We'd like to go ahead and take a look at what you get by running four or five more DELTA-V tests. And prior to that, we'd like to run one of these null bias tests; and since we don't have any way of monitoring any of this stuff on the downlink, I'd like to have you tell us each step when you turn the switch and different orders and things like that.

04 18 20 08	CDR	Okay.
04 18 20 41	CDR	Alright. I'll run a test.
04 18 20 48	CC	Okay. The first thing we want is this null bias, 100 seconds.
04 18 20 54	CDR	You stand by, and I'll do a null bias for 100 seconds. Do you want me to put DELTA-V in AUTOMATIC and let it alone for 100 seconds?
04 18 21 02	CC	That is affirmed.
04 18 21 22	CDR	Going to DELTA-V; going to AUTO -
04 18 21 25	CDR	Now.
04 18 21 27	CC	Roger.
04 18 21 45	CDR	Went to one-tenth and back to zero.
04 18 21 50	CC	Understand; plus one-tenth and back to zero.
04 18 21 56	CDR	One-tenth, now it's a minus one-tenth and back to zero; no, it's not zero yet; wait a minute.
04 18 22 29	CDR	Now it's up some, minus 4; 0.4, that is.
04 18 22 33	CC	Roger.
04 18 22 44	CDR	Minus 25.

04 18 22 46	CC	Roger.
04 18 22 53	CDR	Minus 26.
04 18 23 06	CDR	Minus 0.7, and there is 100 seconds; minus 0.7 at 100 seconds.
04 18 23 12	CC	Roger.
04 18 23 17	CDR	Now what do you want?
04 18 23 19	CC	Okay. If we go back to mode, switch to stand by and FUNCTION switch OFF.
04 18 23 36	CDR	Roger.
04 18 23 37	CC	Okay. Now we'd like to do a couple of DELTA-V self-tests.
04 18 23 38	CDR	Okay. 71586.8.
04 18 23 43	CC	Roger.

END OF TAPE

04 18 24 46	CDR	Say you're going AUTOMATIC?
04 18 24 48	CC	Roger.
04 18 24 51	CDR	Going to a DELTA-V test now. Counting down.
04 18 26 04	CC	Apollo 8, Houston.
04 18 27 14	CC	Apollo 8, Houston.
04 18 28 47	CDR	You back, Ken?
04 18 28 49	CC	Apollo 8, this is Houston.
04 18 28 53	CDR	Roger. Read you.
04 18 28 55	CC	Okay. We got caught in a station handover there. I didn't copy anything after you said you were putting it to DELTA-V test.
04 18 29 06	CDR	I ran - I ran three tests during that handover. Two over minus 19.6 - two of them are minus 19.8; and one of them, minus 19.6.
04 18 29 17	CC	Okay. That sounds real fine.
04 18 29 22	CDR	Roger.
04 18 29 24	CC	Okay. The other thing that - sometime prior to entry - and we're going to be looking at it - is the normal entry test pattern, and it's called out presently in the checklist as something we do around an hour. And we'd like to check if you can read the number on the scroll that is up now so we can see where we are in the test test pattern sequence. We're considering taking a look at one of these test patterns before we get into an hour so we can have more time to

		think about it in the event that there should be something anomalous in it.
04 18 30 02	CDR	Why don't we do it right now? We're on number 8.
04 18 30 06	CC	Okay. Understand; that's number 8, right?
04 18 30 12	CDR	Roger. It takes an awful long time to run them over there anyway. It won't hurt to do one.
04 18 30 18	CC	Okay. If you'll stand by just a second; we're checking to see where we stand in the sequence of events for on pattern 8.
04 18 32 58	CDR	Hey, Ken.
04 18 32 59	CC	Yes, sir.
04 18 33 03	CDR	Another little thing about this EMS: you know, we had it set up when we separated from the booster - -
04 18 33 09	CC	Roger.
04 18 33 10	CDR	- - and the shock of the separation - the shock of the pyro's blowing in separation knocked it up to 100 and something.
04 18 33 21	CC	Understand. Knocked it up to 100.
04 18 33 26	CDR	Roger.
04 18 33 27	CC	Was the pyro separation enough that the - you felt a sensable g in the bird?
04 18 33 35	CDR	Roger. Let's just say there wasn't any question we were separating.
04 18 33 43	CC	Roger. Understand.
04 18 34 00	CDR	While you are checking the scroll, find out which entry pattern I should be using this bird in.

04 18 34 06	CC	Okay. Will do.
04 18 39 39	CC	Apollo 8, Houston.
04 18 39 44	CDR	Go ahead.
04 18 39 46	CC	Okay. While we are verifying that scroll position - they are talking it over in the back room about that now - I would like to go ahead and run down the checklist with you for entry.
04 18 40 00	CDR	Go ahead.
04 18 40 02	CC	Okay. Looking on entry 1: the second item there is the 12-hour Kelvin cold soak, and in discussions here and preflight, I think it is agreed that we don't want to do the cold soak there. So we are going to delete that step 2. And what it amounts to is, I think we do want to do a cold soak, and we certainly want to exercise the water boilers prior to entry in order to insure that we don't have one that is dried out, in the same manner that we had one dried out prior to LOI. And we are working on some procedures for that, and we'll have to come back to you with those a little bit later, and we will try to do it sometime when Bill's on the line so that everybody can get in on the loop at the same time. We would like to add a step between 8 and 9, or as part of step 8. This is all on page E-1, where we turn the VHF to Simplex A at minus 4 hours and 35 minutes. Now this will be beyond two-way VHF range, but it will make sure

that we do have it on at the time when we pick it up. We were able to get out to 20 000 miles with a downlink, and we are checking on the uplink signal. So if we put it on at this point, we know we have it on well in advance of any time we might be able to get into the VHF.

04 18 41 36 CDR Okay.

04 18 41 43 CC Okay. I guess maybe I have that backwards. They copy - you folks copied the VHF out to 20 KM. We're checking on the - on the downlink into that now. But in any event, this 4 hours and 35 minutes will get it well in advance of that.

