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Apollo 13

Transcript  
of FD Loop

55+47 to 58+42  
GET

J. Leeper X5838

55+47

FLIGHT Referring to Comet Bennett, <sup>I'd</sup> they still want a veri-  
fication of the docking angle because that's what we're  
using for computations for all alignments, <sup>like</sup> ~~and~~ anything  
else? Let's see if there's anything else.

EECOM Flight, EECOM

FLIGHT Go ahead EECOM.

EECOM We'll terminate the battery B charge at 55 plus 50.

FLIGHT OK.

FLIGHT/EECOM And at ~~the~~ <sup>that</sup> same time we would sure like to have a CRYO  
stir. All 4 tanks.

FLIGHT Let's wait until they get settled down a little bit more.

EECOM Roger.

GNC Flight GNC.

FLIGHT Go ahead GNC.

GNC We would still like to reenable the other 2 quads for  
the maneuver.

FLIGHT OK, when rolling to 060, you want them to enable  
C and D. Right?

GNC Right

FLIGHT Right, you want them to disable A and B?

GNC No.

FLIGHT OK all four quads.

GNC A coupled jet maneuver.

FLIGHT Roger. Copy CAPCOM?

CAPCOM Got it.

INCO Flight INCO

FLIGHT Go INCO.

INCO I would like to confirm the configuration on their high  
gain now. Would like to know what track mode they're in  
and what SERVO electronics they're in.

55+48

55+48

2

FLIGHT OK let's just standby one there. The C and D for roll to 060, terminate Battery B charge. OK, the third thing we want up there CAPCOM is to verify their high gain configuration. And I assume what you want from there is you want to know their tracking, position of track. Beam width don't need do you? You want the whole works?

INCO Yes, the whole works.

FLIGHT oie. OK

FLIGHT CAPCOM, we want the configuration of the CSM highgain.

FLIGHT Anything else?

INCO No.

FLIGHT OK....Good report.

GNC Flight GNC.

FLIGHT Go GNC.

GNC Can we verify that they reenabled C four thruster?

FLIGHT OK verify that re.... your showing it disabled yet?

GNC Yes.

FLIGHT CAPCOM we are still seeing C four thruster disabled.

EECOM Flight EECOM.

FLIGHT GO EECOM.

EECOM We've got 40 AHS back in battery B now.

FLIGHT OK.

GNC You got it Flight.

FLIGHT OK.

FLIGHT OK all Flight Controllers I want to go around the horn and pick up anything you need configuration wise.  
TELMU.

TELMU Go ahead Flight.

FLIGHT You still worried about any configuration items.

55+51 -

TELMU Negative the LM heater current indicates that the LM was properly closed out. They apparently had not closed the hatch yet.

FLIGHT OK. So you're happy that you don't need them to verify that, what was it, activation 23 of those pages we're on?

TELMU That's right. It was TLC 2 and we're happy.

FLIGHT OK.

GUIDANCE Flight Guidance.

FLIGHT Go Guidance.

GUIDANCE Can we ask about the docking index again?

FLIGHT CAPCOM will get that for me.

FLIGHT OK got your answer Guidance.

GUIDANCE Roger Flight.

FLIGHT OK go with it. [OK GNC you got any configuration items yet?]

55+52 - FLIGHT Negative Flight.

GNC

FLIGHT CAPCOM looks like the last item we need here is the stir on the H2 and O2 at their convenience.

CAPCOM OK.

55+53 - GUIDANCE Flight Guidance.

FLIGHT Go Guidance.

GUIDANCE We finally got a Delta H update. Do you just want to read it up to the crew or uplink?

55+54 - FLIGHT Let's see now. Can we collapse dead bands and do all that good stuff if we uplink?

GUIDANCE AH yeah. Why don't we just read it up to them.

FLIGHT If they enter it through DSKY are they going to do it?

GUIDANCE Standby 1.

FLIGHT They haven't stabled out in that attitude yet--so I don't think we are going to have any problems.



GNC Roger, I don't think we have any problems they haven't opened up the dead bands yet.

FLIGHT Yes that's just what I'm saying. The time to do it is now Guidance.

GUIDANCE Flight Guidance.

FLIGHT Go Guidance.

GUIDANCE As long as he's in POO and don't reselect it he can uplink it or enter it himself or we can do it either. It doesn't matter.

FLIGHT OK. You got to pass the data up to the crew checklist anyway onboard, don't you.

GUIDANCE Right.

55+55 - FLIGHT Don't you got a page update? Or why don't you read it up to them and that will serve both purposes.

GUIDANCE Right.

FLIGHT We'll have them enter it and in WHY don't you tell them what page you want it in the checklist.

GUIDANCE OK.

TELMU Flight TELMU.

FLIGHT Go TELMU.

TELMU We show the LM overhead hatch is closed and the heater current looks normal.

FLIGHT OK.

GUIDANCE Flight Guidance.

FLIGHT Go Guidance.

GUIDANCE We've had a hardware restart. I don't know what it was.

FLIGHT OK. GNC you want to look at it, and see if you see any problems? Rog we're copying it CAPCOM. We see a hardware restart. You see an AC BUS underbolt there Guidance EECOM?

EECOM Negative Flight. Believe the crew reported it.

CAPCOM Well you got a main B undervolt.

EECOM OK Flight we got some instrumentation (A main B?).  
Flight let me add them up.

FLIGHT Rog.

EECOM We may have had an instrumentation problem Flight.

FLIGHT Rog.

INCO Flight INCO.

FLIGHT Go INCO.

INCO We switched to wide beam width about the time he had  
that problem.

55+56 - FLIGHT OK. INCO you say you went to wide beam there?

INCO Yes.

FLIGHT See if you can correlate those times. Get the time you  
went to wide beam INCO.

INCO OK.

CAPCOM Do we have the flood lights off in there now?

TELMU That's affirmative Flight.

FLIGHT We can determine that from the LM current.

55+57 - FLIGHT Rog we copied that also. EECOM you seeing any AC  
problems? Look like there's a lot of instrumentation  
problems? ]

55+58 - FLIGHT ←  
EECOM Flight EECOM.

FLIGHT Go ahead.

EECOM That's affirm. He's flipping the fuel cells around  
Flight.

FLIGHT Well let's get some recommendation here Sy if you get  
some better ideas. Sy well what do you want to do--hold  
your own or... and a Sy, have you got a sig sensor type  
problem there or what?

EECOM Flight EECOM.

FLIGHT Go ahead.

EECOM He's got the fuel cells 1 and 3 are offline--we got main A volts; we have no main B volts. Have him attempt to reconnect the fuel cells. Fuel cell 1 to main A fuel cell 3 to main B. OK. We'll try that.

FLIGHT Fuel cell 1, back to main A, fuel cell 3 back to main B.

EECOM Let's see what happens.

55+59 - FLIGHT OK now do we have instrumentation problem?

EECOM Well it does appear we have lost AC bus 2 voltage. Main B is reading 4 volts and that effectively takes AC 2 away from us.

FLIGHT OK.

EECOM The, he reported the barber poles. ...(garbled)... on the, rodge, on the fuel cells, rodge 3. Flight let's see if we can get our DC back.

FLIGHT Rog.

FLIGHT Go ahead GNC.

GNC Verify that the quad delta valve helium valves are open.

FLIGHT Now are you seeing an attitude problem or are you seeing some bilevels that are giving you problems?

GNC No, it's some low pressures in the fuel and oxidizer, which would be systematic of the helium valve closing and firing some jets.

FLIGHT Quad number 2 helium valve open?

GNC No--quad Delta.

FLIGHT Quad Delta helium valve open, right?

GNC Right.

56+00 - FLIGHT CAPCOM do you want to verify the quad delta helium valve is open? Please. Any other problems in the RCS, Buck?

CAPCOM CAPCOM. Go CAPCOM. OK is that all we could come up with for them? We got any other recommendations?

FLIGHT Yeh we wanted to get the fuel cell 1 configured to main A fuel cell 3 to main B. Did you pass that up?

EECOM Let's attempt that Flight.

FLIGHT INCO this seems is to be a AC type problem and may be tied into that high gain thing you got.

INCO We went to wide beam width flight at 55 + 55 + 04, as near as we can tell.

FLIGHT OK.

EECOM I copy Flight. Let me comiserate on that.

56+01 - CAPCOM Is there any kind of lead we can give them or were we looking at instrumentation problems or have we got real problems, or what?

EECOM FLIGHT EECOM.

FLIGHT Go EECOM.

EECOM Let's reverse the configuration request.

FLIGHT OK, but wait a minute.

FLIGHT We got a good main A bus. Let's make sure that what ever we do doesn't screw up main A.

EECOM Fuel cell 2 is on main A Flight. I'm not going to ask to change that.

FLIGHT OK, what do you want to do.

EECOM Let's try to put fuel cell 1 on main B, fuel cell 3 on main A. We can use the other sensory circuitry.

FLIGHT Fuel cell No. 1 on main B, Fuel cell 3 on main A.

EECOM We're not going to touch fuel cell 2 Flight.

56+02 - FLIGHT OK, but if we got any problems in the system, I want to make sure that we don't blow the voltage off the main A. Then we're not going to be able to see anything. Can we review our status here Sy and see what we've got from a standpoint of status. What do you think we've got in the spacecraft that's good?

EECOM Main bus is reading 25 volts.

FLIGHT OK, main A?

EECOM And that's reflected by the fact fuel cell 2 is putting out 53 amps which is just about the most it can and keep our voltage up.

FLIGHT OK.

EECOM So that's bonifide AC bus 2 is zero which is reflected by the fact that we lost main B.

FLIGHT AC bus 2.

EECOM Standby Flight...

8

FLIGHT Zero output.

56103 - EECOM Flight EECOM.

FLIGHT Go ahead EECOM.

EECOM OK, if we want to keep ... standby he has changed configuration. He has battery A on main A.

FLIGHT Go ahead.

EECOM That's what I was going to ask you for the battery on Flight.

INCO Flight INCO.

FLIGHT Go INCO.

INCO We need omni BRAVO or the high gain won't drive without AC 2.

FLIGHT OK you want omni Bravo?

INCO Right.

FLIGHT You don't think we're going to be able to get high bit rate data here do you on the OMNI?

INCO We may be--we have the 210.

FLIGHT You got the 210.

INCO Right.

FLIGHT Well, that'll save a bit of power. CAPCOM let's recommend selection of OMNI Bravo.

INCO It's Charley now.

FLIGHT OK Charley.

INCO He's maneuvering.

CAPCOM OMNI Charley.

56104 - FLIGHT That's affirmative.

INCO OK Flight, we got OMNI Charley in high bit rate.

FLIGHT OK. You have high bit rates now off of the 210, right?

INCO Right.

FLIGHT OK.

EECOM Flight EECOM.

FLIGHT Go EECOM.

EECOM OK let's get a readout on a couple of fuel cells pressures here.

FLIGHT OK.

EECOM Fuel cell 1 N<sub>2</sub> pressure, Fuel cell 3 O<sub>2</sub> pressure. We're reading zero N<sub>2</sub> pressure on fuel cell 1 and 13 PSI on fuel cell 3 O<sub>2</sub> pressure.

56 + 05 - FLIGHT OK. Fuel cell 1, N<sub>2</sub> pressure, fuel cell 3, O<sub>2</sub> pressure. CAPCOM let's get those as a start.

GUIDANCE Flight Guidance.

FLIGHT Go Guidance.

GUIDANCE When this hardware restart, who was doing a crew defined maneuver and that should have killed it but we're still moving. He ought to stop it.

FLIGHT Are we using RCS now Buck? GNC from Flight. GNC from Flight.

GNC GNC.

FLIGHT Did you see any problems in quad D helium valve? Does that look like that cleared up?

GNC Rog, that cleared up Flight We're in good shape.

FLIGHT OK, now are we using RCS now?

GNC That's affirmative we going to have to switch some thrusters over to main A to hold attitude here.

FLIGHT OK, how much RCS we're using?

GNC Oh, we used, I would guess, 25 lbs.

FLIGHT OK, give me a minimum fuel usage confirmation that will keep me attitude.

56 + 06 - GNC Rog.

TELMU Flight TELMU

FLIGHT Go ahead TELMU

TELMU The IM heater current has become essentially static.

FLIGHT Rog. Let's solve one problem at a time. Come back to me later on.

CAPCOM We are confirming those numbers.

FLIGHT Buck, I need that RCS stuff as soon as you can get it.

GNC Rog, Flight. He has turned off all jets.

FLIGHT OK.

56+07 - CAPCOM OK, we came up with those numbers Flight.

FLIGHT OK, Sy. Next best thing to try.

EECOM Flight EECOM.

FLIGHT Go ahead.

EECOM Why don't we try--leave fuel cell 2 alone and just make sure 1 and 3 are disconnected from both buses, and make sure there won't be any load on them at all. Let's see what happens to those cells.

FLIGHT OK, what do you want to do--open circuit fuel cell 1 and 3?

EECOM That's affirmative Flight.

FLIGHT OK. CAPCOM let's recommend that we open circuit fuel cell 1 and 3 and leave fuel cell 2 as it is.

CAPCOM OK 1 and 3 open circuit, as is, and earlier we got a report from them that 1 and 3 were reading gray but no zero flow.

56+08 - FLIGHT CAPCOM amend that. EECOM from Flight.

EECOM Go ahead Flight.

FLIGHT Why don't we just open circuit 1 and make sure that we don't have any problems getting that back on to the bus, just watch it for awhile before we make any further moves with 3.

EECOM Roger.

FLIGHT OK CAPCOM, let's just open circuit 1 of those now.

GNC Flight GNC

EECOM That's roger Flight that's the AC problem.

FLIGHT Rog.

FLIGHT Crew thinks they're venting something.

FLIGHT I heard that Flight.

CAPCOM Copy that Flight?

