a similar briefing. To tell them at least right now that the program continues and they have no contractual authorization to do anything but what they were supposed to do as of last week and to keep stability on the overall program. I guess I can't emphasize the importance I feel for ultimately getting to the moon. Alright, now let me talk more specifically about things associated with the boards activities and the kind of staff we think can be helpful. We have directed that Spacecraft 14, which is a sister spacecraft to 12, be brought here, because at one time in the program, we had two spacecraft flights of block one that were essentially the same. One was going to be 204 and the other 205. For a number of reasons, we cancelled the 205 flight just before the spacecraft was to have been delivered. Three days from delivery, we had to use the service module for something else, but the command module was built. Later the command module was put in bonded storage. There were minor configurational differences, but extremely minor, in the context of what we are talking about here between those spacecraft. There always are in an involving problem. Rather than try to bring 14 up to the 12 configuration, a lot of people fooling around with it at Downey and so on, we said, "Ship the spacecraft down here; bring with it the configurational records so we can identify differences." And our suggestion is, and I believe this may have been accepted already, that any work done inside 12 – dissasembly, taking things apart, and so on – be done first by the technicians in 14, so that you completely review in 14 every tool you are going to use, every step that is going to be done. If they are going to remove a panel, they remove that panel in there, have them look in, have them understand it. Take pictures in 14, so you are working from a data basis before you go playing around with the evidence upstairs. We would request that you stop short of burning the cables, or scraping wire, or that sort of thing. But I think this will be a tremendously valuable tool, because even if you are talking about trained technicians, they have never been inside that spacecraft down here enough to really know what the guts of it look like. Because, hopefully, we haven't had to get in there all that often.

WILLAIMS: Is that true of removing the seats of 12?

SHEA: I think not. I think that is a sufficiently straightforward operation that we all understand, and I think it's more of a question...

VOICE: And a different configuration somewhat relative to the results of the fire.

SHEA: Well, the fire completely changed the configuration in and around the seat area.

(Off the record discussion.)

CHAIRMAN: The discussion involved the question as to the influence the accident has had on procedures that are planned for the future, so Dr. Shea will now give a statement that answers that question. Dr. Shea.

SHEA: As nearly as we can see, the area of procedure that would be affected by the

accident relates to the operation of the spacecraft cabin in a pure oxygen environment either at 5 psi or at ambient pressure. Because of that concern, we have issued instructions to our contractors to do no such testing either in spacecraft checkout operations, spacecraft test operations or any of our breadboard and subsystem operations throughout the entire program. At this point in time, that direction is not holding up anything on the program, as far as the in-line production spacecraft is concerned. It is slowing down a few qualification tests which are not critical in line of scheduling and in light of the magnitude of the problem that we face.

CHAIRMAN: Thank you.

SHEA: I talked about Spacecraft 14. We have in Houston, another spacecraft called 008 which was used in the thermo vacuum testing at Houston. We have pulled it out of the thermo vacuum chamber but had made arrangements for that spacecraft to be in electrical configuration and probably powered up during the 204 mission. There are again some minor configurational differences between that spacecraft and Spacecraft 12. In addition, the environmental control system had been removed from that spacecraft and put into our environmental control system breadboard in chambers in the crew systems division at Houston. We have brought Spacecraft 8 on line, or will have it on line, within the next couple of days; and it is the place in which we can do electrical testing of systems in order to investigate problems. And we just point out that this is a facility, then, which is available. If you want to know if touching a particular wire to a particular point will cause a particular phenomenon, we believe that that can be reproduced with almost complete fidelity in that 8 spacecraft, and we are doing some tests of that kind ourselves.

This is a facility available to the board for additional investigation. This is also, then, the environmental control system breadboard which I mentioned, which is at Houston, and it is a configuration available for any testing that may be appropriate, as far as the environmental control system itself is concerned. We have, as you know, an extensive materials program going and also a series of special tests on possible, I'd say, non-electrical related causes of the failure. That's being run at Houston under the control of Mr. Joseph Kotawchik who heads the structures and mechanics division at Houston. The materials investigation, by and large, has been directed by the board, and we are also looking at some experiments in spontaneous combustion electrostatic discharge phenomena. We also have had for some time a zero G airplane series of experiments on combustion phenomena at zero G as distinct from 5 psi (corrected) or from 16 psi, and that's going to be very important, as you decide what the risks are upstairs. These would be the risks on the ground. These are two different problems. That program...

(Interrupted by a question)

CHAIRMAN: Is there a question?

YARDLEY: The question was – I wanted a clarification of whether the zero G tests were zero G and 5 psi as opposed to the ground test of one G and 16.

SHEA: That is what we have been running. We can modify the experiment to any atmosphere and pressure at zero G. One other thing that we are doing which may or

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may not be a help – that is we are doing it partially for ourselves and partially for the board. We are trying to take one of our mock-ups which is now a non-flight type spacecraft and put into it, or be sure it is up-to-date with all of the material locations which might be involved in flame and flame transmission. I would picture that we finally would be able to tag that with things like nominal combustion temperatures, propagation rates, with the materials and so on. And this would be a kind of a tool that the flame propagation people, the rest of the board, could have as a visual mock-up of what the thing was as you begin to piece this together. I have given an assignment to one of my people to bring this into being. I don't know how soon we will have it, but it will go now.

(Interrupted by a question)

CHAIRMAN: Identify yourself please.

PHILLIPS: Sam Phillips. Are you setting that up in Houston?

SHEA: I can't give you the location yet. We'll set it up wherever it is convenient to get it done; and it will be a command module mock-up, so it will be transportable. One of your problems here is that your nominal drawings, your nominal spacecraft configuration, I think, involved primarily the stuff that is tied in, in the as-designed condition. There is more dynamism in the stowage, particularly in a test like the one we are running up there where you were not in a final stowage configuration. So what we are going to try to do is get this mock-up into the configuration as we assume it was or as we can document it was in this test, and this is different from anything you will see on any individual drawing. We are bringing down for the Board's help as much visual material as we can about the spacecraft itself. Many of you are familiar with it, some of you aren't, so we have a set of transparencies for examples which is a mult-layered sheet of drawings of both the command module and service module which you can strip off the various layers and be able to look at it in depth, and get a feel for what the spacecraft is like. In addition, I have a mockup in my office that's about this big, and this is high, which can also be similarly disassembled, and it's not going to be anything like a one-to-one representation of the spacecraft. But if you want to get a feel for what the inter-structure is and how the heat shield goes on and what is in the service module and all that kind of stuff, this is a pretty good way of getting a first whack at education on what the system is. We will also send down the instructional books and our manuals, and this type of thing, so there is as much sort of background data, descriptive data available as we think we will be using. We are going back through all of the files at Houston.

LONG: Let me just check if I got that for sure. Are you going to attempt in this mock-up to ultimately duplicate as much as you can in the spacecraft?

SHEA: I've discussed, Dr. Long, two mock-ups. One is just a – a sort of – it's the big kid's model of the spacecraft, except it's valuable. In the earlier one, we are going to duplicate, full scale, the interior of the cabin, all of the materials that may be pertinent to the flame problem, in the configuration we believe the spacecraft was at the time of the incident. I should mention that, in addition to all of these things, we would expect to ultimately reproduce the entire incident – probably in a flame mock-up that we have at Houston. We have a boiler plate of the spacecraft with which we can do complete flame studies. We can outfit it with the things we think are pertinent and reproduce the phenomena in a mock-up at

Houston, and I think that would be one of the certifications that would finally demonstrate that we knew what happened for sure. We are going to collect data at Houston, not now so much related to the. – let's say the data files of the spacecraft and the kind of things that you have already got going in your various panels, but there is a long history of why we were doing what we were doing. It involves decisions that go back to the first time the Mercury Program was laid down. These things have been looked at, discussed, reviewed, second guessed, re-reviewed through a period of about six or seven years, longer than that, and so we're doing a complete data search of our files on everything related to pure oxygen, to purging on the ground, to flammability, hatches, questions of escape, couches, suits, emergency procedures. Again, we're to get that file available because that's kind of the background of when you go into – how come it was that way, and what were the traits that you thought were important coming up to this point in time. We're also doing things like PASC reviews and all that sort of stuff to be sure that everything that anybody's ever said about it is in the file, and that, we'll then organize those files ourselves and any of that information that is obviously available to the Board. As far as design is concerned, we have started a series of design review activities under the control of the Program Office and the Engineering Development people at Houston. These will be tied in to the design review board or design review panel that you've already constituted, but we've got these started over the weekend. The first and probably most obvious is to re-look at the question of the pure oxygen purge on the pad. I don't know how many of you realize why we were doing that, – it's primarily a medical requirement that the crew be completely de-nitrogenated before they go into orbit in order to prevent any possibility of the "bends", nitrogen bubbles coming out of the blood, after you get up there. It turns out that at one time back in the Mercury Program, very early before any flight, the cabin was not so purged -- the guys were just in the pure oxygen suit loop and there developed a leak between the ambient air cabin and the suit loop and the leak interacted in such a way that the guy was consuming oxygen, and the lithium hydroxide cannisters were removing the CO_2, and the concentration of nitrogen was just developing and increasing, and test subject passed out very gradually and very gently but we knew it. He didn't die but that was one of the earlier traumatic instances in the program, and from there on it has been a standard procedure to purge at 16 PSI. I would point out that that would represent a specific, a kind of general reaction to a specific problem. I think one of our difficulties as we review this entire process is going to be what are our general reactions to this specific problems and we've got to have a continuing balance of trades, we've got to know what the risks are when we change and these design reviews are intended to emphasize not just what the design impact is, but what the entire "risk balance" is to the best of our understanding. Because it's kind of in the real world anytime you jump from one thing to something else, you're buying a set of problems that may take you six or seven, eight or ten years to find. All right, in addition to examining the pure O_2 purge, we're also examining the hatch, the questions of hatch design and escape and so on. As you probably know, the Block I hatch has been considered not proper for EVA, and we had a new hatch designed in Block II after we had reviewed the EVA procedures in Block II. We had already had for about six or eight weeks, a Block II re-review going because the program has not been satisfied with the hatch or with the couch arrangements and struts or that type of thing. We're intensifying that effort and that's part of the feed-in here associated with redesign. We're obviously re-examining materials criteria and the impact of re-designing materials or changing materials of cabins, and we are examining that impact of the two gas system introducted at this stage and to the overall program.

In addition to all of those things, I formed a committee out of Houston; it may or may not be something the Board is interested in, but the communications actually all during that day, and you've heard some of the tapes and so on, and communications left a fair amount to be desired. We've set up a committee to examine the entire communication problem. We had had some troubles in the spacecraft. We had thought the spacecraft troubles were solved; the tapes are very noisy and we're going to go through the entire communication system down here to see if we can understand where the transmissions got bad, and I don't think, again, this had anything to do with the accident, but it really, it's partially a clean-up that we have to do anyhow, but partially we need to understand this. There were for the Board's information, which you probably know, records taken at Mission Control. Those records had, for a while been impounded. I asked yesterday that we at least go through the same process there that we've been going through here, which is to take that data and reconcile it. There are some differences in the data, as at least initially analyzed from the records. We've tried to examine all the data here, and be sure that what we were doing was right, and it's one of those funny things where the mission control data bears, in certain instances, a very strong family resemblance to the data here, but then every once in awhile it's a different event in there. And we're going through a major review of those data and a reconciliation of those data with what we see here. Most of us feel that the problem is really one of the distance between here and there and the methods of data processing used over there and so on. But we want to leave no possibility for an anomaly measured someplace and not a second place.

LONG: This is Long. Question! Are there any other places besides these two where significant bits of data were accumulated in real time that might also need reconciliation?

SHEA: There is, of course, the data recorder at Goddard, and I think that's already been brought into the, – over – at least the Goddard station down here, I believe that's already been taken into the loop. There may be some recorded at North American, I don't know for sure. But we will check that sir, and see.

BAXTER: Question. You say that we are going through the data! Is this here now? Has this all been involved with the central data bank?

SHEA: It's not been in here, I've asked..., the Mission Control people at Houston are doing the data processing at the present time. The computers over there are set up to do it and so on. We'll bring the data down here when the Board desires. I think it really should be processed at home there, because that's the place that knows it best just as we've left essentially all the data here for processing because this is the place that knows it best. An independent check! It may do absolutely nothing but I've got an individual assigned to make the reconciliation between the data and determine if there's anything significant there or not. Lastly, we are generating at Houston a PAO plan. Some of you have been involved with the program and you know what the publicity pressure is like, others, I think, are going to be a little bit surprised by the amplification of the inconsequentials that's associated with the program at the time that, particularly, where there's an information vacuum, and the Board is intended, I think, to control the release of all information. We're trying to give you at least the ability to tap our background of experience here, and what the reporters are like and what they might resonate on and what they might not resonate on. And we will have a way of making that available to the Board as well. Lastly, I've moved down here and

will stay here to be available to the Board for either specific actions or if you want to talk about the background of whatever we know about something and so on and if I don't know it, I think I know who does know it, so that over and above the activity going on in the panels, if there's anything I can do for any of you, I'll be around.

LONG: Question. One small point. You mentioned that you were putting together in very complete fashion, the record of flammability studies, experiments, and so on, as they bore on development of decisions the development of this spacecraft, and that these records would be at Houston. Is there a mechanism whereby somewhat similar to some thing Baxter mentioned a moment ago, we could automatically have it understood that these will be made available in duplicate here?

SHEA: Yes sir, there I'd suggest that you give us time to complete the assembly and a kind of bibliography of this thing, because you know what government files are like, they just go on and on. We need to get this stuff pulled out; we need to understand it, and then, about all we are doing is collating now, and then the process of synthesizing from that, the description of what really went on is the process that we will make all the information available to the Board and any file material can be brought down here.

LONG: Question. Are you implicitly suggesting that it might be a good thing if you supplied with some of these large files a librarian to work with us to..?

SHEA: I believe we probably need a librarian, we probably need a language translator, and we probably need somebody who is at least familiar with some of the things that never get written down on paper but are part of the background of why these things happen. I think it is important none of us are trying to be protective or anything but there is just so much that never gets explicitly written down that I think you ought to, as you read things and so on, have somebody available to answer questions and explain. We will try to have such people available if that is what the Board decides.

CHAIRMAN: Thank you, Dr. Shea. Are you proposing a question, Mr. Faget, – you are still on the record now.

FAGET: This is in the form of a remark which I would like put on the record. The story Dr. Shea told about Mercury he got from me and it is wrong in one slight detail because I told it to him wrongly and that was that the introduction of nitrogen into the suit was through a GSE piece of equipment and that analysis showed that it could just as well have been introduced in the cabin and that is the only detail of the story that was wrong.

SHEA: I didn't check the data source.

CHAIRMAN: I want to make an observation relative to the impact of the questions and answers between Dr. Long and Dr. Shea. I have asked the Secretariat to follow up on this matter of assembly of material and in a form that people can make use of here on sort of a library basis. This may require some implementation to carry out the intentions of that discussion and may require action here. Question?

BAXTER: I might suggest that we have done this, the Air Force has done this on other programs as when you have an area of very technical investigation by a particular

Center or group you might ask that they come in with a summary rather than all of their files and work, and tell you what they have found out. It's just a suggestion.

CHAIRMAN: This seems to finish this part of our agenda for this afternoon. I would like to go off the record at this moment.

(Off the Record Discussion)

CHAIRMAN: The next item to be reported on will be the status of the work at the pad relative to the removal plan that was discussed early this morning. Mr. Simpkinson will report on it.

SIMPKINSON: By way of explanation for the change in this, I would like to offer that we are faced with operations we haven't performed before and the planning is proceeding, we are being very cautious in our planning – I think this is the wise way to go. In order to be safe out there, which we certainly want to do, we had certain operations to go through and those were reported earlier. The schedule which now has come out which is tentative and hopefully meaningful, is that we will have the hatch cleaned. I'll explain that there is some debris that got into the little latch mechanisms. We will clean up the hatch by 6:00 p.m. This is some debris that we have checked with the fire people and they have seen the hatch. It got in there in the ensuing days and we are bagging it and holding it. We are going to have the hatch installed by 7:00 p.m. We will have the white room disconnected by 9:00 p.m. We are presently building stands to get to the LES which we do not have. A plan is being put together right now which will be ready at the same time of 9:00 p.m. tonight, by TPS, to move certain equipment to put these stands in bolt holes that exist on the thing. We have got to do this to get to it. I plan to come back to the Board with that TPS before we move any of this GSE. Some of it is connected to the spacecraft. We may have to change our plans again if the Board does not concur with this. If we continue and the Board agrees with our moving plan, we get the stands up, we will have the boost cover off by midnight. We plan to have two hours of photography because this is a new area and it takes quite a while to cover that size, to get all of the flame patterns damage, and so on and we plan two hours for photography. Of course, photography will be taken throughout the operation. The stands that we have built will then be installed by 4:00 a.m. We'll set up the stands, prepare the LES for removal. We raise and hoist it by 7:00 a.m. tomorrow morning. We will have the launch escape system off by 1:00 p.m. tomorrow. We will have the forward heat shield off then by 9:00 p.m. and by way of explanation this takes chipping out a lot of hard epoxy to the hex holes in top of hex bolts in order to wrench them – many of them. Then by 7:00 a.m. the following morning we will have all the pyros shorted. We are then ready to remove the debris from the couches as discussed earlier. We will be in a configuration to allow the first entry on the clean couches for a look at the structure and the heat patterns and the systems by 7:00 a.m., Thursday morning. That, Mr. Chairman, is our present schedule which I have a lot of faith in that we can meet.

CHAIRMAN: Thank you. Other comments? I'll ask Mr. Donnelly, I think you want to say something about the work. Did you want to make some statement.

DONNELLY: No, I want you to make a statement, Dr. Thompson, that you have directed us to take the ordnance off the launch vehicle because that is the first configuration

change they have made to the launch pad and vehicle since the accident.

CHAIRMAN: I don't know whether they heard that but I directed Mr. Donnelly to comply with the requirements and proceed with the removal of the ordnance from the launch vehicle. That accounts for part of the delay in this program. There are several other factors involved. In accordance with our request, Dr. Shea has prepared for consideration the draft of a statement that intends to express our intentions for a policy that will be the basis for implementation of a plan for control of data and documents.

SHEA: This is a policy for the control of data and documents relative to the AS-204 Review. Original copies of all specifications, inspection data, test procedures, test data drawings, etc. Relative to all parts, sub-systems, modules, in space vehicle AS-204 and associated GSE shall be impounded. Access to these data, shall not be restricted for normal program uses. Original copies of all inspection data, test procedures, test data, tapes, etc., relative to AS-204 and associated GSE from 0600, January 27, 1967, on, no matter where recorded, as well as all duplicates of such data shall be impounded. Access to such data, or duplicates of such data, will be restricted to authorized personnel associated with the AS-204 Review Board. For purposes of this instruction, impounding means assuring security of such data from alteration or destruction. No release of any information of this type to public sources shall be made without specific approval of the Review Board.

CHAIRMAN: The intention of this proposed action is to establish a procedure that will allow work to progress wherein it is now hampered by the general impoundment of all material, records, and data that pertains to this vehicle. We are confronted with the necessity for a policy that will permit work to progress in an orderly manner. I would like to ask the Board members whether or not having heard the statement do they consider this is an adequate statement of policy to guide the implementation of action under task 15.

(Off the Record Discussion)

CHAIRMAN: Does anyone have any further comments, or should we proceed? I hear no one objecting to this. I think that we should adopt this as a policy statement for guidance, and I would like to ask that the Secretary prepare a sheet report on that for each member of the Board for tomorrow, so we can have another look at it and see if tomorrow it looks as good as it does today, so that we don't have to modify it. It is possible that, further consideration of it, we will have to find some amendment necessary. This meeting will now adjourn subject to reconvening tomorrow at noon. I want to restrict this meeting to just the Board members. That meeting will be at 12:00.

The meeting is adjourned.

CHAIRMAN: At this point I would like to distribute to the membership a statement concerning policy for control and release of documents. The title of this release is Policy of Control of Data Documents Relative to AS-204 Review. We will have, in accordance with our plans as of yesterday, a report at this time on working progress on the pad. The report was prepared under cognizance of Mr. Faget who will ask for appropriate members to make their report. In the Executive Session this morning, it was agreed that a suitable format which we will follow for operations of this Board, will require a progress statement each morning that will bring the board up to date on activities of the previous time period. Also, it was agreed that there will be an Executive Session of the Board at 4:00 p.m. each day. We will try to formulate activities around those two basic elements of agenda planning for meetings of this Board. I would now like to ask Max Faget to start off with the report of progress for this morning's session by either presenting himself or by appropriate speakers for such a report.

FAGET: This morning's report will follow a form that we think we will continue with if it proves practical. It consists of three parts, the first will be the scheduled activity accomplished in pad 34 area, and other areas having to do with the disassembly of the spacecraft, and the investigation of the actual article. We will also review the anticipated scheduled and authorized scheduled activity that will take place during the next twenty-four hours. The second part will consist of a number of items that need Board approval in carrying out future activity on pad 34, and other locations in this investigation. The third part of the report will consist of the progress that has been made in analysis and in anticipated work that will be carried out in the conceivable future. Mr. Simpkinson will give us the status at the pad.

SIMPKINSON: Essentially we are on the schedule that was recorded yesterday at noon but I have provided 15 copies of this schedule which was completed yesterday on one phase and where we are today. For your information, we are presently removing the Launch Escape System, and plan to be through essentially on this schedule and continue on it the rest of the day until 7:00 in the morning as reported, when we would be ready to go into the spacecraft and perform the TPS according to the plan agreed to yesterday. This TPS will be ready for approval at 3:00 this afternoon by the Board, and we will have to arrange some schedule for this Board to agree to it. As per schedule, we spent about two hours with a number of members and the advisors to the Board, particularly the fire propagation advisors. We had a very good look at it last night. We may have gained quite a bit by looking at that. Other than that, we have nothing new to report. We have a couple of problems that need Board attention in particular. We have here antenna hats which were on the opposite side of the hatch which we need to remove in the next hour, or we will be holding up work. This is a scimitar which is a combination S-band. VHF hat used to pull off the signal not normally on the spacecraft in flight, it is nearly always on for test, it has no hard connection to to the spacecraft, it is taped on, and has a coax cable connected to it for purposes of signal take off. We have decided that proper photographs be taken, proper inspection, proper photographs after removal. We would like to set it aside. This would require no disconnection of connectors we feel that are not in our realm, because of C-band may be a suspect here. We would like a decision from the Board, almost immediately, on whether we can go ahead with the plan I just gave you. Remove it and set it aside with the proper photographic inspection coverage.

CHAIRMAN: I would like to interrupt at this point, and ask Dr. Van Dolah whether he has any comments on the inspection that was made last night. For the information of the Board members here who do not already know it, the status of Dr. Long and that of Dr. Van Dolah has changed. Dr. Long has become a consultant to the Board because he is unable to spend the time required as a Board member, in view of his duties at Cornell. Dr. Van Dolah has now been assigned the position of membership on the Board, and I would like to ask him at this time if he has any comments that he ought to make or wishes to make regarding the observations made last night.

VAN DOLAH: Yes, as was already noted in the statements, a number of us, all of those associated with the origin and propagation of the fire visited the spacecraft and spent about two hours examining it after the boost protective cover on one side had been removed, and after the air supply duct has been removed from the opposite side. We were able to see quite a lot that was impossible to see previously, and were able to gain considerable insight into the nature of the fire. This is all very preliminary and much more needs to be done.

SIMPKINSON: I have the daily schedules and pad progress report. I have one more item I would like to place in the record and get a decision from the Board at your convenience. We have a problem in that our special TPS written for this work has been misconstrued by some to be necessary to work on hardware that is associated with Spacecraft 012, but was never on it, and has been impounded. We would like a decision some time during the day so that we can complete and pass out our ground reules of operation within our pad complex work, and how we can control this work with TPS's. We need a decision as to what hardware should be under our control. We have this suggestion. All hardware, both spacecraft and GSE facilities that is now attached or has been connected or installed at any time since initiation of testing of the spacecraft at KSC. This is about the time you will recall, that we should do our altitude chamber run here. All other hardware would return to normal control by standard Apollo operating procedures that are in existence. We would like the decision sometime today, so that we can get our ground rules out to many of the people, inspectors, and so on. It is very difficult holding meetings and every time we change shifts to give temporary ground rules out. Could we do this sometime today.

(Off the record discussion.)

CHAIRMAN: It is clear from the question with which we were just presented and the ensuing discussion that we are confronted with an unresolved problem of retaining proper supervision and control of these operations while at the same time, allowing work to progress in an orderly and expeditious manner. I would like to ask Max Faget for a comment on that.

FAGET: We will give this problem some consideration because it has a lot of implications and prepare a procedure that will bring here in written form for discussion by the Board, which I think will take care of all this concerned.

CHAIRMAN: Thank you. Max Faget is now going to continue with his presentation of a progress report.

FAGET: Next we would like to ask Dr. Lanzkron who has been receiving the various requests for work out on the pad and other places that have come under the control

FAGET: of this Board to speak. He is going to make some specific recommendations on what should be done in the future.

LANZKRON: I basically handed out a list of items that require attention of the Board. It falls into two categories: those that directly affect the spacecraft, and those that do not affect the spacecraft. I will cover first the items that do not affect the spacecraft. We would like to remove from the pad to the MSOB the Beckman gas analyzer is not connected to the spacecraft at this point. It was used to check the gases in the spacecraft. We would like to move on this very fast, because probably most of the gas has escaped out of the analyzer. We would like to take it to the lab for immediate analysis. We would like to remove this item #1.

JEFFS: Interruption. I presume Rolf and you also intend, of course, to calibrate the analyzer.

LANZKRON: Yes. There will be a detailed TPS written on how to handle the evaluation of this data and how to control it. But we need immediate allowances to remove the hardware from the pad to the laboratory for analysis.

VAN DOLAH: Physically, where is it now?

(Off the record discussion.)

CHAIRMAN: The discussion of Item #1 has led to the conclusion that the Board should insist that in analysis we are assured that outside organizations are involved and in the certification of the processes involved in this analysis. This is in line with a policy that was agreed upon in the Executive Session this morning to insure that the Board is properly monitoring the action. I am asking Mr. Geer to assume the responsibility for the Board of monitoring the action on the analysis in a manner that conforms with this policy.

LANZKRON: Item #2. Remove samples from the different K bottles - which are the bottles which contain the oxygen - and the test set-up, for the same kind of analysis.

CHAIRMAN: The Board requires that the comment made relative to Item #1 apply also to Item #2. So, proceed with the discussion or with the presentation of the plan.

LANZKRON: Item #3. The removal of the signal generator from a piece of GSE. This specific piece of GSE is a piece of communication GSE, which is used to receive data from the spacecraft during transmission. It is not used as the primary mode of reception; it is that reception which is used here in this building only. It is not used as part of the GOSS net, which is used as an official form of communication from the spacecraft. The signal generator, let us say, remove from the impounded condition it is in, in the GSE C-14-442 as a complete unit.

WILLIAMS: Can we get the advisability of this from communications experts when they arrive? I think this is under the same thing . . .

CHAIRMAN: A few minutes ago, we had an unresolved item that needs to be cleared up for action at the Pad regarding the C-band antenna coupler and we deferred action on that until we had some expert advice on that from someone who is to be brought here. I understand that the gentleman is here now, and will resume the discus-

CHAIRMAN: sion of that item based on the presentation or respond to questions. Are you prepared to make a statement on that or just respond to questions. I don't have your name. . .

STELGES: Bill Stelges.

CHAIRMAN: Are you prepared to respond to questions or make a presentation?

STELGES: I understand the question is whether it is acceptable for us to remove the antenna hat off the coupler.

(Off the record discussion.)

CHAIRMAN: On the basis of the discussion, that is the clarification obtained from it, the Board approves the action to proceed with the removal plan for the C-band antenna coupler.

SIMPKINSON: Does this give us permission then, Mr. Chairman, to remove the VHF antenna hat which they have already stated is not a problem. We have had no known anomalies in the C-band as well as the scimitar.