04 18 42 03 CDR Roger.

04 18 42 40 CC Okay, 8. We just got an answer back on the test patterns. We thought it was - We had 25 test patterns which are allocated to ground test, and these are the ones we've been looking at. Then there are five more that are allocated to flight, and the only difference in these patterns is that the flight patterns have instructions actually written on them; so if we are looking at test pattern 8, that means that we're still working on the ones that were allocated to the ground test, so there was no problem there. And I'll get you a number for which pattern we should be using for entry; working on that one right now. So we would like to go ahead and run through these.

04 18 43 21	CDR	I don't mean the - -
04 18 43 23	CC	Say again, Frank.
04 18 43 25	CDR	I don't mean the test pattern. I say, I don't mean the test pattern. We asked them to put the supercircular on the number, the first place on the scroll; I'm sure they did. I'm sure it's the first pattern, but I just wanted to make sure that's right.
04 18 43 38	CC	Roger. That's why we are trying to verify. So - -
04 18 43 43	CDR	You want me to run through a test pattern?
04 18 43 45	CC	Yes, sir. If you would, please. And if you'd tell us each step as you go through it.
04 18 44 42	CDR	Okay. Going through step 1; EMS test 1: wait 5 seconds. There's 5 seconds. Going AUTO. Okay. Indicator lights are all OFF; the range is zero, zero. Now I'm gonna slew the hairline over the notch. Okay. And now we go in EMS test 2.
04 18 44 45	CC	Roger.
04 18 44 52	CDR	Got the 0.05g light; all others are out.
04 18 44 55	CC	Roger.
04 18 44 58	CDR	Go on test 3: far side lower light on 10 seconds; going to set the range counter to 58. Okay. Set at 58; going to test 4.
04 18 45 34	CC	Roger.
04 18 45 50	CDR	Beautiful. It's perfect. It's right in the corridor. It comes down and stops at zero, zero.

04 18 45 55	CC	Very good.
04 18 46 04	CDR	Go in test 5: perfect again. Okay. Now I go to range set,
04 18 46 34	CC	Okay.
04 18 46 39	CDR	In STANDBY.
04 18 46 43	CC	Okay.
04 18 46 45	CDR	Okay. That was perfect.
04 18 46 47	CC	Real fine.
04 18 47 02	CC	Okay, Apollo 8. I'd like to run one more null bias and looks like we will have exercised everything we can get to.
04 18 47 13	CDR	Okay. DELTA-V AUTO, all zeros.
04 18 48 21	CDR	Minus 2.
04 18 48 24	CC	Roger. Understand minus 2. Alright. Is that minus 2 or minus two-tenths?
04 18 48 39	CDR	Two-tenths, three-tenths now.
04 18 48 42	CC	Okay. Real good. That looks like we - -
04 18 48 44	CDR	It looks like we had a lot of noise on the circuit for a while there, Jim.
04 18 48 50	CC	Yes, we did, too; all those electronic glitches I guess.
04 18 48 59	CDR	Okay. One hundred seconds it's plus - minus four-tenths.
04 18 49 02	CC	Okay. Real fine. That looks like that's about all of the functions that we can check, and looks like everything is just down the line.

04 18 49 15	CDR	Roger.
04 18 49 19	CC	Okay. We still owe you confirmation that you can expect your high speed scroll to be the first pattern you come to, and I'll let you know as soon as they come in with an answer on it.
04 18 49 31	CDR	Okay.
04 18 49 32	CC	I'd like to go ahead and finish going through the entry book if you're ready.
04 18 49 37	CDR	Roger.
04 18 49 43	CC	Okay. We've reviewed most of the book up here, and we will have to come back and suggest a way that we can check out the water boiler prior to getting reentry area. We've reviewed all of the last minutes changes that were put in - pen and ink type things - and they're all looking good. On page E-7, like to add a couple of items.
04 18 50 15	CDR	What's that?
04 18 50 16	CC	Okay. On step 34 under final stowage, which is a sort of catch-all area, there's a step that says secondary glycol to radiator that bypass verify. While we are down in this area, we would like to go to panel 382, the water control panel, and set up the evaporator water control valve both primary and secondary to AUTO. Now this is something we would have done had we done the cold soak at minus 12 hours, but since we

weren't doing it there, we would like to go ahead and make sure we have these in AUTO, and this will enable automatic controls from the panel.

04 18 51 02 CDR Can we just make this part of the procedure when we test out the water boilers beforehand?

04 18 51 08 CC Yes, sir. If we get that checked out earlier, we can just leave them in AUTO.

04 18 51 13 CDR I'd rather do that.

04 18 51 15 CC Okay. I'm just going to make a note here, and we can do it the other way, too. The other item that was pen-and-inked in - -

04 18 51 23 CDR ...

04 18 51 27 CC You may already have this down as step 35. It says UP TELEMETRY to BLOCK, VERIFY, and there's a step right after that that says RCS command module heaters to circuit breakers CLOSED.

04 18 51 43 CDR Roger.

04 18 51 48 CC Okay.

04 18 51 49 CDR I have that.

04 18 51 50 CC Okay. I guess that one was sent up to you this afternoon. And when you turn the page over to E-8, it shows the EMS entry check being run at minus an hour, and you know that it's a short test. There is really no reason to wait for an hour; we might as well go ahead and do that as

soon as you get through with step 35 on page E-7 because we're coming up on a pretty busy period.

04 18 52 19 CDR I say that's fine; we'll do that.

04 18 52 37 CDR Houston, are you still there?

04 18 52 39 CC Roger. We got a discussion going; be right back.

04 18 53 50 CC Okay, Apollo 8. On page E-9 - -

04 18 53 57 CDR Okay.

04 18 53 58 CC - - at the top of the page, you have step 38, and right underneath that, prior to step 39, we want to have a primary glycol loop activation. What we are doing is to get the glycol evaporator water switch to AUTO and the glycol evaporator steam pressure switched to AUTO. This will get your primary water boiler on the line prior to entry, or at least it'll enable it.