56+09 - FLIGHT Rog.

FLIGHT OK, let's everybody think of the kinds of things we'd be venting. GNC you got anything that looks abnormal on your system?

GNC Negative Flight.

FLIGHT How about you EECOM? You see anything with the instrumentation you've got that could be venting?

EECOM That's affirmed Flight. Let me look at the system Flight as far as venting is concerned.

FLIGHT OK, let's start scanning. I assume you've called in your backup EECOM? EECOM?

EECOM Flight say again.

FLIGHT You called in your backup EECOMs now to see if we can get some more brain power in this thing.

EECOM We got one here.

FLIGHT Rog.

INCO Flight INCO.

FLIGHT Go INCO.

INCO Never mind.

56+10 - FLIGHT OK.

FLIGHT OK, let's everybody keep cool we got LM still attached the LM spacecraft's good--so if we need to get back home we got a LM to do a good portion of it with. OK let's make sure we don't do anything that going to blow our CSM electrical power with the batteries or that will cause us to lose the main or the fuel cell No. 2. OK we want to keep the O<sub>2</sub> on that kind of stuff working we'd like to have RCS but we've got the command module system, so we're in good shape if we need to get home. Let's solve the problem but let's not make it any worse by guessing.



GNC Flight GNC.

FLIGHT Go GNC.

GNC We have some jet configuration for you whenever you need them.

FLIGHT OK. Give them to me.

GNC Charley 3 and Charley 4 to main A. Bravo 3 and 4 to main A. Charley 1 and Charley 2 to main A.

FLIGHT Standby.

GNC It's all of quad Charley on main A.

FLIGHT OK.

GNC Plus Bravo 3 and Bravo 4.

FLIGHT Well, what are we going to be doing with these GNC? That will give us one jet in each direction in each axis.

56+11 - FLIGHT OK.

GUIDANCE Flight Guidance.

FLIGHT Go Guidance.

GUIDANCE He's getting close to gimbal lock.

FLIGHT CAPCOM. OK CAPCOM, recommend he bring up C3 C4 B3 B4 C1 C2 on main A and advise he's getting close to gimbal lock. Guidance from Flight.

GUIDANCE Go ahead.

FLIGHT Could we go to a course align on the platform here so we don't have to use any gas if we need to? We can reorient if necessary.

GUIDANCE Rog. I was going to recommend a P52 a little bit in...

FLIGHT Well, it's going to take awhile before we get to the point where we're even thinking of a P52.

GUIDANCE Yeh.

FLIGHT Yeh, it will course align itself there won't it?

56+12 -

GUIDANCE It'll course align at 85 itself.

FLIGHT Right.

FLIGHT Ok, EECOM, I'm coming back to you.

EECOM Flight.

FLIGHT Go ahead.

EECOM I think the best thing we can do right now is start a power down. OK let's go down to Emergency 1-5.

FLIGHT You want to power down. Let us look at the TM and all that good stuff and then come back up.

EECOM That's right.

56+13 - INCO Flight INCO, OMNI Bravo.

FLIGHT You want OMNI Bravo again?

INCO Right.

FLIGHT Onboard omni Bravo? CAPCOM recommend OMNI Bravo. OK you want to go to power down? Give me the page.

EECOM Emergency 1-5 Flight we'll go down and try to get a delta of 10 amps reduction.

INCO We got omni Bravo flight.

FLIGHT EECOM do you want to go through that again? What did you want to power down to?

EECOM I want to power down a total of 10 amps Flight. A total of 10 amps.

EECOM That right.

56+14 - FLIGHT OK. CAPCOM we recommend emergency power down checklist 1-5. We want to power down a total or a delta of 10 amps from where we are now.

GNC Flight GNC.

FLIGHT Go ahead GNC.

GNC Can we afford to do a PTC first and then we would shut off all of that stuff with no problems.

FLIGHT Why--do you think we going to have that thermal problem here?

GNC Well we could have, if stay there too long.

FLIGHT OK, we'll run into that one later Buck I want to get our

major problems sorted out now.

CAPCOM

You still want a 1-5 power down?

FLIGHT

1-5 power down, a delta of 10 amps CAPCOM.

FLIGHT

EECOM from Flight.

EECOM

Go Flight.

FLIGHT

You don't want to get fuel cell pumps off do you?

FLIGHT

Optic power is already off I believe.

EECOM

We can do that on fuel cell 1 Flight.

FLIGHT

Well let's make sure that we don't blow the whole mission.

EECOM

Flight EECOM.

FLIGHT

Go EECOM.

EECOM

Would you now want to consider going to PTC?

FLIGHT

Well why don't we get this problem here resolved right now.

EECOM

This will aid our power down.

FLIGHT

Pardon.

EECOM

This should aid our power down I hope.

FLIGHT

Well do you expect that we will be in a thermal problem for the next Many hours? EECOM.

EECOM

Well I don't know where to say the sun is right now FLIGHT.

GNC

Well it's pretty close to quad A right now.

EECOM

About 90 degrees?

GNC

I don't know exactly where; it's between A and B mostly A.

FLIGHT

GNC from FLIGHT= GNC from Flight.

GNC

GNC.

FLIGHT

Buck, I prefer not to make any unnecessary maneuvers now or try to use any of the equipments onboard the

56+17-

spacecraft such things as CMC that type stuff until we nail down what out problem is.

GNC

That's why I was recommending PTC because we don't need any of that stuff then. Heaters or anything else.

FLIGHT

Yeh, but you got to get the CMC on, and keep it on line. And you need a rather precise period of time for Rate Damping there.

GNC

You know there are 20 minutes to damp out and then spin up and then we can do without any of that. If we get a good spin up going.

FLIGHT

OK, that might be a good idea. That would buy us some more time from a standpoint of reviewing the data and to get us back into the--as close to the normal flight plan as we could. How far are we out of attitude right now?

GNC

He's a fair ways out right now FLIGHT, he'd do another V49 then fly back and then stablize there.

56+18-

EECOM

FLIGHT, EECOM

56+19-

FLIGHT

Go EECOM

EECOM

I need ont thing now. He's powering down. He's down to 41 amps total spacecraft; I'd like to get my AC 2 Bus back so I can look at O2 tank 2 pressure. I have no insight into that.

FLIGHT

OK.

EECOM

Let's get--I guess we can put the inverter 3 to Main A, AC 2.

FLIGHT

Let me ask you this. Before you do that would you like to make sure that you got all AC loads you don't need isolated from the Bus?

EECOM

No, let's not do that right now FLIGHT. I think we're in good shape that way. Main A is up high enough where it can handle the inverter.

FLIGHT

The thing that concerns me is throwing equipment--we had a problem we don't know the cause of the problem...

56+20-

EECOM

FLIGHT, I got a feeling we've lost 2 fuel cells. I hate to put it that way, but I don't know why we've lost them. It doesn't all tag up, and it is not an instrumentation problem, as best as I can tell right now.

FLIGHT

OK--I'll tell you what, Let's discuss this for just a little bit longer there Sy. CAPCOM start them moving back to ward the PTC attitude, let's start them going into its rate damping. I feel its going to be a relatively long period of time to try and nail down the problem...go ahead.

CAPCOM

He's asking how do we like his amperage setup right now.

FLIGHT

Are you happy with the power level right now EECOM?

INCO

Flight INCO.

FLIGHT

Go ahead.

INCO

I'd like for him to secure the high gain before he starts into PTC.

56+21

FLIGHT

GNC what's firing now? You got something firing?

GNC

Well we've seen quite a bit of thruster activity.

FLIGHT

OK I guess this kills the PTC too because we're not going to get into PTC as long as you've got something venting.

GNC

Roger Flight--that agrees with what we're seeing here.

EECOM

Flight EECOM.

FLIGHT

Go EECOM. ~~A double correction. Let's put inverter on both AC please. Inverter 1 on both AC. Affirmed. So I can get some AC power back so I can have as many changes to my~~

EECOM

I got a little correction--let's put inverter 1 on both AC busses please.

FLIGHT

Inverter 1 on both AC?

EECOM

That's affirm.

FLIGHT

Why?

56+22

EECOM

So I can get some AC bus power back so I can some insight into my AC bus 2 telemetry, especially my CRYOS the venting may be coming from that and also I think that the fuel cell 2 pumps are on AC2, and this will take care of it without switching the pumps yet.

FLIGHT Say that again. You think your fuel cell pumps---

EECOM Yeh-- fuel cell 2 pumps I think they're on AC 2.

FLIGHT OK but according to the checklist he should have turned those off, right? He said they were down to B mag No. 2 is in warmup so he's already gone through the fuel cell pump stuff. So you want to configure inverter 1 on both AC buses.

EECOM That's affirmed Flight.

CAPCOM Flight I didn't, I wasn't listening, to the spacecraft and I didn't pass up inverter 3 to main A to AC2. Did you delete that?

FLIGHT No we deleted that. You want to put inverter 1 in both AC buses EECOM and CAPCOM let's do it.

CAPCOM OK.

56423 - FLIGHT EECOM from flight.

EECOM Flight EECOM.

FLIGHT Monitor this bear (?) when they switch it in. TELMU and Control from Flight.

TELMU Go Flight.

FLIGHT Will you take a look at the prelaunch data and go through your systems and see if they're anything you've got that may have started venting here.

TELMU/CONTROL Roger Flight.

FLIGHT And I want a report in that in about the next 15 minutes, quick look type stuff.

TELMU OK

FIDO Flight FDO.

FLIGHT Go FDO.

FIDO We're definitely seeing a vent in the data.

FLIGHT OK

FLIGHT Rog. We copied that CAPCOM

EECOM Flight EECOM.

FLIGHT Go ahead.

EECOM Fuel Cell 2 Pump to AC1

56124- FLIGHT You want Fuel Cell 2 Pump to AC1?

EECOM Affirm.

FLIGHT CAPCOM, Fuel Cell 2 Pump to AC1.

EECOM Flight EECOM. Have you got anybody getting a delog on this thing downstairs?

FLIGHT Network from Flight.

NETWORK Flight network.

FLIGHT Bring me up another computer in the RTCC will you?

NETWORK We got one machine on the RTCC and we got dual CP's downstairs.

FLIGHT OK. I want another machine up in the RTCC and I want a bunch of guys capable of running delogs down there.

NETWORK Roger that.

CAPCOM Flight did you hear him say he was getting some rates? We want to know if he's firing any thrusters?

FLIGHT Rog. GNC wants those thrusters will you? GNC, say again.

FLIGHT Have you got any thrusters firing?

56125- GNC We are looking at that C3 thruster. Flight looks like it stays on most of the time.

FLIGHT Well can we turn them all off and see if we still got the rates or any build up in rates?

GNC Well the rate that we're seeing is opposite to the direction of that thruster, so if anything it's just trying to hold and not quite up to it.

FLIGHT OK, but...

CAPCOM He's been trying to counteract the rate with direct--he's been getting a negative pitch and a negative roll.

FLIGHT OK.

CAPCOM But he asked if we were getting some thruster firings that were not being made by him.

FLIGHT I'll tell you what--GNC can you get somebody in the backroom to try to figure out what the equivalent delta V is we're getting, so that we can see if we backtrack to see if we can figure out what's venting. Now it would seem that we could equate that to effective thrust and an axis and then deduce what's venting.

GNC Rog--we'll give it a try Flight.

FLIGHT OK. And that might be of interest to the LM guys.

56+26

CAPCOM He also said that it was coming past window No. 1.

FLIGHT Rog we got that.

INCO Flight INCO we need omni Charley.

FLIGHT OMNI Charley CAPCOM.

FLIGHT EECOM from Flight. What did--OK you got 2 good AC buses--what did all that tell you now?

EECOM It tells me that--give me about 2 more minutes flight.

56+27

FLIGHT OK take your time.

FLIGHT Rog concur CAPCOM.

TELMU Flight, TELMU we copy.

FLIGHT Rog.

FIDO Flight FIDO.

FLIGHT Go FDO. 2 machines in the RTCC.

FLIGHT OK.

56+28

56+29

GNC Flight GNC. ~~Go GNC.~~

FLIGHT

GNC We would like to turn thruster alpha 3 on main A and see if that will help control that pitch, and at the same time we can turn off Charley 3.

56+30

FLIGHT OK get me some real time plotting and how we're using RCS here will you?

GNC Rog Flight. In the pitch axis we really don't seem to be using any and that's why we would like to go to alpha and see if that changes it any.



FLIGHT OK now what do you want again.

GNC Thruster alpha 3 to main A.

FLIGHT Alpha 3 to main A. CAPCOM do you want to pass that up to the crew please.

FLIGHT Give me a gross amount of RCS propellants consumables so far, GNC.

GNC Roger Flight. It'll take 30 secs.

FLIGHT OK.

GNC That's affirmative Flight. We're still below the limits.

EECOM Flight EECOM.

FLIGHT Go EECOM.

56431 - EECOM We really got to get that battery off the line and power down some more and we got some main B power back so we can build our pressure back up in O2 tank 1. It's down to 318 PSI with main B down we have no heaters in O2 tanks.

FLIGHT What do you want to power down?

EECOM Well where do you say he got down to, B mag 2 off not inclusive?

FLIGHT That's affirmative. B mag 2 is in warmup.

EECOM All right. I think we'll go ahead and turn that down--we still have the LM with us right?

FLIGHT That's affirmative.

EECOM So if we shutdown the SCS we ought to be a little better off perhaps. I think we ought to press on and go down to B 2 off and get those lights minimum.

FLIGHT OK--how much you want to power down another 10 amps?

EECOM Get the B mags off and get the lights down to a minimum. Let's go down 2 more steps.

56432 - FLIGHT OK CAPCOM we want to power down a little bit more. Want to get the B mag off and the light minimum. OK Sy how long do you want to leave this battery online?

