Apollo 13

Transcript of FD loop

55+47 to 58+42
GET

J. Leeper x5858
Referring to Comet Bennett, they still want a verification of the docking angle because that's what we're using for computations for all alignments. Anything else? Let's see if there's anything else.

Flight, EECOM

Go ahead EECOM.

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

OK.

And at the same time we would sure like to have a CRYO stir. All 4 tanks.

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

Roger.

Flight GNC.

Go ahead GNC.

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

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

Right

Right, you want them to disable A and B?

No.

OK all four quads.

A coupled jet maneuver.

Roger. Copy CAPCOM?

Got it.

Flight INCO

Go 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.
OK let's just stand by 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?

Yes, the whole works.

CAPCOM, we want the configuration of the CSM highgain.

Anything else?

No.

OK... Good report.

Flight GNC.

Go GNC.

Can we verify that they reenabled C four thruster?

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

Yes.

CAPCOM we are still seeing C four thruster disabled.

Flight EECCOM.

GO EECCOM.

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

OK.

You got it Flight.

OK.

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

TELMU.

Go ahead Flight.

You still worried about any configuration items.
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?]

GNC  Negative Flight.

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

CAPCOM  OK.

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?

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.

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-HY 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.

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.

FLIGHT: Rog we copied that also. EECOM you seeing any AC problems? Look like there's a lot of instrumentation problems?

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.

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, rode, on the fuel cells, rode 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.

FLIGHT: CAPCOM do you want to verify the quad delta helium valve is open? Please. Any other problems in the RCS, Back?

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?
<table>
<thead>
<tr>
<th>Time</th>
<th>EECOM</th>
<th>FLIGHT</th>
<th>INCO</th>
<th>EECOM</th>
<th>FLIGHT</th>
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<th>FLIGHT</th>
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<th>EECOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>56401</td>
<td>Let's attempt that Flight.</td>
<td>INCO this seems is to be a AC type problem and may be tied into that high gain thing you got.</td>
<td>We went to wide beam width flight at 55 + 55 + 04, as near as we can tell.</td>
<td>OK.</td>
<td>I copy Flight. Let me comiserate on that.</td>
<td>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?</td>
<td>FLIGHT EECOM.</td>
<td>Go EECOM.</td>
<td>Let's reverse the configuration request.</td>
<td>OK, but wait a minute.</td>
<td>We got a good main A bus. Let's make sure that what ever we do doesn't screw up main A.</td>
<td>Fuel cell 2 is on main A Flight. I'm not going to ask to change that.</td>
<td>OK, what do you want to do.</td>
<td>Let's try to put fuel cell 1 on main B, fuel cell 3 on main A. We can use the other sensory circuitry.</td>
</tr>
</tbody>
</table>
FLIGHT: AC bus 2.
EECOM: Standby Flight...
FLIGHT: Zero output.
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.
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 N₂ pressure, Fuel cell 3 O₂ pressure. We're reading zero N₂ pressure on fuel cell 1 and 13 PSI on fuel cell 3 O₂ pressure.

FLIGHT: OK. Fuel cell 1, N₂ pressure, fuel cell 3, O₂ 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.

GNC: Rog.

TELMU: Flight TELMU

FLIGHT: Go ahead TELMU
The IM heater current has become essentially static.

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

We are confirming those numbers.

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

Rog, Flight. He has turned off all jets.

OK.

OK, we came up with those numbers Flight.

OK, Sy. Next best thing to try.

Flight EECOM.

Go ahead.

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.

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

That's affirmative Flight.

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

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.

CAPCOM amend that. EECOM from Flight.

Go ahead 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.

Roger.

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

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.

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 O₂ 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.

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?
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.
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.
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 Back I want to get our
| CAPCOM | major problems sorted out now. |
| FLIGHT | You still want a 1-5 power down? |
| FLIGHT | 1-5 power down, a delta of 10 amps CAPCOM. |
| EECOM | EECOM from Flight. |
| FLIGHT | Go Flight. |
| FLIGHT | You don't want to get fuel cell pumps off do you? |
| EECOM | Optic power is already off I believe. |
| FLIGHT | 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 |
spacecraft such things as CMC that type stuff until
we nail down what our 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.