CHAIRMAN: We are still on the record here. Is there any reason to interpret this request otherwise than for both, for the removal of both antenna hats? (pause) This does approve the removal of both antenna hats. The discussion of the proposal for Item #3 has brought out the need for much broader action to release equipment from its impounded state. In taking this action, the Board also will ask Mr. Williams to take the necessary action to bring before the Board a plan for broadening the scope of the requested approval to include the many other items that ought to be examined to permit the orderly release of impounded equipment. So, if Mr. Williams will take into his area of responsibility, we will await a report from him at some future date.

WHITE: Mr. Chairman, I think we should also add to that statement the requirement that we record the configuration of the communications GSE in the MSOB before it is removed from impoundment.

CHAIRMAN: Very good. We will continue with the tests, or with discussion of the tests to be done, or hardware to be removed by Dr. Lanzkron.

LANZKRON: Item #4. On the SLO platform verify storage of GN GSE Cable S. You remember the meeting of two nights ago it was discussed that it's not coherent that the GSE cable was removed from the spacecraft. The cable in the spacecraft which was seen visually was not the GSE cable - we have been able to identify that much. But we want to assure ourselves that the cable was removed and is stored right now in a specific area stated.

CHAIRMAN: Is there discussion?

(Off the record discussion.)

CHAIRMAN: On the basis of this discussion, Item 4, as proposed, is approved for action, so we may continue with the presentation.

LANZKRON: Item #5. Six out of 18 lithium spare hydroxide canisters which are located here at KSC are required in Downey. We would like to move these to Downey. We will also come up with a general plan to allow us to remove other such things out of impoundment.

(Off the record discussion.)

CHAIRMAN: With reference to Item 5, the discussion has revealed the necessity for imposition of a constraint in the release of the canisters to insure that one or more canisters of the lot that are identified as from the same lot as are in the spacecraft be retained, in their current status.

(Off the record discussion.)

CHAIRMAN: By this action we approve the release of all others of the 18 mentioned.

(Off the record discussion.)

CHAIRMAN: I wish to amend the statement made previously about the number of canisters to be retained to say three rather than one or more.

(Off the record discussion.)

CHAIRMAN: We will resume a discussion on items for approval, regarding tests to be done or hardware to be removed. Now going to those in the spacecraft, Dr. Lanzkron, will you please proceed.

LANZKRON: Should we call each one of these pictures a different number or would you like to take the total category of photographs as one item?

(Off the record discussion.)

CHAIRMAN: It is clear from the discussion that at this time, it is necessary to take action that will permit an orderly coordination of the many tasks that are being performed. In particular, we must give attention to the problem of getting Board approval on items that are in a category that requires such action in order to insure an orderly process and proper coordination between all the task groups that are now active. In order to meet the requirements imposed on us by the situation. I'm going to establish at this time a committee[1] that will deal with this coordination task, that is, the coordination task required for an orderly presentation of matters to the Board for their approval. This committee will be chaired by Mr. J. Williams. The other members of this committee are Max Faget, C. Matthews, J. Yardley, and D. Jeffs.

As a responsibility of this committee, the Board is asking that in the daily reports of progress to this Board, that it present an over-view of the entire scope of the activities of the various panels in a form appropriate to the purpose of the Board's meetings. In effect, this means that it should be broad enough to be suitable for the meeting but should not get into great detail. The responsibility for working out the actual format and type of report to be made will be left to the chairman of the committee.

(FOOTNOTE) 1. This is the body which was functioning earlier as a working group in the task of organizing the working panels.

(Off the record discussion.)

CHAIRMAN: The problem of photography has been resolved by Board approval of the plan as specified in the list submitted and with the understanding that additional photographs required by certain of the Board members or task groups needed to supplement photography in the areas of their particular responsibility can be arranged for through the systems already set up without requiring future Board action.

(Off the record discussion.)

LANZKRON: Last Item, Item 7, is the MDAS, Medical Data Acquisition system removal. We would like to remove it for correlation of data as associated with the flight PCM and the central timing equipment and the actual time records on the recorder.

(Off the record discussion.)

CHAIRMAN: The discussion of this item has shown the need to defer approval of this item at this time subject to consideration at a later date. The suggestion has been made and endorsed by the Board that in removal of items from the spacecraft, the location from which the article was removed be identified by some unobtrusive indication that identifies the area and is indexed to a record that permits the inspection from other sources, of what was in fact, removed from that area. The responsibility for insuring that this procedure is followed is assigned to Mr. Geer. In continuation of Faget's report, he will now continue.

FAGET: The third part is a summary of the analysis work of today and some speculation of where it's going in the future.

MARDEL: This is sort of a conclusion of the activities of the (DATA) analysis activity from yesterday. The first item, we should have a complete time line being typed. I'm not sure the time line is available right at this moment.

Just say more detailed time lines; has more data than any presented so far. There were no new data anomalies disclosed from the last 24 hours. In other words, the new time line even though it has more detail is still basically the same as the time lines of a day or so ago. A second item; we need data on cabin temperatures and two cabin pressure measurement systems response times to determine a more real-time of the actual increase in temperature and pressure. The data should be available from qualification or other test data. This list was requested from North American yesterday, and additional testing may be required at North American to obtain the statements.

The configuration of the battery manifold pressure measurement system must be determined to determine the response time. Remember the battery compartment manifold pressure measurement wasn't connected to the manifold, it was laying loose on the floor and it should have been bagged or should have had a dust cap over the pressure ports. We'd have to know what the configuration was and actually run a special test in this case to determine the response time. We don't know at this time what the exact configuration was.

We've requested this morning that the configuration committee provide this data. Item 4, the required data on the over and under voltage samples for the inverters on Spacecraft 012. This is required for correlation with the buss 2 inverter difficulty and the caution warning system. We've requested the information from

MARDEL: North American yesterday, we received most of the information this morning, but right now, we're still trying to correlate serial numbers with inverter positions with busses. We will have this cleared up by this evening, we ought to be able to report on it tomorrow morning. Five, we say a special test will be required on the gas chromatograph electrical connectors and the associate circuitry. We requested North American to configure a harness and connector to the exact Spacecraft 012 configuration yesterday. I have no idea right now, how long it will take to make up these connectors. Item 6, we requested North American to run a quick test on a connector and harness similar to that of Spacecraft 012 of the gas chromatograph system. We're trying to get some feel as to what happened when the connector is exposed to flame.

In a power on and a power off condition. -- We've requested the test yesterday and it may be run today or tonight.

That North American reduce and analyze at Downey, the home plant in California with the following restrictions:

a. That a closed area be provided for all data storage and analysis activity.

b. That the area be closed with limited access to personnel.

c. That a tape copy be provided with the voice track fully wiped out and all data after 23:31:05 wiped out, with a restriction that the medical data playback be prohibited.

d. We request permission to have this tape copy made here at KSC and released to North American Aviation at KSC for hand-carry to Downey.

I request permission to have a tape copy made as per the previous restrictions as stated and released to NAA-KSC for hand-carry to Downey.

Item #8, circuit breaker status for the gas chromatograph must be determined from the procedure and crew check list. We need this to determine if the connector was hot. We will request this of the procedure committee immediately. Now, if you have a little bit of information on it, the procedure said that the circuit breaker should be closed which would make it hot. -- The final switch set before crew ingress. A special check was made and the circuit breaker was closed, which made the connector hot. We had to check the crew check list out to find out if any change was made in that. After the incident, this particular circuit breaker was found open. So we've got one more check with the crew check list after ingress.

Item #9, we need to analytically determine all the failure modes for the oxygen flow measurement system. We need the failure modes that could result in a high oxygen flow rate. This has been requested of North American this afternoon. What we are trying to do here is validate our data. We believe that the data is truly representative of a high oxygen flow or could the measurement system have failed at this point.

Item #10, we have to determine the status of the water glycol, water reservoir valves. I believe we are talking about 3 valve positions to correlate with the water glycol pressure data. This has been requested for a couple of days. We'll go to the proper committee right after the meeting.

MARDEL: Item #11, Item 11 was scratched out and is back in.. Request that a consultant be provided for clarification of voice data to determine what is actually stated by the crew at the time of the difficulty and we have a specific recommendation for a person.

CHAIRMAN: The Board does not agree with the need for this request at this time. Continue with the request item.

MARDEL: We request a special playback of the gas chromatographs of the inverter the C-band data for the last hours and various switch set up to see what the data looks like. This has been requested from the Events Committee and they should be available this afternoon.

We modified the request in the last hour, that based on the fact that during close out before crew ingress the circuit breaker was closed. It was not changed from that point on. Crew ingress through the incident - complete data.

CHAIRMAN: Does this complete your report?

MARDEL: Yes, sir.

(Off the record discussion.)

CHAIRMAN: One comment on the report just made. There was considerable discussion by the Board of the restraint imposed on release of data represented by Item 7C. The Board does not object to the release of this data as proposed but considers it necessary that consideration should be given to the necessity for this restraint and will expect to here from this matter on the subject of reports.

(Off the record discussion.)

CHAIRMAN: Col. Strang is prepared to make a preliminary report on the area of his responsibility.

COL. STRANG: First of all, gentlemen, as we look at it now, there will be three reports: a preliminary report, an intermediate report, which is further down the road, maybe two or three months, based on the feedback of the analysis. (When I use these figures, I'm just taking a guess). Then the final report, which is after all research accomplishments and analyses are completed; unless we are kept in session until the final report. Then, we will have only one report. But in this report, this is what we will have to have -- I submit it to the Board for its evaluation, revision, and/or acceptance.

The authoritative document, this would be the document from Dr. Seamans, that established the Board and would include any other documents that come to us, from now on until the completion of the report that may change the Board's composition. That is Section One. Section Two will be a narrative of the accident.

This will be a two to three page paper to include the period of time up to the accident itself. Number three should be on the investigation and analysis -- This is developed from the time of the accident, right after the fire in other words, through the entire time the Board was in session. In this section we would also include the finalized recommendations. Section Four, a Life Sciences Report,

STRANG: This will be the autopsy, report of death, the report of injuries, a general statement made by the doctor and of anything else in the area of this concern; for example, gas masks, etc. Section Five is Board proceedings.

I would like to take a minute here to tell you what this consists of. We have here a tape being made daily which is being developed into a typewritten report afterwards. This will not become a part of the report itself because there are going to be many, many pages of proceedings. We would put this in the file of the accident; the file would be those backup data and everything else in support of the accident investigation. Where this would be located at NASA, I don't know. The Air Force's, is at Norton AFB in the Inspector General's Safety Office. At NASA, because of the decentralization of safety, it is conceivable that it would remain here at KSC. The second part that we're confronted with here daily are notes that are being taken by the court reporter of important happenings, such as the fact that perhaps we will be visited by some Congressmen -- this would be an important happening. Or important things that are made a matter of record here that Dr. Thompson, the Chairman of the Board, elects to put into the daily log. It definitely should become part of the Board proceedings. Now, there is a third item or a sub of what I just discussed and that is a list of actions that take place in the Executive Board sessions. This will be contained in a book separate from what I discussed. Whether or not this is ever put into the Board Report is entirely up to the Board and Chairman. The sixth section is the Damage Report. In the Air Force, for example, we list the cost of the total damages to the vehicle and I am sure that NASA wants to make that information available -- damage to the vehicle, the equipment, etc.

Section Seven is the Task Group (Panel) Report. This report concerns each and every Task Panel. For example, if we were running around 18 Task Panels, we would have a report from each one of these. The overall report from a Task Panel is broken down to at least five subheadings -- we have the work statements, the proceedings, the findings, the recommendations, and supporting data.

This last item would just have a reference in this Task Panel Report to the effect that the backup data for specimens of some hardware are contained at certain locations. Reports from the Task Panels are part of the basic report itself. Now what I plan to do is come up with a written paper by tomorrow to present to each of you, and each Task Panel, a procedure so that we can help build towards this right now instead of waiting until the end because it gets real bulky and real hard to control.

In some cases you'll find that you have to leave picture numbers blank because the day will come when we have to select maybe a hundred out of a thousand photographs. You will have to number these. You'll have to refer to them accordingly. Are there any questions?

(Off the record discussion.)

CHAIRMAN: There was considerable discussion of this report by Col. Strang. The Board, I believe, feels that the outline presented represents a very good statement of a plan that will be at least at this time, in our view of the situation at this time a workable and satisfactory approach to the problem of making a final report.

CHAIRMAN: The meeting is adjourned.

FINAL REPORT
FEBRUARY 2, 1967

CHAIRMAN: The meeting is now in session. We are privileged to have with us, today, Dr. Seamans, Deputy Administrator, and Dr. Gilruth, Director, Manned Spacecraft Center. I would like to make a few announcements of actions that have been taken since our last meeting. There have been revisions of the tasks that were organized to implement our investigation. There has been a need to change the status of one of our members, because of problems regarding the association of contractors and Government workers. In accordance with the requirements of a situation that we find ourselves in, Mr. Jeffs is no longer a member. He will act as a consultant. I hope that it will turn out that these changes will in no way impair the very good working relationships that have been developed without respect to who anyone is working for, when they are working for a common purpose. Another matter that I would like to announce is that I am asking Col. Strang in my absence, to serve as the Acting Chairman. Another announcement perhaps is a repetition of what I said before, and maybe it is not. The format that we worked out is that the Mission Briefing Room will now be classified as a briefing and hearing room for Board activities. In addition, there is also a Board room at which executive meetings of the Board will take place, rather than here. This room can remain available for other uses that may be appropriate, because of the displays and equipment in here. This morning we have as an agenda, reports of events since our last meeting. To start off, however, I'd like to ask Col. Strang to tell us a little bit about some events that he knows of that are relevant to this, our meeting here, if he'd care to at this time. Col. Strang.

STRANG: Yes, sir. I just received a call from the Executive Officer in Gen. Houston's office. He had been notified by Col. Floyd, Air Force Legislative Liaison Office, to the effect that we're going to have a visit, Friday afternoon at approximately 1430, by two Congressmen. I have the names and all, but it's in a paper being developed upstairs, sir. They expect to proceed from Patrick Air Force Base, right after arrival at 1430, out to the launch complex, where they would like to talk to the authorities in reference to the investigation and conduct of what's going on. They will depart Patrick at noon Saturday, and go to Houston, where they will continue their investigation Saturday night and Sunday morning, then to Brooks Air Force Base, where they will then do a little investigation where the Air Force just had an accident, and then proceed back to Washington. I might bring up that one of the deceased at Brooks Air Force Base is a constituant of one of the Congressmen, from New York. I have all the facts and figures on this - they will be available in a couple of minutes and I'll present them to you.

CHAIRMAN: Thank you, Col.

(Off the record discussion.)

STRANG: I just received a second progress report from Brooks Air Force Base.

CHAIRMAN: Just a minute, Col. Strang, just one comment.

SEAMANS: We were advised yesterday afternoon, by the Armed Services Committee that the Chairman, Chairman Rivers, had designated these two Congressmen to come here

and to go to Houston as well as Brooks Air Force Base to investigate the accidents that occurred both here and at Brooks, but we were aware of this and a little later on we'll discuss with our Chairman exactly what arrangements should be made for the Congressmen while they're here.

CHAIRMAN: Thank you, Dr. Seamans. Col. Strang, you want to continue with your report?

STRANG: Yes, Sir. The second item I have is that I have received the number two progress report from Brooks Air Force Base where the Air Force is conducting an accident investigation. This is on a recent incident where two airmen were killed in an altitude chamber. I have a written report on this, and I'll pass it out to the Board members for their information. We have established, in line with this, a tie with persons on the Board there. We have concurrence from the Chief of Staff of of the Air Force to get this information as it occurs. It will have some bearing possibly. That's all I have, sir.

CHAIRMAN: Thank you, Col. Strang. In addition to the tie we have with the Brooks incident, we also have established another tie that relates to the problem of having what is learned here made applicable to other national programs. A new Board representative has arrived today -- Mr. Collins who will serve in a liaison capacity here to take advantage of the findings that are developing, and their application to the Air Force MOL Program. We will now continue the progress reports.

CHAIRMAN: In case there are planning groups or other groups that need witness statements, before they go out, we have the initial document on the witness statement, I passed it out to all the Board members. Second, what distribution, what kind of control on distribution has the Chairman considered on these witness statements? I would consider out of all our documents they are the most sensitive right at the moment. We can certainly make them available to whoever needs them. In the witness statement of work in response to the charter, for the panel, which describes how we are going to operate. That's all I have, sir.

CHAIRMAN: The Chair, you are asking for instructions and guidance on the classification?

BAXTER: No, sir, not classification, the distribution.

CHAIRMAN: Well, we'll try to develop something on that, and see that you get the necessary information. We will give Lt. Col. Baxter an instruction that the distribution of the information for which he requested guidance will be controlled in the following manner: it will be available to the Board members as they require and with the restraint that they can pass it on to the Task Chairman. Any further distribution is to be restricted except by specific request to the Board member who will have the authority to permit additional distribution if necessary.

CHAIRMAN: We have received a report of preliminary findings of the Apollo 204 data and related material dated 1 February 1967, developed by the Apollo Spacecraft Programs Office. This report is being distributed to the membership, here today. I will now ask Dr. Faget to report on developments of the last day.

FAGET: I would first like to ask Mr. Simpkinson to report the status of the work out on the pad and the predicted schedule of work the next day.

SIMPKINSON: Mr. Chairman, we had some slow-up of the activity and yesterday I reported we

were essentially on schedule. This morning we are several hours behind. At the moment we are safing the pyros in the forward heat shield and this is the reason for the delay. I think you should know that. The same team that is required to remove the launch escape system is required to remove the pyros, and they needed three or four hours sleep between these two operations. We didn't lose this time. We took advantage of it to do other things out there. Our reported schedule did drop back somewhat. There are 20 copies for the Board as of the day's projected schedule. We planned to start safing the pyros at six o'clock this morning and plan to be through by two o'clock this afternoon and we covered up the forward heat shield after that to protect it and removing the hatch some time between two and three o'clock. You schedule shows at three o'clock to start TPS's or work orders as they are available. We do have one approved which cleans the debris from the couches and it is a 30 page document to be very very carefully done and will take considerable time. We are projecting about two days to do that, but we have really no basis to put this on. It's going to be very slow and cautious. We don't believe we can hurry this operation any way. We will be starting about three, we will have Five Panel with us, we'll have anyone that is required. That's our schedule for today -- our activities. The other TPS that we will work in conjunction with this is the one which you approved yesterday to remove the the non-attached, non-connected hardware so that we can have a better place to work now. I do need some guidance for this two-thirty meeting if I could have it.

CHAIRMAN: Thank you, Mr. Simpkinson.

(Off the record discussion.)

FAGET: The next part of this morning's report will be from Dr. Lanzkron who has a number of action items that he would like to put before the Board.

CHAIRMAN: As suggested yesterday, the Board came up with the general policy for removing hardward that is not associated or connected with the accident. These are numbered in continuation of the action item of yesterday and we start with number 8. Basically this is GSE, STE and facility equipment on Launch Complex 34. All equipment of this type not utilized for checkout or servicing of Spacecraft 012 on Pad 34 should be released for normal operation. This equipment is not required for this investigation but is required by other Cape operations. Are you asking the Chair a question, Dr. Lanzkron?

LANZKRON: I am asking for approval of the Board for this action. Item 9 -- all equipment of this type utilized prior to Plugs-In and removed prior to Plugs-In but are still in the complex area should be statused in terms of configuration and released for removal from the complex area.

Item 10 -- all equipment of this type used during Plugs-In or later will require Board approval. Item 11 – GSE STE facilities equipment outside of Launch Complex 34. All equipment of this type utilized in buildup prior to the arrival on Launch Complex 34 of Spacecraft 012 should be released for further use. Item 12 – all servicing equipment of this type utilized prior to arrival at Launch Complex 34 should be checked for configuration status and fluid samples for future reference. Equipment then should be released for further usage. Item 13 – all BME of this type utilized on spacecraft hardware prior to completion of the chamrun should be released for use. Suit BME should remain under Board cognizance.

Item 14 – spares which are utilized in Spacecraft 012 should stay impounded. Spares that did not see the spacecraft should be dispositioned as follows: Items of large quantity production, more than 50, maintain 3 of same lot. Small production, maintain 1 of same lot. Item 16 – GSE spares. All spares should be released except those used to service oxygen and water glycol. Non-flight hardware and non-GSE. Item 17 – equipment of that category not utilized after chamber test should be released except for communication equipment which will be controlled by the Board. Item 18 – equipment in above category utilized during chamber run should be base line in terms of configuration and released for use except the communications equipment which will be controlled by the Board. Item 19 – lab supplies. Any item used on Spacecraft 012 should have set aside adequate quantities allowing for lab analysis. The rest should be released for use. Item 20 – new equipment. Any equipment whose equivalent has not been used on Spacecraft 012, but is now in areas which aren't controlled by the Board will be released for use. Item 21 – IMCC, Houston, Not utilized, but for monitoring should be released for further use on other things. Item 22 – the UCP checklist schematics, both flight and non-flight, being utilized by the crew at the time of the incident should be removed for reconstitution. The removal should be careful, photographs should be taken to establish condition of both. Provide photographs where technically possible showing the location and condition of these items as follows: only books to be removed now are those on the couches. I would like to add an item 23 which is not on this list. Since this Board makes available this room for access, who are the people who have access to this room?

(Off the record discussion.)

CHAIRMAN: It is understood by the Board, that all these recommended actions have been approved by the cognizant committee. The Board approves the recommended action but wishes to reiterate a matter that was brought up in a previous meeting, that where samples are required for analysis, that there be sufficient samples left to provide analysis by outside or independent groups. It is a general policy directive that there be enough for two outside analyses of this type. If there are certain conditions that make this impossible the appropriate action could be brought back to the Board for approval. In bringing that matter back to the Board it is requested that recommendations for appropriate action accompany it.

(Off the record discussion.)

CHAIRMAN: Dr. Kelly.

DR. KELLY: Room 106 at the PIB is set up as stated in Administrative Procedure No. 3. This is an Evaluation Room for the flight suits. Additional aids in this evaluation are needed such as the training suits and photographs. Security will be worked out between myself and Mr. Buckley and patterned after Administrative Procedure No. 3.

CHAIRMAN: Thank you, Dr. Kelly.

BORMAN: Spacecraft 14 arrived here at Cape Kennedy last night and is now in the MSOB. It is proposed that that spacecraft be relocated at PIB and that the work on that spacecraft be under the control of the same panel, the disassembly panel, that is now controlling the work out at Pad 34.

CHAIRMAN: Thank you. I would like to have a statement from the appropriate Board member

as to the intended use of the Spacecraft 014 in the immediate future.

BORMAN: Mr. Chairman, this is Col. Borman. Spacecraft 014 will be located in the PIB Building. It will be under the control of the Spacecraft Disassembly Panel and it will be administered in the same manner as Spacecraft 012. The immediate use will be to provide a "before" item and a comparison with Spacecraft 012. The immediate access should be for the fire people who are not familiar with the spacecraft and also systems experts from the Apollo Program Office who will need immediate access. This will not, of course, involve disturbing or removing any items. This is the immediate requirement. Further on we are going into detail disassembly of Spacecraft 012. It is proposed that the technicians perform the corresponding disassembly on Spacecraft 014 prior to proceeding on Spacecraft 012. We really have two separate utilizations, the initial one is for investigation and observation, the final one will be for disassembly.

FAGET: Mr. Chairman, I propose that we impound the checklist of the backup crew for use in the event that the checklists in the spacecraft were destroyed or partially destroyed. These checklists were updated and represent the best copy of the checklist used by the crew.

CHAIRMAN: Are there any comments contrary to that proposed action? (Pause) The Chair agrees that appropriate action. Dr. Kelly, with reference to your proposed action, this is approved to include the photographs and other material with the understanding that we have established before that they are in proper custody and available to those who have the need to know.

(Off the record discussion.)

CHAIRMAN: With reference to Dr. Kelly's item, the photographs in his custody should be handled in such a way that they are made available to those who have a need to know.

(Off the record discussion.)

STRANG: Gentlemen, in your box today I will place a format for the Task Group Report that we discussed lightly yesterday. Attached to it is a little philosophy as to why we need this information.

CHAIRMAN: Will the secretary take those documents that you all have and see that each one of the Board members gets a copy. The meeting is adjourned until tomorrow morning at 10:30.

CHAIRMAN: I think that at this time it may be appropriate to make a few remarks relative to accomplishments to date, in view of the fact that I believe we have reached a fairly important, or passed, perhaps, an important milestone in the progress of this review. The Spacecraft has now been made available for at least initial photography inside. The process of unlocking the paperwork and equipment – all those things involved in the impoundment – the impoundment action that took place has at least in considerable degree been accomplished. It has not been accomplished in full detail, but I think we can say it has been a relatively effective effort. I think we have accomplished this with sufficient care so that I feel that we are in command of the situation.

The inspection of the Spacecraft by photography at this stage is being controlled in the following manner: The Coordinating Subcommittee will establish priority and coordination for all tasks requiring access to the Spacecraft. In addition, the access to the Spacecraft will be controlled by a crew under the direction of Colonel Borman, who is a member of the Board.

I'd like to make a correction as to the status we have achieved in inspection of Spacecraft. It is not limited to photography – it actually applies to all activities of inspection of the Spacecraft.

(Off the record discussion)

CHAIRMAN: In the discussion that just took place, it appears necessary to point out that in obtaining statements from witnesses which is now in progress, that any information that people have, that should Board Members and other people associated with this Board have, that is in a category that belongs in this statement framework, they should bring it to the attention of Colonel Baxter of the stituation and let him take appropriate action.

We have just witnessed a film concerning fire hazard with conducting wires, and a record of and identification of that film which was supplied by Lockheed – Georgia Company and will be given to the Secretary for the record.

The title of the film is "Investigation Report, Aircraft Wire Harness Fires – Rev. #3." This film describes a phenomena called "Wet Wire Fires" which may be relevant to a possible source of ignition in the Apollo 204 Spacecraft. Three reports in this subject are in the possession of Colonel Strang and will be available to any interested task group.

Mr. Petrone, who had made a statement in a previous meeting, wishes to address himself to that previous record and make some remarks concerning it. Mr. Petrone.

PETRONE: Mr. Chairman, in my verbal report to the Board, late on Sunday, I said we had taken a sample upon a report by the Command Pilot, of an odor – a buttermilk type odor – in his loop. I reported that when we got the sample, a sample was taken from Ed White's loop. I'd like to amend that to state that on further investigation there were two samples taken; the one taken initially reported the butter-

milk odor. We find that upon later review that it was actually taken from Grissom's suit, and the sample taken White's suit was a normal sample. We would like to close out the environmental control system with a Beckman analyzer. It only tells you how much oxygen is present. I was requested to get the names of the people who physically did this job to Colonel Baxter and his group. so that the statements could be taken of what was connected physically to what suit to set the record straight.

CHAIRMAN: Thank you. Mr. Williams, do you have a report?

WILLIAMS: We have the three items that we reported on yesterday. The recommended Board be given by Dr. Lanzkron, summary of panel findings will be given by Mr. Mardel and the Disassembly Committee's report will be given by Colonel Borman. We We will have Dr. Lanzkron's report first.

LANZKRON: That's Action Item No. 25. It deals with the ACE Spacecraft Station Number 1 and computer control room. The feeling is mutual that it could be released for maintenance and normal work after documentation of the computer and control room configuration. Item 25 is releasing the ACE Spacecraft Station for other utilization after configuration inventory to assure that we know what the config- was at the time of the accident.

(Off the record discussion.)

CHAIRMAN: There being no objection, the Item 25 is approved as proposed and so you may proceed, Dr. Lanzkron.

LANZKRON: Item 26 – Authorization is requested for expedited issuance of request to the F.B.I. to insure maximum salvage of burned crew data book and other burned crew documents.

(Off the record discussion.)

CHAIRMAN: Item 26, on the basis of the discussion, is approved with one modification – the word "salvage" is changed to "reconstruction." And with the understanding that Colonel Borman will take steps to obtain the help from appropriate organizations in the process of meeting the requirements of maximum reconstruction indicated by this item.

LANZKRON: Item No. 27 – The S-Band, VHF Spacecraft official tapes should be released to Bell Labs to determine contents of tapes.