EECOM I want to try to get it off as quick as I can but I need to get power down. The crew did report that they removed fuel cell 3; they open circuited it, also didn't they?

FLIGHT I don't believe so.

EECOM Fuel cell 1 and fuel cell 3 should be open circuited.

CAPCOM We just had our last call for fuel cell 1 open circuit and left fuel cell 3 as it was.

EECOM Let's open circuit fuel cell 3 and get it off the bus.

GNC Flight, GNC.

FLIGHT Calling Flight, say again.

56133 GNC We've used a total of about 70 lbs. of RCS. We would like to change the jet configuration, and see if that will help us out any.

FLIGHT OK, what do you want to try now?

GNC We would like to turn the Bravo jets all to the off and all the Delta to main A.

FLIGHT Turn all Bravo to off and Delta to main A.

GNC This will verify that it isn't a Bravo thruster causing the problem with attitudes.

FLIGHT OK, Capcom, we would like to turn all BRAVO jets off and all Delta jets to main A.

CAPCOM Roger.

EECOM Flight, EECOM.

FLIGHT Go, EECOM.

EECOM Let's take Battery A off the main.

FLIGHT We can support the S-band on one fuel cell even with cryo 2 going down?

EECOM That affirm, flight.

FLIGHT What's your worry level on Cryo 2?

EECOM Say, again, Flight. I want to save the battery, flight.

FLIGHT OK. What battery have we got on line, Sy?

EECOM Battery A flight. The next step we've got to worry about is to get some power on main B to get some pressure back up in O<sub>2</sub> tank one.

56+34 FLIGHT Turn battery A off, Capcom.

EECOM Flight, EECOM.

FLIGHT Go EECOM.

EECOM Isolate the surge tank also, and save the cryos as much as we can.

FLIGHT Say that again.

EECOM Let's isolate the surge tank in the CM.

FLIGHT Why that? I don't understand that, Sy.

EECOM I want to use the cryos as much as possible.

FLIGHT But that would seem to be the opposite, if you want to keep the fuel cell going.

EECOM The fuel cells are fed off the tanks in the Service Module, Flight. The surge tank is in the Command Module. We want to save the surge tank which we will need for entry.

56+35 FLIGHT OK. I'm with you. Capcom, let's also isolate the surge tank.

CAPCOM OK, you want to isolate the surge tank. — O<sub>2</sub> SURGE TANK?

56+37 FLIGHT Yeah, what we are really doing is securing our entry systems right now. Yeah, we are trying to figure out some way to get power on bus B. EECOM, from Flight.

56+36 EECOM EECOM.

FLIGHT Would you considered putting a battery on bus B long enough to get the pressure up?

EECOM Well, I want to determine whether or not this 5 amps is going to hurt us any. That's going to be a main A incidentally; I made a mistake. O<sub>2</sub> tank 1 heaters are on main A.

FLIGHT We've got main A with us, haven't we?

EECOM Flight, EECOM.

FLIGHT Go, EECOM.

56+37 - EECOM OK, Since O<sub>2</sub> tank 1 heaters are on main A and we've got them off now, we will be able to stand the 5 amps temporarily for A manual pressurization. Let's have them turn the heaters on manually on O<sub>2</sub> tank 1, and we will watch the pressure.

FLIGHT O<sub>2</sub> tank 1.

EECOM Cryogenic O<sub>2</sub> heater 1, Flight.

GNC Flight we copy that, no problem.

FLIGHT No problem, Capcom. Capcom, we want to get cryo O<sub>2</sub> tank 1 heater on.

FLIGHT You can stand the 5 amps on main A?

56+38 - EECOM We think so, flight.

FLIGHT Did you see the 5 amp increase in current <sup>TEASE</sup>/EECOM?

EECOM That's affirm, we think so Flight. 26.7 volts, looks good. We will watch the pressure. Flight, to be consistent we ought to isolate the repress package also.

FLIGHT OK, you want to isolate repress pack.

FLIGHT AFD from Flight.

AFD Go ahead, Flight. Get one your guys full time in the back room keeping track of the spacecraft configuration as we pass it up to the crew. You might use Larry. Why don't you stay on and get Larry in the back room to keep track of the configuration as we give it to the crew.

56+39 - AFD OK. And we got the voice recorder and we are starting to transcribe that.

FLIGHT Has anybody started the delog of the initial problem? You've got a delog going? Have you got people that are going to be in a position to evaluate it?

FLIGHT OK. Telmu and Control, from Flight.

TELMU Go, Flight.

FLIGHT Right, I want LM manning around the clock.

TELMU Roger.

EECOM Flight, EECOM.

FLIGHT Go ahead, EECOM.

EECOM I want the fans on in O2 tank 1; we are not seeing a pressure increase. We can stand it.

FLIGHT You can stand it?

EECOM That's right.

56140 - FLIGHT Fans on in Tank 1, right?

EECOM Affirm, Flight.

FLIGHT Capcom, we want to bring the fans on in tank 1.

EECOM That's one amp Flight. He's got MC and W for varied reasons.

GNC Flight, GNC.

FLIGHT Go ahead, GNC.

GNC It looks like the vehicle has stablized considerably over the last few minutes.

FLIGHT OK, that could mean one of two things. Either whatever was venting has stopped venting and is empty, or do you feel it could also be associated with the thruster quad Bravo we just isolated.

GNC Possible, Flight. We really don't know yet, though.

FLIGHT Can you figure out what orientation we are from the standpoint of thermal control. Assume what is our rate right now.

56141 - GNC Right now, he has a minus .1 degree in pitch and yaw and roll are very close to zero.

EECOM Flight, EECOM.

FLIGHT Go ahead.

EECOM

The pressure in O2 tank 1 is all the way down to 297. You'd better think about getting in the LM and using the LM systems. I'm going to have to power way down. I don't know if I'm going to be able to save the O<sub>2</sub> for the third fuel cell; for fuel cell 2 rather...  
~~Flight~~ The heaters aren't working. Now let's start thinking circuit breakers, you got any circuit breakers you want to check there?

FLIGHT

EECOM

We saw the current flight.

FLIGHT

You saw the current.

EECOM

OK, let's check it anyway.

FLIGHT

It looks like it is cycling up a pcm count from 297 to 302. Give me some circuit breakers to check.

EECOM

OK, panel 226. Cryogenic O2 heater 1 main A circuit breaker. Also, flight, let's check the fan motor circuit breakers tank 1 on panel 226 also.

56+42

FLIGHT

Fan motor.

EECOM

Cryo fan motors, tank 1. There are 3 circuit breakers 3 phase.

FLIGHT

Get that Capcom?

CAPCOM

I got the 226 cryo O2 heater 1 main A and cryo fan motors, tank 1.

FLIGHT

That's right, all 3 phases. EECOM, I don't think we are going to come to any solution here until we get back to the initial set of conditions. So I hope you got a set of guys looking at a delog pretty soon.

FLIGHT

Telmu from Flight.

TELMU

Go, Flight. I want you to get some guys figuring out minimum power in the LM to sustain life.

TELMU

Roger. OK.

56+43

CAPCOM

We got the circuit breakers all in, flight.

FLIGHT

Rog; copy all circuit breakers in.

56+44

EECOM

Flight, EECOM.

FLIGHT

Go, EECOM.

56+45 - EECOM Don't we have both BMAGS off?

FLIGHT CAPCOM, would you verify that both BMAGS are off, please. You want to bring it off right, EECOM?

EECOM Affirmative, FLIGHT.

FLIGHT CAPCOM, let's get it off. CAPCOM from FLIGHT.

CAPCOM Go, FLIGHT.

FLIGHT Will you get a cockpit, Panel 1, 2 layout and have the crew read across all instruments, all guages and write down exactly what they read in those things?

CAPCOM OK, you want a survey of Panels 1 and 2 and guages?

FLIGHT Yes.

CAPCOM And talkback?

56+46 - FLIGHT That affirmative. Figure out some code you can use and I think that's something we should have gotten started a while ago.

FIDO Flight FIDO.

FLIGHT I see that juice is still going down there EECOM. You got any more suggestions?

EECOM FLIGHT, EECOM.

FLIGHT Any more suggestions in trying to pump up O2 tank 1 pressure?

EECOM No. FLIGHT, we are going to hit 100 PSI in an hour and 54 minutes. That's the end right there.

FLIGHT OK, 100 PSI .....

56+47 - EECOM in less than two hours from now.

56+48 - FLIGHT FIDO from FLIGHT

FIDO Go ahead FLIGHT.

56+49 - FLIGHT Whatever planning you do, I want to do assuming that we go around the moon and we are using the LM for performing maneuvers because in the present configuration, unless we get a heck of a lot smarter, I think we are wasting our time planning on using the SPS.

FIDO OK, FLIGHT.

FLIGHT So I think all of our return-to-earth type planning should be assuming the use of the LM DPS and/or RCS and I think third priority down the line should be CSM RCS.

FIDO OK, and I'm assuming you want fastest possible return.

FLIGHT Yeah, I think that's the case. (OK, we will work on it from that sideline.)

FIDO ✓ OK, no problem.

REPRO I copied that Flight.

EECOM FLIGHT EECOM

FLIGHT Go EECOM

EECOM Listen there is the possibility that we blew a  $O_2$  line in one of the fuel cells and it is affecting manifolded there of course. Now, I want to shutoff the reactant valves to one of the fuel cells. And that would be fuel cell 3. It's  $O_2$  pressure is gone. Now fuel cell 1  $O_2$  pressure is trying up there at 45 PSI. Maybe the problem is in fuel 3.

FLIGHT Sounds like a good assumption. Right there.

EECOM Fuel cell 3 has lost anyway as far as...

GNC FLIGHT GNC

FLIGHT Go GNC

GNC Turn C-1 thruster off.

FLIGHT You want to turn C-1 off? Why?

GNC It looks like we are getting a lost of firing for no reason.

FLIGHT OK, CAPCOM, recommend thruster C-1 to off.

CAPCOM Say again FLIGHT.

FLIGHT Thruster C-1 to off.

CAPCOM C-1 and 2 off.

FLIGHT No, C-1 off. I added a word in there. Turn thruster C-1 off.

FLIGHT EECOM, from FLIGHT



EECOM FLIGHT, EECOM

FLIGHT Why don't you show me where you think that problem is.

56+52+53- EECOM OK, Clint's coming up.

EECOM FLIGHT, EECOM

FLIGHT Go EECOM

EECOM We need to get the a... make sure the inline heaters for fuel cells 1 and 3 are off.

+54- F EECOM from FLIGHT, you want to shutoff both reactant valves to fuel cell No. 3?

E It does that anyway FLIGHT.

F OK

E. And the inline heater off in fuel cells 1 and 3 please.

F What we're preposing here...is supposing here CAPCOM is we may ...had some problem in fuel cell 3 since that's the one that's reading no O<sub>2</sub> right now. And we may be losing our O<sub>2</sub> through fuel cell 3, the O<sub>2</sub> manifold, in as much as they are manifolded together commonly. Ah, it looks the O<sub>2</sub> in fuel cell 1 and 2 seem to be trying to stay up there. And fuel <sup>cell</sup> 3 looks like the odd ball here.

F CAPCOM, let's close the reactant valve to fuel cell 3.

55- C OK, close reactant valve to fuel cell 3. And a...your saying that 1 and 2 look OK.

F Well what it looks like...looks like the pressure is trying to stay up there, and this is the best guess we've got right now. Cause we have got to stop this O<sub>2</sub> flow.

C OK

G FLIGHT, GNC

F Go, GNC

G Some more jet reconfiguration, to see if we can hold the attitude.

F OK

G Like to turn C-2 off.

F Why are we interested in holding attitude? If we are not venting, why not drift for awhile? That would probably be better from a standpoint of thermal control anyway wouldn't it?

G I think we would like to get into a controlled drift rather than just...rather than just some random thing FLIGHT.

F Standby

56+56- F Do you want them to go through that whole smash for fuel cell shutdown, Sy, heaters and all? EECOM?

E That's affirm, FLIGHT. He's gone through much of it already by pumps off.

F OK, you want him to go through the whole fuel cell shutdown, heaters and all.

E Rog, heaters, reactant valves and the pumps of course, he's already got.

F OK. Have him go ahead CAPCOM.

E Get the inline heaters off in fuel cell 1 also, FLIGHT.

F Inline heaters off in fuel cell 1.

E Rog, we'll cut the current requirement down that way.

+57- C Is our comm holding up? Sounds like he's going out.

F How you doing there INCO? From a standpoint of OMNI switching?

I We might be a little better on BRAVO.

F OK, Can you figure me out some way to keep communications and yet cut down a bit on the load? You might talk to EECOM on it.

I OK, we can turn the tape recorder off.

F EECOM from FLIGHT

E FLIGHT, EECOM

F You don't need the tape recorder do you?

E Heck no.

F Let's get it off.

I It may be already off, but one thing we don't need.

E Let's go down the list as much of that INCO stuff as we can get FLIGHT. I think that's about the one biggy right there.

I That's about the only thing we can give up. We turn the power amp off, we won't get HBR.

F CAPCOM from FLIGHT.

C Go.

F Let's also verify tape recorder's off please.

C OK, I think we...

F I don't think we got down that far on the list, did we? We went to the BMAGS and then went with lights, BMAGS and lights and I think we stopped right there.

C Yeah.

E Yeah, that's affirm FLIGHT. We skip a step and go to tape recorder off.

56+58- RECOVERY AFD meet RECOVERY on RECOVERY loop.

F What was that CAPCOM?

GUIDANCE We copy that FLIGHT.

F What was that GUIDANCE?

GUIDANCE He had an 0618 and he couldn't get rid of it. He's got rid of it now.

+59- FIDO FLIGHT, FIDO

C OK, FLIGHT, I had 'em read off a lot of guage readings; we got over to fuel cell 3 and I hope your people are copying all this down.