04 18 54 35 CDR Okay. Tell me what to write in, Ken.

04 18 54 37 CC Okay. It's glycol evaporator water to AUTO.

04 18 55 43 CC Apollo 8, Houston. Are you there?

04 18 55 55 CDR Glycol evaporator water switch to AUTO.

04 18 55 59 CC Okay. And the second switch is the glycol evaporator steam pressure to AUTO.

04 18 56 18 CDR Okay.

04 18 56 25 CC Okay. That takes care of getting the primary water boiler enabled, and it's my understanding that we were going to make the actual entry with

both the primary and the secondary water boilers on the line.

04 18 56 40 CDR I'm not reading you now, Houston.

04 18 56 44 CC Roger. How now?

04 18 56 48 CDR Loud and clear.

04 18 56 49 CC Okay. There's some question from reading the checklist. It is my understanding that both the primary and the secondary water boilers will be ON for the actual entry, and don't find a place in the checklist where it's actually turned on. So we'd like to get confirmation on that, and we'll make sure that we have all the proper switching to put in the checklist.

04 18 57 16 CDR Okay.

04 18 57 23 CC Alright. Still on page E-9 and under step 39 at the bottom of the pyro circuit check, there's a step that says panel 8, all circuit breakers CLOSED except and then it lists five that are printed, one that was pen-and-inked before launch. It says EDS power circuit breakers 3 OPEN, and to be complete, we ought to add the RCS heater circuit breakers. There's two of those, and they should also be OPEN.

04 18 58 06 CDR Okay.

04 18 58 11 CC Alright. The rest of these pages look good; I'm coming over through the graphs. And on page E-11 - -

04 18 58 48	CDR	Roger. I'm with you.
04 18 58 50	CC	Okay. On step 5 on E-11, there's - the first subtitle there is Helmets and Gloves, and the items that follow beneath that are affected by whether you wear suits or come in shirt sleeves, but they do have to be accomplished. And the suit return air valves would actually be OPEN for a shirt-sleeve entry. And you should have a line penciled in of optics power to OFF between an emergency cabin pressure valve and the time when the CMP moves to the couch.
04 18 59 26	CDR	Right.
04 18 59 28	CC	Okay. And the step shows the tape recorder to REWIND at minus 30. Now that's an onboard step rather than a ground step, just to verify that.
04 18 59 48	CDR	Okay.
04 18 59 50	CC	Okay. Under step 6, almost at the bottom - in fact, it's three lines from the bottom of step 6 - there's a section that says secondary coolant loop evaporator to RESET, and should be a note that that's 58 seconds if you hold it in RESET prior to moving the pump OFF.
04 19 00 12	CDR	That's it; that's in it.
04 19 00 15	CC	Okay. Okay. The next comment is on page E-13.
04 19 00 34	CDR	Okay. I'm there.
04 19 00 36	CC	Alright. This is a general comment that refers to any time you're working around P62 or when

you're going between P62 and P63, and you should be careful not to call an extended VERB during this time. This is here in the program notes, and it is just a reminder. What will happen if we get into an extended VERB such as an 83 or an 82? We may get hung-up in P62 and have to recycle through it in order to get the 63, and neither of these displays are normally used, and it's just a good practice. And we're just trying to remind you that we don't want to call an extended VERB while we're in P62.

04 19 01 22	CDR	Okay. Neither do we. That's right.
04 19 01 24	CC	Okay.
04 19 01 41	CC	Okay. In going through the rest of it, we didn't find any other things to make comments on. You have all the latest corrections in your checklist.
04 19 01 51	CDR	Roger. The main thing, that is to come up with a way to determine that the boiler - water boiler is not dry and make sure that Bill gets it activated at TMS 7.
04 19 02 03	CC	That is correct, and we will talk to you some more about that next time we catch both you and Bill up.
04 19 02 10	CDR	Righto.
04 19 06 41	CDR	Ken, this is Frank. I am going to be off the headset for about 5 minutes here.

04 19 06 44	CC	Okay. Fine. When you come back, I will have a systems rundown for you.
04 19 06 50	CDR	Fine.
04 19 17 12	CDR	Houston, Apollo 8.
04 19 17 16	CC	Okay. Loud and clear.
04 19 17 20	CDR	Back with you.
04 19 17 22	CC	Okay. I've got a few good words for you. The erasable memory has been taken completely apart and looked at, and it looks like it's all okay. Your P01 didn't have any effect. The one thing that might be questionable is if you used a VERB 67 when you get to the NOUN 99 display, you may find that one to be unreliable, and what you're going to get there is the - that's an error display for the W-matrix. And it's something you probably won't be using again anyhow; and if the occasion arises, we can update that one, but it's not a normally used display and everything else, all the operational functions, are good.
04 19 18 17	CDR	Very good.
04 19 18 19	CC	Okay. As of 114 hours, your batteries - you had battery A with 39.32 amp-hours, battery B had 35.21, and battery C 38.46. Your cryo quantities remaining at SEP were the same we gave you the last time, 180 pounds of oxygen per tank and 11 pounds of hydrogen per tank. At

present, the service module RCS, using the computer values for the quantities, you have quad A with 55 percent, Bravo with 50, Charlie with 58, and Delta at 48. What we plan to do with the secondary tanks is to go ahead and turn them on at 37 percent actual, and in the event of lost COMM or something like that, recommend that you use 50 percent onboard gaging as being the time to turn the secondary propellants on. However, as long as we can use our own calculations, why, we might as well leave them tied up. We probably won't get into the secondary propellants prior to entry anyhow.

04 19 19 41	CDR	Roger.
04 19 19 42	CC	Okay. A couple of items I want to check up on: I'd like to confirm that the hatch Dog will be taken off while you're on the chutes if you can. If not, you're going to do that in the water. Is that affirm?
04 19 20 00	CDR	...
04 19 20 13	CC	Okay. Now we've got a little better sign 1. Like to confirm that the hatch clamps on the side hatch will be taken off either on the chutes or in the water, whichever you can get to. Is that affirm?

