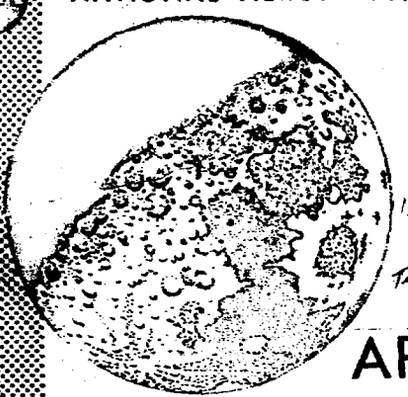
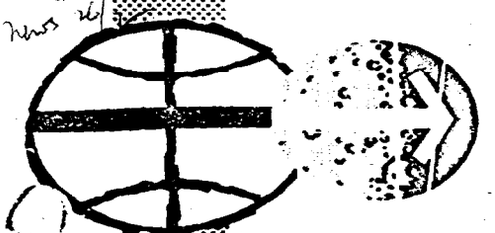
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION



APOLLO 8
TECHNICAL AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)



MANNED SPACECRAFT CENTER

HOUSTON, TEXAS

DECEMBER 1968

Introduction

This is the transcription of the Technical Air-to-Ground Voice Transmission (GOSS NET 1) from the Apollo 8 mission.

Communicators in the text may be identified according to the following list of definitions.

Command Module:

CDR	Commander	Frank Borman
CMP	Command module pilot	James A. Lovell
LMP	Lunar module pilot	William A. Anders
SC	Unidentifiable crewmember	

Mission Control Center:

CC	Capsule Communicator (CAP COMM)

Remote Sites:

CT	Communications Technician (COMM TECH)

A series of three dots (...) is used to designate those portions of the communications that could not be transcribed because of garbling. One dash (-) is used to indicate a speaker's pause or a self-interuption and subsequent completion of a thought. Two dashes (- -) are used to indicate an interruption by another speaker or a point at which a recording was terminated abruptly.

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

MILA (REV 1)

00 00 00 01	CDR	Lift off. The clock is running.
00 00 00 04	CC	Roger. Clock.
00 00 00 14	CDR	Roll and pitch program.
00 00 00 16	CC	Roger.
00 00 00 18	CDR	How do you hear me, Houston?
00 00 00 19	CC	Loud and clear.
00 00 00 42	CC	Mark Mode 1 Bravo, Apollo 8.
00 00 00 44	CDR	Mode 1 B.
00 00 00 58	CC	Apollo 8, you're looking good.
00 00 01 01	CDR	Roger.
00 00 01 52	CC	Mark Mode 1 Charlie, Apollo 8.
00 00 01 54	CDR	Mode 1 C.
00 00 02 07	CC	Apollo 8, Houston. You are GO for staging. Over.
00 00 02 10	CDR	Roger.
00 00 02 36	CDR	Staging.
00 00 03 05	CDR	... second plane SEP.
00 00 03 08	CC	Roger. Understand; SEP.
00 00 03 10	CDR	Roger.
00 00 03 31	CDR	Houston, how do you read? Apollo 8.
00 00 03 34	CC	We hear you loud and clear, Apollo 8.
00 00 03 35	CDR	Okay. The first stage was very smooth, and this one is smoother.
00 00 03 40	CC	Understand; smooth and smoother. Looks good here.

00 00 03 47	CC	Apollo 8, Houston. Your trajectory and guidance are GO. Over.
00 00 03 51	CDR	Thank you, Houston. Apollo 8.
00 00 04 58	CC	Apollo 8, Houston. Your trajectory and guidance are GO. Over.
00 00 05 02	CDR	Thank you, Michael.
00 00 05 04	CC	Yes, you're looking real good, Frank.
00 00 05 05	CDR	Very good.
00 00 05 59	CC	Apollo 8, Houston. Trajectory and guidance are GO.
00 00 06 02	CDR	Roger. Apollo 8. GO.
00 00 06 05	CC	MARK.
00 00 06 06	CC	You have S-IVB to orbit capability. Over.
00 00 06 09	CDR	Roger. Thank you. S-IVB to orbit.
00 00 07 01	CC	Apollo 8, Houston. Your trajectory and guidance are GO. Over.
00 00 07 05	CMP	Apollo 8's GO.
00 00 07 09	LMP	Onboard chart confirmed.
00 00 07 10	CC	Roger. Understand.
00 00 07 31	CMP	Just tried to PU shift, I believe.
00 00 07 37	CC	Roger. That's the correct time for it.
00 00 07 41	CMP	Roger.
00 00 08 03	CC	Apollo 8, Houston. Your trajectory and guidance are GO.
00 00 08 06	CDR	Roger. We're picking up a slight POGO at this point.

00 00 08 11	CDR	Understand; slight POGO. Thank you.
00 00 08 30	CC	Apollo 8, Houston. You have level SENS time. Over.
00 00 08 32	CDR	Roger. Level SENS ON.
00 00 08 35	CDR	The POGO's damping out.
00 00 08 37	CC	Understand; POGO damping out.
00 00 08 42	CC	Apollo 8, Houston. You look good for staging.
00 00 08 45	CDR	Staging?
00 00 08 50	CDR	S-IVB ignition.
00 00 08 59	CDR	Guidance INITIATE.
00 00 09 06	CDR	Hey, Houston. How do you read? Apollo 8.
00 00 09 07	CC	Apollo 8, reading you loud and clear.
00 00 09 09	CDR	Okay. We got guidance INITIATE.
00 00 09 12	CC	Roger. Understand.
00 00 09 14	CC	Trajectory and guidance are GO.
00 00 09 17	CDR	Thank you.
00 00 09 49	CC	Mark Mode 4, Apollo 8.
00 00 09 52	CDR	Mode 4. Roger.
00 00 09 57	CC	Apollo 8, Houston. Your predicted cutoff, 11 plus 28. Over.
00 00 10 03	CDR	Understand; 11:28.
00 00 10 06	CC	Roger.
00 00 10 44	CDR	How do you read, Houston?

00 00 10 46	CC	Reading you loud and clear.
00 00 10 49	CC	Go ahead, Apollo 8.

00 00 10 50	CC	Apollo 8, this is Houston. Over.
00 00 10 54	CDR	Loud and clear, Houston. Loud and clear.
00 00 10 57	CC	Roger. You're looking good, Apollo 8.
00 00 11 16	CDR	HP is coming up —
00 00 11 21	CDR	HP is plus.
00 00 11 30	CDR	— and we have SECO.
00 00 11 33	CC	Roger. SECO.
00 00 11 58	CC	Apollo 8, Houston. You are GO.
00 00 12 01	CDR	Apollo 8 is GO. Thank you, Houston.
00 00 12 11	CDR	AOS is MANUAL.
00 00 12 16	CDR	... is OFF.
00 00 12 19	CMP	Houston, we're recording altitude HA 1026, HP 96.8, RVI 25 560.
00 00 12 32	CC	Roger, Apollo 8. Understand; apogee 102.6, perigee 96.8, and velocity - I understand - 25 560. Could you confirm?
00 00 12 44	CMP	That's affirmative.
00 00 12 45	CC	Thank you, Jim.
00 00 13 04	CC	Apollo 8, Houston. We are rewinding the tape recorder at this time. Over.
00 00 13 10	CDR	Roger.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

00 00 13 37	CC	Apollo 8, Houston. We have you apogee 103, perigee 99. Over.
00 00 13 46	CMP	103, 99.
00 00 13 49	CC	Roger.
00 00 14 28	CC	Apollo 8, Houston. We have you 1 minute from LOS the Vanguard. We'll see you over the Canaries at 16:28.
00 00 14 37	CDR	Thank you, Houston; 16:28.
00 00 14 39	CC	Roger.