F A, did you get it on some kind of master? We got it on tape, I'm sure we can get it off the tape.

C That's affirm. I'd say I have 95 percent of the one's he read.

F OK

FIDO FLIGHT, FIDO

F Go FIDO

FIDO When the systems men can stand it, I need two minutes for a check point to save all of this data.

F I don't see why we couldn't ...EECOM, GNC can you stand a check point right now?

EECOM It only takes a minute, I guess I'll have to if we need it FLIGHT.

G Go ahead.

F I think it would be good to get a check point.

G Go ahead.

F EECOM, have you deduced anything? Have you seen your reactant valves go off? Have you seen flow cease?

E Can't tell FLIGHT. They are open circuited, and the pressure still appears to be going down.

+01- F ~~Yeah~~ YES  
FIDO NEGATIVE, FLIGHT  
EECOM FLIGHT, EECOM

F Go EECOM

EECOM We'd better confirm that the fuel cell 3 reactant valve CB on PNC-226 was closed when he shut those...

F Fuel cell 3 reactant CB... What PNL?

EECOM 226. They're normally open.

F OK, good idea.

+02- C You want them to close the CB on the valve and then...

F ~~Yeah~~ YES

EECOM ~~Yeah~~ YES, he should have got a BP on that.

F ~~Yeah~~ YES, wouldn't he get a BP when he turned the reactants off, EECOM?

E Affirm FLIGHT.

FLIGHT Even with the CB open?

EECOM No.

FLIGHT OK, so he ought to know that. We can just verify that he got a...

FIDO OK, FLIGHT, we have our check point.

FLIGHT OK.

FLIGHT All Flight Controllers, I'd suggest you start handing over cause I think a fresh team is going to be thinking clearer. I think the rest of us can continue working in some other function in support of the new team coming on.

GNC Go on thruster A-4 FLIGHT.

FLIGHT OK .

FLIGHT Go on thruster A-4 CAPCOM.

INCO OMNI C, FLIGHT.

FLIGHT And OMNI C.

57+03 - CAPCOM FLIGHT, he wants to bring on A-4, he hasn't got any way to stop pitch rate; either direct or auto.

FLIGHT Go

GNC He has it on FLIGHT.

INCO I still don't have Omni C.

CAPCOM I didn't get a call for Omni C. You want it?

INCO Yes.

57+04 - EECOM I copy.  
Network? FLIGHT, you're on GOSS Conf

FLIGHT OK, all Flight Controller, I'm handing over to Glen; I assume the majority of other guys are a pretty much briefed and up to speed as best we can. Now what I'd suggest is that the White Team do two things - go over the...OK... Let's go over this again. We're handing over to Glen, I'd suggest the White Team go back and start going through the delog of the data, In other words, let's see if we can go back to the initial conditions and work on that problem to see if we can find out what happened and we may find

57+05 - some better clues as to what to do, and let the fresh guys come on and try to figure out where do we go from here. And the delog is in way now? Rog.

FLIGHT OK, EECOM, tell me about the latch. Do you think you've got the reactants latched?

EECOM FLIGHT, EECOM.

FLIGHT Go.

EECOM The crew reported he got BP whenever he threw the reactants switch, so a implies that he did all the right things and he really got it shutoff. And it looks like that didn't help us any. The pressure is not improving any.

FLIGHT OK. The next question is are you willing to do that  
on ~~FC2~~ Fuel Cell # 1 ?

EECOM That's a question we're pondering FLIGHT. We've got to  
come up with an answer on that one soon.

FLIGHT FC2 is working OK.

EECOM That's affirmative.

FLIGHT Unless we do something get that  $O_2$ , it is not going to do  
us any good to save fuel cells.

EECOM That's affirmative.

FLIGHT OK. GNC, FLIGHT.

GNC GNC.

57+06- FLIGHT You stabilized yet? Standby. Here comes configuration.  
I think it's yours. I didn't copy all of those, did you  
GNC?

GNC Rog FLIGHT, we concur.

FLIGHT Is that good. How are the rates?

GNC Holding down to a  $.1^0$ /sec FLIGHT. He's in ACCEL CMD  
so...

FLIGHT ACCEL CMD?

GNC Rog

CAPCOM FLIGHT, did you copy all those thrusters?

FLIGHT Go ahead...who's calling?

CAPCOM CAPCOM...did you copy all those thrusters?

FLIGHT I didn't copy 'em all Jack. GNC, did you copy 'em all?

GNC That's affirmative FLIGHT.

FLIGHT You like that configuration for right now?

GNC Yes.

+07- FLIGHT The best you tell, the rates are OK. And he's flying  
ACCEL CMD.

GNC Rog.

FLIGHT NO Rate Damping is ~~it~~ right?

GNC Right.

FLIGHT Are both ~~PMAB~~ <sup>BMAC</sup> packages off?

GNC Yes, they are.

FLIGHT OK

FLIGHT Standby, EECOM do you need anything?

EECOM Rog FLIGHT, we'll take some. We want those?

FLIGHT What do you want?

EECOM He can go through the meters on fuel cells 1 and 3.

FLIGHT OK. Just fuel cells 1 and 3 Jack.

FLIGHT EECOM, I don't like the way that O<sub>2</sub> pressure is going down. If you want to do something about these other reactant valves, let's make up our mind.

EECOM OK

FLIGHT Don't you think?

EECOM Let me get back with you in a minute FLIGHT. Standby on these readouts.

FLIGHT OK

EECOM Anybody can copy the readouts, be sure you're discussing this reactants.

CAPCOM FLIGHT, CAPCOM. Long time ago, I heard someone mention something about closing the REPRESS PACKAGE and we never made a decision on that...do you want to do that too?

FLIGHT EECOM? He's busy.

EECOM Go FLIGHT.

FLIGHT Do you want to close off the REPRESS PACK. I think that came on for them before.

EECOM We indicated earlier that we would like to get it closed off, FLIGHT.

FLIGHT Yes, Jack.

57+08-  
+09-

+10 -



EECOM FLIGHT, EECOM

FLIGHT Go

EECOM OK, on the reactants for fuel cell 1. Seems to me we have no choice but to go ahead and do it. The pressure continues to drop; we are not to have anything left soon anyway. So the next best thing to try is to go ahead and turn the reactants off in fuel cell 1.

FLIGHT <sup>yeh.</sup>  
~~Yeah.~~ What is this pounds on your display, Clint?

EECOM On O<sub>2</sub>?

FLIGHT Yes.

EECOM That's invalid. Of course he'll want to make sure his CB's are closed for fuel cell 1 when he starts to close the reactants valves.

FLIGHT Which CB's is that? The one on PNL 226?

EECOM Rog.

FLIGHT Thats fuel cell 1?

EECOM That's Rog. Fuel cell 1 reactants 1.

FLIGHT Alright.

57-11- FLIGHT Is he done with that readout yet?

EECOM I didn't copy the last part of it there FLIGHT.

FLIGHT EECOM, FLIGHT.

EECOM Go FLIGHT.

FLIGHT Is any chance that I'm just looking at a bad pressure reading here; I'm going to shutoff this second fuel cell now. Is there any data you can correlate to say that, yeh that pressure is going down?

EECOM On the O<sub>2</sub> tank?

FLIGHT Yes.

FLIGHT Do you understand my question?

EECOM Yes, I understand your question...the temperatures are also dropping... let me get a verification on that... standby.

57+12 - FLIGHT            Alright.

FLIGHT            Yeh, we copy that. Tell him we are debating shutting off the reactants on fuel cell 1.

EECOM            FLIGHT, EECOM.

FLIGHT            Go ahead.

EECOM            The temperature is the only thing we have.

FLIGHT            And does it correlate?

EECOM            Pretty closely.

FLIGHT            Your saying then that I'm looking at a valid pressure in that tank and it's still going down.

EECOM            That's the way it looks FLIGHT.

FLIGHT            Therefore?

EECOM            Therefore, we need to go to fuel cell 1 and turn off the reactants.

FLIGHT            CAPCOM, fuel cell 1 reactants. CB and switch.

CAPCOM            OK, do you want them to go through the fuel cell shutdown procedure on 1?

FLIGHT            EECOM?

EECOM            Say again FLIGHT.

FLIGHT            Do you want them to go through the fuel cell shut down procedure on 1?

EECOM            That's affirmative.

FLIGHT            Yes, Jack.

CAPCOM            Because?

FLIGHT            The tank 1 is still going down. The pressure going down; temperature confirms it.

CAPCOM            OK.

FLIGHT            EECOM, FLIGHT

EECOM            Go ahead FLIGHT.

FLIGHT The question you want to ask yourself is do you want to open 3?

EECOM Open 3?

FLIGHT Yeh! You don't want to do that?

EECOM Negative, let's leave 3 like it is.

GNC FLIGHT, GNC,

FLIGHT Go ahead...standby.

FLIGHT What main bus do you want up?

EECOM Main A. Just like it is.

FLIGHT Just like like it is. Fuel cell 2 is on Main A.<sup>?</sup>

EECOM That's affirm.

INCO FLIGHT, INCO

FLIGHT Go.

INCO OMNI BRAVO.

FLIGHT OMNI BRAVO too, Jack.

FLIGHT EECOM, FLIGHT

EECOM Go ahead FLIGHT.

FLIGHT How long can I leave that stuff off and still turn it back on? Anytime at all?

EECOM Negative FLIGHT. It's like it wipes it out.

FLIGHT Alright.

FLIGHT EECOM, FLIGHT...I don't know, that's what I'm asking, but we got that shutoff now. OK when you can.

EECOM That's right FLIGHT.

FLIGHT Your ready for that now, sure, absolutely, huh EECOM?

EECOM That's right FLIGHT.

FLIGHT It's still going down and it's not possible that the thing is sorta bottoming out is it?

57+13-

A/G  
HERE+14-  
A/G  
HERE

EECOM Well the rate is slower, but we have a less pressure too, so we would expect it to be a little bit slower.

57+15 - FLIGHT You are sure then, you want to close it?

EECOM Seems to me we have no choice FLIGHT.

FLIGHT Well...

EECOM Standby one minute... I 'll poll my back room.

FLIGHT It went down again, one more .

EECOM We're go on that FLIGHT.

FLIGHT OK, that's your best judgment, we think we'd ought to close that off, huh?

EECOM That's affirmative.

FLIGHT It's dropping down to 234 now. OK. Fuel cell 1 reactants coming off.

GNC FLIGHT, GNC .

FLIGHT Go ahead.

+16 - GNC I think we'd help the CMP a little bit if we could tell him to enable B-D roll in the DAP. He's got A-C turned off and he's got A-C selected in the DAP. Could we tell him to...

FLIGHT Is he under DAP control?

GNC He goes to it occasionally, he's in ACCEL CMD right now.

FLIGHT He's got A-C off huh?

GNC Right.

FLIGHT CAPCOM, when you get a spare minute there, Jack needs to enable B-D roll in the DAP if he wants to use it... ~~Enabled....~~ IF He wants to use the DAP,

FLIGHT Gee, it's really going down.

EECOM FLIGHT, EECOM

FLIGHT Go

EECOM OK, is the LM getting all set up for using LM systems for to support CSM?

57+17 - TELMU That's affirmative.

FLIGHT Yes.

EECOM OK. We'll get you a time.as to what it looks like we'll have for power here shortly.

FLIGHT TELMU and CONTROL, FLIGHT.

CONTROL CONTROL here.

FLIGHT Keep reminding me of that heater. Now I don't want to let that thing go too long.

CONTROL OK, we're still trying to get some data or substantiating data on it FLIGHT. My own personal feeling is that the sooner we can take care of that, the better off, I'm going to feel about it.

FLIGHT Yes, OK, Hal, go get them.

TELMU FLIGHT, TELMU; we're working a procedure now that powers the LM internally from its own power.

FLIGHT Fine.

INCO FLIGHT, INCO.

FLIGHT Go

INCO Save you a little more power if you turn the HGA switch to off.

FLIGHT HGA off.

INCO Power switch off,

FLIGHT Power switch. You're doing OK on OMNI's huh?

INCO Yes, we have the 210.

FLIGHT OK. CAPCOM, he can turn the HGA power switch off. We're doing fine on OMNI's. We've got the Big Dish.

EECOM FLIGHT, EECOM

FLIGHT Go

EECOM Like to charge Battery A.

FLIGHT Yes, I was wondering about that. Let me get the HGA power off first, OK?

57+18-

EECOM OK.

FLIGHT How many Amps will that give us EECOM?

EECOM About 1.3 to 1.4 amp hours/hour. It cost us about 1.5 amps.

FLIGHT So, it's no big deal on the amps.

EECOM That's right. And we'd like to use whatever time we have to put energy back in the battery.

FLIGHT Yes, and I see O<sub>2</sub> tank 1 pressure is 217.

EECOM That's affirmative. Still coming down.

FLIGHT CAPCOM, FLIGHT.

CAPCOM GO FLIGHT...Standby.

FLIGHT GUIDANCE do you want anything done with the CMC right now?

GUIDANCE FLIGHT, we would like V74 before they power down.

FLIGHT V74, CAPCOM.

CAPCOM You ready for it now?

GUIDANCE Standby FLIGHT, let me get the site configured.

57+19- FLIGHT EECOM, FLIGHT

EECOM Go ahead, FLIGHT

FLIGHT Does the temperature in tank 2 correspond to the pressure reading?

EECOM Let me see how close it is FLIGHT.

GUIDANCE FLIGHT, GUIDANCE. We're ready .

FLIGHT Go. Yes, V74 you want?

GUIDANCE Roger

FLIGHT V74.

EECOM FLIGHT, EECOM

FLIGHT Go

EECOM The temperature and pressure correspond. They're verifying that the pressure is reading right.

A/G  
here

FLIGHT In tank 2?

EECOM Standby...that's right FLIGHT.

FLIGHT Is it possible that we still have that tank and it is good?  
And we could some how get power on B and use it.