04 19 20 37	CDR	Roger. That's affirm. As a matter of fact, we didn't even put - didn't even put them on.
04 19 20 45	CC	Okay. Do you plan to put them on for an entry?
04 19 20 50	CDR	I don't think so. It's held pretty well so far. I don't think - everybody tells me it wouldn't help much anyway.
04 19 21 58	CC	Okay. And we realize we never did find out what happened to the Mae West. Did you leave it blown up, or did you dump it?
04 19 21 09	CDR	We dumped it.
04 19 21 12	CC	Okay. Who was the lucky guy?
04 19 21 17	CDR	The same guy that tried to launch us this afternoon again.
04 19 21 23	CC	Okay. And just as a gee whiz item:you're now a 137 915 out, and you've only accelerated the 4883. You might check to make sure you don't have a speed brake hanging.
04 19 21 41	CDR	Uh-oh.
04 19 21 44	CC	Those are nominal values.
04 19 21 50	CDR	Roger. 137 000 miles out, huh?
04 19 21 55	CC	That's affirm.
04 19 33 18	LMP	Houston, Apollo 8. Over.
04 19 33 20	CC	Loud and clear.
04 19 33 27	LMP	Good morning, or good afternoon, or whatever it is. The JOD is back at the CON; CDR went back to bed.

04 19 33 32	CC	Okay.
04 19 33 44	CC	Looks like all the junior guys have the midwatch.
04 19 33 49	LMP	I know what you mean. I had a little sleep earlier, so I am pretty well rested and want to make sure Frank gets a good snooze here prior to entry. This might be a good time to try out your background music, and see if you have any better luck.
04 19 34 16	CC	Okay. We'll try that a little later.
04 19 37 48	CC	Apollo 8, Houston.
04 19 38 43	CC	Apollo 8, Houston.
04 19 38 49	LMP	Go ahead, Houston.
04 19 38 51	CC	Okay. I guess we should start off with a little dialogue about sleep. How much did you have?
04 19 39 03	LMP	Well, let's see; whenever it was I told you I went to bed last night till now. Just a second and let me check the flight plan.
04 19 40 48	LMP	Have you got it logged in when it was I asked for that last Seconal?
04 19 40 57	CC	Okay. I guess we can figure that out for ourselves, can't we?
04 19 41 02	LMP	Yes. Why don't you let me know. I have kind of lost track of time it was when I went to bed. But it was about - I went to sleep about 15 minutes after that and woke up about 10 minutes ago. Good sleep.
04 19 41 12	CC	Okay. So I see it is now 142 hours.
04 19 41 27	LMP	What do you think I am, Rip van Winkle?

04 19 41 30	CC	Just trying to find out how soundly you really slept. I guess you are not that sleepy.
04 19 41 36	LMP	... but not that.
04 19 41 40	CC	Okay. It's really about 4 hours, Bill.
04 19 41 50	LMP	Okay. Good.
04 19 42 39	CC	Apollo 8, Houston. Have you got somebody under the left couch, or could you get down to the water control panel?
04 19 42 49	LMP	I can get down there. Frank hasn't quite gone to sleep yet.
04 19 42 52	CC	Well, what we were thinking about doing was boiling a little out of the secondary evaporator to check it out, just as a component check, something we need to do; but if there's somebody down there in the way, why, we can do that some other time.
04 19 43 17	LMP	Well, if it boils, we are going to know it before - it won't take long to find out it won't boil. There's not a heck of a lot we can do about it, so why don't we wait until someone else wakes up here, Frank wakes up again. How will that be?
04 19 43 27	CC	Yes. That would be fine. There is something you can do; you can reservice it. And it is kind of a tedious process, and that's the reason why we just want to kind of keep our eyes on it so we will have some idea prior to entry if we can count on having two loops or one. Which kind of leads us into

another question we are trying to pin down, two questions, in fact. Number one, we would like to verify that you do plan to use both primary and secondary boilers during the actual entry, and we are also looking for a way of checking the primary boiler to make sure it isn't dried out prior to entry. And that is turning into a little more of a challenge than you might suspect. If you have any thoughts on that subject, we can go over that.

04 19 44 21 LMP The answer to the question is yes, we do plan to use both. Before we get into the water boiler pump though, CDR would like to take a Seconal also; make sure he can get off to sleep here.

04 19 44 41 CC Okay. That's a GO.

04 19 44 46 LMP Okay. On the water boiler: it's interesting that I get my own - I was going to say anytime you have your mike keyed, I can hear myself talk with about a 2-second time delay. With respect to the primary and secondary boiler checks, I think that is a good idea to make sure we got them both prior to entry and have the reservicing procedures handy.

04 19 45 39 CC Roger, Bill. You know the secondary - well, in fact, both reservicing procedures are available in a malfunction book, and sort of the problem with checking out the primary boiler is finding a way to make it boil on the way in.

04 19 46 03	LMP	Yes. Just a second, I got another little chore going here.
04 19 46 39	LMP	Roger. It looks like the only way we'll be able to do it would be to shut off the radiators.
04 19 46 48	CC	We were looking for a little more docile way to do that.
04 19 46 55	LMP	Roger. That way would be agreeable to me too, a little more docile way, but they shouldn't freeze up if we did it quickly.
04 19 47 08	CC	Roger. We are talking over several things, you know, like putting the ten-pin valve to MANUAL or partially closing it or some of these different ideas, and something you can think about while you are laying there with nothing else to do.
04 19 47 26	LMP	Yes. We noticed that it had gotten warmer in the cockpit coming back than it was going out. And I remember going out when we manually positioned the ten-pin valve, but we had pretty good control over the glycol evap outlet temperature. So possibly that would be the thing to attack first rather than the radiators.
04 19 47 49	CC	Okay. We've got the back room boys looking at it.
04 19 47 57	LMP	I guess if we do pick a time, though, we ought to pick a time that if something did go haywire, we could afford to boil ... the rest of the way in, but still leave us enought time to fix - rig up the evap service if it didn't work.