CANARY (REV 1)

00 00 16 31	CC	Apollo 8, Houston through the Canaries. How do you read me?
00 00 16 35	CDR	You are loud and clear, Houston, over the Canaries.
00 00 16 37	CC	Good; you are clear, too. How is it going?
00 00 16 43	CDR	Fine. We seem to be going along very well. We noticed about a 10-pound DELTA-V between the oxygen fuel in the SPS zone.
00 00 17 01	CC	Apollo 8, Houston. That is normal; that's just about what we expected. Over.
00 00 17 07	CDR	Roger.
00 00 20 28	CC	Apollo 8, Houston.
00 00 20 33	CMP	This is 8. Go ahead.
00 00 20 34	CC	Roger, Jim. When you do your P52, you can expect a torquing angle of 0.25 degrees. Over.

00 00 20 44	CMP	Roger. Torquing angle of 0.25 degrees when we do P52. Thank you.
00 00 20 50	CC	Roger.
00 00 21 39	CMP	Stand by for the - a - stand by. Okay. Main REG B valve closed.
00 00 21 49	CC	Apollo 8, Houston. Say again.
00 00 21 53	CDR	Negative. We didn't say anything. Go ahead, Houston.
00 00 21 54	CC	I think you were transmitting; Jim was transmitting and disregard.
00 00 21 59	CDR	Roger. No matter.
00 00 22 28	CC	Apollo 8, Houston.
00 00 22 31	CDR	Go ahead, Houston. Apollo 8.
00 00 22 33	CC	Roger. You have 1 minute to LOS Canaries. Everything is looking good on board the spacecraft and the S-IVB; we will see you over Tananarive at 37 minutes. Over.
00 00 22 44	CDR	Roger. Thank you, Houston. Apollo 8.
00 00 22 57	CC	Apollo 8, Houston. You have the tape recorder low bit rate. Over.
00 00 23 02	CDR	Thank you.
00 00 23 03	CC	You are welcome.
		TANANARIVE (REV 1)
00 00 37 06	CC	Apollo 8, Houston. Over.
00 00 37 18	CDR	Houston, Apollo 8. How do you read?
00 00 37 20	CC	Apollo 8, Houston. Reading you weak but clear. How me?

00 00 37 25	CDR	You're loud and clear, Mike. Everything seems to be going very well.
00 00 37 30	CC	Okay. Everything looks real good on the ground with both vehicles. We still have you 103 by 99 on your orbit from my low speed data, and everything is looking real good. Over.
00 00 37 41	CDR	Roger. Thank you.
00 00 41 37	CC	Apollo 8, Houston.
00 00 41 41	CDR	Go ahead, Houston. Apollo 8.
00 00 41 43	CC	We have 1 minute to LOS Tananarive; we will see you again over Carnarvon at 52:09. Over.
00 00 41 51	CDR	Roger. We do have the optic covers jettisoned, and everything seems to be going fine.
00 00 41 56	CC	Roger. Optics cover jettisoned. Thank you.
		CARNARVON (REV 1)
00 00 52 44	CC	Apollo 8, Houston.
00 00 52 48	CDR	Go ahead, Houston. Apollo 8. You're loud and clear.
00 00 52 50	CC	Roger. You're loud and clear over Carnarvon. We would like to take DSE away from you for a second.
00 00 52 56	CDR	Roger. Go ahead.
00 00 52 57	CC	Thank you.
00 00 55 03	CDR	Lots of lights down there.
00 00 56 00	LMP	Houston, this is Apollo 8.
00 00 56 03	CC	Houston here, Apollo 8. Go ahead.

00 00 56 06	LMP	Roger. The torquing angle's 00026; that's plus 00026 plus 00035 plus 00119.
00 00 56 25	CC	Roger. Apollo 8, Houston. And copy plus 00026 plus 00035 plus 00119.
00 00 56 39	LMP	Roger. We checked on stars 6 and 15, and the error was plus 00001.
00 00 56 51	CC	Sounds pretty good.
00 00 56 55	LMP	Pretty good for a beginner here.
00 00 56 57	CC	Right.
00 00 57 05	CC	Apollo 8, Houston. We have about 1 minute to LOS Carnarvon, and everything is looking good with the spacecraft and the S-IVB. We'll see you over Honeysuckle Creek at 59:27 - just here shortly.
00 00 57 18	LMP	Thank you.
		HONEYSUCKLE (REV 2)
00 01 00 57	LMP	Hello, Houston. Apollo 8. How do you read?
00 01 01 00	CC	Loud and clear, Apollo 8. Houston here.
00 01 01 05	LMP	... How do you read?
00 01 01 06	CC	Apollo 8, Houston. Loud and clear. Over.
00 01 01 18	LMP	Houston, Apollo 8. How do you read?
00 01 01 20	CC	Reading you loud and clear, Bill. How me?
00 01 01 53	LMP	Houston, Apollo 8. Over.
00 01 01 57	CC	Apollo 8, Houston. Loud and clear. Over.
00 01 02 17	CC	Apollo 8, Houston. Over.
00 01 02 25	CC	Apollo 8, this is Houston. Over.

00 01 02 46	CC	Apollo 8, this is Houston. Over.
00 01 03 13	CC	Apollo 8, this is Houston. Over.
00 01 03 17	LMP	Houston, Apollo 8 on S-band. If you read, everything is GO.
00 01 03 21	CC	Roger. Understand, Apollo 8.
00 01 04 10	CC	Apollo 8, this is Houston. Over.
00 01 04 13	LMP	Roger, Houston. Read you loud and clear.
00 01 04 15	CC	We are reading you loud and clear also, Bill. The problem here over Honeysuckle has been on the ground. Your spacecraft equipment is all working fine. We are going to have LOS in about a minute, and we will pick you up over Guaymas at 01:28:13. Over.
00 01 04 32	LMP	Roger. 01:28:13; thank you.
00 01 04 35	CC	Roger.
00 01 04 37	CC	We are giving the DSE back to you, Apollo 8.
00 01 04 40	LMP	Roger. Thank you.
		CALIFORNIA (REV 2)
00 01 28 52	CC	Apollo 8, Houston. Over.
00 01 29 06	CC	Apollo 8, this is Houston. Over.
00 01 29 26	CC	Apollo 8, Apollo 8, this is Houston. Over.
00 01 30 14	CC	Apollo 8, this is Houston. Over.
00 01 30 17	LMP	Houston, Apollo 8. Over.
00 01 30 18	CC	Roger. How do you read me?
00 01 30 27	CC	Apollo 8, this is Houston. Over.
00 01 30 29	LMP	Roger. Houston, Apollo 8. Standing by for a GO for the backup COMM check. Over.