EECOM Not likely FLIGHT.

FLIGHT What's not likely, Clint?

EECOM It's not likely to be able to actually have anything left  
in tank.

57+20- FLIGHT You don't think so?

EECOM I don't think so, but let...we'll pulse that one too...  
let me get you a time that it looks like we've got on tank  
1 here.

FLIGHT Alright.

FLIGHT TELMU, FLIGHT

TELMU Go, FLIGHT

FLIGHT Is there anything simple that we can refer the crew to,  
to get them thinking about using the LM here? Or  
have you got anything in the checklist paperwork to  
describe to them what your intentions are?

TELMU Negative, there is nothing documented in contingency.  
We're thinking about using the LM as a lifeboat.  
We have some procedures here - on the ground though.

FLIGHT I'm sure you do. What do they amount to? Flying with  
the tunnel open?

TELMU Rog. Just a LM low power load supplying power to the  
CSM.

FLIGHT Supplying power to the CSM?

TELMU Yes, about 5 amps.

+ 21 - FLIGHT Ah, to what?

TELMU To their Main Bus B.

FLIGHT OK, where...well...Main B is in Bad shape. We don't  
have anything on Main B right now. What's that power  
for TELMU?

TELMU Just anything you might need it for.  
 FLIGHT GNC and EECOM  
 EECOM Go FLIGHT  
 FLIGHT What power do you need from the LM?  
 EECOM OK, we...  
 FLIGHT That's right.  
 EECOM We confirm that here.  
 EECOM FLIGHT, EECOM. Looks like we've got about 40 minutes left in that tank.  
 EECOM That's affirmative. Would like to get Battery A on charge FLIGHT.  
 FLIGHT Now....CAPCOM, just for his information, we're not going to do a DPS burn until we look around the moon. Let 'em know that, and that's at about 79:30.  
 GUIDANCE FLIGHT, GUIDANCE.  
 FLIGHT Go ahead.  
 GUIDANCE We didn't get a good recording on that V74. We need to do it again.  
 EECOM FLIGHT, EECOM  
 FLIGHT Go ahead  
 EECOM I would like to get battery A on charge, and we would like to go ahead and get some more power off if we can. I'm not sure what the situation is on getting the computer...  
 FLIGHT Clint, let me ask you, is there anything you want to do trying to pump up the other tank, or anything? Or are you satisfied that both of these tanks are going down, and we're past helping them, even with batteries? That's what I'm getting at. I'm just trying to be sure that your satisfied that there is nothing else we can do.  
 EECOM About all we can do is power down and let heat leak help us some, which is probably going to be trivial.  
 FLIGHT OK. There's nothing else you want to try? That's the only reason I'm delaying on this Battery A charge Clint

A/G  
 Here

57+22-

+23-



to be sure you've gone through everything and you don't have any other tricks up your sleeve.

EECOM Sure don't FLIGHT.

FLIGHT OK, what other power do you want to take off? *before we start the charge?*

EECOM Well it looks like we're going to get into the control area. Ah, whatever they can give up, we'll have to come up with here.

FLIGHT OK. Well are you ready to go ahead and charge Battery A?

EECOM That's affirmative.

FLIGHT CAPCOM, why don't they get all they can in Battery A.

CAPCOM OK and Jack also ask me if we wanted to get a P52 and get the LM platform up.

57+24- FLIGHT What do you think of that? GUIDANCE AND CONTROL.

GUIDANCE Go ahead FLIGHT.

FLIGHT The question is do you want to do a quick P52 in the CSM so that we can do an alignment to the LM. I don't know as we want to keep the LM platform up all that time.

CONTROL Negative, that's too much power in my mind FLIGHT, to keep that thing running all that time.

FLIGHT Therefore, you don't....

CONTROL My vote is not to do that.

GUIDANCE Mine too.

FLIGHT Hey, CAPCOM, we don't see any need in doing that because we wouldn't be using the LM platform until about 79:00.

CAPCOM OK. You don't want to worry about the LM platform. We'll align it later with the AOT?

CONTROL FLIGHT, CONTROL

+25- FLIGHT Did you say Battery A charge? OK. EECOM, we're charging A, watch it there OK?

EECOM Watching it FLIGHT.

FLIGHT EECOM, go one more time around that room, we're letting the thing go down, although I realize we don't have any more thoughts to do. But I want to be sure that if there is anything we can do here, that we're doing it...to keep...

EECOM Just power down FLIGHT. All we can power down will put us in that much better configuration.

FLIGHT OK, I got that part but are there any other things that you can do besides that is what I'm getting at?

EECOM Negative FLIGHT.

FLIGHT GNC, Can you help EECOM there as to what else you might power down if anything? I don't know whether you can or not.

GNC Rog FLIGHT, we'll work on it, although we're in an attitude hold situation in here and I hate to give up the CMC and the IMU right now.

FLIGHT Yes, well the CMC doesn't matter.

GNC OK, we'll work on it FLIGHT.

57+26 - EECOM FLIGHT, we are not going to have anything in about 40 minutes here.

EECOM FLIGHT, EECOM. FLIGHT, EECOM.

FLIGHT Go ahead.

EECOM OK. Got an update on the time. It looks like we got about 18 minutes until we get down to 100 PSI and that's the cutoff point.

FLIGHT Alright, but we're charging Battery A?

EECOM Well that doesn't mean much in 18 minutes though, but we're doing all we can do.

FLIGHT Alright.

FLIGHT CONTROL and GUIDANCE. One more time. Will it do any good at all to...TELMU FLIGHT... The question is should we try to a quick align with the CSM and do an alignment in the LM. Can we keep an alignment in the LM up until 79:00? Can you keep that kind of power on?

TELMU Standby

+27 - FLIGHT THE PILOTS ARE REPORTING THAT  
 A..it is difficult to do that alignment from scratch with the LM docked. Now we've got a tradeoff as to whether we can stand that kind of power.

CONTROL Standby one FLIGHT.  
 FLIGHT Pronto.  
 GNC FLIGHT GNC. We'd save a little power if we turned all the jets off in quad C. We're pulsing those jets and we suspect that we've closed the prop isol valves in quad C so it's doing us no good right now, so we need to turn off all the jets in that quad.  
 FLIGHT RCS select off on quad C?  
 GNC Rog.  
 FLIGHT EECOM? They needed to dump water?  
 EECOM Negative FLIGHT.  
 FLIGHT NO sweat there, Jack.  
 EECOM FLIGHT, EECOM  
 FLIGHT Go ahead.  
 EECOM They get the power amp off? I heard them talking about it awhile ago.  
 INCO No, we don't.  
 EECOM We can eliminate that since we're on the 85 ft can't we?  
 INCO That's not exactly true.  
 FLIGHT OK  
 INCO We're looking to see how far down we can go.  
 FLIGHT Alright.  
 EECOM I believe GNC has some things we can turn down here.  
 FLIGHT Yes, auto RCS in quad C can go off. We got that quad prop isolated, which I didn't know. Pardon? Quad C auto RCS. GNC, FLIGHT.  
 GNC Go ahead FLIGHT.  
 FLIGHT Confirm, Quad C is prop isolated off, right?  
 GNC Well we haven't confirmed that FLIGHT, but it appears that's the situation we have. The shock of the O<sub>2</sub> thing is probably closed those valves and we haven't been able to open them because they are powered off of Main B.

AIG  
HERE

57 +28 -

FLIGHT ~~From~~ OK.

GNC Battery A's appears to be working OK.

57+29- FLIGHT OK, we think quad C is prop isoled off Jack. So in that case, we should turn off the auto RCS select. That will save a little power: Probably not much.

CAPCOM You want auto RCS off on C?

FLIGHT Yes.

CAPCOM *How are we doing?*  
How about antennas? <sup>A</sup> Did I hear them give me some bad comm there?

INCO We're in pretty good shape right now FLIGHT.

FLIGHT OK. EECOM, FLIGHT

EECOM Go ahead FLIGHT

FLIGHT Let me try one more time. Is it possible that if we got power to Main B, that we could <sup>get</sup> tank 2 powered up and up in pressure?

EECOM We don't feel like that is a possibility FLIGHT. We might conceivably get power to B, but we don't feel like we can get anything out of tank 2.

FLIGHT OK, Why is that? Tell me why!

EECOM It's because the numbers we're looking at indicate that it is essentially a... a ambient.

FLIGHT ~~Hold on~~ *ALL gone,*

FLIGHT GNC, watch and see that we don't pick up any rates now please.

57+30- GNC OK, FLIGHT.

FLIGHT EECOM, FLIGHT

EECOM Go FLIGHT

FLIGHT How long have we got now on the cell?

EECOM At last account, we had 18 minutes. Let me get an update.

FLIGHT OK, TELMU what do we got to do to power up to get some comm on the LM.

TELMU OK, FLIGHT, we have a procedure here that gets power first on the LM.

FLIGHT Yes, EECOM, FLIGHT

EECOM Go FLIGHT

FLIGHT Yes that get's us power up, but what do you want up, just the comm?

EECOM We will have to have an environment for the crew...but this can be worked up...

FLIGHT That's what I'm asking you EECOM and TELMU. We got to figure out how to tell... we are just about out of CSM talking.

TELMU OK

FLIGHT What do you want them to Power up in the LM?

TELMU Standby one.

EECOM FLIGHT, EECOM

FLIGHT Go EECOM

EECOM Our input here is that we will have to live out of the LM.

FLIGHT Understand.

57+31- FLIGHT We have a power up procedure here from TELMU, but we have to start thinking about what you want configured in the ECS and Comm.

TELMU That get's power in LM and then we'll get you some comm and TM.

FLIGHT Do we need to send any power to the CSM, for the platform or anything? Or can we even do that?

TELMU I'm not sure we can do that yet?

FLIGHT Can't do that. That was a long time ago.

CAPCOM OK, when do want them to start working on this procedure?

FLIGHT Well, tell them they gotta start thinking about going over and powering right now because they are going to have a light problem on a little while in CSM.

CAPCOM OK, I'll send it up. And he wanted to know if we wanted to try and reset the propellant valves in the secondary...

FLIGHT GNC

GNC Rog FLIGHT. That won't do any good because those valves are powered off of Main B and we've lost Main B.

57+32 - FLIGHT NO CAPCOM. *It's off Main B.*

FLIGHT TELMU, FLIGHT

TELMU Go FLIGHT

FLIGHT Does this title on this page mean anymore than power up the LM.

TELMU No, thats all.

FLIGHT Alright

EECOM FLIGHT, EECOM

+33 - FLIGHT Go ahead

EECOM We'd like to go ahead and power down the CSM all we can except leave that Battery charger on. Of course, leave them a little light because we are going to be there in 15 minutes anyway.

FLIGHT CAPCOM, we're going to be out of power in the CSM in 15 minutes ~~from~~<sup>57</sup> the fuel cells. We want them to start getting the tunnel cleared and start getting over there to power up the LM as soon as they can. EECOM and GNC what do you want to switch off in the CSM?

EECOM Power it down FLIGHT, all of it.

GNC GMC and IMU mainly, FLIGHT

A/G Here +34 -  
+35 - FLIGHT That's the problem.

EECOM FLIGHT, EECOM

FLIGHT Go ahead

EECOM Last ditch stand on O<sub>2</sub> tank 2, let's turn the fans on. That cost us about 1 ~~hour~~<sup>hour</sup> amp.

FLIGHT What are they off? Main A?

EECOM They're on AC.

57436 -

FLIGHT OK. Fans in Tank 2 on.

EECOM Fans in Tank 2 on.

FLIGHT CAPCOM, FLIGHT. Tell 'em to try the fans in tank 2. They are off the AC and as a last ditch stand in tank 2. Turn the fans on in tank 2; it only takes 1 amp.

CAPCOM OK

FLIGHT TELMU, GUIDANCE, and CONTROL; FLIGHT. Do you know the status of the CSM platform right now?

GUIDANCE Negative FLIGHT. It's good as far as we know.

FLIGHT No, do you know it's orientation?

GUIDANCE PTC REFSMMAT

FLIGHT You know what you got? It's OK?

GUIDANCE Rog.

FLIGHT EECOM

EECOM Go ahead FLIGHT

FLIGHT Did he get fans 2 on?

EECOM We can't tell FLIGHT.

+37 - FLIGHT He got it Jack, number 2 fan. OK.

FLIGHT GUIDANCE, CONTROL and TELMU. The point is should we quick if you guys can't run out the power study, align your IMU to the CSM, while we study the problem; see what we've got in the way of power. Tom Stafford is concerned that they will have a hell of a time getting the platform aligned in the LM with the AOT.

GUIDANCE I agree FLIGHT.

CONTROL I agree too FLIGHT.

FLIGHT What should a we tell them to do?

CONTROL It's going to take them about 15 to 20 minutes, I understand, to do that procedure. Is that right GUIDANCE?

FLIGHT Which procedure?

CONTROL Docked alignment.

CAPCOM How about giving me....

FLIGHT How about a coarse align?  
At least you start....

CONTROL That's in the ball park FLIGHT, that's great.

FLIGHT Well what do we do to get this done? EECOM, you got all my power on the LM when this procedure. What power have you got on the LM?

GUIDANCE FLIGHT, GUIDANCE.

FLIGHT Go ahead.

GUIDANCE What ought to go ahead and do a P52 first in the CSM...

FLIGHT That's what I'm asking you.

GUIDANCE Right

FLIGHT Do you have one now? We don't have much time, do you have a good one now? As far as you know?

GUIDANCE A good alignment?

57+38- FLIGHT Yes, that's what I'm asking you. Do you have a good alignment?

GNC FLIGHT, GNC.

FLIGHT I'm not worried about .1° either.

GUIDANCE It ought to be that good.

FLIGHT OK...no need to do a P52.

EECOM FLIGHT, EECOM.