04 19 48 12	CC	That's affirm, and we're factoring in things like trajectory considerations and all that sort of thing, too.
04 19 48 22	LMP	Right. I think that the second derivative of the water boiler versus time plot will give us the optimum time to do it.
04 19 48 45	CC	EECOM's copying that.
04 19 48 52	CC	There's also speculation you have a chart on board that gives that information.
04 19 49 02	LMP	Well, if I don't, I'm sure those guys can ship one up. They've shipped up some other pretty good ones.
04 19 49 08	CC	It's also been suggested that if you don't have the chart it's on the tape recorder.
04 19 49 18	LMP	Well, if I don't have a chart, I'll put it on the tape recorder.
04 19 49 27	LMP	Okay. I think, unless you guys got some more comments along those lines, maybe we ought to give these guys a chance to get to sleep, and I'll recline here for a while. If you've got something to brief me on, well, go ahead; but I'd like to keep my answers to yes's and no's and whatever else you think you really need.
04 19 49 51	CC	Okay. Fine, Bill, and I'll check with you like every 30 minutes, just to make sure we still have voice contact.

04 19 50 02	LMP	Okay. I've got some log writing to do and whatnot. So keep an eye on the systems and the gimbal angles, and we'll be all right.
04 19 50 11	CC	Okay.
04 19 52 17	LMP	And, Ken, if your EECOM man wants to play the OMNI-switch game, we're on Dog - Bravo at this time, actually on Bravo but also configured for D's - correction, we are on D and also configured for Bravo. If you want to switch, we'll go ahead.
04 19 52 43	CC	Okay, we'll give that a try, and we are cranking up some background music for you.
04 19 52 55	LMP	Okay. The last time they did that, it sounded like they were running at the wrong speed on the tape, but we're a little closer now. Maybe it'll be a little better.
04 19 53 02	CC	Would you also believe Doppler shift?
04 19 53 14	LMP	Might be another way to range.
04 19 53 25	LMP	Probably it was Doppler shift; we're heading back out again.
04 19 53 38	CC	Looks like we can use your humming for backup ranging in case everything else fails.
04 19 53 46	LMP	Roger.
04 19 54 15	CC	Apollo 8, Houston. You don't need to answer this transmission, but doctors observe that it looks like your - some of your sensors may be working loose, so you might just kind of push on them and see if they are in place.

04 19 54 56	LMP	That do any good?
04 19 55 03	CC	Looks like it is one of your sternals, Bill.
04 19 55 21	CC	Apollo 8. We can't handle the OMNI switching for about thirty more minutes, till we get back to an 85-foot disk, so you will have to watch the antenna store for a few more minutes.
04 19 56 05	LMP	Okay. I don't see any loose sensor - the upper, upper ...
04 19 56 18	LMP	Are you trying to call, Houston?
04 19 56 21	CC	No, I didn't. It sounded like you were getting an echo, and I checked, and I hadn't held the key down at the time either.
04 19 56 27	LMP	Okay. I don't see any loose sensors, but the upper sternal is beginning to irritate a little bit, but not badly; and possibly there is something going on there.
04 19 56 43	CC	Okay. And did you copy about the antenna?
04 19 56 49	LMP	They really disappoint me, but I'll keep that in mind.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

04 20 02.02		(Start music)
04 20 02 28	CC	Apollo 8, Houston. I'd like to make a voice check with you.
04 20 03 01	CC	Apollo 8, Houston. Radio check.
04 20 03 32	CC	Apollo 8, Houston. Radio check.
04 20 04 13	CC	Apollo 8, Houston. Radio check.
04 20 05 12	CC	Apollo 8, Houston. Radio check.
04 20 05 46		(End music)
04 20 05 50	CC	Apollo 8, Houston. Radio check.
04 20 06 37	CC	Apollo 8, Houston in the blind now. We're not receiving down-voice. We have data, and it appears it's probably a ground problem.
04 20 07 12	CC	Apollo 8, Houston.
04 20 07 17	LMP	Roger, Houston. Read you loud and clear.
04 20 07 19	CC	Okay. I got you that time. I take it you were able to copy us with the music? Is that affirm?
04 20 07 28	LMP	I was able to copy you all the time, Ken, but I could only hear the music when you were trying to transmit. And I wondered if you noticed cycling on my suit power switch when you - when you called me. I am hearing an echo now.
04 20 07 47	CC	Roger. I copy your echo. And what switch were you cycling?
04 20 07 57	LMP	I was cycling the suit power which turns off the BIOMED periodically. I figured that would wake the doctors up.

04 20 08 10	CC	It appears that we have more than one communications problem.
04 20 08 17	LMP	Roger.
04 20 11 25	CC	Calm it. (Laughter)
04 20 11 36	LMP	You are cutting out, Houston.
04 20 11 40	CC	Oh, that was an inadvertent cut-in.
04 20 11 45	LMP	Okay.
04 20 18 34	LMP	You need the high gain, Houston, or will the OMNI's be okay?
04 20 18 50	CC	8, Houston. That's negative. The OMNI is okay.
04 20 18 56	LMP	Roger. Be advised that about 50 - I am hearing these echos quite a bit of the time, and if you are trying to play music, I am not hearing it.
04 20 19 06	F CC	Roger. We understand, and we are not trying to play music right now.
04 20 19 15	LMP	Okay. Who is this, COMM TECH?
04 20 19 22	F CC	Ken is only human. This is his substitute; this is Flight Director.
04 20 19 32	LMP	Oh, I didn't recognize your voice there.
04 20 19 36	F CC	I don't get to talk often.
04 20 19 37	LMP	Who is substituting for you now, Flight?
04 20 19 43	F CC	DFD.
04 20 19 46	LMP	Okay. Things are looking pretty good from here. How about down there?
04 20 19 55	F CC	It couldn't be better.