00 01 30 34	CC	Roger. Stand by one, Bill.
00 01 30 46	CC	California, inhibit VHF downlink.
00 01 30 50	CT	California inhibited.
00 01 30 52	CC	Apollo 8, this is Houston. Go ahead with backup voice check.
00 01 31 05	CC	Apollo 8, this is Houston. Go ahead with backup voice check. Over.
00 01 31 21	CC	Apollo 8, Houston. Go ahead with backup voice check. Over.
00 01 31 25	LMP	Roger, Mike. I gave you a count. I'll give you another one. Are you standing by?
00 01 31 29	CC	Roger. Standing by.
00 01 31 31	LMP	Roger. This is Apollo 8 through backup voice: 1, 2, 3, 4, 5, 5, 4, 3, 2, 1. Over.
00 01 31 42	CC	Roger, Bill. Reading you weak but clear. Go ahead with normal S-band voice check.
00 01 31 49	LMP	Roger.
00 01 32 11	CC	Apollo 8, Houston. Over.
00 01 32 18	LMP	Houston, this is Apollo 8 on normal S-band: 1, 2, 3, 4, 5, 5, 4, 3, 2, 1. How do you read? Over.
00 01 32 25	CC	Apollo 8, Houston. Reading you loud and clear normal S-band. How me?
00 01 32 49	CC	Apollo 8, Houston. Reading you loud and clear on normal S-band. How me? Over.
00 01 33 03	CC	Apollo 8, Houston. Over.

00 01 33 06	LMP	Roger, Houston. This is Apollo 8. Reading you loud and clear on normal.
00 01 33 13	CC	Roger. Reading you loud and clear on normal S-band. How me?
00 01 33 20	LMP	Clear.
00 01 33 29	CC	Apollo 8, Houston. Over.
00 01 33 32	LMP	Houston, this is Apollo 8. How do you read on VHF? Over.
00 01 33 35	CC	Apollo 8, Houston. Reading you loud and clear. We are also reading you loud and clear on S-band normal. How me? Over.
00 01 33 43	LMP	Roger. I'm reading you loud and clear. I'll give you another count on S-band normal: 1, 2, 3, 4, 5, 5, 4, 3, 2, 1. How do you read me?
00 01 33 52	CC	Roger. That's loud and clear, Bill. California, would you ENABLE the VHF downlink, please?
00 01 34 07	CT	California ENABLED.
00 01 34 50	CC	Apollo 8, Houston. Over.
00 01 34 53	CMP	Go ahead, Houston.
00 01 34 55	CC	Roger. We are going to rewind your tape recorder, and we have the TLI plus 90 and TLI plus 4-hour PAD's at your convenience. Over.
00 01 35 11	CMP	Roger. Ready to copy.
00 01 35 13	CC	Roger. TLI plus 90, SPS slash G&N, 635 31 minus 164 plus 129. Are you with me so far? Over.
00 01 35 36	CMP	Roger. We're with you.

00 01 35 38	CC	Okay. 004 17 42 65 minus 04402 minus 00001 plus 48387 178 169 359, not applicable, plus 00185 48587 603 48383 06 2027 250, earth center 0123 - correction: down 123; I say again, down 123, right 22 plus 21123 minus 03000 12313 34494 017 47 39, north set stars roll 068, pitch 097, yaw 356, ullage none; other: high speed procedure not required. Over.
00 01 38 17	CMP	Houston, this is Apollo 8. We missed a portion of that maneuver PAD. Can you start with HP and go down to boresight star? Over.
00 01 38 31	CC	Roger. I say again, HP plus 00185. Are you with me?
00 01 38 41	CMP	Roger. We're with you.
00 01 38 43	CC	48587 603 48383 06 2027 250, and the boresight star is earth's center. Over.
00 01 39 33	CC	Apollo 8, Houston. Did you copy?
00 01 39 35	CMP	Roger, Houston. This is a TLI plus 90 as follows: minus - the weight will be plus 63531 minus 164 plus 129 0041 74265 minus 04402 minus 0001 plus 48387 178 169 359 plus 00185 48587 603 48383. We will have to get the sextant information later; 123 minus 030.
00 01 41 18	CC	Apollo 8, Houston. Over.
00 01 41 19	CMP	Houston, did you copy?

BERMUDA (REV 2)

00 01 41 21	CC	Apollo 8, Houston. We are picking you up now over Bermuda. I did not copy your readback after DELTA-V_C. That was the last quantity - I received.
00 01 41 32	CMP	Roger, Houston. Could you give us the sextant information again, the sextant star information?
00 01 41 38	CC	That's affirmative. The sextant star 06, shaft 2027, trunnion 250. Over.
00 01 41 53	CMP	Roger. Starting out with the sextant star, 06 2007 250, earth's center down 123, right 22 plus 1123 minus 03000 12313 34494 017 47 39; north set, roll 068, pitch 097, yaw 356, no ullage.
00 01 42 34	CC	Roger. Jim, on your sextant star, the shaft should be 2027 - 2027. Over.
00 01 42 44	CMP	Roger. Copy 2027.
00 01 42 51	CC	Apollo 8, Houston. Would you go to POO and ACCEPT, please? We want to send up the state back zero.
00 01 43 02	CMP	We are in ACCEPT.
00 01 43 05	CC	Roger. You are in ACCEPT.
00 01 43 08	CMP	Roger. Go ahead. We are in POO and ACCEPT.
00 01 43 11	CC	Thank you. I have your TLI plus 4-hour PAD when you are ready to copy and your TLI PAD also.
00 01 43 19	CMP	Ready to copy.

00 01 43 21	CC	Okay. TLI plus 4 hours, SPS/G&N. Weight is still 63531 as printed; the pitch and yaw minus 164 and plus 129. Are you with me so far?
00 01 43 43	CMP	We are with you.
00 01 43 45	CC	GETI 006 47 27 79 minus 01594 plus 00000 plus 52885 178 155 000, not applicable, plus 00192 52909. Are you with me? Apollo 8, Houston. Over.
00 01 44 47	CMP	This is Apollo 8. You're braking lock on S-band, and again, you got cut off just at HP.
00 01 44 53	CC	Okay. HP plus 00192 52909 627 52694. Are you with me? Over.
00 01 45 23	CMP	Roger.
00 01 45 26	CC	Roger. Sextant star, 12 1037 211, earth center down 063, right 23 plus 1068 minus 16500 12505 35061 026 42 57 north set stars, roll 068, pitch 097, yaw 356, ullage none, high speed procedure not required. Over.
00 01 46 47	CMP	Roger, Houston. TLI plus 4. Weight remains the same, minus 164 plus 129 006 47 27 79 minus 01594 plus all balls plus 52885 178 155 000 NA plus 00192 52909 627 52694 12 1037 211, earth center down 063, right 213 plus 1068 minus 16500 12505 35061 026 42 57, north set roll 068, pitch 097, yaw 356, no ullage, high speed procedure not required.