FLIGHT Go ahead.

EECOM We need to open up the Surge tank, the manifold pressure is dropping.

FLIGHT OK, wouldn't you rather pump that up from the LM?



EECOM We've got to get into the LM first FLIGHT.

FLIGHT CAPCOM, get 'em going into LM, we've got to get the oxygen on in the LM.

TELMU FLIGHT, TELMU.

FLIGHT Go, TELMU.

TELMU We have a procedure here. Probably the easiest thing is to refer them to activation 11 and activation 12.

FLIGHT What will that do for us?

TELMU That'll give them the comm...

FLIGHT Activation 11...

57+39- TELMU ...and activation 12, 13, step 1.

FLIGHT OK, Got that Jack.

TELMU And cross out the VHF stuff.

FLIGHT OK. Does that give us ECS also.

TELMU That gives us glycol circulation.

FLIGHT How about ECS, come on I need some O<sub>2</sub>.

EECOM Disregard the surge tank.

FLIGHT Alright. Come on, <sup>do I need</sup> give me some O<sub>2</sub> right now?

TELMU Roger. Go to Activation step 1...

FLIGHT And start there huh?

TELMU Right.

FLIGHT And go how many steps? Activation...

TELMU Just one. Step 3. Activation 1, step 3.

FLIGHT Step 3, and then what?

TELMU Activation 11, 12, 13 - Step 1.

FLIGHT OK. Got that CAPCOM?

CAPCOM Activation 1, step 3. Activation 11, 12, 13 - Step 1.

57+40 - TELMU Roger, and FLIGHT in Activation 11, omit step 1.

FLIGHT Alright. OK and that will give them what? Glycol flow, comm and some ECS? Is that right? That's what we want..

TELMU Rog.

FLIGHT OK, That's what we want.

TELMU FLIGHT, TELMU.

FLIGHT Go.

TELMU One other input. We also need to Demand Regs to cabin.

FLIGHT Rog.

FLIGHT Do you want them to do Activation 1 down to step 3?

TELMU That's affirmative.

+41 - FLIGHT That's down to step 3... that's 12 and 13...and Demand Regs to cabin. Alright.

FLIGHT TELMU, when do we do Demand Regs to cabin? At the end of those 3 steps?

TELMU At the end of the sequence.

FLIGHT At the end of the sequence, Demand Regs to cabin, Jack. ...and I'm still not satisfied he's got Activation 1 down to step 3.

EECOM FLIGHT, EECOM. The voltage is going to begin to drop, and we'll need to power down with it.

FLIGHT What do you want them to do, turn everything off?

EECOM Leave the lights on...and...leave the lights on. *That's all they need.*

FLIGHT And where do they get power from, the LM?

EECOM They will be powered from the CSM as long as we have anything. We will bring up Battery A when we get down to about 25 volts or so.

FLIGHT Why?

+42 - EECOM Until they get into the LM, and keep their lights up and whatever they have to have. We don't want to destroy the IMU alignment in the CSM right now so we've got to keep that up, I assume, until you get the LM aligned right?

FLIGHT OK.

EECOM We'll do that by bringing Battery A on Main A.

FLIGHT We'd better quick do that or we're going to be losing it.

EECOM We've got 3 or 4 minutes FLIGHT. The thing is that we want to pass to him that when he does see it go down or start going down to get Battery A on.

FLIGHT Now, do you think we really want to spend that to keep the platform on. We're using the entry Batteries too.

EECOM What we take out of the Battery we won't get back.

FLIGHT That's right. Down to step 3. All the way down to step 3... Yes...OK....I just want to be sure we're sure we want to do that, and quick get a coarse align. CONTROL and TELMU, will the steps I've got get me a coarse align.

57+43 - TELMU Negative, that just get's you...

FLIGHT What else do I have to do to get a coarse align?

CONTROL Standby FLIGHT.

EECOM Can we get this read up to the crew to start the power down. Of course they can power down everything but here's a good start...

FLIGHT Is this with IMU power down?

EECOM That Roger.

FLIGHT OK, but we wanted to keep that up for a little while I thought you just said with Battery A to get a coarse align in the LM.

EECOM Well maybe there's a bit of confusion here.

FLIGHT Yes...You don't want to turn the IMU off until we get a coarse align in the LM right?

EECOM That's affirm FLIGHT...and we'll support a Battery until we get that.

FLIGHT OK. CAPCOM, we want to power on down the CSM, only, we want to put Bat A on about now, EECOM?

EECOM Negative, not now FLIGHT. We'll let you know.

FLIGHT We're going to put Battery A on...Can you put it on while its charging?

EECOM Negative, we'll have to take the charge off. We'll have to power down the carger and put it on Main A.

FLIGHT OK.

TELMU The VHF is not required FLIGHT.

57+44 - FLIGHT No VHF.

FLIGHT TELMU and CONTROL. It's unclear enough to me - that I'm going to get a coarse align in the LM. You know where we're then right, Will? Alright. Then what do I have to do to get it?

CONTROL OK, I'm getting those steps for you right now FLIGHT.

FLIGHT OK. CAPCOM FLIGHT.

CAPCOM Go Ahead.

FLIGHT When we get a little lower, we're going to have the pull Bat A off and we're going to have the put it on Main Bus A. We are then going to try to hold up the IMU long enough to get a coarse align in the LM, and then we'll see whether we are going to keep that coarse align up or not. But for right now we're running the profiles and we'll have to determine that. That's the coarse of action. Let Jack know that much.

CAPCOM OK. And he wants to know what he'll see and what he should do when he see's it happen to FC 2.

FLIGHT We're interested in keeping up the IMU and the lights for him to see. That's all. EECOM and GNC, everything else goes off? INCO?

+ 45 - INCO, EECOM That's affirm FLIGHT.

GNC The only concern we have FLIGHT is the IMU heater power, and...for the CSM.

FLIGHT Well, what do you want?

GNC Well, if you want to maintain the IMU for reentry, you gotta have the heater power on.

FLIGHT How much is that?

GNC Standby, we'll get a number.

EECOM FLIGHT, EECOM, We can take it off now.

FLIGHT Take it off now CAPCOM.

CAPCOM OK. I need some LM IMU align procedures.

FLIGHT Yes.

EECOM FLIGHT, EECOM

FLIGHT Go.

EECOM We need to go ahead and start that powering down anytime.

FLIGHT OK. Do you want me to put Battery A on yet?

EECOM Negative, we'll give you a cue.

FLIGHT OK. Where do you want me to tell them to start Clint.

EECOM Keep his lights up and everything else has got to go...

57+46- FLIGHT Everything, except the IMU .

EECOM Roger.

FLIGHT OK. Say again? How about the comm? We don't have comm yet with the LM.

INCO As soon as you take that power amp off, we're going to lose data.

FLIGHT OK. Well let's...let's be clear what we're doing here. We're discontinuing Battery A. OK, so far, I've got the IMU and power amp up. Anything else?

EECOM That should do it FLIGHT.

FLIGHT How about comm?

EECOM Leave the comm configuration alone.

FLIGHT Yes, leave the comm configuration alone CAPCOM until we get comm with the LM.

TELMU FLIGHT, TELMU.

FLIGHT Go.

TELMU OK, we've got one more. We want to make sure his suit fan 1 is his suit is positioned to 1 and on PNL//we want ECS suit 1 CB closed.

FLIGHT OK, you want suit for 1 on with the breaker.

CONTROL FLIGHT, CONTROL

FLIGHT Go ahead, CONTROL.

CONTROL OK. Here's what we need.

57+47 - FLIGHT Standby...CAPCOM in the LM we need the suit fan 1 and its CB on to get flow and CONTROL's coming to me with the IMU procedure. Go CONTROL.

CONTROL PNL 11, LGC DSKY CB close. Then Activation<sup>page</sup> 25, do steps 1, 2 and 3.

FLIGHT And what will that get us?

CONTROL That'll get everything up and running and the platform turned on.

FLIGHT And will that give us a coarse align?

CONTROL Negative. That puts you in P00.

FLIGHT OK....

CONTROL Go to activation 37. Docked IMU coarse align procedure. is there for you.

FLIGHT OK, got that CAPCOM?

CONTROL Excuse me, it's Activation 30 FLIGHT.

FLIGHT OK.

CAPCOM OK. I've got LGC DSKY closed; Activation 25, steps 1, 2 and 3; Activation 30.

FLIGHT OK, TELMU, one more question. Are we bringing up glycol flow here?

TELMU We brought up circulation, we have not activated the boiler.

FLIGHT Should we?

TELMU We're working on it right now.

EECOM FLIGHT, EECOM

+48 - FLIGHT

Go

EECOM OK. When we go through the power down, when we bring Battery A up, we want them to go through the FC shutdown procedure for FC 2, just in case the pressure should recover

and we would still have a FC later. Which is not likely, but it's not going to cost us anything to do it, except a little time.

FLIGHT FC2 shutdown closes the reactants?

EECOM Standby is the word.

FLIGHT Yes. You want me to put FC2 in standby when? After we put Battery A on.

EECOM That's affirmative.

FLIGHT How close are we to doing that?

EECOM Anytime now.

FLIGHT Alright.

FLIGHT Have we got anybody over in the LM yet Jack? Can you tell? Has somebody climbed over there? Their both over there?

CAPCOM Their both over there. They've just taken the procedure for the Activation of the IMU.

FLIGHT OK. I don't know how long we'll be able to keep that up, but at least we'll have something.

57+49 - CAPCOM OK. What other things have you got to go up that I missed while I was talking?

CAPCOM Have we given them the signal on the Battery yet?

FLIGHT NO.

EECOM About another 20 PSI FLIGHT.

FLIGHT GNC, FLIGHT. What do you want the heater CB?

GNC We're still working on that FLIGHT. We're trying to find out if we can power down and bring the platform up later on. Whether we really have a problem or not.

FLIGHT Alright. Go ahead. We'll have BMAGs.

GNC Rog.

+50 - EECOM FLIGHT, EECOM.

FLIGHT Go ahead.

EECOM We can turn the Glycol pump off anytime.

EECOM FLIGHT, EECOM. By-pass on the primary RADS. Turn the Glycol pump off.

FLIGHT CAPCOM, he can turn the Glycol pump off in the CSM.

CAPCOM OK.

EECOM By-pass on the RADS.

FLIGHT By-pass on the RADS, and then turn the pump off. In that order?

EECOM Rog.

FLIGHT OK. By-pass and the pump off.

TELMU FLIGHT, TELMU.

FLIGHT Go.

TELMU OK, we should be OK thermally in the LM vehicle until we get TM and we'll watch it until we tell you to turn on a boiler.

FLIGHT OK. Fair enough. You are going to look at TM before you tell me about the sublimater.

TELMU Roger that.

FLIGHT By-pass and the Glycol pump coming off.



57+51-

CAPCOM OK FLIGHT, anything else I missed while I was talking to them there?

FLIGHT I don't know Jack. I haven't been following everything you've said. You did tell them that we're going to be putting Battery A on to keep the IMU up. I don't know how much time we got. Another 20 PSI was the last I heard.

CAPCOM Yes, and I'm standing by for a mark on that.

FLIGHT Yes. How much power have we got left on in the CSM, EECOM? We haven't got a lot left...

EECOM We've got about 40 amps.

FLIGHT OK, what else can we take off right now?

EECOM We passed the list to CAPCOM awhile ago. It had the IMU heaters...IMU on it...everything on that list but the IMU.

FLIGHT Yes. You got that Jack? You want them to start powering that stuff down, right Clint?

EECOM Roger.

FLIGHT OK Jack, everything but that IMU.

EECOM FLIGHT, EECOM.

FLIGHT Go.

EECOM O2 tank 2 fans off.

FLIGHT You giving up there huh?

EECOM Giving up.

+52- FLIGHT CAPCOM, O2 fan 2 off.

CAPCOM Say again please.

FLIGHT O2 tank 2 fans can go off, there's nothing happening there.

EECOM Let's confirm, all FC pumps off FLIGHT. That's 1,2,3.

FLIGHT You want to shut 2 down now?

EECOM Just pumps.

FLIGHT Just pumps. OK. All FC pumps off CAPCOM. That may be a verify.

CAPCOM OK. Verify all FC pumps off and fans off in O2 tank 2.

INCO FLIGHT, INCO. We have the LM downlink coming in.

CAPCOM We don't want them fans and heaters in tank 1 do we?

FLIGHT EECOM, you don't want anything on in tank 1 do you? Or do you?

EECOM Roger, we want them all on.

FLIGHT Leaving all on in tank 1 CAPCOM.

EECOM That's affirmative.

57+53 - CAPCOM OK.

FLIGHT I'm still seeing 40 amps. What all have we got on there EECOM? CMC, IMU.....

EECOM Roger FLIGHT. IMU and CMC is still up right now.

FLIGHT *And some comm,*  
And suit fan. Now EECOM, FLIGHT.

EECOM Go ahead.

FLIGHT Look I'm worried about shutting this thing down so that's safe when we want to repower it from the Entry Batteries.

EECOM Roger. We're going to ask you to bring up Bat A whenever we see the voltage begin to drop off.

FLIGHT I understand that. I'm still wanting some sort of close out configuration. Follow me?

EECOM OK.

FLIGHT GNC.....same with you. And I haven't heard from you on the heaters yet on the IMU.

GNC Rog, FLIGHT. A preliminary look at it looks like we could pull those CB's, power down the heaters....we're still trying to get a handle on it.

FLIGHT We may well have no choice.

GNC That's a fact.

FLIGHT I don't know. How many amps do they take?

GNC 10

FLIGHT 10 amps?

GNC Rog

FLIGHT I'm looking at 80 hours.

GNC OK, Rog, understand.

FLIGHT That's academic.

CAPCOM FLIGHT, CAPCOM.

FLIGHT Go ahead.