04 20 20 03	LMP	You guys are doing a great job. I really appreciate it.
04 20 23 23	CC	Apollo 8, Houston. Going to be handling over sites at 25. I will make a voice check with you when we come up on the new site, and the ground says thank you for your kind words.
04 20 23 38	LMP	Okay. We will be standing by.
04 20 25 36	CC	Apollo 8, Houston through Honeysuckle.
04 20 25 42	LMP	Roger, Houston. Loud and clear.
04 20 25 43	CC	Okay, Bill, and our BIOMED data still looks a little bit squirrelly. How about checking the blue signal conditioner on your BIOMED harness. You have one connector, should be the center package, has a blue connector on it. You kind of check that, and I don't know if you have changed the BIOMED harness leads recently; if you have, this might have caused our problem.
04 20 26 18	LMP	Roger. I was just cracking open some acorns here for breakfast. Let me put them down, and I will check my BIOMED leads.
04 20 26 25	CC	There is no rush on it.
04 20 28 21	LMP	Everything seems shipshape.
04 20 49 26	CC	Apollo 8, Houston.
04 20 49 58	CC	Apollo 8, Houston.
04 20 50 02	LMP	Go, Houston.

04 20 50 05	CC	Okay, Bill. We're ready to try this music on a different kind of latch-up this time. What I'd like to do in order to make sure that we maintain voice COMM is when you get it if you would, give us a call and tell us you have the music and any comment about its relative volume or anything like that. And if I get your call, then I'll call you back and tell you. And what will happen is when I go to talk to you we'll drop the music link. And we can go ahead and take over the switching of the antennas if you like.
04 20 50 49	LMP	Okay. I'm in Bravo Dog switch configuration, and go ahead with the music. Be advised last time the fidelity was low, and the volume was too high.
04 20 51 02	CC	Okay. And if you'll give us the same kind of comment, hopefully not the same comment but the same type of evaluation when you pick it up this time.
04 20 51 15	LMP	Play it a little bit, and we'll talk about it.
04 20 51 54		(Begin music)
04 20 52 15	LMP	I can barely, barely hear it.
04 20 53 21	LMP	Needs to be just a hair louder.
04 20 53 37	LMP	That's good.

04 20 53 49	LMP	That will keep me awake.
04 20 54 03	LMP	Maybe you ought to crank it back down a little bit.
04 20 54 16	LMP	Great.
04 20 54 52		(End music)
04 20 54 53	CC	Apollo 8, Houston. How was that?
04 20 54 58	LMP	That's real good for background level type, Ken. Maybe you can do some logging in here so that's real nice at that level; maybe for anything else it could be a little bit louder, but that's good for now.
04 20 55 10	CC	Okay. That's about the MAX volume we can take down here; so if you want to talk to us, you may have to call us once or twice. You're just barely equaling it.
04 20 55 24	LMP	Okay. Try it again, and I'll give you a little louder call; I've been trying to keep it quiet.
04 20 55 30	CC	Oh, yes, that's all right. Don't - I was aware you were calling; I just didn't make out what you said. And from now on, any time you call, we'll drop the music, and I'll talk to you.
04 20 55 42	LMP	Roger. Don't hesitate for me a bit.

04 20 55 46	CC	Right.
04 20 56 00	CC	And, Bill, we're going to have to wait until we get around to Bravo before we start switching. Our margin is still a little bit low.
04 20 56 10	LMP	Okay. I'll just go ahead and switch it and save you all that trouble.
04 20 56 14	CC	Okay. Thank you. Our midnight DVA show's back on the air.
04 20 56 20	LMP	Roger.
04 20 56 25		(Begin music)
04 20 57 11	LMP	Really great now.
04 21 14 57	CC	Apollo 8, Houston. Check your yaw gimbal angle.
04 21 14 58		(End music)
04 21 15 04	LMP	You must have been reading my mind.
04 21 15 07	CC	No, the DSKY's.
04 21 15 13	LMP	Oh, okay.
04 21 15 21	LMP	When you go to high gain, would you tell me?
04 21 15 46	LMP	Houston, Apollo 8.
04 21 15 53	CC	Go ahead, Apollo 8.
04 21 15 56	LMP	Ken, do you want me to use the high gain when we come around, or is the OMNI sufficient? It doesn't matter to me.
04 21 16 07	CC	Okay. The OMNI is doing fine. I was just watching your middle gimbal angle there; it was getting a little far out.

04 21 16 17	LMP	Oh, okay. I thought you - I was, too. I thought you said check the DSKY, and I thought you were talking about the high gain antenna.
04 21 16 23	CC	No, I'm sorry. I was just watching your middle gimbal.
04 21 16 25	LMP	Yes, this thing really slops around in deadband, but it's really nice flying otherwise.
04 21 16 40	CC	Glad to hear that.
04 21 16 47	LMP	All I have used the while trip is pulse.
04 21 16 54	CC	You just woke the doctor up. You said pulse, and he came alive. And he'd like to know if you did in fact, check out the BIOMED harness.
04 21 17 07	LMP	Yes, I tightened down all the plugs and checked all the leads, and everything looked in order. And when the other fellows wake up, if you remind me, why, I'll give it a more thorough going over.
04 21 17 55	CC	Okay, Bill. It's been suggested that they would like to see you try switching the two leads, you know, a yellow and a blue one, and just go ahead and switch them, and they'll sacrifice their pneumogram because they'd rather have the EKG.
04 21 18 25	LMP	Do they need it now, or can they wait until somebody else wakes up?