FLIGHT, EECOM
Go EECOM

EECOM
I need one 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...

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. CAPCOM, start them moving back to ward the PTC attitude, let's start them going into its rate damping. I feel it's 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.

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 more 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?

EECOM So I can get some AC bus power back so I can get 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.

FLIGHT: EECOM from flight.

EECOM: Flight EECOM.

FLIGHT: Monitor this bear (?) when they switch it in.

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 ACL.

FLIGHT You want Fuel Cell 2 Pump to ACL?

EECOM Affirm.

FLIGHT CAPCOM, Fuel Cell 2 Pump to ACL.

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?

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.
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.

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

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

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

Rog we got that.

Flight INCO we need omni Charley.

OMNI Charley CAPCOM.

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

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

OK take your time.

Rog concur CAPCOM.

Flight, TELMU we copy.

Rog.

Flight FIDO.

Go FIDO. 2 machines in the RTCC.

OK.

Flight GNC. 0--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.

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

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.

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.

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.

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_2 tank one.

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.

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

CAPCOM  OK, you want to isolate the surge tank. O_2 surge tank?

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.

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_2 tank 1 heaters are on main A.

FLIGHT  We've got main A with us, haven't we?
EECOM: Flight, EECOM.
FLIGHT: Go, EECOM.
EECOM: OK, since O₂ 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 O₂ tank 1, and we will watch the pressure.
FLIGHT: O₂ tank 1.
EECOM: Cryogenic O₂ heater 1, Flight.
GNC: Flight, we copy that, no problem.
FLIGHT: No problem, Capcom. Capcom, we want to get cryo O₂ tank 1 heater on.
FLIGHT: You can stand the 5 amps on main A?
EECOM: We think so, flight.
FLIGHT: Did you see the 5 amp increase in current, 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.
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.

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 stabilized 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.

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.
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 O2 for the third fuel cell; for fuel cell 2 rather...

The heaters aren't working. Now let's start thinking circuit breakers, you got any circuit breakers you want to check there?

We saw the current flight.

You saw the current.

OK, let's check it anyway.

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

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.

Fan motor.

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

Get that Capcom?

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

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 get a set of guys looking at a delog pretty soon.

Telmu from Flight.

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

Roger. OK.

We got the circuit breakers all in, flight.

Rog; copy all circuit breakers in.

Flight, EECOM.

Go, EECOM.
EECOM  Don't we have both IMAGS off?

FLIGHT  CAPCOM, would you verify that both IMAGS 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?

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 ..... in less than two hours from now.

EECOM  FIDO from FLIGHT

FIDO  Go ahead FLIGHT.

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.

WEID  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.

WEID  OK, no problem.

SSTRO  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
FLIGHT

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

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.

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 O₂ right now. And we may be losing our O₂ through fuel cell 3, the O₂ manifold, in as much as they are manifolded together commonly. Ah, it looks the O₂ in fuel cell 1 and 2 seem to be trying to stay up there. And fuel cell 3 looks like the odd ball here.

F

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

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 O₂ 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.
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?

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

Standby

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

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

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

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

OK. Have him go ahead CAPCOM.

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

Inline heaters off in fuel cell 1.

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

Is our comm holding up? Sounds like he's going out.

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

We might be a little better on BRAVO.

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.

OK, we can turn the tape recorder off.

EECOM from FLIGHT

FLIGHT, EECOM

You don't need the tape recorder do you?