57+54 - CAPCOM I've got a procedure for comm activation 28 on my panel here. Is that something you want to go up?

FLIGHT INCO, is that the comm.....

INCO Negative FLIGHT. The comm activation is the same as you got over there, except we want to change the normal voice until we get squared away. I gave him some steerable angles in case we want to activate it, so we'll have it; plus the procedure.

FLIGHT Can we go on the OMNI right now..

INCO Roger. If we come up on GDS with the 210, we'll be alright.

NETWORK We have AOS with the 210 now FLIGHT.

FLIGHT We'll stay on the OMNI now Jack so don't do anything with that.

INCO We have OMNI data on LM right now.

FLIGHT We have AOS on the LM.

GNC FLIGHT, GNC.

FLIGHT Go ahead.

GNC We have a better number on that heater power. It only draws about .8 amps. So we'd like to leave that up.

CONTROL FLIGHT, CONTROL.

FLIGHT Go ahead.

CONTROL PIPA temp looks good 129.9.

FLIGHT .8 amps for the rest of the mission is going to cost me 64 amp hours. GNC, FLIGHT.

GNC Go ahead, FLIGHT.

57+55- FLIGHT This is going to cost me 64 amp hours. I can't afford that. Can't I bring it back up without them. Is that absolutely no?

GNC Yes, I think you can FLIGHT, but the.....

FLIGHT EECOM, FLIGHT

EECOM Go FLIGHT

FLIGHT Turn around here a minute. He's talking about the IMU heater. It's going to cost me .8 amps, 142 hours at landing, I'm 80 hours away. That's 64 amp hours. Can you hack that out of the Entry Batteries?

TELMU FLIGHT, TELMU

EECOM We might hack it transferring power back from the LM to the CSM, but we can't hack it out of the batteries.

EECOM FLIGHT, EECOM. Since it's only .8 amps, let's hack it for a little while here.

TELMU FLIGHT, TELMU

FLIGHT Go ahead TELMU

TELMU OK FLIGHT, it looks like they're still on low volt taps. We need to get to activation step 12, substep 3 and go to HI-TAPS on LM batteries 1 through 4.

FLIGHT Got it Jack?

CAPCOM You want the HI-TAPS on Batteries 1 through 4?

FLIGHT Yes

TELMU Rog. Activation 12, step 3. Looks they're still on low taps.

+56- FLIGHT CAPCOM, did you give them that about the HI-TAPS?

CAPCOM I gave them that about the HI-TAPS and they are going to them.

FLIGHT Alright

TELMU Looks like we're going to HI-TAPS.

INCO FLIGHT, INCO.

FLIGHT Go ahead.

INCO We'd like to get normal voice on the LM on PNL 12, function switch to voice.

FLIGHT It's coming at you now.

INCO OK.

57+57- FLIGHT OK. Everybody in the room; how about setting down a minute and keep a little bit quiet.

CONTROL FLIGHT, CONTROL

FLIGHT Go ahead.

CONTROL All our systems look real good on LBR.

FLIGHT Thank you.

TELMU FLIGHT, we look good.

FLIGHT TELMU is good.

TELMU We need Suit Gas Diverter to cabin.

FLIGHT OK. SUIT GAS DIVERTER IN THE LM, CAPCOM.

FLIGHT OK, they're going the coarse align now. CONTROL can you see your platform?

CONTROL Negative, we're on LBR.

GUIDANCE FLIGHT, GUIDANCE.

FLIGHT Go.

GUIDANCE We want him to go all the way through to the fine alignment and pass the angles to us so we can get a good alignment in the CSM because that CSM is continuing to move.

FLIGHT Which step do you want to get to?

GUIDANCE We want to go all the way through step 7 in the LM activation.

CONTROL What page?

GUIDANCE Page 31.

CONTROL OK, step 7 page 31.

57+58 - FLIGHT All the way through that, Jack, is what he means.

EECOM FLIGHT, EECOM

FLIGHT Go.

EECOM OK, we expect to put the Battery on anytime now. We are still going to give you a cue though.

FLIGHT OK.

FLIGHT EECOM, FLIGHT

EECOM Go ahead, FLIGHT.

FLIGHT While they are working the problem, do you want me to leave Battery A on Main Bus A?...to keep up IMU heaters?

EECOM When we give you a cue.....

FLIGHT Is that what your plan is?

EECOM Until we get through to the LM, that's right.

FLIGHT OK. GNC, I wanted to hear from both of you guys as to whether to leave that on the whole time but we can stand .8 for now out of the Entry Bats.

+59 - GNC Rog FLIGHT. We feel we'll probably be able to power it down.

FLIGHT OK.

GNC Preliminary look at it.

CONTROL FLIGHT, CONTROL.

FLIGHT Go ahead.

CONTROL We indicate that he still has the landing radar heaters on. He can open those up if he desires - PNL 11 row 3.

FLIGHT OK.

FLIGHT They are in the middle of the align.

CONTROL Rog.

FLIGHT Remind me again in a minute CONTROL.

CONTROL OK.

CAPCOM Are we still a ways from the mark on Bat A?

FLIGHT I don't know. EECOM, how far away from Bat A.

EECOM FLIGHT, anytime now, but the voltage is still up. We cue you.

58+00- FLIGHT OK, but I'm afraid it will go fast, aren't you?

EECOM It'll go pretty fast when it get's there.

FLIGHT CAPCOM, you've primed Jack about BAT A haven't you?

CAPCOM I told him we'd give him a mark on Bat A. He wanted to know what to watch for and he'll see the voltage drop but we'll give him a mark.

EECOM FLIGHT, EECOM

FLIGHT Go ahead.

EECOM 02 to N2 SP is dropping, let's burn Battery A on.

FLIGHT CAPCOM, Battery A on. Tell him to hurry. You got it... good boy.

FLIGHT GUIDANCE, copy the numbers. GUIDANCE copy those numbers.

GUIDANCE Roger FLIGHT.

+01- FLIGHT You got Battery A on there EECOM?...11 amps.

EECOM Affirmative FLIGHT. It's on.

FLIGHT GUIDANCE, FLIGHT.

GUIDANCE Go FLIGHT.

FLIGHT Let me know when they're all done and you got what you want in the LM because I want to get that CSM powered down.

GUIDANCE OK, we can't watch the LM, FLIGHT because we don't have HBR.

FLIGHT OK, but from the voice.

GUIDANCE Rog.

INCO FLIGHT, INCO.

FLIGHT Go.

INCO We can get HBR from the LM.

FLIGHT Does it cost me any power?

INCO No. We'd like for him to go on PNL 12 the function switch to voice, and HBR on PCM.

FLIGHT CAPCOM, got that?

CAPCOM Say again please.

FLIGHT They want to go to HBR in the LM. It won't cost us any power. They can tell a little more.

58402 - CAPCOM And FLIGHT, are we checking his arithmetic?

FLIGHT GUIDANCE, arithmetic?

GUIDANCE Standby, we're checking it.

EECOM FLIGHT, EECOM

FLIGHT Go.

EECOM If we can get LBR with the power amp off, let's turn the primary P.A. off in the comm system.



FLIGHT INCO, can we do that?

INCO Yes.

EECOM Let's try it.

FLIGHT CSM P.A. off...

INCO LBR, Down voice B/U.

FLIGHT You want him to do that?

INCO Yes.

FLIGHT OK CAPCOM, LBR, DWN Voice B/U, and P.A. off in CSM.

CAPCOM OK

TELMU We need to get this suit Gas Diverter to Cabin.

58+03 - FLIGHT Yes. CAPCOM, LM suit Gas Diverter to cabin.

FLIGHT GUIDANCE, how's that arithmetic?

GUIDANCE It looks good Flight.

FLIGHT The arithmetic is go?

GUIDANCE Rog.

FLIGHT CAPCOM, the arithmetic is good.

FLIGHT Does that mean we got an alignment now?

GUIDANCE A coarse alignment.

404 - FLIGHT OK. CAPCOM...OK...as soon as we've got the alignment<sup>OP</sup> and we're finished with it, we're going CMC off, IMU<sup>4</sup>off, we've leave the heater CB's on and power them from the Battery A until you tell me whether we can keep them up or not.

CAPCOM How come I'm getting so much noise on the comm?

FLIGHT Don't know. INCO?

INCO We'd like for him to do a CMD reset on the CSM so that we can get the LBR.

FLIGHT I thought we just told them that.

INCO We did, but the way the CMD's work and everything...

FLIGHT Alright. Their in the middle of it, I'll get it in a minute.

58+05 - INCO OK

FLIGHT We're turning off some more of the instrumentation now gentlemen.

FLIGHT GUIDANCE, have they got the fine align down where you want it yet?

GUIDANCE FLIGHT, we need them to read the angles to us. We've lost CSM data. We don't know what the CSM got on the 06, 20.

FLIGHT OK. You really need that huh?

GUIDANCE Rog.

FLIGHT CAPCOM, they need the VO6N20 out of the CSM...here they are.

+06 - GUIDANCE Copied FLIGHT.

FLIGHT Yes.

FLIGHT Got everything you need GUIDANCE?

EECOM FLIGHT, EECOM

FLIGHT Go

EECOM We're ready to go ahead and power down the CMC now.

FLIGHT Wait a minute. I want to be sure the Guidance is up.

EECOM OK.

FLIGHT GUIDANCE, can one of you tell me if you got everything you need?

GUIDANCE FLIGHT, GUIDANCE. We got everything. We're working on it now FLIGHT.

+07 - FLIGHT My question really is, when can I turn the CMC off? Are we that far enough through the procedure that we can turn it off? Yes or no?

GUIDANCE We are FLIGHT.

FLIGHT You are?

GUIDANCE Rog.

INCO FLIGHT, INCO

FLIGHT Go.

INCO If get us that CMD RESET, we'll get some data. We're blank here.

FLIGHT OK. Well in the CSM you mean?

INCO That's affirm.

FLIGHT We're turning it down right now anyway Ed.

FLIGHT CONTROL and GUIDANCE, one more time, you got everything you need through the fine align and we can proceed to power down the IMU in the CSM correct?

GUIDANCE AND CONTROL That's affirmative FLIGHT.

FLIGHT OK, and we'll leave the heaters on. Heater power CB on in the CSM.

CONTROL Check the LM landing radar heater breaker also.

FLIGHT CAPCOM, for the CSM. We've got the fine align data and everything is set up, so therefore we can start *powering* down the CMC and the IMU. For now, leave the heaters CB on and the Battery A on the bus like it is. We're running that IMU heater to ground to see if we need to leave it on or not. And here's the paper.....

GNC FLIGHT, GNC. We've got the go ahead to turn the heater power off.

FLIGHT Say again.

GNC IMU heater power to off.

FLIGHT And we'll still have it?

GNC That's right. We feel we'll have a real good chance to bring the platform up in real good shape.

58+08- FLIGHT Now do you want more time to debate it? I'm willing to give you .8 amps.

GNC I don't really know how much debate really needs to be done on that.

FLIGHT Your satisfied?

EECOM FLIGHT, EECOM. We need some data. We need to get to LBR. I think we need CMD RESET.

FLIGHT CAPCOM, CSM CMD RESET, and then give them those instructions. We got enough, we might as well save what we can out of the Battery now, and power down.

CAPCOM You want the CMC and IMU powered down?

FLIGHT Yes.

CAPCOM And the heaters CB.....

FLIGHT And all the heaters, etc.

EECOM And CMD RESET.

FLIGHT CMD RESET before they.....

CAPCOM And Bat A.

FLIGHT Yes

+09- TELMU FLIGHT, TELMU.

FLIGHT Go.

TELMU OK, we been watching our Glycol temps and I guess we'd better go crank up the water boiler. This is activation 20, Primary Loop Activation and Activation 21, Step 3.

FLIGHT Do you want to leave Battery A on EECOM? Is that still the story? For how long?

EECOM That's affirmative.

FLIGHT How long will you want to do that?

EECOM Till we get squared away with the LM.

EECOM All RCS autos off - the 16, plus the 2 FDAI's off.

58+10 - FLIGHT Yes. Got that CAPCOM?

EECOM I'll give it to him.

FLIGHT OK.

FLIGHT Yes, before we turn these thrusters off in the CSM, you'd better verify that they got some control in the LM. Plus they need to bring up the water boiler. Calling FLIGHT?...

CONTROL You mentioned in powering up the RCS? Is that right?

FLIGHT Well.....

CONTROL We're going to have to do that.

FLIGHT Yes, OK.

PROCEDURES CSM Data FLIGHT.

EECOM FLIGHT, EECOM.

FLIGHT Go ahead.

EECOM Heaters/fans in O2 tank 1 off.

FLIGHT CAPCOM, all tank 1 off.

EECOM FLIGHT, EECOM.

+11 - FLIGHT Go ahead

EECOM Disregard FLIGHT.

FLIGHT Yes, have them go ahead and get that stuff off....OK.... Auto RCS and heaters in tank 1.

EECOM FLIGHT, EECOM.

FLIGHT Go ahead.

EECOM We need to get that power off as soon as we can.

58+12 - FLIGHT Yes, we just handed it to the CAPCOM.

TELMU FLIGHT, TELMU.

FLIGHT Go ahead.

TELMU OK, did you copy that we need to crank up the Glycol loop? Activation 20. Under Glycol loop activation and activation 21, step 3.

FLIGHT Down to step 3?

TELMU No, step 3 only.

FLIGHT Activation 20 and activation 21, step 3 only.

TELMU That's affirm.

FLIGHT OK

+13 - FLIGHT ....20 amps....

FLIGHT CAPCOM, FLIGHT. For the LM, he needs to get his sublimator up....yes....Jack, the LM needs to get his sublimator up, activation 20 and 21, step 3 only.

EECOM FLIGHT, EECOM.

FLIGHT Go ahead EECOM.

EECOM Go ahead and get those O2 tank 1 heaters off as soon as we can, that's a big chunk.