00 01 48 07	CC	Very good. That's all correct, and I have a TLI PAD for you whenever you're ready to copy it.
00 01 48 16	CMP	Ready to copy.
00 01 48 17	CC	Okay. Your computer PAD is in and verified. You can go to BLOCK, and we're going to have LOS here in about 45 seconds. I'll start on the TLI PAD anyway. Time base 6P24136, roll 179, pitch 045, yaw 001, born time 5 plus 15, DELTA V_C prime 105 196 ZI 35569, roll 357, pitch 091, yaw 001. Comments: TLI plus 10 minutes; abort attitude is 199 degrees, and I don't believe you've got time to read that back. We'll see you over Canaries at 1:50 GET. Adios.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

CANARY (REV 2)

00 01 50 30	CC	Apollo 8, Houston. Over.
00 01 50 33	CMP	Roger. Houston, Apollo 8. Reading you loud and clear. TLI plan 24136 179 045 001 515 105196 35569 357 091 001; TLI plus 10, abort -ttitude 199 on the pitch.
00 01 51 06	CC	Roger, Apollo 8. That is correct. We'd like to double check one number on the TLI plus 90 minutes. When you can dig that out, let me know.
00 01 51 18	CMP	Roger. Go ahead.
00 01 51 19	CC	Okay. It's - the sextant shaft angle should be 2027. Over.
00 01 51 29	CMP	Roger. Sextant shaft is 2027.
00 01 51 35	CC	Thank you, sir.
00 01 53 09	CC	Apollo 8, Houston. Over.
00 01 53 12	LMP	Go ahead, Houston.
00 01 53 13	CC	Roger. S-IVB looking good, both from a guidance and a consumable viewpoint; it all looks GO.
00 01 53 20	LMP	Roger.
00 01 53 30	CC	The DSE is all yours, Bill.
00 01 53 32	LMP	Thank you.
00 01 54 18	CC	Apollo 8, Houston. We will have LOS in 1 minute; we'll pick you up again over Tananarive at 02:09.

00 01 54 28	CDR	Roger, Michael. Thank you.
00 01 54 30	CC	Roger. How does it feel up there?
00 01 54 33	CDR	Very good, very good. Everything is going rather well. It looks just about the same way it did 3 years ago.
00 01 54 42	CC	Has Bill got time from playing with his tape recorder to look out the window?
00 01 54 45	CDR	Roger. We had one little incident here. Jim Lovell inadvertently popped one liferaft, so we've got one full May West with us here.
00 01 55 02	CC	Roger. Understand.
		TANANARIVE (REV 2)
00 02 09 49	CC	Apollo 8, Houston through Tananarive. Over.
00 02 09 55	CDR	Roger. Houston, this is Apollo 8.
00 02 09 57	CC	Roger, Apollo 8. We don't have anything for you; we are just standing by. You're looking good.
00 02 10 02	CDR	Roger. Thank you.
00 02 14 07	CC	Apollo 8, Houston.
00 02 14 11	CDR	Gemini 8 - correction: Apollo 8.
00 02 14 16	CC	Roger. Gemini 8, Houston. We would like to bring you up to date on the COMM situation while we've got some quiet time here. We'll be LOS Tananarive in another 2 minutes; we'll be picking you up over Carnarvon at 2 hours 25 minutes and 22 seconds. LOS Carnarvon will

be 02:31:55; then we've got ARIA number 1 coming in about 02:37:30; and after that, we will have a hand-off to Mercury to Hawaii to Goldstone, and we should have continuous COMM. Over.

00 02 14 28 CDR Very good. That's very good. Thank you.

00 02 15 01 CC Roger.

00 02 15 10 CC Thought you were Gemini 7, not 8.

00 02 15 14 CDR Roger.

CARNARVON (REV 2)

00 02 26 02 CC Apollo 8, Houston. Over.

00 02 26 06 CDR Go ahead, Houston. Apollo.

00 02 26 08 CC Roger. Loud and clear. We'd like to take your tape recorder for 2 minutes, please.

00 02 26 13 CDR Can he have it, Bill?

00 02 26 15 LMP Go ahead.

00 02 26 16 CDR Thank you.

00 02 26 20 CC By the way, we read out the voice tape, and the quality of the voice tape is good - from the DSE.

00 02 26 28 CDR Good.

00 02 27 20 CC Apollo 8, Houston.

00 02 27 21 CDR Go ahead, Houston.

00 02 27 22 CC Alright, Apollo 8. You are GO for TLI. Over.

00 02 27 27 CDR Roger. We understand we are GO for TLI.

00 02 31 26 CC Apollo 8, Houston. Over.

00 02 31 29	CDR	Go ahead, Houston. Apollo 8.
00 02 31 31	CC	Roger. We will have LOS in about 30 seconds, and we'll pick you up over ARIA 1 at 02:37:30.
00 02 31 38	CDR	Roger.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

ARIA 1 (REV 2)

00 02 38 21	CDR	Houston, this is Apollo 8. How do you read?
00 02 38 24	CC	Apollo 8, Houston. Over.
00 02 38 29	CDR	Houston, Apollo 8. I hear you garbled but fairly clear.
00 02 38 33	CC	Roger. Apollo 8, Houston. We're transmitting through ARIA 1, and you are also garbled.

MERCURY (REV 2)

00 02 45 12	CC	Apollo 8, Houston. Over.
00 02 45 15	CDR	Go ahead, Houston. Apollo 8.
00 02 45 17	CC	Good; you're loud and clear through the Mercury, and you're looking good down here. Everything looks good.
00 02 45 23	CDR	Roger. Understand. Our O_2 flow is a little bit higher than I thought, but Bill says that it's just about what he expected.
00 02 45 31	CC	Roger. Understand.
00 02 45 36	CC	Your He flow looks good down here.
00 02 45 43	CDR	Thank you.
00 02 49 28	CC	Apollo 8, Houston. You're looking good.
00 02 49 31	CDR	Roger.
00 02 50 13	CC	Apollo 8, coming up on 20 seconds to ignition. Mark it, and you're looking very good.
00 02 50 20	CDR	Roger.
00 02 50 40	CMP	IGNITION.
00 02 50 41	CC	Roger. IGNITION.

GET 2:50:37.1

00 02 51 12	CC	Apollo 8, Houston. You're looking good.
00 02 51 58	CC	Apollo 8, Houston. Trajectory and guidance look good. Over.
		HAWAII (REV 2)
00 02 52 02	CDR	Roger. Apollo 8, looks good here.
00 02 52 19	CC	Apollo 8, Houston. We're predicting cut-off, 02:55:58, and it looks exactly nominal here.
00 02 52 27	CDR	Roger.
00 02 52 34	CC	Apollo 8, Houston. That predicted cut-off, 02:55:52, 52, and that's exactly as it should be.
00 02 52 40	CDR	02:55:52.
00 02 53 42	CC	Apollo 8, Houston. You are looking good here, right down the center line.
00 02 53 45	CDR	Roger. Apollo 8.
00 02 54 54	CC	Apollo 8, Houston. You are looking good, right down the old center line.
00 02 54 58	CDR	Roger. Apollo 8.
00 02 55 57	CDR	Okay. We got SECO right on the money.
00 02 55 58	CC	Roger. Understand; SECO.
00 02 57 27	CC	Apollo 8, Houston. Looks like a good cut-off. Everything is looking real good down here.
		CALIFORNIA (REV 2)
00 02 58 04	CC	Apollo 8, Houston.
00 02 58 06	CDR	Go ahead, Houston. Apollo 8.