(Off the record discussion.)

CHAIRMAN: With reference to the last item, that is, Item No. 27, there was considerable discussion on how best to make use of the additional data hitherto not known to us, or not analyzed by us, to insure that we obtain the maximum value from it and run no undue risks in the process. The selection of the Bell Lab as a contractor takes into account a need for an outside, disinterested party of high quality with well established qualifications to make this analysis. However, in the process of getting an appropriate copy to them, we would like to charge the people who have custody of the tapes here to explore with Bell the problem of how best to

CHAIRMAN: insure that when they analyze the original that we retain the best possible copy in order to avoid all possible risks of losing the value of a very important record.

As a result of further discussion, an additional instruction is given regarding exploration of the manner in handling this tape. There will be an exploration of the problem of extracting the maximum information from tapes that may be in our possession and could possibly yield additional information of value to this review.

(Off the record discussion.)

CHAIRMAN: We are now prepared to hear a report from Mr. Mardel.

MARDEL: Item 1. The gas chromatograph powered sensor cable connector was exposed. A special check disclosed that the plastic bag of this connector was removed during close-out. This was a question raised in the Board Meeting on Wednesday. From statements received from two of the people, it was stated that during close-out, the plastic bag was removed. There is a standard practice that no open connector remain in the Spacecraft, that every electrical connector, every exposed plumbing line be covered. We will plan on a meeting with these people again, around noon, to try to determine why the plastic bag was taken off.

CHAIRMAN: With reference to Item 1, the discussion discloses that the Board will be very interested in a very careful and complete evaluation of the situation that surrounds and is associated with Item 1. So we may proceed, Mr. Mardel.

MARDEL: Item 2: A taped sequence of the events chart is complete. The chart you see on my right, the white board. This chart will be updated daily, each morning. And that contains the complete sequence of events from the data, versus time.

Item 3: The latest data indicates a rotational controller output transient at 22 hours, 30 minutes, 54.85 seconds. This is the same time that the AC Bus 2 voltage changed. This data is preliminary, it is not validated . We will do some validation on it today, reporting on it tomorrow morning.

CHAIRMAN: We are receiving a progress report and I think we have to keep in mind that these item-by-item progress reports do not, in general, represent findings, nor is it intended to create the impression that this is all of the action that is intended. Mr. Mardel, continue.

MARDEL: Item 4: The Witness Statement Panel has received two statements that mention a peculiar odor near the Spacecraft, prior to the incident. We don't know the exact period of time when these statements were made. We will check this today, report on it again tomorrow, the same item.

Item 5: A GSE measurement, the hydrogen tank fan motor was found to vary at 23 hours, 26 minutes, 30.4 seconds. At the exact time of the previously recorded ground supply center variance. This measurement cable was not hooked up at the service Module and should not have to read anything. A check will be made to determine if it's an ACE Station noise problem. It's preliminary data, and we have to investigate it further.

Item 6: The gas chromatograph rate was found to vary a number of times in the

(Sheet 3 of 4)

MARDEL: last one and one-half hours, before the fire. The significance and meaning is being studied. We looked at special playback last night, and going back from the first variance near the fire, the trace remains stable, and 35 minutes before the fire, it showed a variance. Going back through the total hour and a half trace, we had about 4 variances in the data. We are making additional playback today, going all the way back to the time of crew ingress and will review that data some time this evening, and will report on it again tomorrow. We are also making a special check on airframe 008 at Houston where we've got this connector in the Spacecraft and we'll move the connector around to try to determine if there is any variation from connector movement. This information should be available some time this evening. We'll be reporting on it tomorrow morning as well.

CHAIRMAN: Thank you, Mr. Mardel.

Colonel Borman, are you prepared to give a report?

BORMAN: The report from the Spacecraft Disassembly Committee. The debris is now off the couches. We are preparing to remove the leg rests and headrests. This should be completed by 1600. After 1600, we'll install the plywood covers over the couches and we will be ready for the fire experts to make the initial look within the interior of the cabin. We are planning also today to transport the hatches over to the PIB Building and we are now formulating the TPS' to continue on with the work as directed by the Board. I think that the rest of the day will be spent in examination and photographic evidence from the couch area. And that's all I have.

CHAIRMAN: Thank you. I wish to make further reference to an action we took earlier here about the responsibilities of the Panel Coordination Committee as to their activity in relation to setting up priorities for access to the vehicle. I would like to point out, particularly based on the previous discussion, that the panel should consider themselves as having a responsibility for reviewing the entire process, not only in regards to passing on priority, but perhaps questioning and suggesting items that should be included that may not have been proposed to them. And particularly this matter of the structural examination, as being essential part and parcel of the examination should be considered.

CHAIRMAN: In opening the meeting this morning there are certain things I would like to say regarding things that are underway. We are taking appropriate steps to be certain that offers of help from organizations, groups, or individuals to assist in this review are acknowledged by the Chairman, and that with the understanding that we are also taking appropriate action to follow up on these offers. This will include, particularly as regards many of the suggestions that are coming in from individuals that probably have very little to actually contribute other than their extreme interest in this review, an acknowledgement of their suggestion to this Board. We have one matter that I would particularly like to emphasize this morning. That is, we proceed here in establishing our course of action. We find it necessary to re-examine procedures, particularly those that relate to the control of, access to, and preservation of exhibits. This means that responsibilities of individuals may be modified and that everyone that has knowledge or custody of material relative to this review take appropriate action to insure that it will be placed in the designated areas.

In the discussion, it was brought out that the adherence to procedures or the development of procedures to adequately deal with the situation with which we are presented has many complexities that will require individual judgment to be applied at many levels. It is clear that there must be a very careful attention given to the implementation of procedures that will meet the broad requirements outlined, and at the same time permit a workable pattern that will permit this review to proceed in a direction that will yield a maximum result.

I will ask Mr. Williams to proceed now with the presentation of the reports of the Task Groups for the acts that have taken place in the last periods.

WILLIAMS: We'll call on two panels this morning. We do not have any tests to be done, or items to be removed at the present time, but we will have the Dissassembly Panel on the work schedule to be carried out. And also a report from the Integration Panel, which will bring us up to date on what has happened since the last report.

CHAIRMAN: In an action yesterday afternoon the Chair approved the removal of items from the spacecraft that went beyond the authorization that was on the record in the morning meeting, and I think the report that is now being made, the progress report, will reflect this action. I will ask Mr. Williams, in connection with his approval to itemize the extent of the approval as it now exists.

WILLIAMS: In executive session yesterday, we approved the installation of plywood covers for the couches. What was approved last night was inspection by the fire experts followed by another inspection by the spacecraft inspection groups. The third item was the Materials Panel inspection. The Materials Panel wanted to take a look at the inside of the spacecraft. We approved the inspection by the systems engineers, to see if they could see items out of place, an item that shouldn't have been there. After the inspection by these three groups, we authorized a series of photos of the interior. Once photos are taken, we then plan to remove the top hatch. The next item was to cut the cables from the translation controller. The next item was to tie back the cobra cables, install the platform under the couch, to be followed by the fire experts inspection from the platform, and then we are ready to remove the couches. Following the removal of couches, we want another inspection by the fire experts from the Z platform, a panoramic photography of the interior of the spacecraft and a detailed floor inspection and

sketch. Following that, we want to remove discrete pieces from the floor, install a false floor to protect the remaining pieces of evidence on the floor and then proceed with our inspection of the interior of the cabin. This is as far as the planning went last night.

CHAIRMAN: Thank you, Mr. Williams, I would like to ask Mr. Williams, at this time, to explain how far in time the current defined and approved plan takes them.

WILLIAMS: The current plan or approved plan should take about 3 or 4 days. We are in the process of working on an overall plan covering the remaining period of time.

CHAIRMAN: Let me ask you further, can you give us a notion where we will be at that time regarding our ability to inspect, and inspection of the spacecraft.

WILLIAMS: At the end of the approved plan, we will have the fire group inspecting the spacecraft and what we are working on now is to have the design people and subsystems specialists develop what testing should be done after this period of time. I think that we can have an overall plan by the next Board meeting, say Monday.

CHAIRMAN: I would like to discuss this a little more with the group under Mr. Williams after this meeting to see and get a little better idea of just how we are and have an overview of how far we go, how far our current planning takes us. I would also like to ask this group to address themselves to the overall planning of making their progress known so that the Board can be in a better position than it is now to understand the course of action when major milestones may be passed or reached.

Mr. Williams will proceed with the Progress Report.

WILLIAMS: I would like Mr. Simpkinson to give us the Progress Report on Complex 34.

SIMPKINSON: Mr. Chairman, our present schedule has been passed out to all of you, work fashion, and it contains the items that Mr. Williams repeated before in the record and just to briefly summarize with milestones here. For the record, we have just about finished, at this point in time, the inspection by the Quality Control Inspectors will be going into further inspection by engineers and specialists and taking some specialized photographs stereo-type. That will be completed by 1400, at 2 o'clock this afternoon, we hope. They'll be started at 2 o'clock this afternoon and be finished at 4 o'clock. After that, we'll do some minor work on the spacecraft including installing a platform underneath the couch which starts at 1800, and our fire experts will get underneath the couches on the Z-platform for an underneath type of inspection starting at 2000. At 2100, we will start the removal of the couches. This is planned on here as an eight hour task. This is an average time for a removal of this type but could take longer. Providing we get along all right with that, we start with some more inspections and further photographs from the Z-platform with the couches removed, revealing the entire inside. This will start at 0500 Sunday morning providing we meet our schedule. And then, a detailed floor inspection and sketch of the floor which will include the pointing out of certain discrete pieces by the inspection people to remove. This will all be completed by noon tomorrow, at which time we hope to install a false floor to protect the other floors as Mr. Williams pointed out. We have four hours on the schedule for that test, very flexible, it could take much more than that. And we have allotted eight hours at the end of this on the false floor with free access to the entire inside of the spacecraft on a "no touch" basis. All of

this inspection so far now will be on a "no touch" basis of what is not removed. We hope to finish that by Sunday night, midnight; however, I point out that's quite an optimistic schedule. In addition to the work in the spacecraft, the schedule includes last night's building the Z-platform and trying it in Spacecraft 014. It has worked out well. They are now, at this time, until they are ready to go in the spacecraft, going to practice removal of the couches from the Z-platform which is a difficult task that they have never tried before. We are writing out procedures for that. As you approved the other day, we also are cleaning levels 6, 7 and 8 of the gantry and hope to have that finished by tomorrow morning. A word on that -- this is proceeding according to an approval list of GSE facility and special test equipment that we've received yesterday. In order to get it out of the way up there, we are moving it to bonded storage in the PIB. Anything that is to be, has not been connected, is not connected, or was not connected during the test. Things that may have been connected prior to that we will move into the PIB, per your instructions to maintain control. And, I hope that meets the approval of the Board. That's the extent of my report for today.

CHAIRMAN: Thank you.

WILLIAMS: I would like Mr. Mardel to present the findings since the last Board meeting.

MARDEL: I'm not sure that I have anything for the record. I have no prepared statement; I'd like to talk on a number of things, prefer to speak off the record.

(Off the Record Discussion.)

CHAIRMAN: Mr. Mardel described many of the events and actions being taken off the record but because some of the things he wanted to say are in such a tentative or preliminary form they are not properly a part of the records at the time; however, for the record, I would like to have him, in outline, tell us what subjects he reviewed. Mr. Mardel.

MARDEL: We're showing special interest right now in the area of the translational controllers. This was brought about by examination of photographs. We've seen a hole, either burned out or blown out, at the translation controllers. The controller is located on the left side of the command module, and the controller is also associated with the communication system in that we had a push-to-talk switch on the controller. One of the actions we are taking now is to determine where all the translation controllers are and what their configuration is – trying to determine the exact spacecraft quality configuration for further tests. Another action was to try to determine what the condition is of the command pilot's suit on the left side right above the knees. In the area of the chromatograph connector, with respect to the plastic bag, we have a fairly conclusive story (from which we can conclude) that the bag was removed. The technician remembers removing the bag. Two of the technicians remember that in the area where the bags were removed, the only bag that had tape on it was the chromatograph connector bag. The bags were passed out to one man outside the command module; he passed these to the second man. The second man remembers bottling up the bags, and after bottling these up, finding tape in the bags and putting tape around the bottom; the tape that only had come from the connector bag. He then threw these in a trash can or towards a trash can. We went through the trash can last night; couldn't find it. We're going to make another search around the platform to see if we can find the bag. From all the statements we had so far, we are satisfied that the bag has

been removed. In the area of the elapsed time indicators, we received a report yesterday that we did have smoke in the command module 14 at Downey at North American. The smoke was attributed to a burning of an elapsed time indicator behind panel 13. Preliminary data available this morning indicates that we do have an elapsed time indicator of the same type installed on Spacecraft 12, behind panel 13. This elapsed time indicator, this particular one, was to be removed before the FRT, the Flight Readiness Test. An action was taken to survey what elapsed time indicators were installed in the spacecraft, which were to be left on, and the qualification status of each one of these timers. With respect to data reduction and data analysis, we have reduced all of the data at Houston, and completed an analysis. The analysis results will be available this weekend. We've also reduced the data at North American at Downey. The Analysis results will also be available this weekend. This weekend we will integrate the three analysis results. The one we have here, the one from Houston, and the one from Downey. And, Monday morning, we will have available, on the events chart, a fully integrated picture from the three different analyses. We, then, would be prepared, Monday, to give a complete briefing on what the events mean and what the status is.

Another item is to talk about a burnt-out blower in Spacecraft 8 in the second manned altitude run on Spacecraft 8 in Houston. We had a burnt-out blower in the waste management system. The blower motor in Spacecraft 12 is reported to have had some 25 hours of operating time. It's also been reported that the circuit breaker blew on Spacecraft 008, somewhat like it blew on Spacecraft 012. It's also reported that when the circuit breaker blew on Spacecraft 008, there was a pungent odor. The last item concerns the voice tapes. Information from the Bell Labs is that they do require the original tape. The original tapes will be handcarried, and by this evening we will have prepared a complete set of instructions for what has to be done to track all the data from this station. That's all that I have.

CHAIRMAN: Thank you, Mr. Mardel.

Board was called to order and the records show that the Board convened at 1150 hours this date by Col. Strang, Acting Chairman.

CHAIRMAN: There was discussion relative to Administrative Procedure No. 13 and it was recommended that the agenda inputs be provided to the Secretariat by 2000 hours in lieu of 1800 hours daily, due to the fact that the panel meetings take place at 1700 hours. Mr. Simpkinson, will you give us a run down, please, on the progress of your panel?

SIMPKINSON: It's been two days since we reported on the record of our progress at the pad. We have accomplished all of the scheduled items and are presently in a configuration where we have the command module completely empty as far as we planned. We have accomplished putting a plexiglass floor suspended from the original strut points in the top of the command module so that nothing is touching the floor. We have had inspection going on in this area by QC inspectors this morning. We have had the fire panel group in there for many hours and they are preparing their reports for the Board. We have had materials people in this morning and they just got out early this morning, about 8 o'clock, and I am sure they are preparing their reports. This afternoon, as soon as the inspection people get out, we will have the systems people back in for a second look. At that point in time we will be ready to proceed with the plans that have been given to us as of this morning with the spacecraft itself. In the PIB area we are removing the articles from bonded storage today, placing them on the tables for inspection by appropriate members of the team. However, this is a no-touch inspection and will require written paper to do anything physically with this hardware. That is our present situation, ready to proceed as the Board desires.

CHAIRMAN: Mr. Jeffs.

JEFFS: Mr. Jackson, Carl Jackson, of AiResearch, accompanied by Mr. Nate Nicollo and Mr. Spencer, also of AiResearch together with Mr. Stowall of North American and Mr. Jolly of North American are on site to date. They are surveying the spacecraft with the objective of coming up with a proposed further plan of action on the ECU and also other areas of the ECS. They are working with a member of the Integration Panel in development of that plan in consonance with the procedures that have been developed here by the Board and will present that plan when it is ready for the Board's further consideration.

CHAIRMAN: Thank you, Mr. Jeffs.

LANZKRON: If you would like to reopen Item #7, which was deferred the last time we brought it up in front of the Board. Item 7 reads that the MDAS, the medical data acquisition system removal; we would like to remove it. I would like to have approval of the Board.

CHAIRMAN: Off the record.

(Off the record discussion.)

LANZKRON: On Item 28, we would like to have authority to disassemble the panel, be free to remove equipment cover panels, and to open normal access doors, provided that pre-removal or pre-opening configuration is photographed and that the fire inspectors agree. Basically, there are a lot of compartments in the spacecraft which are used for storage of equipment, there is nothing electrically connected to them, but there will be a lot of new areas that we have not exposed as yet and would like to be able to open up these compartments which have no hardware behind them, connected functionally, and take a look at these areas.

CHAIRMAN: Let us show that the two items Dr. Lanzkron has just discussed have been approved as long as the Fire Panel and the Disassembly Panel Chairmen with their designated personnel are available and in the presence of the work.

MARDEL: Item 1, we completed a power status review. This is attached in your enclosure – the three page write-up plus the sketch, and since Saturday at the Board's request we have put in all the verifications from data and from the panel switch positions. Now, this write-up covers only the external and internal DC main and the internal DC main and the internal pyro busses. We are preparing a supplement to cover other miscellaneous power sources to the spacecraft such as the service module jettison controller batteries, Q-ball powers and Saturn instrument Q-ball heater power and so forth. We plan on having a supplement available either tomorrow or Wednesday, so there will be additional power data.

Item 2, we do now have a list of the elapsed time communicators installed in spacecraft of the type to be removed before flight. This listing is also enclosed immediately following the sketch. We now have verification that the unit that experienced the difficulty in Spacecraft 14 is the same kind of a unit that we had installed in Spacecraft 12. The difficulty in 14 was a shorted capacitor. The cause of the shorting was not and could not have been determined because of the changed condition of the capacitor. We still have not determined the qualification status of all these elapsed time indicators. It's being worked on today and should be available tomorrow.

Item 3, a squeeze bottle of cleaning fluid was found in Level 8 White Room. This bottle does have a tag on it. Work is under way to perform a chemical analysis to determine what the fluid is and we are also reviewing all of the inspection records to determine how this bottle was used that day.

On Item 4, before I talk about item 4, I would like to pick up a photograph and explain geographically in the spacecraft what I'll be talking about the remainder of the morning...I'll pass it around but I will be glad to explain everything here. We're concentrating on the left side of the spacecraft, here you have the ECU, The Environmental Control Unit; one thing I'll be talking about this morning. You'll notice two gold colored connectors on the Environmental Control Unit. These are transducers. The translation controller will be located at about this point. I'm talking about a screwdriver incident that occurred in a panel here and then the chromatograph connectors located close to this panel with the chromatograph installed. The connector would have been laying on the deck where the chromatograph is here. So I'll pass this around and then talk, and refer to the photograph somewhat.

The QC people that went into the spacecraft Saturday noted that two transducers were damaged in a study of the Environmental Control Unit. These are the two transducers with the gold colored connectors. It appears that the electrical connector end of the transducer was separated from the case by a quarter to a half inch as of from overpressure. These transducers will have to be examined to determine the cause of failure. At the present time we're reviewing the design to try to analytically determine the failure cause possibilities. We have a plan of action for a more detailed examination of the translation controller; however, we're putting this in a hold. This is not an official plan. A policy has to be worked out and is being prepared now on exactly how hardware will be disassembled, so I'd like to strike whatever I've got written on Item 5.

On Item 6, this is referring to the panel that I pointed out in the photograph. During trouble shooting, this panel had to be removed to look at the wiring in back of the panel. To try to remove the panel – the panel has four screws – the two sets of right hand screws cannot be removed because one of the harnesses is in the way. So what they did was unlace the harness, separate the harness, and insert the screwdriver through the harness to get at the screws on the panel. The technician had a difficult time removing the screws. Finally the QC man tried it, he drew an arc. At that point then the technician took the screwdriver and tried to remove the screws; he also drew an arc. Finally they removed the panel. They examined the wiring closely. They found wiring damage; they repaired the damage. We questioned the people in reinstallation of the panel. We wanted to know when the panel was reinstalled, how do we know we didn't have any damage. Was the power off the vehicle when the power was reinstalled, so that if you nicked the wire you wouldn't know it? And we still don't have complete information at this time on whether the wiring was examined after the panel was reinstalled. The panel was reinstalled on the first shift, and the technician transferred the work to the second shift. We had to call the second shift man in today to find out after the final close out, if the wiring was examined for any physical damage. Now this may have some significance in that some of the wiring in the stabilization control system and some of the wiring may be associated with the translation controller. We are also making a wire by wire check today to try to determine every wire in that panel, what its relationship is with the various subsystems. That is all I have in writing. I've got three items I would like to talk about. The chromatograph connectors we spoke about last week. We have conducted some testing on Spacecraft 8 at Houston. Some of the data from testing was brought in last night and a quick look at the data at about midnight disclosed that the variations in the chromatograph connector trace resemble very closely what we had during the incident when the connector was wiggled. Wiggle around and you get variations much similar to the test data. This will be studies in more detail today. All I want to point out is that it is of some significance that the variation of the data can be produced not only by fires, as reported from the North American testing last week, but also from a physical movement. We will try to have some plots here tomorrow to show the degree of correlation. We are also preparing today a complete history and configuration on the environmental control system water glycol – and what we have for power today we will have for the water glycol system tomorrow. Now the last item I have is that we did receive the analysis results from Houston over the weekend. We also received the analysis results from North American at Downey. The results were integrated with our data yesterday afternoon and evening. There is no additional data from Houston or Downey that contributes to the picture we have here. The Board has been updated this morning and the Board now represents a total integrated picture

of the three different sets of data, the one from here, the one from Houston, the one from Downey. And we are prepared anytime the Board desires to have Mr. Arabian come down and explain every item on the board and explain what it means, explain where we stand with the data. That is all that I have.

CHAIRMAN: Thank you Mr. Mardel.

BAXTER: Item 3, a cleaning problem. I saw two bottles while I was up at Level 8. I wonder if the other one has been identified.

(Off the record discussion.)

BAXTER: Mr. Mardel, just clarify how many bottles. You just mention a bottle...

MARDEL: Well, we are talking about one bottle, and as they tag with a number on it, it is very discretely identified by a number.

DR. LONG: Question: It's the only bottle in the White Room.

YARDLEY: Was this bottle in the White Room at all or was it outside the White Room on the gantry area?

MARDEL: I can't specifically tell where it was. What I will do is have inspection people make a sketch and have the sketch brought in before noon, exactly where the bottle was found.

CHAIRMAN: Right, thank you Mr. Mardel. For the purpose of the record let it be shown that Mr. Williams presented to each Board Member a copy of a proposed master plan display, and briefed the Board on it. It is hoped that each Board Member will use this proposed plan throughout the day, working with his panel chairmen as to any possible changes to the plan. The Board Members will present this to the chairman, Dr. Thompson, during an executive session this evening. Second item, let the record show that there are now ninety witness statements as of ten thirty a.m. 6 February 1967. Off the record.

(Off the record discussion.)

VAN DOLAH: Mr. Horeff has been in touch with the Civil Aeronautics Board and will shortly get confirmation of which investigator the CAB will make available to this Board. He is also getting information on the laboratories and investigators that the Civil Aeronautics Board makes use of in their investigations so that we can have additional expert assistance, if needed.

CHAIRMAN: Let the record show that Col. Baxter has accepted the responsibility to gather up the gas masks and provide for an analysis to be taken.

Let the record be corrected to show that Panel 13 will take charge of having the gas masks analyzed. The requirement to gather the gas masks and provide for analysis will be accomplished by Panel 11, in lieu of Col. Baxter or Panel 13.

The Board adjourned at 1203.

CHAIRMAN: With reference to the master planning schedule that was discussed yesterday, the Board has approved the preparation of this plan and it will be available for circulation to the various people involved. Later today, according to our current understanding, it will be made available to Board members, Panel Chairmen, and such others as have a need for this schedule.

In two actions, the Board approved many items of a removal schedule, one of those actions took place in a meeting yesterday afternoon, and one in an Executive Board meeting this morning. I would ask Mr. Williams to detail for this meeting, the items covered in those approvals. Mr. Williams.

WILLIAMS: Item 29 is to perform Launch Vehicles Spacecraft Interfacing Impedance Test to resolve engine 8 light anomaly. We need to make resistance measurements, a Q-ball power, and Q-ball heater wire.

Item 30: Remove MDAS, take to the PIB, call vendor technicians to come for disassembly and tape removal.

Item 31: Remove mechanical covers over the functional equipment for better inspection: (1) covers on data storage equipment records, (2) flight qualification records, (3) ECS CO_2 absorber panel, (4) cabin heat exchanger inlet screen, (5) heat exchanger access panel forward of inlet screen, (6) compartment D scientific door, (7) structural panel next to panel point 24, (8) G&N computer close-out panel.

Item 32: Disconnect batteries and measure bus resistance.

Item 33: Establish continuous ohmmeter resistance. Continuous bus resistance should be made during all subsequent operation. This item is restricted to DC at this time.

Item 34: Methodically depress all open circuit breakers on the DC system one at a time per detailed TPS to determine ground resistance of the bus resistance change.

Item 35: Make special inspection of all elapsed time indicated, of the type "to be removed before flight" to determine condition. Carefully inspect in place. Note any suspicious ones for further TPS action. One additional mechanical panel removal may be required in order to view the elapsed time indicators for the caution and warning system.

Item 36: Pick up gas chromotagraph plug and carefully examine and photograph from all sides.

Item 37: Carefully inspect wire harness which was involved in the screw driver spark incident.

Item 38: Remove parachutes and inspect the heat damage.

Item 39: Remove battery vent lines in batteries entry, labeling each location.

Item 40: Remove inverter terminal cover, place and examine for arcing.

Item 41: Measure resistance from each inverter terminal in the spacecraft ground without disconnect or wire cutting.

Item 42: This is the one we want to approve, but we don't watn to do it as yet. Remove circuit breaker panel bolts and carefully back out panel. Inspect and photograph for arcing.

Item 43: Remove cover on translation controller and inspect for evidence of explosion.

Item 44: Inspect cobra cable wires laying across translator controller for evidence of arcing.

Item 45: Record panel 101 and 105 switch positions.

Item 46: Read CVU's in place; taking care to avoid thumb wheels.

Item 47: Remove 02 panel and inspect.

Item 48: Remove $H2_0$ panel and inspect.

Item 49: Xray glycol reservoir to determine quantity.

Item 50: Xray water tank to determine quantity.

Item 51: Inspect CSM on umbilical guillotine area prior to removal, and

Item 52: Remove the water gun.

CHAIRMAN: Thank you, Mr. Williams.

(Off the record discussion.)

CHAIRMAN: I will now ask for the progress reports for today and I understand that Col. Borman is prepared to make the presentation of a report. Col. Borman.

BORMAN: We have removed the flight books. All the flight logs from the spacecraft were transported to the PIB. Unfortunately, due to weather, they could not go to Washington this morning. We have an airplane standing by tomorrow morning. They will be transported to the FBI tomorrow morning. The biomed recorder is removed in the PIB and is waiting for the technicians from Cook Electric before any further work is generated in that area. The lithium hydroxide panel has been removed and it is in the PIB. The panels covering the area for constant wear garment storage have been removed. The panels for food storage have all been opened and photographed. We have removed the mechanical covers over the functional equipment as authorized by the Board. This includes covers on data storage equipment, flight qualification recorder, the cabin heat exchanger inlet screen - we found that this had a hinge on it and rather than remove the hinge, we opened it and inspected it and closed it back up. The heat exchanger access panel forward of the inlet screen, the compartment D scientific door structural panel next to panel 24 in the G&N computer closeout panel have all been removed. The paperwork is now in process and work

is proceeding on the disconnect of the batteries, establishing the ohmmeter resistance readings that were requested. The circuit breaker testing is in work. We are also making a special inspection for all elapsed time indicators as authorized and the gas chromatograph plug inspection is going on at this time. There was a little misunderstanding on which wire harness (wire bundle) we wanted examined as far as the screw driver spark incident is concerned. That TPS is being rewritten so that we get the right wire bundle. Another progress item, sir, we have delivered the tapes to Bell Laboratories and I have a trip report from Mr. Cunningham that I would like to submit to the minutes.