FLIGHT OK.

CAPCOM You want O2 tank heaters off?

FLIGHT Yes.

CAPCOM OK, and activation 20 and 21, step 3?

FLIGHT Yes, get the sublimator up.

CONTROL FLIGHT, CONTROL.

FLIGHT Go ahead.

CONTROL

We need to get our RCS heaters on, and start those warming up and get the RCS system pressurized if we going to be going out of CSM control here very shortly.

FLIGHT

Yes, we are.

58+14 - CONTROL

That needs to be taken care of shortly.

FLIGHT

~~CAPCOM~~  
OK.....yes O2 tank 1.....tank 1.....

EECOM

FLIGHT, EECOM.

+15 - FLIGHT

Good, that was for the CSM, the FDAI...and for the LM CAPCOM, we need the RCS heaters on, they need to pressurize the RCS to have control and for the water sublimator activation 20 and 21, step 3.

CAPCOM I gave him 20 and 21 step 3 already and you want RCS htrs on and...

FLIGHT Yes, RCS pressurize...we didn't tell them to pull the FDAI in the LM.

CAPCOM No its the CSM.

FLIGHT Ya, does he understand that, was that Jim that answered?

FLIGHT CONTROL do you want him to power the balls up and the RCS.  
~~CONTROL~~ Definitely the RCS, FLIGHT.

FLIGHT Well, they need the ball to tell where they are.

CONTROL Rog.

58 +16 - FLIGHT CAPCOM, get one ball up and RCS htrs and press.

CONTROL And they'll need to have all the CB's in for the isol valves and the Main SOV's. FLIGHT on puls. 11 and 16.

FLIGHT OK.

CAPCOM OK in our orderly fashion please read what you want FLIGHT.

FLIGHT OK. How's the CSM - anything for the CSM?

EECOM FLIGHT, EECOM think we're ready to power the main busses down if everybody's ready.

CONTROL Don't have any heat control (LM)? FLIGHT.

FLIGHT Let's make sure we have control on the LM although he's probably out of jets right now.  
 GNC, anything for CSM?

GNC Negative.

FLIGHT OK CAPCOM, for LM we think he ought to have an 8 ball and we get his RCS heaters and his RCS pressurized and needs to get all his CB's on 11 and 16 closed for control.

CONTROL Yes, Jack what we're talking about is the quad heater breakers the Main SOV's, Isol valve breakers, on panels 11 and 16.

CAPCOM Don't you just have an activation page I can tell them to turn to.

+17 - CONTROL Ya, if you want to control all those dadgum breakers on that that page and he can go back and open them up later the ones he doesn't need. Thats activation 22 and 23.



FLIGHT EECOM, GNC copying his question?

EECOM Negative FLIGHT.

FLIGHT Jack wants to know how we want to pursue the SPS. Go ahead John,

FLIGHT CONTROL are you giving us something for getting your RCS up?

CONTROL Yes Sir.

58+18 - FLIGHT Hurry up will you please we just got a lot of traffic through the CAPCOM thats all.

GNC FLIGHT the CMC and the IMU are completely powered down at this time.

FLIGHT OK.

FLIGHT ~~Copy~~ all that CONTROL?

CONTROL Right, put the TCA breakers in last, the TCA breakers in last.

+19 - FLIGHT OK, TCA breakers in last.

CONTROL Copy FLIGHT.

FLIGHT ~~OK~~, CONTROL, DO you understand the configuration we're getting into?

CONTROL Right now as I understand it were getting into a PGNC attitude control mode - attitude hold.

FLIGHT OK, my point is lets be careful what we're telling the CAPCOM to do here and try to give him clear instructions by switches and activation pages as we can, OK?

CONTROL OK, but the CB's all botched together on these charts.

+20 - FLIGHT OK, you ready to power down the inverters, the battery relay bus and you're ready to pull the entry battery off?

EECOM

Thats right - thats not going to get us completely configured to do it but I think we've got to get off the entry battery and do it with the flashlight thru the LM. Thats going to kill comm and everything.

FLIGHT

You're ready to do that - is everybody ready to kill comm in the CSM? GNC you ready to kill comm GUIDANCE - we're going to turn down the CSM.

58121-  
+22-  
+23-

GUIDANCE Rog.

FLIGHT I wanna be sure we have control somewhere. I'm not satisfied we do <sup>get</sup> attitude control.

CAPCOM OK we haven't got ourselves in a position where we have no attitude control in either vehicle, do we?

FLIGHT I'm waiting to see when we get attitude control in the LM. Would you ask them to call us when they have attitude control in the LM? Then we'll power the inverters etc. down in the CSM.

CONTROL OK once they get control established we're going to do some clean up work as far as loading the DAP to get it....

FLIGHT OK, ya, ya. I just want to get attitude control first.

CONTROL Rog. He's going to have to put his PGNS mode control switch to ATT HOLD.

FLIGHT OK.

CAPCOM Hey FLIGHT they don't have attitude control and they don't have it in the CM.

FLIGHT OK we're trying to get it up right?

CONTROL We're getting pretty close to gimbal lock as I understand it. We're need to get that RCS pressurized.

FLIGHT They're on their way doing it.

FLIGHT He doesn't have a ball to do it with.

GUIDANCE He has the DSKY, FLIGHT.

FLIGHT Who? *The CSM or the LM?*

GUIDANCE The LM.

FLIGHT We're <sup>leaving</sup> leaving a control problem. What's the best way to get it. Are you saying the LM, CAPCOM?

GNC They can go to direct RCS FLIGHT.

FLIGHT CAPCOM have them go to direct RCS and hold attitude in the CSM.

TELMU We're going to have to have AC here for this - for the balls.

FLIGHT CAPCOM they need AC.

TELMU Both of them go in FLIGHT.

FLIGHT Did you copy, TELMU?

TELMU Roger, his logic power CB should be in A and B.

FLIGHT A & B logic should be in

58+24 - CONTROL RCS is pressurized.

FLIGHT OK

TELMU OK FLIGHT we got a procedure for the AC coming at you.

FLIGHT He needs AC for the 8-ball. CAPCOM, we need to get AC powered up in the LM. Assume they know the procedure but here it is.

FLIGHT TELMU what's the current level in the LM?

TELMU 41 amps - we show him still armed we asked him to go MASTER ARM OFF.

+25 - FLIGHT OK.

TELMU OK we got AC, FLIGHT, looks good.

FLIGHT OK.

TELMU We see the pyros are disarmed FLIGHT.

FLIGHT OK.

+26 - CONTROL Copy.

FLIGHT CONTROL - you want them to do that checkout?

CONTROL There's no need for it FLIGHT. All we need to do is....

CAPCOM He wants to know if you want him to go down activation 37.

CONTROL Negative.

FLIGHT Is he got control now?

CONTROL Negative, he doesn't. I don't think he has his TCA breaker in yet.

FLIGHT Well, what do you want him to do?

CONTROL Want him to get his TCA breakers in after he's got everything else configured and then he will be in PGNS attitude hold - 5° deadband.

58+ 27- FLIGHT Anything need to be done to the DAP?

CONTROL Ya, we got to load the DAP FLIGHT.

FLIGHT Well do we want to be in PGNS altitude hold before we load it?

CONTROL He's got the TCA's in now and everything looks real good. We can load the DAP and it would be no problem.

FLIGHT What numbers do you want him to put in there?

CONTROL The load for this configuration is 30120.

FLIGHT 30120

CONTROL And we're going to have to get you some weights. We don't have those yet.

+28- FLIGHT Approximately.

FLIGHT Do we need a weight to go in there?

CAPCOM Let me have the weight.

CONTROL CSM weight 63,400.

FLIGHT 63,400

CAPCOM We ready to go to PGNS attitude hold now?

FLIGHT CONTROL, you ready for PGNS attitude control now?

CONTROL He's in POO.....he's in attitude hold right now FLIGHT.

FLIGHT OK

CAPCOM How about it?

FLIGHT Go ahead....Be sure you tell Jack that. ~~now.~~

+29- CONTROL I couldn't hardly copy. Does he mean he had a problem firing his jets?

FLIGHT Don't know, didn't hear. He's asking if he's firing.

CONTROL Need to make sure the ATCA/PGNCS CB is in.

CAPCOM OK what other control CB's you want in?

FLIGHT If he's having trouble check his ATCA/PGNCS CB.

58-30

CONTROL ATCA/PGNCS CB on panel 11, now 3, and the attitude direct control CB. He's got that if he's got direct right now.

FLIGHT OK that must have been what it was.

CONTROL That should help him.

CAPCOM OK can we check the switch configuration, CB's and black boxes to make sure that everything's configured for attitude control?

FLIGHT I'd like to be sure the LM is OK while we power the CSM now. CONTROL are you OK?

CONTROL Yea we got one TCP switch failure.....

FLIGHT But are you OK?

CONTROL Look OK now, we'll need another DSKY entry here shortly to inhibit our upward firing jets.

FLIGHT TELMU, are you OK?

131- TELMU Rog, we're doing pretty good - I got to get with you in little while on high ascent O2 pressure.

FLIGHT OK - GUIDANCE you OK in the LM?

GUIDANCE Good FLIGHT

FLIGHT OK GNC and EECOM - we're going to power down. You ready?

GNC/EECOM Rog.

CAPCOM OK FLIGHT they got attitude control on the LM now, what you want to do with the CSM?

FLIGHT

OK here it is - it's right behind you Jack - we're powering it down - there's the paper.

FLIGHT

EECOM, are there any switches you want in the OFF position before we power down, like for instance compressors or anything?

EECOM

No flight lets just power that bus down and we'll fix it later.

CAPCOM

You want them to open circuit FC No. 2, right?

EECOM

Thats affirm, if he hasn't done it.

FLIGHT

CAPCOM, we OK there with them right now?

EECOM

Just close the react valves FLIGHT

FLIGHT

Just close the reacts..

NETWORK

We lost both CP's we'll be up in a minute.

FLIGHT

Hurry up. We just lost data in the building gentlemen, its the CP's. Standby.

FLIGHT

TELEMU - my problem next when I get around to it is going to be what configuration to power down to...at the present time I'm thinkg I'd like to keep the LM IMU up to the burn.. We're up on the CP's....

FLIGHT

But thats about as far as I've thought it through...everybody's running power profiles and Jim McDivots people have a set of numbers right now.

TELEMU

OK we're working on it.

FLIGHT

EECOM you all the way down yet?

EECOM

We think an inverter went off, FLIGHT. So he's in the process...

FLIGHT

Copy, CAPCOM - I thank you.

FLIGHT

OK look gentlemen...good LM data, EECOM?...

EECOM

Affirmative, Flight,

INCO

FLIGHT we have a problem.

FLIGHT

We going to have good data here for awhile?

INCO In and out flight. We got a different problem. By turning off the CSM we end up without any good tracking data. There's no way we can get any good tracking data. That LM data is biased because of the uplink shift and data select cannot use that tracking data. Consequently, somewhere in here we're going to have to bring up some kind of tracking on the CSM again.

58+37 - FLIGHT FIDO would you figure that out? We're well clear now of the moon, right?

FIDO As far as we can tell, we are FLIGHT.

FLIGHT Why can't we track the LM. Because of LM interference... IU interference?

INCO Right, we had to bias <sup>off</sup> up the up frequency to change the downlink and its biasing the data and the data's no good.

FLIGHT Is it possible to go back to the original and just leave the....?

INCO We've tried it - doesn't work.

FLIGHT OK Ed, thanks.

FLIGHT OK, we have a number of long-range problems - we have the burn to do which is at about 79 hours - 28 hours from now. That's one business. We have to get the track up as we need it to take care of that burn, hopefully we won't need to do too much with that though I don't know how many amps that's going to take. However, right now I want to be sure we get the whole situation stabilized with the LM and the CSM. We gotta start bringing the LM power down some and getting the non-required stuff off the line so we don't use up any amp-hours we don't need to give away. And I want you to pay attention to the configuration we're currently in and get the people off-line working on the long-range problems. Especially the life-boat problems now associated with the LM. You know - LIOH, etc. Let's get all that figured. But right now I want the guys here in the room to concentrate on keeping this thing right now going along alright and watch it.

+38 - CAPCOM Are my gyro torquing angles still good?

FLIGHT GUIDANCE are those gyro torque angles good?

GUIDANCE Rog.



FLIGHT And the crew wants those.

GUIDANCE Rog, we oughta go ahead and fine - align that platform.

FLIGHT There you go CAPCOM.

CAPCOM OK, Fred asked - he'd like to pull some CB's on displays and have us watch them. Is he cleared to do that?

58+39 - FLIGHT CONTROL and TELEMU - you got good data there and we can pull the display CB's in the cockpit.

CONTROL Rog.

CAPCOM Want you to tell me what CB's to pull and define as to panel, etc. Just like in TCP's. So no misunderstanding, OK?

CONTROL Copy.

FLIGHT Why don't you get them TELEMU?

GUIDANCE Thats activation 40 FLIGHT.

+40 - FLIGHT OK.

+41 - CAPCOM OK FLIGHT do you want them to proceed with IMU fine - align as outlined on page 40?

FLIGHT + GUIDANCE ?

GUIDANCE Rog. FLIGHT thats what I want them to do.

FLIGHT TELEMU did you come up with those CB labels?

TELEMU Rog - we're working on it.

FLIGHT What do you mean - don't you know what the CB names are?

TELEMU Yeah there's a whole slew of them what were going to do is just give you a page of them with CB's open-circled.

FLIGHT OK.

CAPCOM I'm looking for a panel - system - breaker name.

FLIGHT They're going to give you a picture of the panel with the breakers circled.

CAPCOM Do it just like a TCP at the Cape.

FLIGHT TELEMU while you're doing that have somebody else figure out what we might take off here to save some current.

58+42 - TELEMU OK.