00 02 58 07	CC	Your cut-off looked very good down here. We have a whole room full of people that say you look good.
00 02 58 11	CDR	Roger. Thank you. The only situation we have here is the O_2 flow is high, O_2 flow is a bit high.
00 02 58 22	CC	Roger. Understand; O_2 flow high.
00 02 58 24	CMP	We'll get to first status report here shortly.
00 02 58 26	CC	Roger.
00 02 58 57	CC	Apollo 8, Houston. Your booster configured normally, and we're not concerned with the O_2 high flow. We think it's normal.
00 02 59 05	CDR	Okay.
00 02 59 52	CMP	Houston, Apollo 8.
00 02 59 54	CC	Go ahead, Apollo 8.
00 02 59 56	CMP	Roger. The DELTA-TIG looked like it was right on. Burn time appeared to us to be about 2 seconds longer, 517. VGX was reading 95485 when we got it. The attitude was nominal. V_I was reading 35452 at cut-off, H-dot 04552, and H is 01791. DELTA-V_C on the EMS was minus 20.6.
00 03 00 35	CC	Roger. We copy that, Jim, and I've got some times here for you.
00 03 00 41	CMP	Roger. Go ahead.
00 03 00 42	CC	Booster begins maneuver to SEP attitude at 03:10:55. Takes 5 minutes, so it arrives at

		03:15:55, and SEP time, 03:20:55. Your SEP attitude, the gimbal angles on the PAD remain good.
00 03 01 06	CMP	Roger. I have those times. The SEP time will be 03:20:55.
00 03 01 10	CC	Right.
00 03 03 08	LMP	Houston, Apollo 8. Over.
00 03 03 10	CC	Apollo 8, Houston. Go ahead.
00 03 03 12	LMP	Roger. Going to start charging battery B.
00 03 03 15	CC	Okay. Battery B.
00 03 03 17	LMP	And would you keep a special eye on the purge tank and cryo O_2 tank 1 DELTA-V for us since our flowmeter is pegged out, we got no warning on O_2 high flow.
00 03 03 29	CC	Roger, Bill. We'll do that for you.
00 03 03 31	LMP	Thank you.

END OF TAPE

NOTE

Subsequent to TLI, there is continuous acquisition among Goldstone (GDS), Madrid (MAD), and Honeysuckle (HSK).

00 03 11 08	CDR	Okay. Maneuvers started to separation attitude.
00 03 11 12	CC	Roger, Apollo 8.
00 03 11 21	CDR	Houston, Apollo 8. How do you read?
00 03 11 23	CC	Yes, reading you loud and clear, Frank. Understand you've started the maneuver to SEP attitude.
00 03 11 27	CDR	Roger.
00 03 11 28	CC	Are you reading us alright?
00 03 11 30	CDR	Loud and clear.
00 03 11 31	CC	Thank you.
00 03 14 16	CC	Apollo 8, Houston.
00 03 14 18	CDR	Go ahead, Houston. Apollo 8.
00 03 14 19	CC	Okay. Coming up on 3 hours and 15 minutes as per flight plan; we have you GO.
00 03 14 26	CDR	Roger. GO.
00 03 14 29	CDR	You got any reading on that O_2 flow?
00 03 14 32	CC	Stand by one.
00 03 14 50	CC	Apollo 8, Houston.
00 03 14 51	CDR	Go ahead.
00 03 14 52	CC	We're reading about the same as we were before on that oxygen flow. The reason it's that high is due to the cabin gas changeover. According to Apollo 7, if your data repeats theirs, you can expect it to be high for another few hours.
00 03 15 10	CDR	Roger. Thank you.
00 03 15 43	CC	Apollo 8, Houston.
00 03 15 47	CDR	Go ahead.

00 03 15 48	CC	You can expect that the S-IVB will be 10 degrees off in pitch at SEP attitude; however, that is GO. There is no problem involved.
00 03 15 57	CDR	Roger.
00 03 20 25	CC	Apollo 8, Houston.
00 03 20 27	CDR	Go ahead, Houston.
00 03 20 28	CC	Roger. We have you about 30 seconds prior to separation, and everything's looking good.
00 03 20 33	CDR	Roger.
00 03 21 55	CDR	What a view!
00 03 21 58	CC	Looks pretty good, huh?
00 03 22 12	LMP	We've SEP'd Houston. We got the IVB, right?
00 03 22 16	CC	Roger, Apollo 8.
00 03 22 52	LMP	Houston, do you read Apollo 8?
00 03 22 53	CC	Go ahead, Apollo 8.
00 03 23 01	CC	Apollo 8, Houston. Over.
00 03 23 16	CC	Apollo 8, this is Houston. Over.
00 03 23 26	LMP	This is Apollo 8 on VHF and S-band. How do you read?
00 03 23 29	CC	Hear loud and clear, Bill. How me?
00 03 23 31	LMP	Read you loud and clear. We have SEP and looking good.
00 03 23 34	CC	Roger. Looking good here.
00 03 28 23	CDR	Houston, Apollo 8. How do you read?
00 03 28 25	CC	Read you loud and clear, Frank. How us?

00 03 28 27	CDR	Roger. Loud and clear. We are taking pictures of the S-IVB; the postseparation sequence is completed, and we seem to have a high gain.
00 03 28 39	CC	Okay; fine.
00 03 30 38	CC	Apollo 8, Houston.
00 03 30 40	CDR	Go ahead, Houston. Apollo 8.
00 03 30 41	CC	Roger. Is Bill ready for his VHF test? We can configure any time he is.
00 03 30 48	CDR	Okay. Stand by.
00 03 35 21	CC	Apollo 8, Houston.
00 03 35 22	CDR	Go ahead, Houston. Apollo 8.
00 03 35 24	CC	Roger. We would like to ask whether you did a VERB 66 ENTER to transfer the state vector from CSM to LM slot. We didn't copy that down here.
00 03 35 32	CDR	We did not.
00 03 35 33	CC	Okay.
00 03 35 34	CDR	Do you want us to do that now?
00 03 35 36	CC	At your convenience.
00 03 35 38	CMP	Roger.
00 03 35 44	CDR	We see the earth now, almost as a disk.
00 03 35 49	CC	Good show. Get a picture of it.
00 03 35 51	CDR	We are.
00 03 35 54	CMP	Tell Conrad he lost his record.
00 03 35 59	CMP	We have a beautiful view of Florida now. We can see the Cape, just the point.

00 03 36 05	CC	Roger.
00 03 36 06	CMP	And at the same time, we can see Africa. West Africa is beautiful. I can also see Gibraltar at the same time I'm looking at Florida.
00 03 36 20	CC	Sounds good. Get a picture of it. What window are you looking out?
00 03 36 29	CMP	The center window.
00 03 36 30	CC	Roger.
00 03 36 39	CC	Are your windows clear so far?
00 03 37 08	CC	Apollo 8, Houston.
00 03 37 10	CDR	Go ahead, Houston.
00 03 37 11	CC	How about your VHF check? We would like to get that done before you get too much further away.
00 03 37 34	CDR	Okay.
00 03 37 38	CDR	We are listening on VHF now for Simplex.
00 03 37 42	CC	Apollo 8, Houston. Say again.
00 03 37 45	CDR	We are listening for VHF alfa Simplex.
00 03 37 48	CC	Okay, good. Thank you. VHF alfa Simplex, and we will get configured for it; and in between times, give us a clue as to what it looks like from way up there.
00 03 38 00	CMP	Roger. Well, Mike, I can see the entire earth now out of the center window. I can see Florida, Cuba, Central America, the whole northern half of Central America, in fact, all the way down through Argentina and down through Chile.