CHAIRMAN: Thank you, Col. Borman. We will now open the meeting for discussion of this report, but go off the record.

(Off the Record Discussion.)

In the discussion, it was brought out that there is a need and possiblity of assigning priorities to areas within the vehicle to which we should direct our immediate attention since they are defined by the inspection to warrant such an assessment of priority.

(Off the Record Discussion)

CHAIRMAN: The discussion has just brought out the fact that there is work in front of us in planning systems removal and systems testing that is being properly coordinated with the committee. The Coordination Committee has general responsibility for the coordination of the investigation.

(Off the Record Discussion)

CHAIRMAN: With further reference to the matter just discussed, the importance of this action of a plan for removal and testing is that it brings in contractors in the operation to such an extent that we are at this point asking the Coordinating Committee to develop for the Board's consideration a plan that will properly inform the Board on the nature of this aspect of our program and bring to the Board's attention such items as are necessary for the Board's consideration or approval. We are prepared now to hear a report of the panel #5 which is coordinated by Dr. Van Dolah, and I will ask him in just a minute to make a report on the fire inspection.

VAN DOLAH: Yes. Mr. Pinkel will make the report.

PINKEL: This is Mr. Irving Pinkel reporting on the findings of Panel #5 called the Fire Panel. In exploring fire problems and our approach to the exploration, we recognize that our responsibilities are these: To plot the fire progress in order to assess the history of the fire and the possible site of the origin of the fire; to determine ignition source or sources through inspection of the accident actual site and related laboratory tests; to explore other fire hazards and recommend changes to reduce the hazards and prepare a final report in which we review all combustibles contained on the spacecraft during the operation leading to the accident and attempt to determine for each combustible, whether or not this combustible could have been the initial combustible. Now, in order to appreciate the situation in the space capsule, I have made this layout which attempts in two dimensions to show a three-dimensional arrangement. I used the Peeled

Banana technique. The floor, as you see, is essentially circular and represented by this circle which is approximately 12 feet in diameter. The vertical walls have been sliced at appropriate corners and layed flat so that moving from the center of the circle in any direction implies going upward from the floor once we reach the zone outside the circle which represents the floor. The coordinate system shown on this illustration has been accepted as standard for describing the orientation of the space capsule. +Z being in a direction away from the hatch if you look at the bottom of our figure -Z would be in a direction towards the center of the floor. +Y to the right as viewed from the hatch and -Y on the left. Now, the general arrangement of the space capsule going in a clockwise direction would be the environmental control unit and systems on the left in the forward portion; in other words, in the +Z idrection - that panel contains food lockers, places for experiments, navigational zones, assortment of electrical equipment, batteries. In the +Y direction, the panel on the right as we view the capsule through the hatch is a waste disposal area with medical equipment and other associated devices and the controls for the capsule. In the neighborhood of the hatch itself, the principal elements are rather massive cables which run along the wall directly beneath the hatch and appear to be the nerve center for much of the distribution of the electrical wiring in addition to the umbilical cords which join the capsule to the Service Module. Now, our first interest, of course, is with the initial distribution of combustible materials and I've diagrammed this on the opposite side.

(Refers to diagram)

Proceeding again in a clockwise direction, those items that are of interest to us in the fire and distribution of the combustibles are plotted here in the gross sense. On the left, in other words in the -Y direction, and on that panel on the left, we have a variety of combustibles - principal combustibles being portions of the glycol system, carbon in the filter canister to remove organic vapors from the atmosphere, pads of felt made out of plastic which are combustible, and contained in such canisters, and considerable insulation which I am told is silicone rubber, which covers much of the glycol system is quite extensive in this area. The fact that this is a foam, I think is important too, in our latest consideration of this matter. Now, an associated important feature of this system is the fact that we have oxygen carried at 900 lbs., water and glycol in aluminum tubing which lie close to the floor all in close proximity to each other. Along the +Z panels, the principal combustibles are plastic strips which go under the brand name of Velcro which are used to hold items of personal gear like pencils and so on, during Zero G flights to keep them from floating around; this is a hook-and-pile arrangement for holding these pieces of equipment. These are applied extensively with considerable exuberance, I expect, all through the panelling which appears in the Command Module. It appears that some of the wiring insulation in this area which, if not combustible, is melted quite readily by heat. I'm not sure that they're not combustible, but if they're not, they seem to be susceptible to heat damage, whereas the bulk of the wiring is Teflon, I am told and stands up to the fire and heat very well. That constitutes the description of the principal combustibles that are visible to the eye without removing any panel assemblies on the Z axis. Now, in the +Y direction, the cabinets there contain a variety of items having to do with bio-medics, I suppose, which are cased in what appears to be nylon. Now, in the -Z direction, which is the wall immediately above the hatch, I am told that an extensive nylon net was stretched across the entire width of the -Z wall which reaches from the level of the hatch to the floor. Now, for

the floor itself, the combustibles there appear to be in two classes, perhaps there are others they haven't discovered yet. The first is a mat made up of foam plastic which occupied a zone immediately below the hatch on the floor. I'm told its purpose was to receive the hatch and avoid damage during an egress exercise, and also, three helmet covers which I assume are made of nylon or a related material. That constitutes the bulk of the combustibles distributed on the permanent parts of the capsule. In regard to the couches, one must regard the suits and the equipment of the astronauts as being part of the combustibles in this system.

Now to discuss the distribution of fire and the probable direction. Let me say this, that in a fire-enclosed space where a succession of rather drastic events occur, the fire pattern goes through several histories each leaving its trace. The last phase of a fire, if it's an important phase, may overshadow all the earlier traces left by the earlier phases of the fire. However, we have this pattern developed which we have fair confidence in, from what we're able to observe. We believe first that in the -Y direction, the area covered by fire looks something like this (and I should change the color of the chalk - I'll do this in red or something that approximates it). The area of the fire....I'm talking about fire where a certain amount of the damage exists, substantial fire, in contrast to portions of the cabin which are licked by the flames and have only a soot deposit located thereon.

(Off the Record Discussion)

CHAIRMAN: Proceed, Mr. Pinkel.

PINKEL: Now for purposes of orientation, I provide a line which goes approximately half way up from the floor on each of the walls of the capsule which marks about the couch level (and I've shown this here). And you'lllnotice that most of the fire that we observe is below couch level along the walls. With certain notable exceptions, this is true. The principal notable exception is the zone near the environmental control unit and in a corner, the corner would be the YZ corner (in other words, a line with 45° to the axis), where the flames appear to have done meaningful damage above that level. In other words, that level being the level of the couch. Now the surprising thing is that there's very little damage above it. A typical picture of the underside of the couch just before the couch is moved shows it fairly clean and almost smudge free. However, above the couch, things were burned badly. Let me draw a pattern of the damage there and I'll show it this way - I've taken what would have been the couch area and now have reproduced it to the right - these are the three couches. I include only the outline of one suit on said couch. Now, the fire appears to take a pattern something like this, and this can only be considered approximate. This would be the zone of major damage, located here, now - crosshatch that area, with less damage in the X area. These must be regarded as very preliminary. I think that we should make a more dtailed examination of the debris taken from the couches to get a better feel for distribution but in a rough way since I was the one who removed this debris, I could get a fairly good rough estimate of what must have been the relative intensity of the fire.

(Off the Record Discussion)

CHAIRMAN: At that point, there was an interruption to discuss a plight regarding the contour outlines that were just drawn by Mr. Pinkel. The question being whether

he had considered that this outline might reflect somewhat different locations of the astronauts relative to the couches. His answer to that question was that it does possible reflect such a situation. So I'll ask Mr. Pinkel not to continue.

PINKEL: Thank you. Before proceeding, I'm reminded of another feature that I should have raised with regard to the distribution of combustibles. And that is, the point that considerable paper was in the cabin in the form of books and check-lists and so on, during the incident. These were scattered about the cabin mostly at control panel locations and on the couches that the astronauts occupied.

Now we get the direction by observing the fire damage and the marks left by the fire, we have this impression - At first the fire was quite directional. In other words, there wasn't a general fire burning in the capsule, the kind of fire you would get if you had a homogenous mixture of fuel in air occupying the atmosphere of the cabin. These represented tongues of flames from local area of burning that took discreet paths responding to the expansion of the gas that occurred as the capsule deformed and broke. Starting at the environmental control unit and plotting the course here, we seemed to feel that the fire progressed in the general direction leading toward the hatch, so as one arm of the fire, staying largely below couch level, except in the area of the couch, a tunnel of flame seems to have approached the couch position so, and rise above the couch level. The progress of the fire, below couch level in the neighborhood of the hatch, was influenced by two major factors. First the availability of the nylon net which lay there to provide additional fuel to move the fire in the counter-clockwise direction, the presence of the astronauts in that area, causing the flame to split and the presence of the couch supports which also seem to split the flame into several tongues.

(Off the Record Discussion)

CHAIRMAN: There was an interruption to permit some discussion of the presentation up to this point, with particular reference to obtaining a better understanding by the listeners as to the nature of the flame propagation that Mr. Pinkel was describing. It became to appear that he was describing progressive flame propagation through the media as contrasted to what might be called a very abrupt flame throughout the entire vessel. With that explanation, I will ask Mr. Pinkel to proceed.

PINKEL: Thank you, very much. Another path of the progress of the flame appears to be in this direction -- going clockwise from the environmental control unit, mostly below the couch level.

(Off the Record Discussion)

CHAIRMAN: After a brief interruption, we'll ask Mr. Pinkel to proceed.

PINKEL: We were discussing the propagation of the fire originating. We suppose for the purpose of our discussion, in the minus YZ corner and proceeding clockwise across the front panel containing the navigation equipment, the batteries and electronics. We have the impression that there were two main branches to the fire which proceeded in a clockwise direction. One which swept across the panel, and one which swept across the floor. I'll diagram these. The one across the panel below, again couch level, and the one that swept across the floor was in this direction. In the minus YZ corner, the flames did indeed reach fairly

high, so that in that corner, we see evidence of much heat applied to the metal structure high in that zone. We assume, or we suspect that the fire that I'm describing now was projected in this direction, clockwise direction, by streams of burning liquid in contrast to the fires I described earlier which represented the progress of fire along continuous paths of combustibles. The fire proceeding from the portion of combustibles to the next. We think we have a burning stream of combustibles presumably glycol. The high elevation, relatively in the capsule, reached by the flames in the $-YZ$ corner, we think resulted from the burning of glycol in that corner. The evidence for the fire direction on the floor is provided by the helmet covers on the floor which show zones of more intense burning in the 9 to 2 o'clock position on the helmets as contrasted with the zones from 3 to 7 o'clock, these being the results from 3 to 7 o'clock on the helmets as viewed from above, helmet covers, I should say, as viewed from above these zones appear to be in the lee of a fire which has some velocity so that the greatest heat transfer occurs at the leading edges of the helmet with respect to the fire progressing with some velocity and then we have as a result more charring in these zones than in zones which are in the lee of such movement of burning fluids.

Now we reach a point in the progress of the fire when the pressure in the capsule is large enough to cause failure of the floor. This is now another phase. This accelerates the displacement of the fire that I described earlier moving in a counterclockwise direction, starting from the environmental control unit and moving counterclockwise heading for a break, as we appreciate this now, in the floor which is at the perimeter of the floor to the right of the hatch occupying the 5 o'clock position, approximately. The fire issuing through that floor widened the initial crack by burning away the local material so that the crack has in this zone an appearance as shown. The failure of that floor is hard to observe with the capsule in its present configuration since the failure disappears under the cabinetry and so on, so its extent cannot be appreciated at this time. The movement of air of the cabin atmosphere through that hatch accelerates the velocity of the gases generated in the fire. There are other breaks in the floor which may have modified the course or the movement of the fire. These are hard for us ... the effect of these breaks in the floor on such movement is difficult to assess at this time. We hope that with further removal of some of the panels which obscure our view, we'll get a better appreciation of these factors. Now, there were several explosions that occurred ... Oh, incidently, I should make this point which I think is important, the amount of combustibles required to raise the pressure within that capsule to the point where the floor will break is surprisingly small. It would be less than a pound. The heat released by less than a pound of material would account for the pressure rise which our structures people say would give us a floor fracture.

These then are the principal features of the fire as we see it. There appears to have been a flash fire which has little consequence to us in this study, we feel at this moment at least, in the tunnel above the capsule. This is the cylindrical portion of the capsule above the cabin. Characteristically, in most fires,,the combustible materials give off combustible vapors which do not burn where they are generated because locally the vapors are coming off at such a rate as to render the zone too rich to burn. These vapors then float to the higher regions of the capsule where they accumulate - now, that accumulation is starting from a condition which is too lean, in other words, pure atmosphere, and then a continuing accumulation of combustibles until you reach the lower combustible limit. Then, that is ignited as a flash fire in the volume of that space in the

atmosphere. It does very little damage; it is short-lived, and we see no evidence in that zone that the fire did any substantial damage. It did appear to have ignited the Velcro. This Velcro is, incidently, the plastic materials that are used to give a pseudo friction to stabilize the position of somebody crawling thru that tunnel. And that, then, constitutes the description of the fire as we see it now.

Now there were two explosions or two events, that could be assumed to be explosions which are really characteristic of such fires. In the course of a fire, you frequently have explosions. The temptation is always in investigation these things to attribute the fire to the explosion, or to the explosions that one sees. Generally, the reverse is more apt to be true. The explosions occur during the course of the fire. One explosion appears to have happened in the oxygen purification system here, which contains carbon as an absorbent of organic vapors. It also contains a felt made of plastic which could be a polyurethane; the felt ignites easily. This was determined in the experiments that were run last night by Dr. Carhart. Their intimate contact with a pure oxygen atmosphere he feels would give their burning an almost explosive quality. The rate of propagation of fire would be great enough so that locally you could raise the pressure sufficiently to damage the rather substantial structure associated with the containment of these, carbon dioxide absorption capsules. Whether the carbon also in the canister was involved in that explosion seems to be problematical. The felt appears to have been the principal one to have given the pressure rise - it shows the distortion here.

We are anxious to get to these devices, these carbon dioxide absorption devices, which we suspect were involved in one explosion. The second explosion appears on the controller on the left couch. A corner of the control box is gone. It's not clear whether it is gone because an explosion occurred within the box that ripped off the corner - and that's a strange place for the box to have a failure. The corner is not the place you generally will find a failure. However, that corner is gone and it's a substantial corner. It's not just a flick - it's a substantial piece. There is some evidence on examination that seems to indicate that corner may have been helped along the way by being struck by a projectile coming from other part of the cabin. Also, small explosions take place in fluid lines, if the fluid is trapped between two closed valves and sits in the fire, sooner or later these lines will burst. Some of these lines have this appearance of having burst. Water, one of the water lines, in particular. I think then this represents all that we observe now that we can speak about, except to say that the greatest fire damage to the floor and to systems occurs in the zone beneath the lithium hydroxide cannisters which purify the cabin atmosphere. The situation at the base of that zone near the floor and including the floor shows an extremely severe fire here, enough to melt aluminum and cause it to puddle on the floor as ingots, which is a rather unusual situation. It implies several things: First, the fire was hot, and another, and more important, of long duration. Meaning that it started first and burned for awhile to give this much heat transfer into fairly massive aluminum pieces. This would not be the case, even with a hot fire, which would appear there only momentarily. Remember now, we have only a limited budget of oxygen here. The oxygen in that capsule could probably burn materials of a weight, say between 12 lbs and 15 lbs, depending on their chemical compositions. And this is all the material that can be burned by the available oxygen. Much of that oxygen was lost when the floor broke and the gases expanded; flame and oxygen came out together. So, the total amoont that could have been burned in that capsule is perhaps no more than 12 lbs of nylon-like materials. In that case, the extensive

damage done here would account for much of the heat release in the whole system. We think, just guessing, that glycol was the principal combustible in this area, to have provided so much heat release.

CHAIRMAN: Thank you, Mr. Pinkel.

(Off the Record Discussion)

CHAIRMAN: Mr. Pinkel wishes to add an additional statement.

PINKEL: With reference to the damage done at the floor and of the Environmental Control System, and in the zone immediately above the floor location, I think its necessary to point out that in the location we are speaking of, we have a co-mingling of oxygen lines and glycol, water glycol lines. The oxygen lines carry 900 psi oxygen and 100 psi oxygen in aluminum tubes which are vulnerable to local fire. The releases of oxygen into that zone helped to continue the fire. One thing I should point out, that under these conditions, aluminum itself can be a combustible and represents some of the combustible distribution to be considered when you have a situation of this kind. So, in addition to glycol, aluminum itself. The zones in this area, or adjacent to this area, which were not quite so hot, show characteristic white powder on them which we assume, without a test, to be aluminum oxide. This concludes then this phase of my remarks.

CHAIRMAN: Thank you, Mr. Pinkel.

(Off the Record Discussion)

CHAIRMAN: I believe Dr. Faget has a progress report to give.

(Off the Record Discussion)

FAGET: I have nine items. I'll just read them out quickly. The review of the environmental control system, water glycol circuit has been completed and is attached. This is a review similar to the one we had on power and I have a copy for distribution for the people here so they can look at it. The preliminary report is attached on the history of the environmental control unit's installation and removals in water glycol leakages on Spacecraft 012. This report does not contain leakages at Downey, nor does it contain a history of leakages during gas tests. But what it does contain is a number of cases where we have leakages and I think a great number of people are interested. The plan for examination of translation controllers is attached. This is supplemental to an item that has been approved today. It shows in detail how we will examine the translation control. Approximately 95% of the Command Module switch positions has been verified per the procedure, crew check list, and voice data. A list of all elapsed time indicators permanently installed on Spacecraft 012 and not to be removed before flight, is attached. Yesterday we had those that were supposed to be removed before flight. These are the ones that aren't. A check was made on Spacecraft 014 to determine visibility of the caution and warning system elapsed time indicator and capacitor. The removal of an access panel disclosed clear visibility. This panel will be removed on Spacecraft 012. This is already an approved action. As you might remember, this particular item is of interest in that we had a previous case of the condensor in question having had a fire in it. A simulation of the screwdriver incident reported yesterday has been

completed on Spacecraft 014 and the findings are attached. A review of the oxygen system is in work and should be available tomorrow. And this will be a report similar to the one that we have now on the water glycol system and on the power system. As a matter of information, there has been an inquiry about the last item. Two fresh lithium hydroxide cannisters were installed in Spacecraft 012 on the date of the test, January 27, 1967- They were installed on that date.

That completes my report and we'll pass out the package.

CHAIRMAN: Thank you. This meeting is adjourned at 1:00 p.m.

CHAIRMAN: This meeting is now in session. I would like to advise that the system for recognition of suggestions and offers of help is now fully in operation which includes letters signed by me to all individuals and organizations who make such offers or suggestions.

The master planning schedule has been prepared and distributed to those who have a requirement for it.

Mr. Williams, I understand you are now ready to present the progress reports for the day.

WILLIAMS: Yes, I would like to call on Col. Borman first to give the work status.

BORMAN: Yes sir, last night we found that the action items that were approved by the Board yesterday were completed with the following exceptions.

The gas chromatograph plug that we were concerned about was found stuck to the floor of the spacecraft and could not be moved without undue prying so we left it in place, and we are calling a team out now to examine it before we go ahead any further. The elapsed time indicator, you remember, we were concerned about because one of the elapsed time indicators was similar to the part that had had a failure in Spacecraft 014. We removed the panel and we were able to view it yesterday and it appeared to be in good shape so that removes that possibility.

The hypergolic unit that we're having a problem with and seems to be a concerning, reoccurring item is being removed from the pad today.

We also got the inverter cover panels out last night and No. 1 inverter, from a cursory inspection by the people on the pad, appeared different, and we have members of the Fire Investigating Committee on now looking at this number one inverter. Today, we are going to remove the main parachutes so we can examine the temperature-sensitive paint located below them, and we have already examined the umbilical area and found nothing unusual there. So the main emphasis now is developing a plan for progressive disassembly of the environmental control unit. We are working on this and this will probably be the first major system that we remove from the spacecraft. Incidentally, I have taken action to have the executive secretary of our panel reference or "close the loop," on the Board action items so that you get back not only the final action and the parameters involved, but also a reference of the test procedure that was written to cover it – so, if you want any further detail you can go to that. This will be initiated tomorrow.

CHAIRMAN: Thank you.

Mr. Williams, you have another report to give?

WILLIAMS: Yes, I have the report presenting additional removals which is a continuation from yesterday. It's Item 53. What we would like to do is propose a total interface check for the launch vehicle-spacecraft. Yesterday we verified certain key wires to the cue ball and the malfunction of the No. 8 engine light. This is a continuation of that, to verify the whole interface between the launch vehicle and spacecraft.

Item 54 is to determine the position of the direct O_2 valve. We would like to determine what position the valve is presently in.

Item 55 is a DC circuit breaker check in combinations, this is, after the inspection that was already approved.

Item 56 is the examination of Panel 150 and repositioned in the spacecraft. This is to verify if shorting behind this panel caused the fire.

Item 57 is to remove the pyro batteries behind the panel.

Item 58 is to disconnect the service module jettison controller batteries. We would like to remove the active power source from the service module.

Item 59 is to inspect ECU wiring-nondestructive. It is a routine check and inspection.

Item 60 is to remove mechanical cover on C15-1852 Junction box. We want to inspect the wiring where the screwdriver incident occurred, take the panel off and look at it.

Item 61 is to remove the X003 Recorder from the Launch Complex 34 and transport to S/C 017 at the VAB. Now this was the recorder that was used during the plugs-in test about two days prior to incident. It was disconnected during the plugs-out test, and we would like to verify configuration prior to transfer to S/C 017. It is a piece of GSE. The reason is to support the checkout Spacecraft 017.

Item 62 is to remove the cobra cable from the command module. What we are primarily interested in there is to see if there is any indication of arcing between the wires laying on top of the translation controller.

Item 63 is not on the list -- we would like to add it. We will pick it up on the list tomorrow. It is to conduct a limited analysis on the rotational hand controller, the same way we did the translation hand controller.

CHAIRMAN: Thank you. The plan is approved as presented by Mr. Williams.

BORMAN: Sir, I have one item that I inadvertently missed, and I think it is significant in our work statement. We got the main batteries out -- the reentry batteries out and first inspection shows that they were not in bad condition. We could find one small hairline crack, but no evidence of explosion or heavy fire damage.

CHAIRMAN: Thank you. In the authority under which this Board was constituted by letter from Dr. Seamans, one item stated is this: (paragraph 6, item d): "The Chairman shall appoint or designate such representatives, consultants, experts, liaison officers, observers or other officials as required to support the activities of the Board. The Chairman shall define their duties and responsibilities as part of the Board's records." We have arrived at definitions regarding these categories that apply to the Advisory Group.

A Representative - An individual representing a major element of NASA or other government agency having programs and activities associated with the Apollo Program, who participates in general meetings of the Board.

Consultants - Individuals who serve as an advisor to the Apollo 204 Review Board. It is the responsibility of the consultant to give his views or opinions on problems or questions presented by the Board or Panels. Consultants will, as appropriate recommend to the Board or cognizant Panels courses of investigation action to be undertaken in the field of their competence.

Liaison - An individual representing an activity having a recognized interest in the Apollo 204 Review, who attends general meetings of the Board for the purpose of familiarizing himself with the current status of the Apollo 204 Review. Liaison personnel are empowered to coordinate with the Panel Chairman or Board members as appropriate, in areas of interest, to acquire data that is of interest to the activity represented by the Liaison individual.

At this point we are going beyond the scope of the directive I previously referred to:

Panel Chairman - An individual designated by the Board to serve as a Manager to direct and coordinate the activities of the Panel to which appointed in accordance with a statement of work prescribed for the Panel by the Board. The Panel Chairman reports directly to the appropriate Board Monitor. Panel Chairmen will report to the Board when required on a progress of work and obtain Board approval of work plans.

Observer - An individual who attends general meetings of the Board for the purpose of familiarizing himself with the current status of the Apollo 204 Review, particularly in the area of his expertise and responsibility. Observers are empowered to enter restricted areas upon approval in order to be able to assist the Board or Panels. They shall also be prepared to submit to the Board, either orally or in writing such reports and recommendations as the Board may require.

One additional definition that we are applying to the procedures is that of Secretariat.

The Secretariat provides administrative, secretarial, clerical and other supporting services to the Board and Advisory Group.

Representatives, consultants and individuals serving in a liaison capacity will receive letters from the Board that confirm their relationship with the Advisory Group.

Dr. Faget has a project report to present.

FAGET: As reported earlier, there were nine instances of indicated high O_2 flow rate during the test prior to the incident. Of these, six were of sufficient duration to trigger the master caution alarm switch. The master caution alarm was delayed for 15 seconds prior to giving a high O_2 flow indication. The first high O_2 flow which occurred at 2145 Zebra did not trigger the alarm in 15 seconds; it took 27 seconds. This could be indicative of either:

a. Some type of intermittent condition in the O_2 sensor and/or a time delay device, or

b. The flow leaving the high flow condition during the data sampling intervals. The data sampling rate is only once every second. Of added interest the time delay device is attached to the junction panel, where the screwdriver incident occurred. The last instance of high O_2 flow indication, approximately 4 seconds before the fire call had a rather steep slope. In reviewing the nine instances of high O_2, only two others indicated this type of steep slope. One was at 2319 Zebra (Zebra - Zulu Mean Greenwich Mean Time) when the command pilot opened the space plate, the other was at 2323 Zebra and the voice recording did not reveal anything out of the ordinary at this second time.

Item 2. A review of all available data discloses that the C-band transponder dropout and the VHF-FM interruption at 233054.7 Zebra was caused by an AC power interruption. It cannot be concluded at this time whether AC power interruption was caused by AC power or DC power glitch (a malfunction detected over a very small period of time in the electrical or electronic systems). A playback of the MDS recorder should help to clarify this situation.

Item 3. The elapsed time indicator and capacitor for the warning systems on Spacecraft 012 was examined and found to be satisfactory yesterday. This was the same indicator that was burned on Spacecraft 014.

Item 4. The medical tape recorder will be opened late today or early tomorrow. TPS's are in preparation fro removal of tape and the strip-out of data at the KSC facility. A test tape is being prepared to verify the reduction and strip-out of data at this facility. Cook Electric, the recorder manufacturer, and 3-M, the tape manufacturer, have each a tape expert enroute to inspect recorder and tape prior to removal.

Item 5. During inspection of spacecraft inverters this morning, visual inspection of inverter 2 and 3 indicated they were in good shape; however, inverter #1 looked suspicious. Systems engineers and fire board panel people have been requested to inspect this inverter immediately.

Item 6. The chromatograph connector cannot be lifted from the floor. It is stuck. Another TPS is being prepared for its removal. This is the chromatograph connector that we were suspicious about earlier in the investigation. That ends the report.

CHAIRMAN: Thank you.

Col. Baxter, do you have any progress report in the operation of your panel?

BAXTER: Yes, sir. Very briefly, we followed a priority along these lines. Eye-witnesses first. That is, people who actually saw flame or fire, or heard something at the command module. Other witnesses, who were remote, but had a view through television; people who heard things; and lastly, a general category of other. Now, in this other category, we have quite a number of people. We have had in all categories approximately 100 statements as of this morning. We have been promised approximately 150 other statements which will probably be of primary interest to the procedures panel, inasmuch as these people neither heard nor observed anything, but were simply stating what they did during the test in question. That's all I have, sir.

CHAIRMAN: Thank you.

Off the record discussion.

CHAIRMAN: Mr. Williams has an additional item of action taken by the Board in approving an additional panel. Mr. Williams.

WILLIAMS: This is Panel 21, Service Module Disposition. We discussed it yesterday at the meeting, and it was approved at the Executive Session last night. The task description is, "This task involves the planning and execution of necessary service module activity beginning at the time of Board approval for Command Module demate. This task will be performed by appropriate Apollo line organizational elements in accordance with a Board approved plan which identifies the Board requirements for documentation control of this activity."