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 HPR.
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 EMAGS and then went with lights, EMAGS 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.
RECOVERY AFID meet RECOVERY on RECOVERY loop.
F What was that CAPCOM?
GUIDANCE We copy that FLIGHT.
F What was that GUIDANCE?
GUIDANCE He had an O618 and he couldn't get rid of it. He's got rid of it now.
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.
F                     YES
FIDO                  NEGATIVE, FLIGHT
EECOM                 FLIGHT, EECOM
F                     Go EECOM
EECOM                 We'd better confirm that the fuel cell 3 reactant valve
                      CB on PNL-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.
C                     You want them to close the CB on the valve and then...
F                     YES
FIDO                  YES
EECOM                 YES, he should have got a BP on that.
EECOM                 YES
F                     YES, wouldn't he get a BP when he turned the reactants off,
                      EECOM?
E                     Affirm FLIGHT.
<table>
<thead>
<tr>
<th>FLIGHT</th>
<th>Even with the CB open?</th>
</tr>
</thead>
<tbody>
<tr>
<td>EECCOM</td>
<td>No.</td>
</tr>
<tr>
<td>FLIGHT</td>
<td>OK, so he ought to know that. We can just verify that he got a...</td>
</tr>
<tr>
<td>FIDO</td>
<td>OK, FLIGHT, we have our check point.</td>
</tr>
<tr>
<td>FLIGHT</td>
<td>OK.</td>
</tr>
<tr>
<td>FLIGHT</td>
<td>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.</td>
</tr>
<tr>
<td>GNC</td>
<td>Go on thruster A-4 FLIGHT.</td>
</tr>
<tr>
<td>FLIGHT</td>
<td>OK.</td>
</tr>
<tr>
<td>FLIGHT</td>
<td>Go on thruster A-4 CAPCOM.</td>
</tr>
<tr>
<td>INCO</td>
<td>OMNI C, FLIGHT.</td>
</tr>
<tr>
<td>FLIGHT</td>
<td>And OMNI C.</td>
</tr>
<tr>
<td>CAPCOM</td>
<td>FLIGHT, he wants to bring on A-4, he hasn't got any way to stop pitch rate; either direct or auto.</td>
</tr>
<tr>
<td>FLIGHT</td>
<td>Go</td>
</tr>
<tr>
<td>GNC</td>
<td>He has it on FLIGHT.</td>
</tr>
<tr>
<td>INCO</td>
<td>I still don't have Omni C.</td>
</tr>
<tr>
<td>CAPCOM</td>
<td>I didn't get a call for Omni C. You want it?</td>
</tr>
<tr>
<td>INCO</td>
<td>Yes.</td>
</tr>
<tr>
<td>EECOM</td>
<td>I copy.</td>
</tr>
</tbody>
</table>

57:03 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 depllog 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
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 HP 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 [?] \text{Per} / \text{Cell} / ?

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 \text{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.

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.

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

GNC: Rog.
FLIGHT  NO Rate Damping is right?
GNC    Right.
FLIGHT  Are both WAP 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 O₂ 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.
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

Yeah. What is this pounds on your display, Clint?

EECOM

On O₂?

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

That's fuel cell 1?

EECOM

That's Rog. Fuel cell 1 reactants 1.

FLIGHT

Alright.

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 shut off this second fuel cell now. Is there any data you can correlate to say that, yeh that pressure is going down.

EECOM

On the O₂ 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.
Alright.

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

FLIGHT, EECOM.

Go ahead.

The temperature is the only thing we have.

And does it correlate?

Pretty closely.

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

That's the way it looks FLIGHT.

Therefore?

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

CAPCOM, fuel cell 1 reactants. CB and switch.

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

EECOM?

Say again FLIGHT.

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

That's affirmative.

Yes, Jack.

Because?

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

OK.

EECOM, FLIGHT

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.
EECOM That's affirm.
INCO FLIGHT, INCO
FLIGHT Go.
INCO OMNI BRAVO.
FLIGHT OMNI BRAVO too, Jack.
FLIGHT EECCOM, 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 EECCOM, 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 EECCOM?
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?
EECOM: Well the rate is slower, but we have a less pressure too, so we would expect it to be a little bit slower.

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 23\(\text{h}\)/now. OK. Fuel cell 1 reactants coming off.

GNC: FLIGHT, GNC.

FLIGHT: Go ahead.

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...

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?
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?
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 O₂ 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 V7 4 before they power down.

FLIGHT: V7 4, CAPCOM.

CAPCOM: You ready for it now?

GUIDANCE: Standby FLIGHT, let me get the site configured.

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, V7 4 you want?