00 03 38 25	CC	They picked a good day for it.
00 03 38 30	CDR	Stand by. We are going through the separation maneuver checklist here.
00 03 38 34	CC	Roger. Standing by.
00 03 39 20	CDR	Houston, this is Apollo 8. We've lost sight of the S-IVB here. The separation maneuver may be delayed slightly, or else we will go ahead and make it without having her in sight.
00 03 39 30	CC	Roger. Understand, Frank.
00 03 41 58	CDR	Houston, Apollo 8.
00 03 42 01	CC	Apollo 8, Houston. Go ahead.
00 03 42 03	CDR	When does the S-IVB do their blowdown maneuver?
00 03 42 05	CC	Stand by one.
00 03 42 42	CC	Apollo 8, Houston.
00 03 42 46	CDR	Go on.
00 03 42 48	CC	Your blowdown will be 1 hour from now, a little more that 1 hour from now.
00 03 42 51	CDR	Roger. We have the S-IVB in sight again now. We have done the separation maneuver.
00 03 42 55	CC	Good show. Thank you.
00 03 43 25	CC	Apollo 8, Houston.
00 03 43 31	LMP	Go ahead, Houston.
00 03 43 32	CC	We would like to take control of the DSE for a while, Bill.
00 03 43 35	LMP	Go ahead.
00 03 43 36	CC	Thank you.

00 03 43 54	CC	Apollo 8, Houston. We would like to get an approximate GET of your SEP maneuver to use for our ephemeris tracking data.
00 03 44 06	CDR	Roger. It was 3 hours 40 minutes zero seconds.
00 03 44 10	CC	Good, 03:40 and a foot and a half - feet per second. Right?
00 03 44 15	CDR	Roger. About that --
00 03 44 16	CC	Okay.
00 03 44 18	CDR	-- We have the - Mike, we have the exact callout here for you and a burn status report.
00 03 44 22	CC	Alright.
00 03 44 28	CDR	Alright, DELTA-V_X minus 00011, DELTA V_Y plus 0002, DELTA-V_Z minus 0002, roll 0, pitch 180, yaw 0. Over.
00 03 44 46	CC	Roger, Apollo 8.
00 03 46 25	CC	Apollo 8, Houston.
00 03 46 29	CDR	Go ahead, Houston. Apollo 8.
00 03 46 31	CC	Roger. At your convenience, would you please go POO and ACCEPT? We're going to update to your W matrix. And also when you get a chance, we would like to know about the SLA panels. Did they all depart? And do you have any comments about the SLA?
00 03 46 43	CDR	They all departed, and they worked fine.
00 03 46 47	CC	Okay. Thank you.
00 03 46 58	SC	We are in POO and ACCEPT.

00 03 47 00	CC	Thank you.
00 03 48 26	CDR	Houston, Apollo 8. Will you give us the information when you want us to stop the venting and so on?
00 03 48 32	CC	Apollo 8, Houston. Roger.
00 03 50 39	CC	Apollo 8, Houston.
00 03 50 42	CDR	Go ahead, Houston.
00 03 50 44	CC	Roger. What is the venting information are you inquiring about: the O_2 flow high out through the waste tank or waste compartment, or are you talking about your evaporator?
00 03 50 53	CDR	Evaporator. We are configuring now to stop boiling.
00 03 50 56	CC	Okay.
00 03 50 58	CC	We concur in that.
00 03 51 02	CC	Apollo 8, Houston. You can go back to BLOCK. We have gotten in the load to the W matrix update.
00 03 51 10	CDR	Roger.
00 03 51 58	CDR	Houston, Apollo 8. The back pressure valve is closed, and the water flow is OFF.
00 03 51 03	CC	Back pressure valve closed, and water flow OFF. Thank you.
00 03 53 04	CDR	Houston, Apollo 8 here.
00 03 53 05	CC	Apollo 8, Houston. Go ahead.

00 03 53 07	CDR	Roger. It looks like I might have to do a couple more small maneuvers to stay away from the front of this S-IVB, the way we are ending up now. Do you want me to do these with our P47 if we have to do them?
00 03 53 19	CC	Stand by one, Frank.
00 03 53 28	CC	That's affirmative, Frank, on this P47.
00 03 53 30	CDR	Okay. And give me the time again when it starts to damp, please.
00 03 53 35	CC	Roger. We're working on an exact GET of that, Frank.
00 03 53 48	CDR	Roger.
00 03 54 54	CC	Apollo 8, Houston.
00 03 54 57	CDR	Go ahead.
00 03 54 58	CC	I'd like to give you some idea about your trajectory. It looks like a midcourse correction number 1, projected out to TLI plus 6 hours, would be only 7 feet per second. So, of course, any further maneuvers you do would add to that, which is probably good.
00 03 55 24	CDR	I just want to stay from away from in front of this thing.
00 03 55 27	CC	Roger. We concur. Looks like it is chasing you, huh?
00 03 55 32	CDR	Yes.
00 03 55 53	LMP	OMNI D.

00 03 56 01	CDR	Boy, it's starting to vent now, blowing down.
00 03 56 07	CC	Apollo 8, Houston. Say again.
00 03 56 09	CDR	The S-IVB is really venting.
00 03 56 13	CC	Roger. Understand; that is supposedly a non-propulsive vent. The big blowdown maneuver, it starts maneuvering to blowdown attitude at 04:44:55, and the vent occurs at 05:07:55.
00 03 56 32	CDR	05:07:55.
00 03 56 34	CC	Roger.
00 03 56 35	CDR	That is the nonpropulsive vent, but it's pretty spectacular. It's spewing out from all sides like a huge water sprinkler.
00 03 56 45	CC	Roger. Get some pictures of it.
00 03 56 48	CDR	We are.
00 03 57 07	CDR	Say again that big vent time, so I can write it down please, Houston.
00 03 57 11	CC	Roger. Big vent time 05:07:55, and it will maneuvering to vent attitude beginning at 04:44:55. Bill has got the tape recorder back.
00 03 57 32	CDR	Thank you. Roger.
00 03 58 31	CDR	We're receiving VHF music now, Houston. Thank you.
00 03 56 35	CC	Yes, you took the words right out of my mouth, Frank, and we would like to know also how far away from the S-IVB you are now.
00 03 58 48	CDR	I guess we are between 500 to 1000 feet.

00 03 58 51	CC	Roger.
00 03 58 57	CDR	Herb Alpert seems pretty good.
00 03 59 00	CC	Roger.
00 04 02 04	CDR	Houston, Apollo 8.
00 04 02 06	CC	Apollo 8, Houston.
00 04 02 10	CDR	Roger. I believe we are going to have to vent or thrust away from this thing; we seem to be getting closer.
00 04 02 18	CC	Roger. Understand, Frank; go ahead whenever - just give us some idea of when you did it and how much.
00 04 02 24	CDR	Roger.
00 04 02 32	CC	Apollo 8, Houston. Could you stand by one? We are working on something here.
00 04 02 37	CDR	Okay.
00 04 05 10	CC	Apollo 8, Houston.
00 04 05 16	CC	Apollo 8, this is Houston. Over.
00 04 05 39	CC	Apollo 8, this is Houston. Over.
00 04 05 40	CDR	You are loud and clear, Mike. Go ahead.
00 04 05 43	CC	Okay, Frank. On your additional separation maneuver, we recommend that you make a radial burn, point your plus X-axis toward the earth, and thrust minus X for 3 feet per second. Over.
00 04 05 57	CDR	I don't went to do that; I'll lose sight of the S-IVB.