CHAIRMAN: Thank you, Mr. Williams. This action reflects a suggestion made in the morning meeting yesterday, resulting in the action taken later on by the Executive Board in the afternoon.

The meeting was adjourned at 11:31.

CHAIRMAN: The February 9 general meeting is now in session. First, I would like to point out that we have felt the need to establish our own letterhead for the use of the Review Board and its panels. The nature of our responsibilities is such that it was inappropriate to use other letterheads. We have formed our own letterheads. All correspondence going out of here from the Board will be on this letterhead. It says National Aeronautics and Space Administration, Apollo 204 Review Board.

In action of the Executive Session yesterday afternoon the Board approved a standardized diagram for use by all Board Members and Panels. The diagram is designated the "Apollo 204 Orientation Drawing." It is to be used to depict exact locations of equipment or activities referenced in documents and reports. The drawing is on exhibit here in this room.

(Off the Record Discussion.)

CHAIRMAN: Copies of this drawing will be distributed today to all the Panel Members and Board Members and others who have a need for this drawing.

In yesterday's general meeting it was brought up that there was a need for the development of workable procedures for an effective program for testing systems and components as they are moved from the spacecraft to the plants of prime contractors investigating them. As a result of the discussion, an ad hoc committee meeting was called to meet with Mr. Malley, Counsel to the Board, at 1:00 PM to prepare recommendations for the Board on this matter. That panel prepared a proposed method of handling this problem which was presented in the Executive Session of the Board in the afternoon meeting. The Board approved in principal a method of classifying material so that the intent and requirement for rigid controls, and proper control by the Board, of certain material could be followed, but that other material could be handled in such a way that we could have a workable arrangement that would not impede our progress in the entire program. The classifications of material that were developed are as follows:

A. Highly relevant material under rigid control.

B. Relevant materials subject to normal program procedures.

C. Material released from Board jurisdiction.

Category A material which must be sent off site for testing, analysis or other reasons to satisfy requirements of the review will be accompanied by representatives or a witness designated by the Board. Appropriate quality control and contractor personnel must also accompany the Board representative.

Category B material sent off site need not be accompanied by a Board-appointed representative.

Category C requires no further comment since it will be released from Board jurisdiction.

(Off the record discussion.)

CHAIRMAN: We'll call on Mr. Williams now for a progress report.

WILLIAMS: Col. Borman will give the work progress on the pad.

BORMAN: Yesterday we completed all the outstanding TPS's and these included removing the main parachute and several other inspection items. I have a copy of this I'll submit for the official record. Today, we have a rather light load on the spacecraft. As of this time we have some TPS's that have been authorized that are in preparation and these will be worked as soon as they are completed. The main one will be electrical resistance check and continuity checks in mapping of damaged wiring. That was the extent of the activity yesterday and for today, sir.

CHAIRMAN: Thank you, Col. Borman. Will you please continue, Mr. Williams.

WILLIAMS: First item I will pass on is the one that was approved yesterday – analysis of rotation hand controller in the same way that we did the translation hand controller.

Item 64: Is to remove stowed crew systems equipment from the spacecraft. The reason for removing loose equipment is to eliminate damage, primarily, – here it's the cameras and the wire bundles that were not connected with the spacecraft wiring at the time of the incident. We feel it's satisfactory time to remove them now and place them in the PIB building.

As you recall we had an item yesterday to inspect the command-module, service-module, umbilical guillotine and what we're interested in here is to inspect it and see if there is any way we would dislodge evidence. The inspection shows that we can use action Item 65 to remove the guillotine. What we're primarily interested in is to remove the pyro device.

Now Item 66 we're getting into disconnecting plugs. I'd like to discuss Items 66 and 70 at the same time. To measure continuity and pin-to-pin check of all wires through the fly-away umbilical, if there's no visual evidence of fire damage. This is the main umbilical that goes into the spacecraft. We discussed this for about an hour this morning, the pros and cons, and I feel that by removing this and the inspection of it, we can ring into the spacecraft and find out more information on the wire bundles in the spacecraft. It will be removal of GSE umbilicals from the spacecraft.

PETRONE: You're not proposing removal – you're just saying check?

WILLIAMS: No, check involves removal.

PETRONE: You've got to disconnect the umbilical?

WILLIAMS: That's right.

PETRONE: You cannot make it through the interface?

WILLIAMS: No, that's why I'm highlighting this one point. I'm assuming that we could discuss it during the discussion period.

Item 67: Is continuity and pin-to-pin check of all wires, the service module, GSE access connector. There's nothing tied on to the wire bundle now. It's a GSE plug; there's no removal of any wire bundle.

Item 68: Is in the same category as continuity and pin-to-pin check of all wires terminating at RCSC, GSE-connector. This is ringing into the spacecraft without removal of wire bundles.

Item 69: Is the continuity and pin-to-pin check of all wires in the tower disconnects to establish the configuration of it.

Item 70: Is in the same category as 66, continuity and pin-to-pin check of all wires to the command-module/service-module umbilical if there is no visual evidence of fire damage in the area. The reason is to establish configuration.

Item 71: Is to determine the configuration of sequential systems using GSE connectors. This is to establish the configuration.

Item 72: Is to determine the configuration of spacecraft wiring associated with the event inputs of the "Caution Warning" system. There is a plug with about 8 resistors in it that we want to remove that was a flight team. It was to change the scaling factor on certain measurements of "Caution - Warning." The mod was put in the plug at the GSE point. We discussed this one also. What we want to do is ring out the "Caution - Warning" system through this GSE plug.

Item 73: We had a preliminary meeting on the ECU removal and analysis yesterday and I don't think we'll be able to give the Board a presentation on what we expect to do on this before tomorrow afternoon. I would like to check with the people again today and if it's satisfactory I would like to give the Board a presentation of the ECU plan sometime tomorrow afternoon.

Items 73 to 77: Were preliminary plans leading up to getting more visibility into the ECU.

Item 73: Is the removal of the O_2 valve panel.

Item 74: Is inspect the CO_2 absorber element; analysis is the charcoal absorber for traces of possible early combustion products and source materials.

Item 75: Is remove the water valve panel for additional visibility required after O_2 panel removal.

Item 76: Is a chemical analysis of selected ash material from the spacecraft.

Item 77: Is to remove 17 screws from the Lithium hydroxide access panel to obtain access.

Item 78: Is to remove the octopus and corba cables from the command module. Reason is to prevent further damage to cabling during command module work and troubleshoot the communication keying problem encountered during the test.

Item 79: Is the release of non-accident associated miscellaneous materials from

levels 6, 7, and 8.

CHAIRMAN: Thank you, Mr. Williams.

(Off the record discussion:)

CHAIRMAN: The discussion has brought out the need for clarification of certain items relative to the fact that they do involve the disconnection of certain of the equipment. I would like to ask Mr. Williams to comment on a plan to provide this clarification. Mr. Williams.

WILLIAMS: Yes, sir, we'll modify our list for the record and point out the item numbers that require the disconnection of flight bundles. Primarily items 66, 70, and 72.

CHAIRMAN: Thank you, Mr. Williams.

(Off the record discussion:)

CHAIRMAN: I would like to ask Mr. Yardley if he can clarify the actual intent of the phrase "establish configuration" which appears in many of the items that we're discussing.

YARDLEY: The real intent is to establish the damage configuration to the electrical system. We would take the information that we obtained by unplugging these items and measuring and compare them to the previous information before the accident. The differences would define the damage configuration. We would then take this damage and go further into the spacecraft looking for potential ignition sources.

CHAIRMAN: Thank you, Mr. Yardley.

(Off the record discussion:)

CHAIRMAN: The list of items presented by Mr. Williams is approved subject to the condition, that the clarification of certain items previously mentioned will be provided in the final listing; and further that with reference to Item 79, that clarification of the manner in which this item is to be administered will be provided the Board in Executive Session this afternoon at which time they will be in a position to take action on that item.

(Off the record discussion:)

CHAIRMAN: Dr. Faget will continue with a progress report.

FAGET: The item for the day concerns a power glitch. All the deductions concern the AC Bus 2 glitch at approximately 23:30:55, point to the problem being associated with an AC source rather than a DC source. Because AC Bus 2 is fed from DC Bus B and because DC Bus B feeds the Biomed recorder, it is quite possible that the tape from this recorder will help validate the deduction. One possible explanation for the AC glitch would be if the crew had the telecommunications on AC Bus 1 instead of AC Bus 2, - switching from AC 1 to 2 at this time would produce the results indicated by the data. The records are carefully being reviewed from crew ingress to the time of the incident, to determine if any switching to AC Bus 1 had occurred earlier.

A structures assigument report has been passed out. This consists of a list of all structural damage from a thorough inspection. No discussion or analysis as to the possible cause, other than that implied in the description of the damage is included. Two main categories are listed: first, damage of major significance. Damage in this area is classified into a number of categories such as metal, where primary failure is cracking; metal where primary failure is due to melting and so forth. Damage of minor insignificance includes such things as cracked glass, melted plastic, and things of that nature.

(Off the record discussion:)

FAGET: Starting with today, we plan to prepare a Board action summary sheet, which will be passed out daily. I haven't got them here at this time, they are being reproduced and will be put in the boxes for the various Board Members and others who get this type of material. This summary sheet lists the Board actions by number; the description of the Board action; the reason for the action; the date at which the Board approved the action; the TPS number that resulted from that action; the summary of the results of the TPS's work; and whether or nor the action is completed or still open. In today's listing I have all of the Board action numbers from 0026 to 0062. We weren't keeping quite as good a record prior to 0026, but we will have those from 0001 to 0025 tomorrow. As I said earlier, these sheets will be updated daily and the updated sheets will be passed out at the meeting.

CHAIRMAN: Thank you, Mr. Faget.

(Off the record discussion:)

CHAIRMAN: The Chair wishes to point out that the standardized drawing that was referred to earlier is actually on exhibit here for the members of this meeting to look at. I think it was pointed out earlier that it will be distributed to all those who have a need for it, – that is copies of it will be distributed this afternoon.

(Meeting adjourned at 11:43)

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CHAIRMAN: In the first part of the Executive Session activities yesterday we met with the Panels, not only the Chairmen but also the membership to hear a brief report of their activities up to now. Each Chairman presented a brief statement supported by a written statement that he provided the Board. This review is considered by the Board to have been very successful in accomplishing the purpose of getting an overall view of the actions of the Panels up to now. So we are very grateful for the effort that all the Board Monitors, the Panel Chairmen and the Panel Members did in making this review possible. With reference to work schedules for this weekend, the current plan is that there will not be formal meetings, either of the General Meeting or the Executive Sessions, Saturday and Sunday. The pacing items in this investigation are the work at Complex 34 and the PIB. It is the understanding of the Board at this time that the approved plan for work at these activities, which will be further supplemented by the Executive Session this afternoon, will cover this entire period to the extent that formal meetings will not be required. There will be people on hand, including the Chairman, to handle emergency questions that may arise.

In order to obtain a proper understanding and assessment of the manning requirements to carry out the program that is in progress, we will place on the agenda for next Tuesday's General Meeting a report from each of the Board Members, (the Board Monitors) of an assessment of the manning requirements for the Panels for which they are responsible. This will provide us with an assessment of the manning requirements to execute the program as we have laid it out in our plans that were developed a few days ago.

I will now ask Mr. Williams if he is ready with the progress report for today. Mr. Williams?

WILLIAMS: I would like to call on Colonel Borman first concerning the work at the Pad.

BORMAN: The Spacecraft now is being worked on the TPS 049, which is the electrical continuity check. We estimate two plus days to complete this. We also have some TPS's in preparation, ready to start Monday morning. First priority will be to X-ray the glycol tanks. We have approval for three people on the Spacecraft and we will be removing the cobra cables. We will also be removing some of the GSE from around the Spacecraft. The work now is going into the detail pin-to-pin and pin-to-ground electrical continuity checks that we approved two days ago.

CHAIRMAN: Thank you, Colonel Borman. Mr. Williams, will you continue the report?

WILLIAMS: The Phase A Removal and Test Plans were approved last night at the Executive Session, Items 0079 and 0080. Item 0079 is, release the GSE to support electrical test. This GSE includes 6 TPS's.

CHAIRMAN: To interrupt a moment. For the benefit of the people here, the Chair would like to remind you that we left as unfinished business yesterday, clarification of certain items in Mr. Williams' report, and particularly Item 0079, which was taken off in the Board Executive Session yesterday afternoon. Approval was given subject to the understanding that it will be discussed here this morning

in the General Session. This, I take it, is the action that Mr. Williams is now covering. Mr. Williams?

WILLIAMS: That is correct. Item 0079, release of GSE to support electrical test. This GSE includes 6 TPS's. Launch Complex 34 TPS 5562561. GSE is as follows: One Breakout box X00-076, three battery sub-unit cables, one support test equipment cable and one milliohmmeter. Reason is, this GSE is required to support electrical test. Item 0080 is to perform translation control electrical operation verification. This includes checking the installation resistance and push-to-talk function. The reason is to check the electrical function and translation hand control which includes the talk leads. Item 0081 is removal of aluminum wickets that cover switches in the SCS main display console. Both sides of SCS direction. These wickets were in the line of the fracture of the translation hand controller. Reason: to examine and determine if melting or fracture were the mode of failure. Item 0084 is to remove a metal chip located in ECU demand regulator, left-hand equipment bay. Reason: to perform metalurgical analyses of metal chip which may aid to find thermo profile. Item 0085 is to perform electrical check of rotation hand controller. Previous work on the Rotation Controller 0063 was to perform mechanical inspection. This is to check functions from the Controller to the appropriate SCS in the J-box stub. Check function from pin-to-ground. This needs to be accomplished prior to seat removal. The reason is the continuity check. Item 0085 to perform translation controller pin-to-pin to vehicle ground point continuity check. Previous work, 0043, was mechanical inspection. Reason is to verify the Translation Controller to the Spacecraft interface. Item 0087 is to measure continuity of push-to-talk function on the SCMD cobra cable. Reason is to verify interfaces. Item 0088 is a portion of the hand control, both translation and rotational wiring which is attached to the right-hand couch and couch supports struts. In order to complete couch removal, this wiring was cut in two places. The continuity test needs to be run on the wiring on the couch to the SCS junction box on the couch. This equipment is located in the PIB. Reason is to verify continuity.

CHAIRMAN: Thank you, Mr. Williams.

WILLIAMS: I would like to add that we will have an overall Removal Plan available around four o'clock this afternoon on the removal and various test and removal of ECS. And from this, rather than do it in individual items, we would like to present to the Board the overall plan and then break it down at that particular time and get approval for removal and test on that phase.

CHAIRMAN: Are you preparing that for the Executive Session this afternoon?

WILLIAMS: Yes, so we can present it at the Executive Session.

CHAIRMAN: Thank you, Mr. Williams. Dr. Faget will continue with the progress report.

FAGET: There are several handouts that have been given out already. The first one, the one we started with yesterday, which is a summary report of Action Items, and includes at this time number 0026 through 0080, I had hoped that we would have the 0 to 0025 Items included but I think we need more time to research the records and get this straightened out. We have every reason to believethat we will have them in this form sometime next week. The next handout is the Integration Analysis status report. It looks much like the other one but deals with a different thing. It deals with the investigation of each and

every item under consideration and we have them listed by description, status and conclusions. Each finding has a particular number assigned to it. As the Board saw yesterday in the Action Center, we have these displayed on a large board on the wall inside the room. Accompanying our status report, there is another report that goes with it. These are the conclusions and the findings. If you look at the first report I talked about, wherever you see a conclusion marked with an "X", that means that's a closed out item, and we will have conclusion. For instance, #6 VHF-FM video drops out for thirty milliseconds at 233054. It's an indication that the investigation is completed and the action in this case says it did not cause the incident. And we have a little paragraph on that particular conclusion here. In the event that anyone is interested in knowing more about the conclusion that what is contained in this paragraph, we have a complete file on each one of these findings in the Status Support Room and you are welcome to go up there and look at the folder. Of course, we cannot let the folder leave the room. At this time we have nothing in the conclusion column under the title "May have contributed to the incident". We have one more handout that's being passed out to the Board today. It is a summary description of the ECS oxygen system that was prepared by Frank Samonski and is in five parts as indicated on the cover sheet. Oxygen system description, the cyclic accumulator operation description, oxygen system schematic, oxygen system characteristics and a tabular summary of anomalies and associated notes. Monday or Tuesday we hope to have a written status similar to the oxygen description on the Communications System status at and prior to the time of the incident. That concludes my report.

FAGET:

CHAIRMAN: Thank you Dr. Faget. This meeting is adjourned at 11:16 a.m.

CHAIRMAN: At the start of this general meeting, we have just witnessed a photographic study, completed at Houston at the Manned Spacecraft Center, a photographic study obtained with Vehicle No. 8 which shows what can be seen through the hatch window with the television monitor with various degrees of external and internal lighting. The record of this study will be available for correlation with eye witness accounts.

Dr. Seamans spent most of Friday here and one item of business that was agreed upon is that at the earliest possible date date he wishes to obtain significant information and tentative findings. The subject of flame propagation. I'll ask Dr. Van Dolah for verification of the understanding the understanding that we have, that it may be possible to make such a reporting to Dr. Seamans by Wednesday of this week. Dr. Van Dolah, do you have any comments?

VAN DOLAH: yes sir, Mr. Chairman. This we agreed to prepare, and will have it in your hands late today or tomorrow.

CHAIRMAN: Thank you, Dr. Van Dolah.

Also, we have tentative plans for a meeting of this Board with the Deputy Administrator and such others as may be required for review of our progress, a review of the activities of the panels for guidance of the Apollo Program. This meeting will tentatively be held February 22nd or 23rd, 1967, here at the Cape. This understanding; however, is tentative and will be confirmed at a later date.

We are obtaining considerable help from a few people that reported to assist the activities of the panels. One from Langley Research Center, representing the Life Support Program activities there and 7 from Marshall Space Flight Center from various activities there. I will ask Mr. Geer if he can briefly outline the activities or assignments that these people will be engaged in here - Mr. Geer.

GEER: Mr. Chairman. Mr. Key from Marshall has been working Panel #2 and Mr. Krupnick from Marshall, Panel #5. Mr. Brooks from Marshall is Panel #7, Mr. Rio from Marshall, Panel #8, and Mr. Hypes, Langley, who is interested in the life support area, we assigned him to Panel #9, and Mr. Haley, Marshall, is Panel #18, Mr. Glass from Marshall, Panel #18, and Mr. Cole, Marshall, Panel #18. That's all.

CHAIRMAN: Thank you, Mr. Geer.

In a meeting with the panel members on February 9, 1967, Mr. Jeffs brought up the question about names on panel reports. The Board has decided that Panel reports will be signed by the Panel Chairman only. The administrative procedure involved in putting that matter into our system will be developed by Panel #15. **As regards the concern that may have underlied Mr. Jeffs' suggestion that we need assurance that the Chairman of panels are not withholding an important minority opinion from proper considerations, we are asking that the Board monitors will assume the responsibility for assuring that minority views are given proper consideration and that serious differences that are not resolved are brought to the attention of the Board.**

I would like to ask Mr. Geer whether the Panel #15 work in developing administrative procedure to deal with the control and release of material for testing and analysis has been prepared and distributed. Mr. Geer.

GEER: Mr. Chairman, the Procedure #11 has been developed and has been distributed, this morning. And this procedure actually covers all the material related to this incident and we have broken it down actually into the three categories; Category A is this material is considered highly relevant and is to be maintained under rigid Board control. Category B is that material which would fall under normal program procedures. Category C is material released from Board jurisdiction. The procedure by which this material will be handled is spelled out in Administrative Procedure #11. And, it should be remembered that all categories, all spacecraft and GSE and all material related to this incident falls in Category A before it is degraded to B or C and does come directly under the control of this Board. Thank you.

CHAIRMAN: Thank you, Mr. Geer.

I will now ask Mr. Williams for a presentation of report of progress. Mr. Williams.

WILLIAMS: Col. Borman, will you give the Pad report.

BORMAN: Within the past 24 hours TPS 89, 63, 65, 66, 82 and 90 have been closed-out. These include making GSE continuity checks, removing the water panel, removing the oxygen panel, removing a selected metal chip and photographing it, removing panel C15 and 1A52, and also removing a CO2 sensor. On the pad now, we are working TPS's that include checking the continuity of the launch escape system, we are testing the 02 system, we are planning to remove the 1 lb. oxygen bottle and we are going to attempt to drain any water glycol that may remain in the system. The X-ray of the tanks has been completed and we are attempting to see if there is any valuable data on that. A great deal of the work now is being done outside the command module and we do have an opportunity now for people to investigate the inside if there are any valid requests.

CHAIRMAN: Thank you, Col. Borman. Will you please continue, Mr. Williams.

WILLIAMS: Yes, sir. We only have two additional Board items. One would be taken care of by this administrative procedure, but we would like to get an okay now. In order to determine the cause of communication problems encountered in the AS-204 plugs out test, it is requested the following equipment be released from impoundment. Some of it has already been released, some hasnt't. I think the one that hasn't is the astronaut astro-communicators console A48 KS panel and the MSTC test conductor panel, the OIS RF located in ACE Station #1, ACE Station tape recorder voice channel, and the MOLC S-Band and VHF voice tape recorder during reported communications problem approximately 30 minutes prior to the incident. Reason is intended to simulate, as close as possible, configuration of total voice communication system involved in the test with particular emphasis placed on OIS channels Black 2, 3, 4, and associated off-site circuits. Item 0109, the cameras that were on board the spacecraft were located over at the PIB and was removed by another action item. It appears that the lenses are off, but we would like to develop the film in the camera. Cameras have already been removed from the spacecraft and the reason is there

is a possibility some of the crew activities were filmed during the plugs-out test. I think we're at a point now where we can have tomorrow, a detailed electrical review like we had of the ECS system, a removal and an investigation. It should be ready some time tonight. We'll review it and maybe we can shoot for tomorrow afternoon the electrical sequences.

(Off the record discussion)

CHAIRMAN: The items proposed by Mr. Williams are approved. I understand that Dr. Faget has a report to make. Dr. Faget.

FAGET: My report today consists of the results from Board action items. This is the report that will be prepared daily. Today's report also includes the first twenty-five Board actions. These were not included in the previous reports.

CHAIRMAN: This meeting is adjourned at 11:39.

CHAIRMAN: The meeting is now in session. The plans for obtaining panel reports and the subsequent action to coordinate these reports and prepare them for presentation to Dr. Seamans so that they will constitute an assessment of significant information and tentative findings is fairly well planned. The meeting with Dr. Seamans will occur on the afternoon of February 22 here. This meeting with Dr. Seamans will be preceded by a report, that has been prepared from all this assessment, before the board here on the afternoon of the 21st. At that meeting Dr. Mueller and members of his staff are being invited to sit in and discuss the report with us.

The period from 5:00 PM, Friday of this week until the afternoon of Tuesday February (22) will be utilized to coordinate and finalize the draft summaries presented by the panels into the form of the presentation that we are preparing to make to Dr. Seamans on Wednesday, February 22nd.

In the executive session yesterday, the Board approved a suggestion by Dr. Faget that it would be appropriate to have suit experts participate in the action of this review for the purpose of helping to assess the significance of the suit damage and also to provide a useful information regarding future suit designs.

I'd like to ask Dr. Faget whether the action that was approved has reached a status that people are really on their way to participate in that.

FAGET: Two people from the MSC Crew Systems Division will spend a day here Thursday. They will ask for one or two people from the David Clark Company to accompany them. I don't know about the David Clark people, but I do know the MSC people will be here Thursday.

CHAIRMAN: Thank you, Dr. Faget.

BORMAN: We're now entering a period of reduced activity within the spacecraft. The overall plan is to prepare TPS' to clear up the work prior to moving the spacecraft on Friday. We have now in work a TPS to remove the surge tank and we're also draining the water glycol. This is currently in work. Plans for the day are to initiate the TPS to check the vacuum on the cold plates, water glycol cold plates, and also to inspect wiring that might be moved during the move to do the ring-out on the command and and service modules umbilicals. These hopefully will be completed tomorrow. We'll use Thursday to clean up the spacecraft and we'll move it on Friday.

CHAIRMAN: Thank you, Colonel Borman.

Will you proceed, Mr. Williams.

WILLIAMS: Yes, sir. We have developed the overall electrical plan similar in nature as we developed the ECU removal plan last week and would like to present this to the Board, possibly three o'clock this afternoon. And from this approval of the electrical plan we'll start sequencing the other systems into it for Phase C operation back in the PIB Building.

CHAIRMAN: Thank you.

WILLIAMS: If that's all right with the Board at three o'clock, we'd like to set it up.

CHAIRMAN: This is an action that you wish to bring before the Board at three?

WILLIAMS: Right.

CHAIRMAN: For approval.

WILLIAMS: For approval of the electrical and sequential test plant.

CHAIRMAN: We will be prepared to take that action at three o'clock, as recommended by Mr. Williams.

WILLIAMS: I have item 113 of about five items today to inspect the spacecraft 012 service module and record damage.

WILLIAMS: The reason is to determine the general condition of the service module and give a description of any specific damage.

Item 114 is inspect the main display console DSKY and wiring harness, will require removal of an access plate. There are no cables being broken below the DSKY. Reasons to determine the general condition of main display console and DSKY -- its wiring harness.

Item 115 to make pin-to-pin resistance check and the GN and GSE access connective. Reason is to determine further the extent of the damage to the spacecraft wiring harness. There is no cabling hooked up to this GSE connector at this time.

Item 116 -- Remove the gas chromatograph Hughes connector from spacecraft and perform lab. analysis. Reason is connector was uncapped throughout the test and analysis needs to be made of this connector to determine if it could be an ignition source.

Item 117 is to remove the CO2 absorber cannister from the aft bulk-head in bront of the ECU. Reason for this is the CO2 absorber cannister must be removed prior to the ECU removal.

There is another item here that was passed out, of change in the categories from A to C on a lot of material on the pad and also the PIB.

My suggestion is thaa the Board review it for the remainder of the day and possibly make a decision on its disposition at the executive board meeting this afternoon at 4 o'clock.

CHAIRMAN: Thank you.

(Off the record discussion)

CHAIRMAN: After discussion, it is agreed that items 113 to items 117 recommended by Mr. Williams are approved. His recommendation that the Executive Session this afternoon review the recommendations for change of status, classification of material is also approved.

The progress report will be continued with Dr. Faget making a report.

FAGET: The daily progress reports on summary of board actions and the status of the analysis is hereby submitted. At this time, we still have nothing in the conclusion column that would be listed as "may have contributed to the incident".

CHAIRMAN: Thank you. Just wish to comment on the request that was made Friday for board members to come in with an assessment of the manning requirements for the activities of the panels with which they are associated. The review of that problem shows that the manning requirements supplemented by actions of the last several days seem to leave only one area that we need address ourselves to and that is in the area of assembly of report under Colonel Strang. He needs some additional help and we will take up with him the problem of getting additional help.

This meeting is adjourned at 11:46.

CHAIRMAN: The first portion of the meeting this morning was spent in a general discussion of the communications system as outlined to us by personnel who are handling this part of the review. With reference to the item discussed yesterday concerning the integrated electrical sequencial test plan which was to be discussed with the board at 3 PM, I wish to report that that meeting was held, and as a result of that meeting certain of the detailed items involved in the overall plan were approved and will be reported in a progress report today. In addition the overall plan was approved in principle as a basis for planning the detailed items which will be submitted to the board for approval.

Col. Borman has just presented for consideration by the board a list of items ov items of material proposed for release from Category A to Category C. These items are listed on 59 pages. The discussion brought out the need for certain revisions of the proposals and the final action on this entire list will be taken this afternoon in the Executive Session of the Board.

I will now ask Mr. Williams if he is ready with the progress reports.

WILLIAMS: Yes, Col. Borman do you want to give the status report?

BORMAN: Yes, the spacecraft work is again preceding rather slowly, we were not able to to remove the surge tank and we are going to have to wait till we get the environmental control unit out before we remove the surge tank. This is a difficult operation, - they made a special tool but they still could not get it out, so that we will have to delay that until we remove the ECU.