04 21 18 35	CC	I guess we can wait, Bill. Is that a hard thing to get to?
04 21 18 43	LMP	You have to take your pants off and about everything else - stand by.
04 21 22 07	LMP	How's that, Houston?
04 21 22 13	CC	Okay. Stand by, Bill. We'll take a look at it.
04 21 22 30	LMP	Houston, Apollo 8.
04 21 22 33	CC	Roger. Read you. We're looking at data now. (Laughter)
04 21 22 40	LMP	I suppose you'll tell me my heart has quit beating.
04 21 22 44	CC	We couldn't argue with you. That doesn't help at all. That's pretty bad.
04 21 23 12	LMP	Is the pneumogram NO-GO for entry?
04 21 23 17	CC	Roger.
04 21 23 24	CC	One thing you might be interested in: we listened to that low speed information that you taped on the first couple of REV's that we thought was going to be unusable. And it must have been a ground problem because it's coming in loud and clear now.
04 21 23 41	LMP	Hey, that's great. I was just writing a long dissertation on why we have problems and can't use that DSE in low bit rate. So that's real good.

04 21 23 55	CC	Yes, it's coming in loud and clear. Pretty interesting.
04 21 24 00	LMP	Let me tell you, it was a hectic revolution.
04 21 25 13	LMP	If you've got the music going, I'm not hearing it, Ken.
04 21 25 17	CC	No, I was waiting to see what we did on that before I started it up again.
04 21 25 23	LMP	Okay. If they could hold off here for a couple of hours, if they have anything at all, just tell them I'm alive, why, I'll give my real good going over here when I get done. I might even make a statement to the world that I haven't noticed that their little amplifiers had gotten hot.
04 21 25 41	CC	You say it did get hot?
04 21 25 46	LMP	No, I hadn't even noticed it until I started changing the lead.
04 21 25 49	CC	Oh, okay. Okay. I'm going to crank the music up again then.
04 21 25 56	LMP	Okay. Have they got anything at all down there?
04 21 26 00	CC	Well, we're on low bit rate right now, so it'll be a few minutes before we get a chance to take another look at it. We'll let you know if you get sick.
04 21 26 07	LMP	Oh, well, we can hold off for a little while.
04 21 26 13	CC	Roger.

04 21 27 02 LMP I can't hear it, but it sounds like something I'd rather not hear anyway.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

04 22 17 19		(End of music)
04 22 17 40	LMP	Houston, Apollo 8.
04 22 17 43	CC	Hello, Apollo 8. We interrupt this program of music to bring you the late evening status report.
04 22 17 50	LMP	Good. What's up?
04 22 17 56	CC	Okay. We are getting ready to have a shift turnover, and I wanted to go over a few items before I do. On the midcourse correction number 6: right now, that looks like it is at most 0.3 a foot per second, so there will be no burn for midcourse number 6. Midcourse number 7 is a little larger, and we'll make a decision on that later. Your weather in landing site still reported as being good and the forecast to be about 2000 scattered and 12 000 broken, about the same numbers they gave Frank earlier. Visibility will be about 10 miles, wave height about 4 feet. And I guess there is some scattered thundershowers, like less than 5 percent, that you should worry about. And they're 10 to 30 percent maybe at 2000, broken as opposed to scattered; so it looks pretty fair. We have got a - -
04 22 19 12	LMP	Just my kind of weather.
04 22 19 14	CC	Roger. Got a couple of flight plan things to consider. Now number 1 at 119:30: we have got a P52 IMU realignment which we need to slip in ahead

of the P23 sightings, and that will be an option 3 REFSMMAT.

04 22 19 40 LMP Roger.

04 22 19 45 CC Okay. Some of the folks in sitting back and looking at the TV business have some ideas about things they would like to see tried with the filters. And I would like to read you what they have here and let you think about it; and in the next 10 hours, you can decide whether or not you think it is worth the effort. Basically, they would like to try using a whole different series of filters - -

04 22 21 04 LMP Okay, Ken. I got something to write on. Was that P52 at 18:30 or 19:30?

04 22 21 11 CC 119:30.

04 22 21 15 LMP Okay. I'm ready to copy on TV.

04 22 21 31 CC Okay. Before you copy, let me read it all through to you here so you will get the feel for what it is we are talking about. The title of this little epistle is "TV and Film Photography Correlation Experiment," and what they want to do is mount the TV camera with the telephoto lens on a bracket in the rendezvous window and take a TV picture of the earth through the red and blue filters, 1 minute per filter; that means red and blue filters individually. Then they would like to take a TV picture of the earth through through the red, in this case, the 25 Alfa filter combined

with the polarizing filter. Rotate the polarizing filter through 360-degree increments, again 1 minute per position. Then they'd like to take a TV picture of the moon with the polarizing filter at 360-degree moon-rotation increments and again, 1 minute per position. And to go with this, we would like to have Hasselblad pictures.

04 22 22 44	LMP	One minute.
04 22 22 45	CC	Okay. I am standing by.
04 22 22 49	LMP	Are those - when you were talking about pictures through the polarizing filter, is that the TV pictures through the polarizing filter?
04 22 22 55	CC	That's affirmative. All above was TV.
04 22 22 59	LMP	Okay. Now the only thing - the only problem here is it's darn near impossible to aim that television camera; the field of view is so narrow that it took three men and a boy up here to get the thing pointed in the right direction. And we tried using chewing gum for a sight and everything else, and let me tell you that the odds of getting that thing in the earth is pretty small.
04 22 23 25	CC	Okay. I think we weren't too clever in our ground callup as to how to point the spacecraft. For one thing I think we can do that a lot better next time now that we have stumbled through it once. I agree with you - -

04 22 23 41 LMP It's not the spacecraft; it's not the spacecraft that's hard to point, it's the camera. The bracket has sufficient slump in it that it can take the camera out of field of view when configured through the window. And it took a lot of microadjustments with a lot of coaching from the ground to get the thing in, and it was a real tough job. So I think you ought to take all this in mind; if you could possibly use the wide angle, you might be better off.

04 22 24 14 CC Okay. I understand what you are saying now. I'll run that back by the TV guys and see what they have to say about that. In conjunction with the above, they wanted to take some Hasselblad pictures of the earth through the rendezvous window with the red and blue filter and black and white film, and then again through the polarizing filter, and this is all going to be used in order to try and correlate the TV and the regular film photography. So if you think it is a worthwhile thing, and you would like to give it a try, I'll run this by Jack and the TV cats and see if they would like to get something out of it with the wide angle, and we can talk about it a little later.