00 04 06 01	CC	Okay. The reason we want a radial burn is to increase your midcourse correction so we can use the SPS. Stand by on it.
00 04 06 33	CC	Apollo 8, Houston.
00 04 06 35	CDR	Go ahead.
00 04 06 36	CC	How close to a radial burn can you get without losing site of the S-IVB, Frank?
00 04 06 41	CDR	Well, I don't know because I can't see the earth now, Mike.
00 04 06 44	CC	Okay.
00 04 06 51	CDR	We can pitch down some. Jim has the earth in the optics so we could pitch some and get pretty close to one, I guess.
00 04 07 31	CC	Apollo 8, Houston.
00 04 07 32	CDR	Go ahead, Houston. Apollo 8.
00 04 07 34	CC	We can give you a pitch gimbal angle on radial direction if that would be a help. It's 181 degrees; pitch gimbal angle would be exactly radial at 4 hours and 10 minutes. I don't know whether that solves your visibility problem or not.
00 04 07 46	CDR	181?
00 04 07 47	CC	That's affirmative.
00 04 07 54	CDR	Well, then zero would be just as good, wouldn't it?

00 04 08 05	CC	Frank, if you use zero, then make the SEP if possible in the plus X thrusters. That's the direction of the burn we'd like.
00 04 08 13	CDR	Well, can't do that. I'll thrust right square into that S-IVB.
00 04 08 16	CC	Yes, okay. Understand.
00 04 08 22	CDR	What will he maneuver to as far as the gimbal angle for his blowdown?
00 04 09 03	CC	Apollo 8, Houston. At blowdown, that S-IVB should be oriented to perform a retrograde blowdown along the local horizontal.
00 04 09 14	CDR	Okay.
00 04 09 22	CC	Is it still chasing? Does it look like it is closing on you, Frank?
00 04 09 25	CDR	It is about the same. The trouble is it is pointed at us pretty well.
00 04 09 30	CC	Roger. Understand.
00 04 10 00	CC	Frank, what we want to do is get a radial upward burn; and as long as you can through the optics or some other means out the window figure out where the earth is, then use the appropriate thrusters to thrust upward, radially upward for 3 feet per second. That is what we are looking for for trajectory reasons.
00 04 10 18	CDR	Okay. Understand. I just - as I say, I just can't very well do that now. I don't want to lose sight of this S-IVB.

00 04 10 26	CC	Roger.. We concur with that. I just thought perhaps Jim, through his optics, or you could get some feel for where the earth is. That's what we want to do, is radially upward.
00 04 10 35	CDR	Okay. As soon as we find the earth, we will do it.
00 04 10 37	CC	Thank you.
00 04 11 03	CDR	Houston. The venting on the S-IVB is terminated.
00 04 11 08	CC	Roger. Thank you.
00 04 13 53	CC	Apollo 8, Houston.
00 04 13 55	CDR	Go ahead, Houston. Apollo 8.
00 04 13 56	CC	Roger. Frank, do you think you are going to be able to do this burn radially? We would like to add to its magnitude if you are going to make it in some other direction. Over.
00 04 14 08	CDR	No, I am not even sure we are going to do it yet, Mike. If I can get - we seem to be drifting away from this thing a little bit, although it is still pointing at us quite closer than I'd like.
00 04 14 20	CC	Roger. Understand.
00 04 14 25	CC	Apollo 8, Houston. We would like you to do some additional maneuver; it is just a question of how much and in which direction.
00 04 14 33	CDR	Okay. Right now, our gimbal angles are about - roll's about 190 and pitch is about 320 and

		yaw is about 340. We could certainly do it in this position. That would be alright.
00 04 14 51	CC	Stand by. We will check those.
00 04 17 06	CC	Apollo 8, Houston.
00 04 17 09	CDR	Go ahead, Houston. Apollo 8.
00 04 17 11	CC	Roger, Frank. You could help us out if you would explain where you are relative to the booster. In other words, with respect to the earth and the radius back there, are you above or below or one side, or where exactly is the booster relative to you?
00 04 17 27	CDR	Well, it's as I said before. We can't definitely find the earth. I think we are in front and a little bit above - a little bit above the - almost in front of the - directly in the front of the booster.
00 04 17 41	CC	Roger. Understand; almost directly in front of the booster.
00 04 17 45	CDR	Perhaps a little bit horizontally displaced towards the - let's see - Houston, to help you, we are looking right directly above the S-IVB with the sun - it's on the right side of the S-IVB and on our - coming in our left number 1 window.
00 04 18 34	CC	Okay. Understand; the sun is on the right side of the S-IVB and coming in your number 1 window.

		And are you - when you give us those angles, that means that your plus X-axis is pointed at it with those angles. Is that affirm?
00 04 18 47	CDR	Roger.
00 04 18 48	CC	Okay.
00 04 19 04	CDR	The earth is in our plus Y, plus Z-direction now, Mike.
00 04 19 09	CC	Thank you. Earth is plus Y, plus Z.
00 04 19 12	CDR	Right, and a little minus X.
00 04 19 16	CC	Okay.
00 04 20 52	CMP	Houston, for information, I am looking through the scanning telescope now, and I see millions of stars; most of them - the venting from the S-IVB.
00 04 21 04	CC	Right. Are you having any trouble telling which are the stars and which are the S-IVB particles?
00 04 21 09	CMP	Definitely; we are in sunlight, and it looks like they are all S-IVB, but we don't know. I am going to attempt a P52 realign at this time and see what I can do.
00 04 21 18	CC	Understand you.
00 04 26 37	CDR	Mike, anything more on this separation maneuver you're on?
00 04 26 41	CC	We are working on it, Frank. We are trying to compute what radially outward will be in close terms. Now, you still have the earth - as I

understand plus Y and plus Z quadrant. In other words, it's down below you on your right and slightly to your rear? Is that still true?

00 04 26 59 CDR That's right. Quite a bit to our rear and down below us. Off to the right.

00 04 27 03 CC Okay. Well, we - of course, in that attitude, you want to burn some upward and some to the left, and we are trying to be more precise than that. Frank, is it still about the same distance away? Are you opening or closing?

00 04 27 23 CDR It sure is staying close to us.

00 04 27 25 CC Understand.

00 04 28 03 CDR Mike, can you just tell us which way the S-IVB pitches and how far it will pitch to the sling shot maneuver attitude?

00 04 28 11 CC Roger. Stand by.

00 04 28 46 CC Frank, the S-IVB is within 10 degrees of its final attitude at this time.

00 04 28 52 CDR Okay. Thank you.

00 04 29 00 LMP Houston, are you ready to copy the IMU align information?

00 04 29 03 CC Go ahead.

00 04 29 05 LMP Alright. Star ID is 03, and star 36, star angle difference 0.01, torquing angle X minus 00034, Y minus 0027, Z plus 00100. Over.

00 04 29 33 CC Okay. Thank you for Y; I just got four digits here: 0027.