The continuity check and the umbilicals are proceeding. We have a plan now to demate the spacecraft from the service module and that also is proceeding. The leak check of the water glycol system, we have a TPS for that and that is in work right now on the spacecraft. In attempting to drain the water glycol out of the spacecraft, they were only to get about one quart out of the system and this may be due to the we don't know how much is still left in the reservoir, but to date we have only been able to get one quart out of the system. The plan for today is to start cleaning up there on the Level 6 and 7 in preparation for movement on Friday and we're preceding with the approved TPS's.

CHAIRMAN: Thank you Col. Borman. Mr. Williams do you have other progress reports to present?

WILLIAMS: Yes, we reviewed the electrical plan yesterday afternoon at 3 o'clock and the proposed board actions are listed here as the results of the tentative approval. I would propose rather than read them all off the three pages that you could consider them during the rest of the day and approve them.

CHAIRMAN: Mr. Williams has just presented to the board for proposed board action items 118 to 138. These items will be taken up for final action in the executive session this afternoon.

Col. Borman has just submitted for approval of the Board an additional four pages of items for material release and the items are approved as recommended, subject to the understanding that the complete list of items that he submitted for

approval today, including the previous 59 pages, will be brought to the Board tomorrow with the continuous numbering system that will identify the items.

With further reference to the proposed list of actions submitted by for board approval by Mr. Williams, items 118 to 138, these items will be submitted tomorrow morning at the general meeting for action rather than to the executive session this afternoon.

In continuation of the progress reports we are waiting for a report from Dr. Faget.

FAGET: First, I have the status of the analysis. We're submitting that today on a new form which includes a little bit more information. We have 92 items listed. Of these seventeen have been completed. Three other item numbers have been marked void as work has been dropped or grouped into other catagories, however, we expect to use these numbers on new work in the future. At present there are still no items upon which work is completed that falls into the category, "May have contributed to the incident". We also are submitting conclusion summary sheets from seven recently closed out items. I would like to propose that instead of bringing the analysis up to date every day like we have been doing, that we do this in the future just on Fridays and Tuesdays because of the large amount of work involved. I will bring in each day the conclusion summary sheets on those that have reached a conclusion. I alsoopropose that we do the same thing on the summary status of the board approved action. These also will be submitted just on Fridays and Tuesdays. This will eliminate a lot of reproduction of the same material every day. I also have a summary "write up" on the use of liquid material and solvents used in spacecraft 012 for such uses as cleaning, painting and bonding during January 1967. This summary was prepared by Panel 6 (Historical Data) and has been submitted to Panel 18 as a matter of record.

I thought the board would be interested in it. In addition to the oral report which you have heard, there is a written summary on the communications systems submitted today. That concludes my report.

CHAIRMAN: Thank you Dr. Faget, Dr. Faget made a proposal for simplifying the form of reporting progress and presenting action items that would result in a large reduction in the paper work and the discussion has brought out an agreement that this is a desirable action. The understanding is that the reporting forms will be simplified by having a complete summarization twice a week with each day a presentation of pertinent items that are of interest to the Board and should be brought to the Board's attention during the intervening period.

The meeting is adjourned at 12:52.

CHAIRMAN: In yesterday's meeting, you will recall that we agreed that an up-dated material release record will be distributed in this morning's meeting. I will ask Col. Borman if he has taken that action. Col. Borman.

BORMAN: Yes, sir. We have transcribed 35 of the items that were approved by the Board yesterday. We have them in the permanent material release record and this will be kept as a permanent record for the Board. Other items that we approve will be added sequentially.

CHAIRMAN: In yesterday's morning meeting a list of proposed action items were presented by Mr. Williams, Items 118 to 138. It was agreed that more time was required for review of these items, that the action would be deferred for consideration at this morning's meeting so that we will get the benefit of advice of more people who had a chance to see the proposed items. I will ask Mr. Williams now if the list that has been circulated here this morning is the same list that we had yesterday or for any comments regarding any changes or additions that we should consider at this time.

WILLIAMS: Yes, it is the same list with the correction as mentioned yesterday on Item 120. Panel 150, a loose piece of equipment, should be removed and we will remove it after we get the Command Module back to the PIB and wiring checked to establish wiring configuration. That is the only change on the lists at this time.

(Off the record discussion.)

CHAIRMAN: In the discussion of the items previously referred to by Mr. Williams, it appears that they are probably satisfactory. In addition, he has presented Items 139 thru 143 for consideration. Item 143 is an urgent item as regards the need for early approval. In the light of the discussion, Item 143 is approved at this time, all remaining items I think will be approved in the Executive Session this afternoon unless we learn something that will bring up the need for some modification between now and then. Mr. Williams, are you prepared now to proceed with your progress report for the day?

WILLIAMS: Yes, sir. I think we covered the items previously to action items, and the plan that we have now is to get an overall schedule for Phase C and D by Monday. That's a completely integrated schedule of all systems that should carry the rest of the work in the Command Module, ECS, communications, instrumentation, etc., on one Master Plan and we're shooting to have this by either Sunday or Monday.

CHAIRMAN: Thank you, Mr. Williams. Do you have anything else to report? Do other members of your Committee have items to report?

WILLIAMS: Col. Borman has a work report.

BORMAN: Yes sir. We are proceeding with disconnecting the inverters, continuity check of the cabin fan, and, of course, work is going on in preparation for the spacecraft move. The indications are that the spacecraft will be moved at noon tomorrow and go directly to the PIB building. All the work that's posted today is in direct support of the move.

CHAIRMAN: Col. Borman, you have a recommendation about work shifts. I'd like to ask you to state what that request is.

BORMAN: Yes sir, after the spacecraft is moved to the PIB building, I request that we be allowed to go on a two shift, 6-day a week operation, with the understanding that the technicians will be on call in the event the workload increases. The basis for this request is the fact that we are not able to program enough work in to keep the people busy 24 hours a day at this stage of the operation.

CHAIRMAN: The recommendation made by Col. Borman is approved. In continuation of the progress reports we will now hear from Dr. Faget.

FAGET: I have two items that have been closed out by Panel 18, Integration Analysis Panel. These are Items 15 and 52, one has to do with the inertial guidance system, it has been concluded that the changes in the readings of the inertial guidance system are associated with the increase and subsequent decrease of the pressure of the Command Module prior to and subsequent to the ruptured pressure vessel. The other has to do with the investigation of a waste management system blower that failed on a test of Spacecraft 008. It has been concluded that this failure is not connected with the instruments on Spacecraft 012. That ends the report.

CHAIRMAN: Thank you, Dr. Faget.
This meeting is adjourned at 11:21.

CHAIRMAN: The panel meeting is now in session at 10:44. In the Executive Session yesterday the Board approved items 118 thru 142 that were discussed in the morning meeting. The morning meeting you will recall approved 143 because of the urgent nature. In addition, one other item was added in the Executive Session, 144. It was urgent and it was approved and will be added to the list of approved items available for all parties concerned.

Mr. Williams has additional items to present for discussion this morning, for consideration of this body: Mr. Williams.

WILLIAMS: Item 144, approved last night at the Executive Session, was the removal of the TV container that was laying on the floor of the spacecraft. The reason for removing it was that we did not want it laying loose on the floor during the move of the spacecraft from the pad to the PIB.

Item 145 is to remove panel 24, it requires the removal of screws and disconnection of wires. The reason we want to remove this panel is that it represents a constraint on the removal of the ECU. We have to remove the panel to get at the bolts to remove the ECU.

Item 146 is demate the Service Module SLA combination from the launch vehicle. Required to remove the Service Module SLA combination from the launch complex and move it over to the MSOB Building.

Item 147 is analyze the contents of squeeze bottles located in white room at the time of the accident. The reason is several instances of odors both in the spacecraft and on the work platform were reported.

CHAIRMAN: After consideration of these items there seems to be no objection or comment. They will be brought to the Executive Session this afternoon for approval.

Col. Borman, you have a request concerning the approval of items previously discussed. Will you state the request, please?

BORMAN: Yes, sir. These are items we discussed on the 15th regarding items that are located now in the PIB and will be disposed of in accordace with the Board's wishes. We have now categorized and itemized every item and I would like to have items 36 through 55 noted as approved by the Board in accordance with the decisions that were reached on the 15th.

(Off the record discussion.)

CHAIRMAN: Thank you, Col. Borman. Are there any further comments? If there are no further comments, the recommendation made by Col. Borman is approved.

In yesterday's Executive Session, the Board approved a general plan for the disassembly procedures that will place the responsibility for the execution of the individual steps in the hands of the Coordinating Committee, or the Chairman of the Coordinating Committee and I'll ask Mr. Williams to discuss that procedure.

WILLIAMS: The procedures will be, that the Board will appoint a government witness to witness disassembly of the ECS system. This man will be responsible for the disassembly and assure that it is carried out along the guidelines that are approved by the Board. The disassembly will be performed at KSC in the Life Support Building Test Cell. Paper work used will be the normal TPS paperwork that requires the normal signatures of the Integration Committee, the Fire Group, and a Board member of the PCC group. At the end of each major disassembly, such as the oxygen panel, a test report will be written. The plan will show the various routes that may be yaken during the disassembly. An attempt will be made at a functional check first. If this fails we will go directly to disassembly, a report will be written covering disassembly and malfunction of individual components. The plan as stated could start work around the 20th of February and end up the latter part of March, about the 20th.

CHAIRMAN: Thank you, Mr. Williams. The plan that was discussed by Mr. Williams will require that the steps taken by reported at regular intervals to the Board and significant findings as soon as they occur. The intervals of reporting will be not less than a week, probably twice a week would be more appropriate.

A problem of access to the PIB has arisen because of the large number of people that have a need to be in there and the requirement that not too many be there at any one time. This is being worked on and I think satisfactory solutions seem to be in hand but there will be further detailed consideration given this problem and an administrative procedure distributed to cover the plan that actually is worked out.

In yesterday's general meeting it was agreed that we would obtain a report from Dr. Faget regarding additional testing items that resulted from the anomaly review of the preceding day and I would like to have Dr. Faget report of those items at this time.

FAGET: Specifically, we plan to do the following: We will use spacecraft 2 TVI which is a special spacecraft for test in the space environment simulation laboratory at Houston. The following test will be made to further pursue the oxygen system anomalies, that is, the high 02 flow rate just prior to the fire alarm and the suit flow drop to zero and back to normal shortly after that time. We will investigate the following: leaks in pressure suits, the effect of cabin pressure rise with the face plate open, and the effect of physical force to restrict the flow of oxygen within the suit. All these tests will be made with the hatch open with air in the cabin; however, for the first and third of these tests we will require 02 in the suit loop. In pursuit of the gimbal motion anomaly we will analyze all the date we can get our hands on from a number of different system tests to associate particular crew action with gimbal motion, i.e., such things as throwing switches, egress and movement within the cabin. We will use spacecraft 008 in Houston to associate possible effects on the chromatograph channel with various things such as crew motion within the spacecraft. The verification of glycol data in continuing. This is awaiting further strip-out of temperature parameters from the records to determine total enthalpy change within the system. This is the complete report at this time.

CHAIRMAN: Thank you, Dr. Faget. Another action item discussed in yesterday's general meeting pertained to an assessment of the activities people external to the spacecraft during the period of the incident. Col. Baxter has undertaken to get

information on that, and I think he is prepared to report at this time. Col. Baxter.

BAXTER: Yes Sir. As of late last night we checked all the crew people that were on the third shift. None had any memory or recollection of having touched or leaned up against the capsule or Service Module, Command Module or Service Module in the 15 minutes preceding the incident, except one individual, we were following up this morning, who had been adjusting some N2O4 lines for clearance from the umbilical, standing on a ladder down at the Serice Module, and we will follow up on that. But this is the only possible adjustment or movement or contact with either Command Module or Service Module near the time of the incident.

CHAIRMAN: Thank you, Col. Baxter. Are there progress reports that are to be made now, Mr. Williams, Col. Borman?

WILLIAMS: Yes, mine is on the record already. I believe Col. Borman can give you a status report of the spacecraft.

BORMAN: Yes, Sir. The spacecraft is still on schedule as far as the move goes. We plan to start hoisting it at noon today and it should be in the PIB building at 1600.

Everything has been checked out and so far, it is going according to schedule.

CHAIRMAN: Thank you, Col. Borman. Is there anything further, Dr. Faget?

FAGET: The status of the analysis items under investigation by Integration Analysis Panel is submitted with their interim report. To summarize, 92 items were listed. Of these investigated, 24 have been completed and one item has been closed. Five other item numbers have been marked void as work had been dropped or regrouped into other categories. Action item number 20 - momentary interruption of the VHF-FM and S-Band data has now been reopened to allow the investigation of post-test motor switches. At present, there are still no items upon which work is completed that fall into the category "May have contributed to the incident". On the status of Board actions, the Board Action Status Summary is also submitted today. There are a total of 144 Board Actions. Of these, 49 have been closed and 95 remain open. Of those remaining open, 48 are still awaiting the TPS's will be completed after the Command Module has been transported to the PIB. Of the 47 Board actions in work, many of the TPS's have been completed but the summary is yet to be submitted. That completes the report.

CHAIRMAN: Thank you, Dr. Faget.

(Off the record discussion.)

CHAIRMAN: Further efforts in the test described by Dr. Faget involved the use of oxygen atmosphere for suit experiments; the concern over testing with osyben prompted considerable discussion. The matter is being resolved in this manner by the Board, that the testing which will be done at MSC will be subject to the approval of the Director, Manned Spacecraft Center who has the responsibilith and authority to approve such programs as may be required.

Col. Borman has submitted for approval by the Board a material release item

number 56 - ECU 02 Flow Rate Transducer - the requested action is approved.

The Panel reports have been submitted by the Panels in preaparation for the review that is in progress for presentation to Dr. Seamans next week. The Board will review these reports and ask that Panel Chairman meet with the Board this afternoon in this room at 4:00.

The meeting is adjourned at 11:35 a.m.

CHAIRMAN: The meeting is now in session. The primary purpose of the meeting this morning is to discuss the preparation of material for the interim report to be made to the Deputy Administrator next week. Yesterday we received draft statements from the Panel Chairman. Copies of all those draft statements which constitute working papers for the purpose of supporting the preparation of the report for the Deputy Administrator will be made available to all panels. There will be a folder such as this prepared for each panel. The distribution will be controlled. These are controlled working papers. Any other use or the disclosure to other people will be arranged for as necessary by the Board.

In the discussion of the designation of these as working papers, the significant point to keep in mind is that at this stage they do not constitute the opinions in any manner of the Board. They are simply working papers that have been submitted for the purpose of preparation of the report that we are now working on.

In the executive session this morning, we approved two items that were presented for approval by Mr. Williams.

Will you describe those items, Mr. Williams?

WILLIAMS: Yes, sir. Item 48 is remove the CM aft heat shield. And the reason for this is, need to provide better visibility ot the CM external aft structure. We are noting going to remove the heat shield this weekend or the early part of next week, but what we are going to do is take the necessary steps now that we are in the alignment stand to drill out the ablative plugs. The second item is remove the crew compartment heat shield. This is needed to provide better access and visibility to CM external structure. We are not going to remove the heat shield this weekend or next week. The present plan is to remove the ECU starting Monday. We want to remove the ECU before we drop the heat shield and we have to generate TPS' to shore up the flooring when we drop the heat shield. All we are going to do this weekend is to take the necessary steps to remove the ablative plugs, to get at the bolts.

CHAIRMAN: Thank you, Mr. Williams. The discussion of the steps being taken to prepare the report for the Deputy Administrator and the other items of business have been completed.

CHAIRMAN: This meeting is adjourned at 11 a.m.

CHAIRMAN: This meeting is now in session on February 20, 1967, at 10:38. Over the weekend there were several meetings concerned with the preparation for the meeting with Dr. Seamans on Wednesday. There was an Executive Session at 8:00 A.M. on Saturday; another Executive Session at 3:00 P.M. Sunday, February 19, 1967; and, other informal meetings, primarily concerned with the preparation for the meeting with Dr. Seamans on Wednesday, next.

There will be an Executive Session this afternoon at 3:00 P.M. in the Board Room concerned primarily with the continued review of the material being prepared for presentation to Dr. Seamans on Wednesday. Any other matters that arise or require Board action will also be considered at that time.

I would like to have a progress report of the work at the Pad and at the PIB and I will ask Col. Borman to report on that.

BORMAN: As you know the spacecraft is now in the PIB and we are preparing to remove the Environmental Control Unit. We are putting in the structure that has been designed to assist in the removal. We are also doing resistance checks on the electrical cabling that have been approved by the Board and we hope to get into the removal of the ECU at 1300 today. The GSE is being disconnected from the Service Module and we are preparing the service module for removal.

CHAIRMAN: When will that be done?

BORMAN: The preparation should be completed at 1600 today and we will move it tomorrow or Wednesday.

CHAIRMAN: Thank you, Col. Borman. Is there anything to report on the PIB? Do you have a report on that?

BORMAN: Yes, sir. All the activity that I referred on the spacecraft is, of course, occurring in the PIB. The spacecraft was removed to the PIB, as you know, Friday, and we are now in a weight and balance jig. We have also done some work in preparation for removing the heat shield, but we are constraining the heat shield removal until we have the Environmental Control Unit out of the spacecraft because of the weight involved.

CHAIRMAN: Thank you. I would like to ask Mr. Geer as to what arrangements have been made for a proper disposition here at Kennedy for the Service Module. Mr. Geer.

GEER: The Service Module will be moved to the MSO Building on Tuesday. A specified area has been set up for the S/M and will be under security control.

CHAIRMAN: Thank you, Mr. Geer.

(Off the record discussion.)

CHAIRMAN: The discussion has just brought out the need for a definite planning of the complete release of material at the Pad following removal of the Service Module. We will attempt to have a study made that can be reported to this Board within the next two days.

I will ask Mr. Williams if he has a progress report to present to us at this time? Mr. Williams?

WILLIAMS: Yes, sir. We have two action items that came up when the meeting started and the first action item is the removal of personal effects, materials from the couches to Room 106 of the PIB Building. I think we have approved the inventory of the items and so forth, and we now have a TPS to actually physically remove the items from the couches to the PIB, to Room 106. That's action item 150. 151 is to move the hand-controller wire bundle that hampers the removal of the ECU. We want to "ring" the wire bundle out with the push-to-talk circuit before movement, it's in the way of removing the ECU. We checked with the fire people and they have no objection.

(Off the record discussion.)

CHAIRMAN: The items just proposed by Mr. Williams have been carefully considered by parties interested and are approved.

I understand that Mr. Williams is prepared to designate the person who will represent the Board in the operation of removing the ECU. Mr. Williams can you report on that?

WILLIAMS: Yes, sir. We would like to nominate Mr. Doug Hampton from KSC to be the Board witness on the ECU component testing.

CHAIRMAN: Very well.

This meeting is adjourned at 11:03.

CHAIRMAN: This meeting is now in session at 10:54. I will ask Mr. Williams for a progress report. Mr. Williams.

WILLIAMS: The report presented yesterday, the CM equipment removal plan has been reviewed by MSC, KSC and North American personnel. They feel that this is the way to go on the removal of the equipment inside the Command Module. The action item today is No. 152, a demate of the Service Module from the SLA here in the MSO Building when the Service Module -SLA is removed from the pad. Reason is to allow better access. Status of Board action as of February 20th is as follows: The total Board actions are 151, closed Board actions 61, open Board actions need TPS's 37, in work 53. Most of these Board actions requiring TPS's will be completed after looking inside the S/C and will be completed after the Command Module is transported to the PIB. Of the 53 Board actions in work, many of the TPS's have been completed but lack TPS summaries. That is all I have for today.

CHAIRMAN: Thank you, Mr. Williams. The Command Module equipment removal plan presented by Mr. Williams has been thoroughly reviewed by all interested parties and is now approved by the Board.

Col. Borman has submitted for consideration a list of 14 items, for consideration of release, and a list of material to be released. These items will be considered and action by the Board will be taken in a subsequent meeting. These items are unnumbered at the present time.

CHAIRMAN: Col. Borman has some proposed urgent action items that he would like to present to the Board. Col. Borman.

BORMAN: Yes, sir. I would like to have action on items 69-72 in our material release record. The items are Log Books from the Unified S-Band station, an air duct used on Spacecraft 012 to supply circulating air that is now needed for Spacecraft 017, and two mounting racks for GSE that have previously been released. These are items 69-72.

CHAIRMAN: Is there any discussion of these items? There being no discussion, these items are approved. Col. Borman will continue with a progress report.

BORMAN: Yes, sir. The ECU removal continues in progress. It's now estimated to be completed at 1700. We're continuing to resistance check the cabling in the spacecraft in coordination with the ECU removal. The Service Module and the SLA should be removed today from the launch pad at the MSOB.

CHAIRMAN: Thank you Col. Borman. I will ask Dr. Faget for a progress report.

FAGET: We're submitting our status and analysis end of the items under investigation by the Investigation Analysis Panel, 93 items now are listed. Of these, investigation on 26 items has been completed. Four items have been marked void as work has been dropped or regrouped in other categories.

At present, there is still no items which we are to complete according to the category "May have contributed to the incident." There are also a number of

conclusions from some of the investigation that have been under way. The write up sheets are submitted on these items.

(Off the record discussion.)

CHAIRMAN: Dr. Faget during an off the record discussion, did note some of the progress that is being made in the testing that is proceeding at MSC with particular reference to a better understanding of glycol. He will be prepared with a more detailed report later, probably by tomorrow.

This meeting is adjourned at 11:30.

CHAIRMAN: This meeting is now in session at 10:40.

With reference to attendance at the meeting this afternoon, it is clear that many of the Panel Chairmen are not really required at the meeting. The Board members are being asked to review the list of Panel Chairmen to determine which ones can be excused and to advise the secretary of the results of that survey.

We have just discussed the problem of filing and material that must be retained by the Board, with reference to selecting what material must be retained in the file and what can be actually released. Col. Strang will prepare some comments concerning this problem for consideration of the Board within the next few days.

Col. Borman has submitted the list of items that were discussed yesterday for consideration by the Board as suitable for material release. The items have been considered by the appropriate people, certain amendments have been made. They have been numbered from 73 to 86 and they are now approved.

Col. Borman has a request for an additional number of items for release and I'll ask him to describe those items.

BORMAN: Yes, sir. We would like to have released the normal operational land lines that connect the ACE in the MSOB with the launch pad. And also, various and sundry items or pieces of test equipment that were located in trailers on Pad 34, but that were not in any way connected to the spacecraft or had anything to do with the test. These would be items number 87 through 103.

CHAIRMAN: These items have been considered by the Board and the request is approved.

Mr. Williams has some proposed action items. Mr. Williams.

WILLIAMS: The plan that was approved yesterday on total equipment removal plan, right hand lower equipment bay and main display console panel, has been assigned a0tion item 153.

Item 154 is to photograph the remains of suits, connectors and personal effects. Filming to be directed by Dr. Kelley or his designee. Films to be processed as restricted data; all negatives and prints to be returned to Dr. Kelly. 155 is remove from all three suits - cobra cable adapter, bio-medical harness, suits side communications harness, helmet side communications harness and signal conditions. Reason: released to determine fire damage and evidence of arcing. Item 156 - Following 155, determine electrical continuity both of released equipment, separately and in series.

Item 157 is perform chemical analysis of residue collected from various locations in all three suits.

CHAIRMAN: The items proposed by Mr. Williams for Board action, items 153 to 157, have been reviewed by the Board and are approved. Dr. Faget has a report of progress in some special tests that are underway. Dr. Faget.

FAGET: This hand-out I have today is a memorandum from Dr. Downs of Manned

Spacecraft Center. The subject is "Some Investigations on Potential Hazards of Spillage of Glycol Water RS89A Coolant that was used in Spacecraft 012." I'll have additional information on the same subject, hopefully tomorrow.

CHAIRMAN: Thank you.

Several days ago we asked the Panel Chairmen to supply figures as to how many people were directly involved in the tasks for which they had responsibility. A summation of the reports obtained from that survey show a total of 600 government and 900 industry personnel. This number, in the opinion of the Board, is probably a minimal number in that it accounts for the direct support and certainly, in all cases, there are more people involved than those represented by this count.

Meeting adjourned at 11:31.

CHAIRMAN: This meeting is now in session at 10:43. As a matter of record I will point out that because of the interim report to the Administrator and the deliberate break of the sequence of meetings over the weekend there has been a period of several days in which there has been no regular session. There have been certain special meetings and executive meetings throughout this period. The meeting on the 24th was at 10:30; it was a special meeting chaired by Col. Strang to take up with the Panel Chairmen the problem of getting reports finished and organizing the business of the panels. This meeting was followed by an action taken in the executive meeting on February 25th at which a release was made that I signed, directed to all Panel Chairmen, firming the agreements made at that special meeting as to when they expected to have their reports finished. The one thing that we need to keep in mind, at this time, is that having set this machinery in motion we have reached the stage where the Panel work has been completed and we need a finished report that can be accepted by the Board. The Panel Reports must be acceptable to the Board before the Panels can be dismissed. The completion of reports is something that we must pay attention to from now on.

I will ask Col. Borman to describe the items 104 to 122 which were approved by the Board in the Executive Session at the meeting on the afternoon of February 23. Col. Borman.

BORMAN: Yes, sir. Item 104 was the approval to release bulk spares, spacecraft spares, nuts, bolts, wires and so on, that have been impounded, as needed in support of the other Spacecraft 017. Remaining items of 105 through 122 were items that are associated with the service structure. They were located on levels 6, 7 and 8, during the test, but were not in any connected with the incident. They have all been inspected and returned upon the approval of 105 through 122, to normal use.

CHAIRMAN: Thank you, Col. Borman. I've asked Col. Borman to continue with the description of Borman to continue with the description of Action Items that were taken up at the meeting on February 24th.

BORMAN: Yes, sir. We have 123 which releases a tool bag which was located on level 7. The contents were recorded and returned to the owner, and Action Item 124 was the release of Launch Complex 34; all areas below the adjustable level 5, not to include the spacecraft GSE. This was checked, all the areas were inventoried, walked down and released.

CHAIRMAN: Thank you, Col. Borman. I'll ask Mr. Williams for a discussion of other items that were approved in the meeting of the 24th, Items 158 and 162.

WILLIAMS: Yes sir, Action Item 158 was the overall plan for the action for the stabilization control system tests that would be performed on the system after it was removed from the spacecraft.

Item 159 was to conduct the test on the Spacecraft 012 pressure hatch, the reason was to find out why a wrench that was used could not be inserted in the hatch as far as it should go.

Item 160 was approval to conduct low level continuity test on all equipment removed from the Spacecraft 012. The reason, so that continuity tests can be conducted on all removed equipment as soon as possible after removal.

Item 161 was approval to conduct non-destructive laboratory inspections and analyses of all equipment removed from Spacecraft 012. The reason is that laboratory analysis and tests can be conducted on all equipment as soon as possible after removal from the Spacecraft.

Item 162 was to conduct inspections and functional test on Spacecraft 012 cobra cables and the reason is to determine a possible ignition source.

CHAIRMAN: Thank you, Mr. Williams. I would like to ask Mr. Williams to continue a discussion of Action Items that have been approved, Action Item 163, it was an urgent item that came up on February 27. Will you continue, Mr. Williams?

WILLIAMS: Yes, the action items I am formally presenting to the Board today is 163, 164, and 165.

Action Item 163 is the Service Module Investigation Plan; we passed it out this morning for all members of the Board to review. It looks like it is about the best detailed plan we have had so far. The reason is to investigate the service module used during Spacecraft 012 accident to determine if it was related to the cause of the fire.

Action Item 164 is to conduct G&N computer investigation and the reasonis to possibly obtain additional data from the erasable memory.

Action Item 165 is to conduct test on the MDAS recorder from Spacecraft 012, and the reason, to determine if installed recorder was DC glitch sensitive similar with those found with test article.

CHAIRMAN: Thank you, Mr. Williams.