04 22 25 05 LMP Okay. Another thing to keep in mind is that we haven't seen the moon - we didn't see all the way out, and we rarely see it going back. We have seen it once since we left, but we have maneuvered the

wrong way from a sighting attitude to the shortest way to PTC; and to go from an earth view to a lunar view will take quite a bit of time and some RCS. So you might keep that in mind, too.

04 22 25 35 CC Okay. I just wanted you to be aware of this and think about it and what its implications to the flight plan might be, and I'll run this wide angle and comment about the moon back by and see which sections they think would be most appropriate. Okay. On the EMS scroll, Frank wanted us to verify the order that he could expect to see the entry profile, and the first profile that comes up is labelled "Nonexit Number 2" and that is the short-range high-speed entry. The second thing that will come up is entitled "The 3500 Mile" which is also high-speed entry, but it is the one you would use in event we go to the longer entry ranges. Then the third profile will be "Nonexit Entry Number 1," and it will be followed by a fourth 3500 mile. So you have four entry profiles. Numbers 1 and 3, as you come to them, are the short ranges, and numbers 2 and 4 are the long-range scrolls. On coldsoak, I think we talked about what we're going to do there, but somewhere inside of about an hour, we'll want to get into the coldsoak business. We certainly don't want to do it at 12. Talking to the trajectory people - what they thought about water boiling -

something to keep in mind is the fact that they do see your water dumps and water boiling on your trajectory plot. It seems to be that it's a function of their computational scheme rather than a function of the fact that the trajectory is being perturbed that much. So it looks like one time that we're going to consider, if we're going to do some of this water boiling, we may do it just prior to the midcourse after all the tracking is settled down and they know what the midcourse correction will be. Then in that period just prior to the midcourse we can do it, and they'll pick up their tracking again following the midcourse correction. So if someone proposes that the - - It is probably nice to know that we are not throwing away our data at the most important time, that it is a function of the computer program rather than so much a function of your trajectory being changed.

04 22 28 04 LMP Let me ask you one thing then. Do you want a coldsoak sometime prior to the midcourse correction for 1 hour. Is that what you're trying to tell me?

04 22 28 12 CC Not really. I think we are looking at that prior to the midcourse correction as being the time when we would like to check out the water boilers. The coldsoak does involve some water boiler, too, but that's going to be done right before entry when these things are not going to be very sensitive,

and if we don't do it in 12 hours, it is not real clear where the coldsoak takes place or where you turn on the secondary water boiler. In looking through the entry checklist tonight, we didn't find a place for that.

04 22 28 48 LMP Okay. Is it really clear that you need the cold soak? We kind of figured on sometime prior to SEP bringing up the secondary EVAP, and also having the primary at that point sometime prior to that date on your suggestion.

04 22 29 06 CC Okay. We're talking about doing that like an hour prior to SEP; but in the pre-SEP check, one of the things we power down was the secondary loop. And they won't need to turn it back.

04 22 29 21 LMP We do that to save - -

04 22 29 22 CC Right. We're doing that to keep our power profile where we want it. And then we're going to be turning it back on sometime prior to entry. And the time to turn it on in entry, of course, isn't specified because as you turn it on, the voltages show that they can back it.

04 22 29 41 CDR Hopefully, right after separation.

04 22 29 43 CC That sounds like a real good place. Okay. I'm sure we're going to discuss that one a little bit more, Bill. But right now those are the kind of things we're talking about doing. And on the high gain, there is still a lot of discussion about

		as to what - exactly what we saw and what it means. And I think it is a little too early to tell you anything about that one.
04 22 30 11	LMP	Roger. I think it's got X-ray eyes.
04 22 30 17	CC	That's as good as some of the explanations.
04 22 30 26	LMP	Yes, I think that's what they hashed out on the ground, Ken.
04 22 30 29	CC	Okay. I think we all agree that we don't want to try experimenting with it if we really don't know what it is we're looking at.
04 22 30 39	LMP	Roger. I've written down some numbers here that I hope will be helpful.
04 22 30 43	CC	Okay. Fine.
04 22 30 46	LMP	And I'll give them to you in the debriefing.
04 22 30 49	CC	Real fine.
04 22 30 52	LMP	I don't think it's any great big deal, because the antenna switching is not hard at all and the ... is required to work; if it doesn't work as advertised, at least it works in a reasonable manner.
04 22 31 26	CC	Okay. And we're looking at 120 hours for the next water dump, Bill.
04 22 33 41	LMP	Ken, is it my imagination, or do you have the music running?
04 22 33 45	CC	I'm sorry; say again.
04 22 33 49	LMP	Is it my imagination, or do you have the music running?

04 22 33 54	CC	I think it's your imagination.
04 22 33 59	LMP	Uh-oh. Don't let the doctors hear that.
04 22 34 01	CC	It's too late; he already heard you.
04 22 34 06	LMP	I must be getting that detached feeling.
04 22 36 49	LMP	Apollo 8, Houston.
04 22 36 51	CC	Go ahead, 8.
04 22 36 55	LMP	Roger. Just to make sure the urge to get red and blue filter shots of the moon haven't crept into this TV test. We have got red and blue filter shots of the moon, so you need not worry about that.
04 22 37 12	CC	Okay. I don't think that would throw it away. I think we're trying to come up with something definitive so that postflight will have some real good data to compare with what we do on the ground for future work. I would like to have you go over and take a look at the battery Charlie, please.
04 22 37 35	LMP	I'm on my way.
04 22 38 08	LMP	Okay. Battery Charlie, that's about 36.8 volts.
04 22 38 13	CC	Okay, 36.8. Thank you.
04 22 38 19	LMP	Roger.
04 22 38 26	LMP	Also with respect to the TV test, I would think that we could probably get a pretty good handle on the operation just by taking red and blue and polarizing shots of the earth independent of the TV, but within the same time frame or at about the same range we had the TV last time.