GUIDANCE: Roger

FLIGHT: V7 4.

EECOM: FLIGHT, EECOM.

FLIGHT: Go.

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

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.

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 DES 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
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.

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

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.

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

FLIGHT
The pilots are reporting that 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.
Standby one FLIGHT.

Pronto.

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.

RCS select off in quad C?

Rog.

EECOM? They needed to dump water?

Negative FLIGHT.

NO sweat there, Jack.

FLIGHT EECCOM FLIGHT, EECCOM

Go ahead.

They get the power amp off? I heard them talking about it awhile ago.

No, we don't.

We can eliminate that since we're on the 85 ft can't we?

That's not exactly true.

OK

We're looking to see how far down we can go.

Alright.

I believe GNC has some things we can turn down here.

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.

Go ahead FLIGHT.

Confirm, Quad C is prop isolated off, right?

Well we haven't confirmed that FLIGHT, but it appears that's the situation we have. The shock of the O₂ thing is probably closed those valves and we haven't been able to open them because they are powered off of Main B.
FLIGHT: Battery A's appears to be working OK.

GNC: OK, we think quad C is prop isolated 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 about antennas? 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 couldn't 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.

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

EECOM: Yes, EECOM, FLIGHT

FLIGHT: Go FLIGHT

EECOM: 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.

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.

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, that's all.

FLIGHT  Alright

EECOM  FLIGHT, EECOM

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 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  GNC and IMU mainly, FLIGHT

FLIGHT  That's the problem.

EECOM  FLIGHT, EECOM

FLIGHT  Go ahead

EECOM  Last ditch stand on O{ tank 2, let's turn the fans on. That cost us about 1 amp.

FLIGHT  What are they off? Main A?

EECOM  They're on AC.
OK. Fans in Tank 2 on.

Fans in Tank 2 on.

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.

OK

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

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

No, do you know it's orientation?

PTC REFSDMAT

You know what you got?

It's OK?

Rog.

EECOM

Go ahead FLIGHT

Did he get fans 2 on?

We can't tell FLIGHT.

He got it Jack, number 2 fan. OK.

GUIDANCE, CONTROL and TELMU. The point is should we jump 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.

I agree FLIGHT.

I agree too FLIGHT.

What should we tell them to do?

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?
FLIGHT Yes, that's what I'm asking you. Do you have a good alignment?
GNC FLIGHT, GNC.
FLIGHT I'm not worried about .10 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?
ECCOM: 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...

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 O₂.

ECCOM: Disregard the surge tank.

FLIGHT: Alright. Come on, give me some O₂ 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.
Roger, and FLIGHT in Activation 11, omit step 1.

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

FLIGHT

OK, That's what we want.

FLIGHT

FLIGHT, TELMU.

FLIGHT

Go.

FLIGHT

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?

FLIGHT

That's affirmative.

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?

FLIGHT

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?

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.

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 it's charging?

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

FLIGHT: OK.

TELMU: The VHF is not required FLIGHT.

FLIGHT: No VHF.

FLIGHT: TEMLU 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 sees 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?

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?
Standby, we'll get a number.

FLIGHT, EECOM, we can take it off now.

Take it off now CAPCOM.

OK. I need some LM IMU align procedures.

Yes.

FLIGHT, EECOM

Go.

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

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

Negative, we'll give you a cue.

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

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

Everything, except the IMU.

Roger.

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

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

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?

That should do it FLIGHT.

How about comm?

Leave the comm configuration alone.

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

FLIGHT, TELMU.

Go.

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.
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 125, 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 POO.
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
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.

**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 EMAGs.

**GNC**

Rog.

**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.
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: 02 tank 2 fans off.

FLIGHT: You giving up there huh?

EECOM: Giving up.

FLIGHT: CAPCOM, 02 fan 2 off.

CAPCOM: Say again please.

FLIGHT: 02 tank 2 fans can go off, there's nothing happening there.

EECOM: Let's confirm, all FC pumps off FLIGHT. That's i,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 02 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.