(Off the record discussion)

CHAIRMAN: Following a discussion of the items that were presented Mr. Williams it appears that they are satisfactory and that they are hereby approved by the Board. I would like to refer back to the series of meetings last week at which the Board participated in the presentations to the DEPUTY Administrator here at KSC and then Friday in a meeting with the Administrator in Washington. At the later meeting I participated along with Dr. Van Dolah and Col. Borman. We made a presentation of significant information and tentative findings and I think I can say that perhaps an important milestone has been passed in that we have been able to give the Administrator the benefit of a great deal of significant information of value in directing the course of action that must be taken in the Apollo Program from here on out.

(Off the record discussion)

CHAIRMAN: We have just had an extensive discussion of the steps in the problems that we face in completing the Apollo 204 Review, so that we can have a definite completion date that is supported by a workable plan. We have already gone on record as stating that the final report will be available near the end of this

month. The planning necessary to bring this about will be discussed in the Executive Meeting this afternoon. It appears from consideration of the business appropriate to the general meetings that we can dispense with the General Meeting tomorrow. The next meeting will be held at 10:30 Friday, March 3rd and then there will be another one Monday at 10:30, March 6th. I'll ask Mr. Williams for a report of progress or presentation of Action Items that must be considered by the Board. Mr. Williams.

WILLIAMS: Yes, we passed out this morning an Amendment to Action Item 153; it is to pick up additional items on the lower equipment bay removal list and the right hand equipment bay, and the ECU. The first phase of the ECU inspection is completed, various X-rays were taken, and the ECU was moved over to the Launch Support Building last night for disassembly.

CHAIRMAN: The Action Item proposed by Mr. Williams will be considered in the Executive Meeting this afternoon. Col. Borman has some action items proposed for consideration. Col. Borman.

BORMAN: Yes, sir, I would like to have the Board's approval to change categories from A to C for the following items. Number 127 is a pressure test stand that was used to reduce the pressure between the K bottles and the Service Module entrance. It was not located in the White Room; it was on the southeast corner of 8A. The constraint prior to release is none. This equipment has been sampled and no unusual amounts of contaminants were found. Analysis is in the hands of Panel 16. Item 128, I'd like to release the entire voice operational intercom system that was used for the 204 Plugs-Out Test. The intercom system has been thoroughly documented by the voice communication Panel, a group of Panel 9, and a test was run on it last week. These circuits are needed for other tests.

Finally, there is Item 129, a protective pressure unit to maintain a pressure on the service propulsion tanks. The Service Module, as you know, has been removed from the gantry and there is no reason to believe that there is any connection between this and the incident.

(Off the record discussion)

CHAIRMAN: After consideration of the recommended action just proposed by Col. Borman, the Board approves the release of the change of category of these items, as recommended. Dr. Faget has a progress report. Dr. Faget.

FAGET: I have a report summary of the status analysis up to March 1st. There are six new items that have been added, and three items have been closed since February 24th. A summary of the closed items is attached. To this date, there are 104 items listed of which 66 remain open, 37 are closed, and one marked void. There are still no items which were closed that fall into the categroy "could have contributed to the accident".

(Off the record discussion and film)

CHAIRMAN: Thank you, Dr. Faget. Dr. Faget has just shown a film of a test that was made at MSC in the boilerplate model to investigate the flame propagation with materials that were installed to simulate those that were in the 204 vehicle It appears from the results of this test that MSC has made considerable progress in developing a tool with which to conduct flammability test and one that will

be very valuable in qualifying materials that will be ultimately used in the Spacecraft.

CHAIRMAN: This meeting is adjourned at 11:59.

CHAIRMAN: This meeting is now in session at 10:35. We've asked the Panel Chairmen to meet with us today so that we can discuss the preparation of Panel Reports. Before we get into that matter I will ask for a report of action items that were taken in the last two Executive Sessions on the afternoon of Wednesday, March 1 and Thursday afternoon, March 2. I'll ask Mr. Williams if he will describe the action items that were taken up at the meeting. Mr. Williams.

WILLIAMS: Yes, does the Secretary have the Action Item Numbers? We modified Action Item 153 and what we did was include Revision 1 which picked up several other panels that were in the lower equipment bay and also in the right hand equipment bay; it is part of the disassembly plan of the internal parts of the spacecraft.

Action Item 166 was, "remove and analyze non-functional equipment and debris from the Command Module floor", and the reason to investigate relative positions of equipment, and possibly determine the time that the equipment arrived there.

Action Item 167 was remove the floor of the Gas Chromatograph Compartment. The reasons, to investigate the harnesses located under this floor.

168 - ECS Phase C and D Test and Disassembly Plan. The reason, to investigate and analyze all components of the ECS subsystem.

And Action Item 169 was a plan of action - the interior lighting flood lights and the reason is to investigate and analyze all components of the interior lighting subsystem.

CHAIRMAN: Thank you, Mr. Williams. I would like to ask Col. Borman for an assessment of the Disassembly Plan as to when he thinks that it will be completed. Col. Borman.

BORMAN: Yes, sir, the Chairman of Panel 4, Mr. Simpkinson, assured me that by next Friday we should be essentially complete with the disassembly of the Spacecraft. We would like to have permission to operate a three-shift operation when we start removing the heat shield, but unless there are some unforeseen holdups we should essentially have the Spacecraft dismantled by next Friday.

CHAIRMAN: Thank you, Col. Borman.

(Off the record discussion and reports from the panel chairmen.)

CHAIRMAN: We have just listened to a report of the Chairmen of the Panels as to the progress that they have made and their expectation of meeting the dates that were agreed upon last week. The summation shows that the Panels arerating in accord with the schedules that were agreed upon and the entire effort supports the objective of providing the Board with Panel Reports that will permit the completion of a Board Report near the end of this month.

Col. Borman has a report to make.

BORMAN: Yes sir, we have just received the first interim report back from the FBI on the work that they have been doing on the flight logs and other flight books that were in the spacecraft. I would like to turn this into the Secretary for future reference.

CHAIRMAN: Thank you, Col. Borman.

(Off the record discussion)

CHAIRMAN: In a discussion, it appears that a new schedule of General Meetings will meet the requirements for the future. These meetings will be held on Monday, Wednesday and Friday. The schedule for Executive Meetings will not be altered by this change in meeting schedules, in other words, Executive meetings will continue to be held at 4 o'clock each day.

CHAIRMAN: This meeting is adjourned at 11:33.

CHAIRMAN: This meeting is in session at 10:43.

(Off the record discussion)

CHAIRMAN: We will have a report by Mr. Mardel on data analysis this morning. Mr. Mardel.

MARDEL: The most significant thing we found over the weekend, Friday evening, in inspecting the wiring in the vicinity of the junction box in the lower left hand equipment bay, we did find an indication of an arc in a wire. We then went back to the cover plate and found a like-indication that lined up fairly well, within an eighth of an inch on the cover plate itself. We're saying now that in the area where we think the fire initiated, we do have an arc indication. I'll bring down photographs to go through it in more detail. At the present time, we are going to take the cover plate and go through a metallurgical analysis to try to determine if the arc occurred when the cover plate was cold or when the cover plate was hot. We'll try to find out was it an initiator, or was it an effect from the fire. At the same time we're cutting away the gas chromatograph compartment shelf, inspecting the wiring beneath the shelf. We'll also unlace the wiring and try to identify exactly which wire it was that shorted to the cover plate. We'll try to find out what it carries. So we'll have more information on this later today. Now, if I could, I would like to bring some photographs down showing the detail.

CHAIRMAN: Thank you, Mr. Mardel.

(Off the record discussion)

CHAIRMAN: We'll have a status report from Mr. Simpkinson regarding the disassembly; also, I understand he has some proposed Board Action Items. Mr. Simpkinson.

SIMPKINSON: That is correct. We proceeded with the disassembly along a schedule that we've all had. We've nearly reached the end of that; however, there were several items added, many items, and in taking a relook at the schedule Saturday, we felt that it would be more advantageous to remove the heat shields, both the aft shield and the crew compartment heat shield, as soon as we could get to them. So I have here a schedule for the Board's approval, to go ahead and do that, which, step by step, uncovers a gas chromatograph area for inspection and then removes Panel 150, a C15/1A52 Junction Box, and a waste menagement Panel 202, unclamps some ECU lines, inspects the floor area, and supports the aft bulkhead, or the floor, from the top of the Command Module, and then removes some excess items from the floor that have to be removed in order to use this support, and then prepares for and removes the aft head shield. We will then move the entire Command Module, with the aft heat shield removed, over to the impounded area, and then remove the aft heat shield. This schedule is prepared here for, unfortunately, two 8-hour shifts and I have just talked to the crew and they'll start tomorrow morning with 24-hour coverage, which would advance this about a day and a half. In other words, we would be in a posture to continue with normal disassembly work of the added items about March 10th. So we would essentially complete the job of disassembly required to take off the aft heat shield and do that, and take off the crew compartment heat shield

and be ready to continue Friday, March 10th, if that meets with your approval.

CHAIRMAN: Thank you. We will now have a discussion of the proposed schedule.

(Off the record discussion.)

CHAIRMAN: The discussion ha brought out the understanding that the proposed action items are a revision of the plan that was approved last Friday. It does appear desireable to go ahead with this revision because it will permit the aft heat shield to be removed at an earlier date than would otherwise be possible, the removal of the aft heat shield is of great interest to the Board. According to the plan that is proposed, the aft heat shield probably will be an interruption of further work on the interior of the spacecraft starting Wednesday and lasting about three days. The advantages of this proposed revision are such, that the action is approved at this time.

(Off the record discussion)

CHAIRMAN: Mr. Simpkinson has some proposed Action Items that he now wishes to submit to the Board for consideration.

SIMPKINSON: Item 170 - Remove the Command Module aft bulkhead, which is the floor. The reason: For metallurgical evaluation required to define the origin, mode, and sequence of failure in the Command Module primary structure; Item 171 - Move the SLA-5 which was involved in the accident from the integrated test stand to storage area, in the MSO High Bay. This item is self-elplanatory. We have completely exonerated the SLA-5 from the incident. 172 - Conduct an S-band voice tape evaluation by Mr. Michael Luce of NASA-MSC; the reason: we feel we would like to have a second look by a different party of the last few minutes of the voice tape. Item 173 - Conduct an S-band voice tape evaluation by an outside agency, probably Civil Aeronautics Board for the same reason. In other words, we fell we would like our own evaluation by MSC, as well as two outside agencies. Item 174 - Perform metallurgical analysis on the LEB junction box cover-plate arcing spot, and an analysis of the nylon edging grommet and its adhesive cement. The reason: to determine if the arc occurred when the metal cover was cold or hot, and if the grommet or its adhesive could have propa. gated the flame. Item 175 - Unlace the wire bundle leading from LEB junction box. Identify and remove the wire that appears to have caused the arc spot on the cover plate and perform a metallurgical analysis of the wire. The reason: to determine the metal flow content and to conclusively establish that arc did occure. Item 176 - Remove connector connecting Command Pilot suit with PGA cable. This is to isolate locwtion of shorts in PGA and bio-med and communication harness assemblies. Item 177 - Remove portion of wires of Command Pilot's bio-med harness, the communication harness, conduct a metallurgical analysis, recheck remaining portions for shorts. The reason: to isolate the location of shorts and to establish temperatures that wires were subjected to. That completes the eight items for action for the Board as of today.

CHAIRMAN: Thank you, Mr. Simpkinson. We'll go off the record for discussion of these items.

(Off the record discussion)

CHAIRMAN: After discussion of the items just proposed by Mr. Simpkinson, it is noted that one word should be changed in Item 176, changing the word "remove" to

"disconnect". The items are in urgent need of approval in order that work may progress and the discussion discloses no reason why they cannot be approved at this time. They are, there approved.

(Off the record discussion)

CHAIRMAN: Mr. Simpkinson has another item regarding the classification of material and he wishes to ask for the approval of it.

SIMPKINSON: This is item 0147 of the material release record. It is a switching console part number G16-850130. It is located at the MSOB sequential lab. Room 3412. It normally is located there, and was impounded there. Its purpose is to connect one of three identical transmission lines from the Spacecraft to the RF System Checkout Unit. This is merely a piece of switch gear that is impounded. We feel there is no constraint and would like it to go from Category A to Category C.

CHAIRMAN: Thank you, Mr. Simpkinson.

(Off the record discussion)

CHAIRMAN: The requested action is approved.

(Off the record discussion)

CHAIRMAN: We have a report of action taken by the newly constituted Screening Committee that is screening the items associated with the Command Module to determine whether they should be in Category A or B. Mr. Sasseen has a report to make on the action to date.

(Off the record discussion)

CHAIRMAN: Mr. Sassees will proceed with the report.

SASSEEN: Per your instruction we formed a screening committee for the purposes of categorizing the Command Module equipment, in either Category A or Category B as was defined earlier. I'm going to be the Chairman and the Panel will be co-chaired by Mr. Don Mayhue from MSC and Mr. Dave Levine from North American. We categorized the spacecraft into its 16 subsystems.
We've had 39 people assigned to support this effort. They will arrive this evening, and we will hold a formation meeting tomorrow. Instructions have been written to define this operation and the charter of the group. They have been incorporated into Administrative Procedure 5C. I believe you all reviewed this instruction Thursday afternoon and approved it. In addition, we've developed forms to allow each subsystem to log every one of its parts and we've developed a form to permit justifying the reclassification of each of these parts. All of this was also incorporated into the Administrative Procedure 5C. We have, in addition, two lists of discrepancies and open items that we are going to use to essentially restrain hardware from being transferred from A to B. The first of these lists was published by Panel 8 and given to us. The second of these lists is currently being made up and it will include all all open discrepancies and interim discrepancies on equipment that was experienced during this particular test. I believe that's the status.

CHAIRMAN: Thank you Mr. Sasseen.

(Off the record discussion)

CHAIRMAN: During the weekend, several of the Board members were active in reviewing the transcripts and other material in preparation for its inclusion in the final report. In accordance with the work schedules that have been set up, there was no action of the disassembly people on Sunday.

CHAIRMAN: This meeting is adjourned at 11:26 am.

CHAIRMAN: This meeting is now in session at 10:41 a.m. I would like Col. Borman to report on the disassembly of the heat shields. Col. Borman.

BORMAN: Yes, sir. The aft heat shield was removed last night and confirmed that the crack, the eruption in the structure was about two-thirds of the way around the aft bulkhead, not completely around. The work that now is in process leading to the removal of the forward heat shield and we hope to have this accomplished by tomorrow.

CHAIRMAN: Thank you, Col. Borman.

(Off the record discussion)

CHAIRMAN: Before the Executive Board Meeting yesterday afternoon, the Board and some of the personnel interested in fire hazard witnessed the film from MSC covering Test Number 2 from the Mockup Flame Propagation Series of tests that are underway at MSC. The Board feels that the procedures being followed constitute a valid one for permitting studies of flame propgation as applied to an assessment of the hazards that will be very useful in qualibying the materials that are used in the future.

(Off the record discussion)

CHAIRMAN: I'll ask Dr. Faget to report further on the item discussed by Mr. Mardel in Monday's meeting regarding the LEB junction box cover plate as it relates to possible source of ignition.

FAGET: The cover plate has been delivered to the Malfunction Analysis Branch and is awaiting analysis there. A section of the wire that presumably made contact with this cover plate will also be removed from the spacecraft, and when it arrives at the laboratory, a metallurgical analysis will be made to ascertain that the arcing did indeed take place. And, if possible, the exact nature of the arcing will be determined. Also, I think we would like an analysis of the molten material along the bottom of the plate. This will ascertain that the chaffing strip was indeed nylon as opposed to, perhaps, teflon. An effort has been completed to determine the function of the wire in question. This wire is a DC power line that goes from the stability control system in the command module up to the plus yaw thrusters on the service module. This wire is normally powered with 28 volts through a 20 amp circuit breaker. I think that is about all we can say at this time. Further analysis and work is underway.

VAN DOLAH: Can you verify the buss?

FAGET: This should be on buss A but we cannot verify that it is indeed on buss A. There is some question.

CHAIRMAN: Thank you, Dr. Faget.

(Off the record discussion)

We have just learned of some further information about the circuit, Mr. Levine,

will you make a statement regarding that?

LEVINE: The circuit breaker that was in the circuit from the DC power supposedly, buss A, was supposed to have been in the closed circuit condition, circuit breaker physically in, and was found after the incident to be in that position.

CHAIRMAN: Thank you, Mr. Levine.

(Off the record discussion)

CHAIRMAN: I would like to acknowledge the receipt, from Mr. J.J. Williams of a status of Board actions dated March 7, and made available to all the Board Members.

(Off the record discussion)

I would like to now have Col. Borman present a proposed Board action for discussion.

BORMAN: This is Board Action No. 178. It's an attempt to streamline the procedures required for removing samples for analysis from the spacecraft. It gives approval from removal of samples based upon the discretion of the systems engineers, electrical systems engineers, and the Fire Panel involved. I think it would help greatly in expediting the work of the investigation.

CHAIRMAN: Thank you, Col. Borman. This item has been previously discussed by the Board Members and in the light of that discussion, this Action Item No. 178 is approved.

(Off the record discussion)

CHAIRMAN: Dr. Faget has a progress report to make.

FAGET: The summary of the status of the analysis of items under investigation along with a complete summary of all items considered closed are included in this week's submittal. Only one new Item, No. 34, arcing noted on junction box cover plate and this is discussed earlier today by myself. As of this date, 104 items are listed of which 59 remain open. There's still no items in which the analysis have been completed that fall in the category of having contributed to the incident.

There is also submitted at this time a special report on the investigation of the AS-204 main batteries and pyrotechnic batteries. This report has a cover sheet and a great number of pages of substantiating data.

(Off the record discussion)

CHAIRMAN: There has been some discussion of the battery report that Dr. Faget was making and some clarification of that report that I would like to have Dr. Faget summarize at this time.

FAGET: There are two Items to summarize, first on page 9 of Appendix A of the report, paragraph 7. Reference is made to arcing that was indicated on the lugs of the negative terminal of battery B. Subsequent to the writing of this report, the spacecraft discrepancy reports have been examined and discrepancy report 0248

on September 23, 1966, indicates that an arc was indeed drawn on the terminal lug. The other item of interest has to do with discussion of hydrogen that may be vented from the batteries. The re-entry and recovery batteries are all vented overboard through a manifold. The pyrotechnic batteries are not vented except through a relief valve. Tests have been carried out to determine the amount of time required for battery hydrogen to accumulate sufficiently to open the relief valve. It would be a matter of several days, even at elevated battery temperature. Therefore the 60 CC of hydrogen gas which could be expelled in one venting is a very remote possibility for the Plugs-Out Test.

CHAIRMAN: Thank you, Dr. Faget.

(Off the record discussion)

This meeting is adjourned at 11:21.

CHAIRMAN: This meeting is now in session at 10:36 a.m. I am asking the Board Members to advise the Secretary regarding any requirements for secretarial support during the week-end to support the activities of Panels. I would like to have the Board Monitors find out from their Panels what the requirements are.

(Off the record discussion)

CHAIRMAN: We have asked Mr. Sasseen to report on the activities of the Screening Committee. I think you are prepared to report--are you, Mr. Sasseen?

SASSEEN: We have reviewed items with eleven different sub-systems groups, each of these one at a time and I'll tell you about where we stand. The Sabilization Control System people broke their subsystem into 14 different packages, we will recommend all of these items be Category B. The Structures people broke their entire assembly into 18 items; we will recommand all these also be Category B. The Earth Landing System people broke their assembly into 5 items; this is also complete except we are having the two antennas under the forward deck verified by the Communications people; we will recommand all these 5 items also be Category B. Pyrotechnic people broke their assembly into 14 different items; it looks like it will all also be Category B. We expect to treat the Launch Escape System as one assembly and recommend to you that it be placed in Category C. We still have the optical portion of this to be verified. The Guidance and Navigation people have 16 items. We reviewed 8 of them since the other 8 are still in the spacecraft. Three of them are completed to our satisfaction and the other 5, of course, require another review. The Reaction Control System people have a total of 12 items; they will also be recommended Category B; but their material still needs a rewrite. We talked to the Controls and Displays people, the Instrumentation people, the Communications people, and the Power people; we reviewed all their items, we sent them all back for a rewrite, and we expect to have this completed by Tuesday. The Environmental Control System people we talked to this morning; they are not in very good shape, as most of their components need a considerable amount of testing, so in all probability by next week we will not recommend any of their equipment go to Category B. Of the items that will probably remain in Category A, ECS stuff, there is an S-band Power Amplifier, I believe, that has a little more investigation because of a hole in it. The VHF AM transmitter with its keying problem will probably have to stay there, the Audio Center with the hot mike. There is another device which you probably haven't talked about, called a Circuit Interrupter, that, in essence, breaks the Command Module from the Service Module at the time of in-flight separation. It's not really part of harnessing, but it's buried so deeply in the harnessing that you can't take it out without a physical disassembly. Chances are that we will recommend this remain in Category A and be treated like the rest of the harnessing in the spacecraft. By next Tuesday or Wednesday, we should have a large composite MRR of most all of these items for you. This is basically where we stand.

CHAIRMAN: Thank you, Mr. Sasseen.

(Off the record discussion)

CHAIRMAN: We have discussed the report that Mr. Sasseen made, and we are very appreciative of the work that they have accomplished to date; they made very good progress in carrying out the responsibilities that were assigned to them, and it appears from the progress that has been made that by the middle of next week at our General Meeting on Wednesday, we can expect a report that will be close to a final report of the actions that this Committee has taken in preparing recommendations to the Board for the proper classification of materials of the Command Module.

(Off the record discussion)

CHAIRMAN: There is a need to consider the reclassification of the heat shield, the aft heat shield, and the crew compartment heat shield which had been removed from the Command Module, to Category B. This action will reduce the necessary guard service. The discussion has shown that this action is appropriate. We, therefore, approve at this time the classification of those two items at Category B.

(Off the record discussion)

CHAIRMAN: Colonel Borman had some Action Items to present to the Board.

BORMAN: These are MRR items that were released in Executive Session and I would like to make a matter of record. No. 148 released the Launch Complex No. 34 back to operational status, Categroy C. This was completed in Executive Session on the 6th of March; 149 released the Q-ball on the top of the Launch Escape System and was completed on 7 March ; No. 150 released the Service Propulsion Engine Gimbal Locking Links on 7 March; 151 released the Pitch Electronic Control Assembly as spacecraft spare, it's needed for support of Spacecraft 17 that was completed on the 9th of March; 152, the Roll Electronic Control Assembly for the same reason, on the 9th of March; 153 was a tool box that was inventoried and the contents recorded, released on the 9th of March; 154, another tool box, released on the 9th of March with the same constraints.

CHAIRMAN: Thank you, Colonel Borman.

(Off the record discussion)

CHAIRMAN: Dr. Van Dolah has an Action Item that he will describe concerning an action that was taken in the Executive Meeting yesterday afternoon.

VAN DOLAH: Action Item 179 calls for conducting low level continuity checks on all harnesses and equipment remaining on Spacecraft 12. This is to facilitate spacecraft electrical ring-out; it was approved in Executive Session on the 9th of March.

CHAIRMAN: Thank you, Dr. Van Dolah.

(Off the record discussion)

CHAIRMAN: I ask Colonel Borman for a report on disassembly progress.

BORMAN: The forward or the crew compartment heat shield has been removed, and the component disassembly and removal is proceeding. We now have a schedule that shows the entire spacecraft disassembly process completed by 18 March.

This may slip because of some further wire ring-out that we are doing while the spacecraft is in its present configuration.

CHAIRMAN: Thank you, Colonel Borman.

(Off the record discussion)

CHAIRMAN: In the Executive Session yesterday afternoon, an item concerning the handling of the wire bundles during disassembly was discussed and I would like to have Dr. Faget to comment on that.

FAGET: Now that the systems are in the final stages of removal from the spacecraft, the only significant rema ining hardware that could have contributed or been associated with the fire remaining in the spacecraft are the wire bundles themselves and the water-glycol plumbing and cold plates. This morning we have instituted an effort to determine the best plan for investigating these two items. Hopefully we will be able to remove the wire harnesses from the spacecraft in a way that will both optimize the inspection of the wiring as well as minimize any disturbance in the loss of evidence that might be in the wiring.

CHAIRMAN: Thank you, Dr. Faget.

(Off the record discussion)

CHAIRMAN: I would like to have Dr. Faget give a report on the test work in progress at MSC.

FAGET: There has been another mock-up test carried on at MSC which was completed Wednesday afternoon. This was test in which the boiler plate mock-up was filled with oxygen at a 5 psi pressure; unlike the previous test, the internal configuration was a flight configuration as opposed to the plugs-out configuration. The significant difference in combustibles was that the two large cushions were not in the spacecraft. Also, the nylon covers over the suit hoses were not present. With the exception of those two items, the combusitbles were just about the same. In this test the fire progressed much more slowly, the cabin relief valve lifted at 6 pis and the flow through the cabin relief valve was adequate to control the pressure in the capsule, it never exceeded 6½ psi and the fire went out after 5 or 6 minutes without consuming all of the combustibles. As a matter of fact, only the left side of the capsule was burned, and half of the left couch. We have a movie showing the progress of that fire and the damage that resulted, and I'd like to show it at this time.

CHAIRMAN: Thank you, Dr. Faget, we will proceed to show the movie that Dr. Faget just described.

(Off the record discussion and film)

CHAIRMAN: After viewing the film presented by Dr. Faget, it appears that the difference between the flame propagation, combustion process in this test as compared with the earlier test was well summarized by the statement made by Dr. Faget before showing the movie.

(Off the record discussion)

(Sheet 3 of 4)

CHAIRMAN: In the Executive Session yesterday afternoon, the Board appointed Mr. Robert Bruce, who arrived from the Langley Research Center, as an Alternate Board Designated Agent for the ECS investigation.

(Off the record discussion)

CHAIRMAN: This meeting is adjourned at 11:33 a.m.

CHAIRMAN: This meeting is now in session at 19:41. The weekend has passed without formal meeting since Friday afternoon at the Executive Session. Considerable progress has been made in the acquisition and assessment of Panel Reports. Several have been received and distributed. I think it would be appropriate to ask Col. Strang for assessment of the activities of Panel 17. Col. Strang, do you have something to say about that?

STRANG: Yes sir. As of 11 March, six of the 21 Panels submitted their final reports. These are from Panels 2, 12, 13, 16, 19 and 20. The reports were reproduced and distributed to the Board members for individual study and Board review. That's all at this time.

CHAIRMAN: Thank you Col. Strang. I might add that we are acquiring some additional technical engineering support to assist in the editing of the Panel reports. We are expecting two people from Langley to report in tonight and I expect also one additional man from MSC. They will support activities from Panel 17.

(Off the record discussion)

CHAIRMAN: Mr. Malley has also acquired some additional help over the weekend. Mr. Malley, would you like to say something about that?

MALLEY: Mr. Robert Allnutt, the Assistant General Counsel for Patent Matters, NASA Headquarters, is here today to assist in the legal review of the Panel reports and to assist in the preparation of the Final Report particularly, with respect to the Findings - Determinations Section of the Final Report.

CHAIRMAN: Thank you, Mr. Malley.

(Off the record discussion)

CHAIRMAN: The Board is proceeding to review the Panel reports with the Chairmen and such others as they need, to assist them in the overall review with the Board, and the plans are this afternoon for a review of Panel 20 report at 1:30, and following that, we hope also to cover panel reports for Panels 12, 16 and 19.

(Off the record discussion)

CHAIRMAN: In the Executive Session Friday afternoon, action was taken on two items of material release. I would like to ask Mr. Simpkinson to describe those items and also to make a progress report on disassembly.

SIMPKINSON: The two items that were put up for material release record on Friday were 155 and 156. There were similar items, tool kits for the suit technicians that at the time of the incident were in the transfer van and not used. We required inventory prior to release and will release these items as soon as the inventories are completed. That is the report on material releases. As far as disassembly goes over the weekend: we worked Friday all day, until midnight, and Saturday and did get about two or three hours of electrical inspection of the harnessing that's left; quite a bit of that to go yet. Other than that, we removed a number of small items, toe plate and harness from the PCA's, a group of solenoids and we have no new things to report in the disassembly. We are

proceeding along our present schedule, which shows complete disassembly by the 18th; however, we may have to lengthen this somewhat due to the electrical checkout which we're putting in as we can.