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 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
FLIGHT
GNC
FLIGHT
GNC
FLIGHT
CAPCOM
FLIGHT
CAPCOM
FLIGHT
INCO
FLIGHT
INCO
NETWORK
FLIGHT
INCO
FLIGHT
GNC
FLIGHT
GNC
CONTROL

10
10 amps?
Rog
I'm looking at 80 hours.
OK, Rog, understand.
That's academic.
FLIGHT, CAPCOM.
Go ahead.
I've got a procedure for comm activation 28 on my panel here. Is that something you want to go up?
INCO, is that the comm.......
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.
Can we go on the OMNI right now.
Roger. If we come up on GDS with the 210, we'll be alright.
We have AOS with the 210 now.
We'll stay on the OMNI now Jack so don't do anything with that.
We have OMNI data on LM right now.
We have AOS on the LM.
FLIGHT, GNC.
Go ahead.
We have a better number on that heater power. It only draws about .8 amps. So we'd like to leave that up.
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.

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


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.

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.
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.

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 6P 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.

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.

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.
ESECOM 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.
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.
FLIGHT OK. CAPCOM...OK...as soon as we've got the alignment, and we're finished with it, we're going CMC off, IMU 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.
FLIGHT: We're turning off some more of the instrumentation now gentlemen.

GUIDANCE: FLIGHT, 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.

GUIDANCE: Copied FLIGHT.

FLIGHT: Yes.

GUIDANCE: FLIGHT, 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.

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 ELIGHT, 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.

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 GNC 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

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.

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.

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.

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

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 02 tank 1 heaters off as soon as we can, that's a big chunk.

FLIGHT: OK.

CAPCOM: You want 02 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.

CONTROL
That needs to be taken care of shortly.

CAPCOM
Ok........yes 02 tank 1......tank 1......

ECCOM
FLIGHT, ECCOM.

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.

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 cut 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.

CONTROL: Ya, if you want to control all those dadgum breakers on that page and he can go back and open them up later the ones he doesn't need. That's 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.
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.
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 PGN53
       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.
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.
GUIDANCE

FLIGHT

CAPCOM

FLIGHT

CONTROL

FLIGHT

FLIGHT

CAPCOM

FLIGHT

GUIDANCE

FLIGHT

GUIDANCE

FLIGHT

GNC

FLIGHT

TELMA

FLIGHT

Rog.

I wanna be sure we have control somewhere. I'm not satisfied we do get attitude control.

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

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.

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

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

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

OK.

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

OK we're trying to get it up right?

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

They're on their way doing it.

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

He has the DSKY, FLIGHT.

Who? The CSM or the LM?

The LM.

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

They can go to direct RCS FLIGHT.

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

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

CAPCOM they need AC.
CONTR0L 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.

OK.

TELMU OK we got AC, FLIGHT, looks good.

FLIGHT OK.

TELMU We see the pyros are disarmed FLIGHT.

FLIGHT OK.

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.
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.

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.

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.
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.

OK that must have been what it was.

That should help him.

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

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

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

But are you OK?

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

TELMU, are you OK?

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

OK - GUIDANCE you OK in the LM?

Good FLIGHT

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

Rog.

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

That's affirm, if he hasn't done it.

FLIGHT

CAPCOM, we OK there with them right now?

EECOM

Just close the react valves.

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, it's 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 thinking I'd like to keep the LM IMU up to the burn. We're up on the CP's....

FLIGHT

But that's about as far as I've thought it through...everybody's running power profiles and Jim McDvot's 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're going to have good data here for awhile.
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.

FIDO would you figure that out? We're well clear now of the moon, right?

As far as we can tell, we are FLIGHT.

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

Right, we had to bias up the up frequency to change the downlink and its biasing the data and the data's no good.

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

We've tried it - doesn't work.

OK Ed, thanks.

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 lifeboat 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.

Are my gyro torquing angles still good?

GUIDANCE are those gyro torque angles good?

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?

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 That's activation 40 FLIGHT.

FLIGHT OK.

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

FLIGHT GUIDANCE? Rog. FLIGHT that's what I want them to do.

GUIDANCE Rog. 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.

TELEMU OK.