(Off the record discussion)

CHAIRMAN: The discussion of the wire inspection program shows that considerable study and attention is underway, and that by Wednesday's general meeting, we can expect a fairly detailed program to be presented to the Board.

(Off the record discussion)

CHAIRMAN: I woule like to ask Mr. Williams to present a progress report.

WILLIAMS: This is a progress report on the dismantling of the ECU System. Saturday night, they completed the continuity check of the ECS ECU wiring harness and they disassembled, or removed the lithium hydroxide canister assembly. At the present time, they are running a leak check on the water glycol portion of the ECU. This should be completed sometime this morning and following the leak check, they'll start dismantling the various components on the ECU package itself.

CHAIRMAN: Thank you, Mr. Williams.

(Off the record discussion)

CHAIRMAN: Mr. Williams has an Action Item to propose.

WILLIAMS: We have a modification, the second revision to Action Item 153, which is the Command Module equipment removal plan. It was passed out this morning to the Board, and the items that were added to the basic plan is shown by two asterisks along side of the items in the plan.

(Off the record discussion)

CHAIRMAN: On the basis of the discussion, the item just proposed is approved at this time.

(Off the record discussion)

CHAIRMAN: Witness statements were distributed to Board Members and Panel members in accordance with the plan that was made for their use in pursuing the work on the review. We now require that all copies of these witness statements by returned to Panel 12. I would like to ask that all Board members and Board Monitors advise their panels to that effect.

(Off the record discussion)

CHAIRMAN: This meeting is adjourned at 11 o'clock.

CHAIRMAN: This meeting is in session at 10:37. I would like to ask that Panel Chairmen be present at the next meeting of this body, the General Meeting Friday morning; that is, all Panel Chairmen except hose who have already completed their responsibilities to the Board and whose reports have been accepted.

(Off the record discussion)

CHAIRMAN: I would like to ask Col. Borman to review the Material Release Items that have been accumulated during the last day or so.

BORMAN: Sir, I have Items 157 through 160; these include spare batteries, that were stored in the battery shop for release and for support of other programs, Item 161 was the Service Module which was approved for release to "C" category yesterday afternoon. That brings up up to date on all the records.

CHAIRMAN: Thank you, Col. Borman.

(Off the record discussion)

CHAIRMAN: I would like to ask Mr. Williams to make a report of the progress being made in the plan and execution of the disassembly.

WILLIAMS: The disassembly of the spacecraft is progressing along the following line: The primary interest now is in the electrical wiring harnesses, and we're using the second shift for the electrical people to inspect the wire harness in place, with permission to cut some of the structure away so they can get a better observation of the wire harnesses that go behind structure. The disassembly of the components are being taken care of on the first shift with the electrical inspection, the ring-out of the cables taken place on the second shift.

(Off the record discussion)

CHAIRMAN: Mr. Williams, are you prepared to make a distribution of the items up to date now which action has been taken.

WILLIAMS: Yes sir, we've passed out our status of the Board actions today, and the total Board actions so far, a total of 179. The closed items are 95; the open items are 84: TPS's completed, but need engineering analysis - 41; TPS's in work - 35, and we need TPS's on eight (8).

CHAIRMAN: Thank you, Mr. Williams.

(Off the record discussion)

CHAIRMAN: I'll ask Dr. Faget to make a report of the progress of the Integration and Analysis Panel.

FAGET: The up-dated status of the analysis under investigation by Integration and Analysis Panel has been passed out this morning. Only one new item, Number 105, which is an investigation of a possible short in the suit wiring of the Command Pilot's suit, has been added to the investigation. Twenty items have been

(Sheet 1 of 2)

closed since March 8th. As of this date, 105 items are listed of which 40 remain open and 65 have been closed. Integration Analysis summaries for the 20 newly closed items are attached. There is still no item for which analysis has been completed which fall into category "MAY HAVE CAUSED THE ACCIDENT". And, also, I am handing out a report this morning which is the result of the Mobility Evaluation Test results that was conducted on 28 February, Mock-Up Two.

CHAIRMAN: Thank you, Dr. Faget.

(Off the record discussion)

CHAIRMAN: I would like to have a report from Col. Strang, on the progress of Panel 17.

STRANG: In a special session on March 13, 1967, the Board reviewed and approved Final Panel Reports 12, 16, 19, and 20. In another special session March 14, 1967, the Board approved Final Report of Panel 21. The Final Report of Panel 13, previously reviewed, was approved by the Board Executive Session, March 14. All reports approved by the Board are being processed for final editing and printing. Panel 17 has received and distributed to the Board, Final Panel Reports 2 and 6 for individual study prior to Board review. At this time, for today's session, we have Final Panel Report 6, for review.

CHAIRMAN: Thank you, Col. Strang.

(Off the record discussion)

CHAIRMAN: After some discussion, we have rearranged the schedule for this afternoon to have Panel 5 report to the Board at 1:00 and, Panel 6 to come in later at around three o'clock.

(Off the record discussion)

CHAIRMAN: This meeting is adjourned at 10:55.

CHAIRMAN: This meeting is now in session at 10:36. I've asked the Panel Chairmen to meet with us this morning, because we wanted to review the situation relative to the preparation of the Panel Reports and their acceptance and coordination by the Board.

(Off the record discussion)

CHAIRMAN: The discussion of the Board with the Panel Chairmen was concerned with the problems that we now see in completing the Panel Reports and incorporating the substance of those reports into the Final Report of the Board.

(Off the record discussion)

CHAIRMAN: I'd like to ask Mr. Simpkinson to describe the status of the disassembly of the spacecraft.

SIMPKINSON: The spacecraft down at the PIB has been undergoing disassembly now for some time, and we are about at the stage of, I would say, and we are about at the stage of, I would say, more than 90 percent complete with that phase of the investigation. To sum it up, we have a total of about 40 more tasks left out of several hundred that we have already worked and these 40 consist of about 20 more removals of items that are very low, or practically no-suspect, nonfunctional panels and crew system components that were just in there with no connection to them. These final items are being removed to gain complete visibility of the inside of the spacecraft. The other 20 of the 40 tasks consist of TPS's (work orders) to run resistance checks and continuity checks of the harnesses. The remaining work out there at this point in time appears to consist of about five or six days which will be spent removing essentially these nonfunctional parts. Also, we're spending eight hours a day, as you know, with the electrical people going over the harnesses practically wire by wire looking for any indication of the origin of the fire. That's about where we stand at the moment.

CHAIRMAN: Thank you Mr. Simpkinson. I would like to ask Mr. Williams to report on the progress of the study of the ECU.

WILLIAMS: The ECU was completely taken apart by last Wednesday. The components of the ECU that will be disassembled in the Malfunction Investigation Lab are now in the bonded area in the MSOB Building. We should have an overall plan to show the various dates that we expected disassembly of the individual components of the ECU by Monday and we'll give a status of what we've found so far in the examination of the components in the plan at the Monday Board Meeting.

CHAIRMAN: Thank you Mr. Williams. Col. Borman has an action item to propose for the preparation by the Board.

BORMAN: Yes sir, I have five items that I would like to get released from Category "A" to Category "C". No. 162 the rate gyro assembly. 163 is an attitude gyro accelerometer assembly. 164 auxiliary electronic control assembly. 165 is a displays electronic control assembly. 166 is a gimbal position attitude set indicator. These items were stored in the warehouse or have arrived on the Cape since

the accident. They were not installed in the Spacecraft 012 at any time and they are required to support Spacecraft 017's operation.

CHAIRMAN: Thank you, Col. Borman.

(Off the record discussion)

CHAIRMAN: In view of the discussion among the recommended actions, these actions are approved. I will ask Mr. Sasseen to report on the activities of the and progress of the Screening Committee. Mr. Sasseen.

SASSEEN: The Screening Committee has reviewed to date 312 items of the Spacecraft equipment. I would recommend that 171 of these go into Categroy B. We have published a preliminary report in justifying each one of these items as describing the condition. We have 49 more items, some of which are still in the Spacecraft and should be removed by Wednesday. We expect to review these additional items and be finished by next Friday.

CHAIRMAN: Thank you, Mr. Sasseen. Mr. Williams has an action item to propose for consideration by the Board.

WILLIAMS: Action Item 180, approve or utilize the open TPS technique for Action Item 160, which is "Conduct low level continuity tests on all equipment removed from the Spacecraft 012"; and Action Item 179, "Conduct low level continuity checks on all harnesses and equipment remaining in Spacecraft 012". This technique utilized on Action Item 178 which was, "Approval to remove small samples of material from Spacecraft 012 and send them to the Lab for analysis", has proven to be an effective time-saver in that a separate TPS properly signed and distribution was not required.

CHAIRMAN: Thank you, Mr. Williams. I am assured that this matter has been given sufficient consideration so that it can be approved at this time, so therefore, it is approved. This meeting is adjourned at 11:16.

CHAIRMAN: This meeting is now in session at 10:35 a.m. The weekend has been a busy one for the Board and Panel Members. I'd like to ask Colonel Strang to summarize the weekend activity on the report preparation.

STRANG: As of 19 March 1967, the Board has reviewed and accepted, subject to editorial corrections, the final reports of Panels 1, 8, 10, 12, 13, 14, 15, 16, 19, 20 and 21. Also, the Board has reviewed and accepted, except for the Findings and Determinations, the final reports of Panel 5. Panel 17 has received the final reports from Panels 3, 4 and 17. These reports were distributed for individual study for Board Members. That's all.

CHAIRMAN: Thank you, Colonel Strang. I would like to ask Colonel Borman for a report on Material Release Items. Colonel Borman.

BORMAN: Yes, sir, I have several items, they're Material Release Items Number 167 through Number 192. They were approved in the Executive Session on Sunday, that was yesterday, the 19th of March. I won't list them all specifically. They're generally miscellaneous items that were located in the area of the spacecraft during the incident but, all have been determined to have no-effect, or no-cause, or no-relation to the incident. They have all been released from Category "A" to Category "C".

CHAIRMAN: Thank you. Colonel Borman.

(Off the record discussion)

CHAIRMAN: I understand Mr. Williams has some action items to propose to the Board. Mr. Williams.

WILLIAMS: Yes, I have two action items. Item 181, utilize TPS technique to remove all debris from the aft bulkhead and vacuum, photograph and grid aft bulkhead prior to removal and vacuuming. No additional work will be accomplished under Board Action 0166. The reason is to allow inspection of the floor and better access with the Command Module. Action Item 182, return Inverter #2 to the vendor for detailed investigation. The reason, to investigate known anomalies associated with the inverter and determine their relationship, if any, to the accident.

CHAIRMAN: Thank you, Mr. Williams.

(Off the record discussion)

CHAIRMAN: I'd like to ask Dr. Van Dolah to comment on the first proposed action item just presented by Mr. Williams.

VAN DOLAH: An additional reason for this action item is to remove all of the debris, all material located on the floor, excluding of course, wire bundles. This material will be examined visually and thick sections of the material will be examined by X-ray and other techniques to insure that nothing unsuspected is in it.

CHAIRMAN: Thank you, Dr. Van Dolah.

(Off the record discussion)

CHAIRMAN: Mr. Sasseen of the Equipment Screening Committee has brought to the Board for consideration a proposed action item that pertains to AC Inverter No. 2. The proposal is that this item which is a Category "A" item of equipment be returned to clear up any suspicion that applies to an anomaly, or rather any relationship to the accident. The action item carries with it, the recommendation that Mr. E. E. Eastman of MSC, be designated as an agent of the Board for this action. I would like to have the Board consider this recommendation.

(Off the record discussion)

CHAIRMAN: It is the consensus that this action be approved. The proposal therefore is approved.

CHAIRMAN: I would like to have a progress report from Dr. Faget. Dr. Faget.

FAGET: The wiring on the Spacecraft 012 has been inspected. Inspection was completed this weekend. This inspection consisted of separating all wires from the bundles and inspecting visually each wire individually. The location of possible shorts and arcs in the wiring was noted. In addition, notation of fire damage and other anomalies in the wiring was made. A complete report on wiring inspection will be submitted at a later date.

CHAIRMAN: Thank you, Dr. Faget.

(Off the record discussion)

CHAIRMAN: We departed from a normal schedule that we've been following recently and yesterday (Sunday, March 19) kept the PIB open for an investigation. I would like to ask Dr. Van Dolah to comment on the work that went on there yesterday. Dr. Van Dolah.

VAN DOLAH: The investigation concerned the question of the development of static electricity on a suited crewman. It was carried out in Spacecraft 014. The conditions were made as nearly similar to those that prevailed at the time of the accident as could be made. The air inside the cabin was very dry, and the suit loop was fed with dry air. A full report on the results will be presented.

CHAIRMAN: Thank you, Dr. Van Dolah. I would like to say that this afternoon the Board will meet with Dr. Gilruth, a group from the program staff at MSC, and the contractor to discuss joints in the spacecraft. This meeting will take place about 1:00 p.m.

(Off the record discussion)

CHAIRMAN: We have received a status report from Mr. Hampton and Mr. Bruce regarding the ECS review and examination that is underway. It appears that the subject of the status of this effort should be presented at the Executive Session this afternoon at 4 o'clock.

CHAIRMAN: This meeting is adjourned at 11:03.

CHAIRMAN: This meeting is in session at 10:41 a.m. The Board spent some time this morning in witnessing a demonstration of the operation of the hatches at the PIB to obtain a complete understanding of the operation of opening the hatches from the inside and from the outside. Following the demonstration of the hatch operation at the PIB, the Board went to the ACE Control Room to get first-hand knowledge of the operations that are carried on there. The Board has been spending most of its time in reviewing panel reports, and I'd like to ask Major Butler, in the absence of Colonel Strang, to report on the progress that has been made. Major Butler.

BUTLER: Yes sir, as of March 12, the Board has reviewed and accepted, subject to editorial changes, the final reports of Panels 1, 4, 5, 8, 10, 12, 13, 14, 15, 16, 17, 19, 20 and 21. The final reports from Panels 7 and11 have been distributed to the Board for individual study. Board review of these latter two reports is scheduled for today, starting with Panel 11 at 1:00 p.m. The final reports from Panels 15, 16, 17, 19 and 21 have been submitted for printing. The final reports from Panels 10, 13, 14 and 20 are presently being edited and should be submitted for printing later today or early tomorrow morning. Lastly, the final reports from Panels 1, 4, 5, 8 and 12 are being retyped and will be available for editing this afternoon or tomorrow morning.

CHAIRMAN: Thank you, Major Butler.

(Off the record discussion)

CHAIRMAN: Following Major Butler's report, discussions brought out that veri-typing required is posing a problem that is now being examined as to whether or not the facilities for typing are going to be able to keep pace with the requirements. This matter will be looked into after this meeting is adjourned. Colonel Borman.

BORMAN: Yes, sir. In the Executive Session last evening, we approved Items 194 through 199, which are miscellaneous items that were located on Level 8 of the gantry. They had no association with the spacecraft and were not physically connected to the spacecraft at the time of the accident.

CHAIRMAN: Thank you, Colonel Borman. We have additional progress reports this morning, I believe, or reports to be distributed. Mr. Williams, do you have reports to make or distribute this morning?

WILLIAMS: Yes, sir, I have distributed the status of the Board action items to date. There are no new action items to be presented to the Board today.

CHAIRMAN: Thank you, Mr. Williams. Dr. Faget has a report to make. Dr. Faget.

FAGET: An updated status of the analysis of the items under investigation by the Integration Analysis Panel is hereby submitted. No new items have been added. 13 items have been closed since March 15. As of this date, 105 items are listed, of which 27 remain open and 78 are closed. There are still no items upon which analysis has been completed that fall into the category, "may have caused the accident."

CHAIRMAN: Thank you, Dr. Faget.

(Off the record discussion)

CHAIRMAN: This meeting is adjourned at 10:56 a.m.

March 31, 1967

CHAIRMAN: This meeting is now in session at 10:33. I would like to ask Colonel Strang for a report on the progress of Panel Reports preparation. Colonel Strang.

STRANG: Reports from the following Panels have had printer's copies prepared and distributed to the Board for final review: 4, 10, 14, 16, 17, 19 and 21. Most of these Reports have been returned by Board Members for final editing and printing. The following Panel Reports are being processed for preparation of printer's copies as of this date: 3, 5, 7, 11 and possibly 6. Printer's copies of Panel Reports 1, 13, 15 and 20 are to be distributed to the Board today for their final individual review. Final draft copies of Panel Reports 2, 8, 7 and 12 are srill being individually reviewed by Board Members. After return of these Reports to Panel 17, they will be processed for preparation of printer's copies and subsequently distributed to the Board for final review. The Final Report from Panel 18, is still undergoing rewrite by the Panel.

CHAIRMAN: Thank you, Colonel Strang. I would like to ask Dr. Faget for a report I believe he is prepared to make. Dr. Faget.

FAGET: I have the final status report. One new item has been added to the 105 items under investigation by the Integration and Analysis Panel since March 22, 1967. As of this date, 79 items have been formally closed and the remaining 27 are still undergoing the validation and determination process. Twenty-six of the remaining open investigation items are not significant with respect to being the potential ignition source. Ten cases of arced, shorted and/or suspicious looking wiring have been identified. From these 10 items, only one is considered a possible cause of the accident. The one possible cause is the wiring providing instrumentation power for some of the Environmental Control System. This wiring contains both DC bus A and DC bus B electrical power, and is located along the floor on the Command Pilot's side in the Command Module in the vicinity of the lithium hydroxide canisters. A special report has been submitted by the Environment Control System (ECS) Investigation Committee. Out of the 78 ECS components, 58 were categorized as non-fire initiators and 20 as a possible fire initiator by this committee. Conservative criteria was used in classifying components as non-initiators. Further investigation is in work to establish whether or not the remaining 20 items are, in fact, possible initiators.

(Off the record discussion)

CHAIRMAN: I would like to ask Colonel Borman to present items upon which he requires action.

BORMAN: Yes, sir. I have two MRR items that I would like to propose. Number 1 - we would like to remove from Category A to Category C all parts and equipment, excluding records, that were not physically attached to the Spacecraft at the time of the accident.

CHAIRMAN: I believe that this proposed action is a desirable one, acceptable to all the Board Members. That being the case, these recommendations are approved. Do you have something further to report on, Colonel Borman?

BORMAN: Yes, sir. We're taking steps to obtain a container from the Navy that will be located here at KSC in which we can store the Spacecraft. Work is in progress now to provide a proper storage place for all the items and equipment in the Spacecraft.

CHAIRMAN: Thank you, Colonel Borman.

(Off the record discussion)

CHAIRMAN: The screening committee, as reported in an earlier meeting by Mr. Sasseen, has presented the Board with the results of the screening of the parts, components and assemblies of the Spacecraft and their recommendations as to how they should be categorized. The Board accepts the Report of this committee as the basis for custody and for further analyses of these paets, components and assemblies.

(Off the record discussion)

CHAIRMAN: We are now in the final stages of preparation on our Report to the Administrator and it is no longer necessary to adhere to the schedule of meetings that we have been following. There will be no further General Sessions or Executive Sessions until we recess, except on call of Chairman.

(Off the record discussion)

CHAIRMAN: This meeting is adjourned at 10:55.

CHAIRMAN: This General Session called this morning, March the 28th, is now in session at 10:30 a.m. This is a meeting that was postponed from Friday morning the 24th of March. On Friday morning Panel Report Reviews were in progress and it was determined that it would be unnecessary to interfere with that by having a General Session, a decision was made to postpone the meeting till this morning. During the weekend the Board was in recess, however, work continued in the preparation of Panel Reports.

(Off the record discussion)

CHAIRMAN: I'd like to ask Col. Strang to report on progress in preparation of these reports.

STRANG: Yes sir, Mr. Chairman, a follow-on review by the Board of the Final Reports from Panels 5, 7, 9 and 18 is required. The Panel 18 report will be available for Board Review at 9 a.m. March 29, 1967. Eleven Panel Reports have been submitted for varityping. After these Reports have been varityped, copies will be provided to each Board Member and Counsel, for individual review and corrections prior to the actual printing of the Report. Panels 2 and 7 have been requested to prepare a narrative of Spacecraft 012 test sequences and their objectives. This narrative should contain the significant events up to T-10 hold before the accident. Panels 3, 11 and 12 have been requested to prepare a narrative on the time-line of events from the start of the T-10 minute hold through the medical determination of death. Panel 18 has been requested to prepare a narrative on the investigation and analysis activities of the Board. This covers the period of time immediately after the determination of the cause of death through the completion of the Apollo 204 Board Review activities.

CHAIRMAN: Thank you Col. Strang.

(Off the record discussion)

CHAIRMAN: Mr. Sasseen is here this morning to report on the status of the Screening Committee's activities. Mr. Sasseen.

SASSEEN: The Screening Committee closed its books on the 24th of March; with a small regrouping, there are 300 items that were included, the regrouping was in crew systems. Of these we are recommending 238 items to be transferred to Category B and in addition there are 54 ECS items which will be covered in the ECS Committee's report and not ours. This leaves a total of eight items that we would recommend remain in Category A, I'll go over them here. (1) One of them is an instrumentation J-Box which is essentially a portion of the ship's harness. (2) The Statis Inverter #2 that was sent back to the vendor, (3) the kick plate, or cover plate for the Lower Equipment Bay Junction Box that had the arc on it. (4) There is a main display console panel #8 where a wire was apparently off the structure. (5) The Bio-Medical Octopus Cable, we don't intend to exonorate; (6) the Command Pilot's Cobra Cable is also remaining in Category A since there was not a positive investigation to say conclusively that there could be no arcing. (7) The Command Pilot's torso harness is in the same Category and thus for obvious reasons so is (8) the Velcro and debris traps in the Spacecraft. These 300 items did not include harnessing tubing or some of those small, permanently attached items.

CHAIRMAN: Thank you Mr. Sasseen.

The Board will review this Report and determine whether it agrees with all the actions. I think we will be able to act on this within the next day or so. Thank you very much.

(Off the record discussion)

CHAIRMAN: I've been concerned that early in this Review we injected into the record a figure for the melting point of aluminum, 1400 degrees. I'm not quite certain how that figure originated. It is a surprisingly high figure for aluminum. In view of that fact we recently took action to determine what the actual melting point of the aluminum involved in the Spacecraft is. There is, of course, a wide range for melting points of aluminum. Samples were taken and tests run here at the laboratory. I'd like Mr. Geer to comment on where those samples were obtained from and what figures were obtained for a melting point.

GEER: The samples were taken from the tubing of the 900 pis oxygen system, the water-glycol system, and the 20 psi oxygen system. Tests were run on the 6061-T6 aluminum tubing and the melting point on all of them was found to be 1241°F.

CHAIRMAN: Thank you Mr. Geer.

CHAIRMAN: It is my understanding that that figure corresponds to the point where the aluminum actually becomes liquid.

(Off the record discussion)

CHAIRMAN: I'll ask Col. Borman to make a report on certain action items for material release and the disassembly program. Col. Borman.

BORMAN: Yes sir, we had Item 200 which was approved over the weekend, the couches from Spacecraft 014 were released to Category C to be sent to Houston. I have two other items, one is trash that was removed from the garbage cans in the White Room, the fire panel and interested parties have checked through the residue and they can find nothing relevant to the accident. We'd like that placed in Category C. The other is Clean Room clothing that has been soiled from normal use and we'd like to return that back to the normal channels.

CHAIRMAN: Thank you Col. Borman

(Off the record discussion)

CHAIRMAN: The proposed recommended material release items are approved. Will you please continue with your report, Col. Borman?

BORMAN: Yes sir, we have essentially completely disassembled the Spacecraft, the visibility of the parts and all the areas of the structure is complete. As of today we have logged 1241 separate items through the Bond Room for display to interested parties. Of these 1241 items approximately 1000 came from the C/M directly.

CHAIRMAN: I'd like to ask Col. Borman at what time was disassembly completed? Col. Borman.

BORMAN: Yes sir, disassembly of the Spacecraft was completed on the 27th of March during the first shift.

CHAIRMAN: Thank you Col. Borman.

(Off the record discussion)

CHAIRMAN: This afternoon an exercise will be set up in the PIB to clarify the events associated with the actual opening of the hatches. Eye witnesses and other people who are concerned with recording the events will be on hand to clarify the record pertaining to that portion of the incident. Board Members are advised of this and are encouraged to attend if they can.

(Off the record discussion)

CHAIRMAN: In view of the way the General Session schedule has worked out it will be unnecessary to have a meeting tomorrow morning in accordance with the usual schedule. The next General Session will be held Friday morning at the usual time. This meeting is now adjourned at 11:13 a.m.

CHAIRMAN: This meeting is now in session at 10:33. I would like to ask Colonel Strang for a report on the progress of Panel Reports preparation. Colonel Strang.

STRANG: Reports from the following Panels have had printer's copies prepared and distributed to the Board for final review: 4, 10, 14, 16, 17, 19 and 21. Most of these Reports have been returned by Board Members for final editing and printing. The following Panel Reports are being processed for preparation of printer's copies as of this date: 3, 5, 7, 11 and possibly 6. Printer's copies of Panel Reports 1, 13, 15 and 20 are to be distributed to the Board today for their final individual review. Final draft copies of Panel Reports 2, 8, 7 and 12 are still being individually reviewed by Board Members. After return of these Reports to Panel 17, they will be processed for preparation of printer's copies and subsequently distributed to the Board for final review. The Final Report from Panel 18 is still undergoing rewrite by the Panel.

CHAIRMAN: Thank you, Colonel Strang. I would like to ask Dr. Faget for a report I believe he is prepared to make. Dr. Faget.

FAGET: I have the final status report. One new item has been added to the 105 items under investigation by the Integration and Analysis Panel since March 22, 1967. As of this date, 79 items have been formally closed and the remaining 27 are still undergoing the validation and determination process. Twenty-six of the remaining open investigation items are not significant with respect to being the potential ignition source. Ten cases of arced, shorted and/or suspicious looking wiring have been identified. From these 10 items, only one is considered a possible cause of the accident. The one possible cause is the wiring providing instrumentation power for some of the Environmental Control System. This wiring contains both DC bus A and DC bus B electrical power, and is located along the floor on the Command Pilot's side in the Command Module in the vicinity of the lithium hydroxide canisters. A special report has been submitted by the Environment Control System (ECS) Investigation Committee. Out of the 78 ECS components, 58 were categorized as non-fire initiators and 20 as a possible fire initiator by this committee. Conservative criteria was used in classifying components as non-initiators. Further investigation is in work to establish whether or not the remaining 20 items are, in fact, possible initiators.

(Off the record discussion.)

CHAIRMAN: I would like to ask Colonel Borman to present items upon which he requires action.

BORMAN: Yes, sir. I have two MRR items that I would like to propose. Number 1 - we would like to remove from Category A to Category C the complete Launch Escape System that was on Spacecraft 12 at the time of the accident. Secondly - I'd like approval for a general MRR that would release from Category A to Category C all parts and equipment, excluding records, that were not physically attached to the Spacecraft at the time of the accident.

CHAIRMAN: I believe that this proposed action is a desirable one, acceptable to all the Board Members. That being the case, these recommendations are approved. Do you have something further to report on, Colonel Borman?

BORMAN: Yes, sir. We're taking steps to obtain a container from the Navy that will be located here at KSC in which we can store the Spacecraft. Work is in

progress now to provide a proper storage place for all the items and equipment in the Spacecraft.

CHAIRMAN: Thank you, Colonel Borman.

(Off the record discussion.)

CHAIRMAN: The screening committee, as reported in an earlier meeting by Mr. Sasseen, has presented the Board with the results of the screening of the parts, components and assemblies of the Spacecraft and their recommendations as to how they should be categorized. The Board accepts the Report of this committee as the basis for custody and for further analyses of these parts, components and assemblies.

(Off the record discussion.)

CHAIRMAN: We are now in the final stages of preparation on our Report to the Administrator and it is no longer necessary to adhere to the schedule of meetings that we have been following. There will be no further General Sessions or Executive Sessions until we recess, except on call of Chairman.

(Off the record discussion.)

CHAIRMAN: This meeting is adjourned at 10:55.