00 04 29 39	LMP	Roger. Three zeros: 00027.
00 04 29 43	CC	Thank you.
00 04 29 46	CMP	Houston, we are going to have to hold up on the cislunar navigation until after this next little maneuver.
00 04 29 53	CC	Roger, Jim. We understand.
00 04 31 20	CC	Apollo 8, Houston.
00 04 31 22	CDR	Go ahead now, Mike.
00 04 31 23	CC	Can you give us an updated readout of your gimbal angles. When your plus X-axis is pointed toward the booster, please?
00 04 31 29	CDR	Roger. Stand by.
00 04 34 08	CC	Apollo 8, Houston.
00 04 34 11	CDR	Go ahead, Houston.
00 04 34 12	CC	Could you give us those gimbal angles, Frank, when you have a chance?
00 04 34 14	CDR	I'm getting the COAS right on it now so it will be accurate.
00 04 34 18	CC	Thank you.
00 04 34 28	CDR	Okay. With the COAS right on the S-IVB, the roll reads 105, the pitch is 275, and the yaw is about 325.
00 04 34 47	CC	Roger. Copy roll 105, pitch 275, and yaw 325.
00 04 34 53	CDR	Roger. That should be 115 for the roll.
00 04 35 46	CC	Thank you. 115 roll.
00 04 35 52	LMP	Houston, Apollo 8. Over.

00 04 35 58	CC	Apollo 8, Houston. Go ahead.
00 04 36 00	LMP	Roger. If it will help you any, Mike, the earth is plus Y about 45 degrees in a minus X. I can see it out my side window, and it's a beautiful view with numerous cloud vortex.
00 04 36 15	CC	Roger, Bill. Thank you. Understand; plus X 45 degrees halfway between plus Y and plus Z and slightly minus X.
00 04 36 26	LMP	Negative. It's 45 degrees in the plus Y, in the XY plane towards minus X. Over.
00 04 36 37	CC	Roger. Understand in the XY plane, toward X 45 degrees.
00 04 36 43	LMP	Forty-five degrees from plus Y to minus X.
00 04 36 48	CC	Roger. Thank you.
00 04 36 51	LMP	It's behind us to the right, if that will help.
00 04 36 54	CC	Roger.
00 04 37 15	CDR	I can still see the Cape and isthmus of Central America.
00 04 37 22	CC	Roger. Understand. Frank, what we want on this burn is 8 feet per second now, 8 feet per second. We want it radially upward, and we want you to use whatever thrusters are required to burn radially upward at 8 feet per second.
00 04 37 37	CDR	Why do you want to use - do so much, Mike?
00 04 37 42	CC	Because of the separation distance we would like to achieve between now and the time of S-IVB blowdown.

00 04 37 53	CDR	Okay.
00 04 38 56	CDR	Mike, do you want me to go ahead and try to do this, or are you going to give me some gimbal angles?
00 04 39 05	CC	Apollo 8, Houston. Go ahead and do it without gimbal angles, if you can do that. Over.
00 04 39 11	CDR	Okay. I don't understand why you want so many feet per second on it, but I think I can - with just a little maneuvering, I can get away from it a lot simpler than that.
00 04 39 22	CC	Well, we would like the radial upward for trajectory reasons, and the magnitude we'd like because of the separation distance which we're predicting you will have at S-IVB blowdown.
00 04 39 31	CDR	Okay.
00 04 39 54	CDR	VHF sounds good.
00 04 39 57	CC	Roger. On the VHF.
00 04 41 25	CMP	OMNI B.
00 04 41 27	CC	Understand; OMNI B Baker.
00 04 41 59	CC	Apollo 8, Houston.
00 04 42 01	LMP	Go ahead, Houston. Apollo 8.
00 04 42 03	CC	Roger. About 12 minutes before your big blowdown, there is a small continuous vent which opens at a GET of 04:55:55. You may notice that on the booster, 12- or 15-pound thrust.

00 04 42 19	LMP	Okay.
00 04 42 25	CC	And, Apollo 8, could you give us your burn information whenever you have it?
00 04 42 30	LMP	Roger. We are maneuvering to the attitude now.
00 04 42 33	CC	Okay.
00 04 43 18	CDR	Okay, Houston. I understand you want 8 feet per second burn, is that right?
00 04 43 21	CC	Right. Eight feet per second, radially upward.
00 04 43 33	CDR	Well, we are as close to being radially upward as we can determine.
00 04 43 36	CC	Roger.

END OF TAPE

-- -- -- --	CC	Apollo 8, Houston. Are you going to use P47 to monitor the burn?
-- -- -- --	CMP	Yes, Jim, that's Roger. We are putting it in right now.
-- -- -- --	CC	Thank you.
00 04 45 05	CDR	Maneuvering now.
00 04 45 06	CC	Thank you.
00 04 45 54	CDR	Houston, we made the burn at 7.7 plus X plus 00001 Y, and Z's are all zeros. Gimbal angles, roll 180, pitch 310, and yaw 020.
00 04 46 19	CC	Roger. I copy plus X 7.7, Y 0.1; and roll, pitch, and yaw 180, 310, and 20.
00 04 46 30	CDR	Did you get that information, Houston?
00 04 46 33	CC	Apollo 8, Houston. How are you reading?
00 04 46 36	CDR	Read you loud and clear. Did you get the information?
00 04 46 38	CC	That's affirmative. I say again, we copied plus X 7.7, one-tenth in Y, no Z; roll, pitch, and yaw, 180, 310, and 020.
00 04 46 52	CDR	Roger. The burn was made at - initiated at 04:45.
00 04 47 06	CC	Roger. Copy 04:45 --
00 04 47 30	CDR	Okay. Do you want us to transfer that to the CS - to the LM state vector or just leave it alone? You --
00 04 47 39	CC	Affirmative, Frank. We would like you to transfer from the CSM to the LM state vector.

00 04 47 43	CDR	Roger.
00 04 50 33	CC	Apollo 8, Houston.
00 04 50 35	CDR	Go ahead, Houston. Apollo 8.
00 04 50 37	CC	How is that booster looking now? Is it drifting away rapidly, or how does it look?
00 04 50 41	CDR	Bill is the only one that can see it. Just a minute.
00 04 50 45	LMP	We're 90 degrees from its X-axis, and we must be out 1000 feet and moving out.
00 04 50 53	CC	Roger. Understand; 90 degrees from its X-axis and about 1000 feet and separating.
00 04 50 59	LMP	Plus or minus a couple of thousand.
00 04 51 03	CC	Understand.
00 04 51 58	CDR	Houston, this is Apollo 8. I think we've got clearance now; we got a little behind on our P23's, but I suggest we go ahead and start those now.
00 04 52 06	CC	Roger. Stand by.
00 04 52 38	CDR	We're well clear of the S-IVB now, Houston.
00 04 52 40	CC	Roger, Bill. Thank you, and at your convenience, could you give us the PRD reading? And as far as the P23 goes, that's just fine to get started with it. It looks like your first star, which is number 14, should be good until about 05:15 GET. Over.
00 04 53 02	LMP	Roger. We'll start P23.

00 04 54 18	LMr	Houston, Apollo 8 with a PRD reading.
00 04 54 21	CC	Go ahead.
00 04 54 23	LMP	Roger. At 4 hours 4 minutes, Commander is 0, CMP 0.64, LMP 0.02.
00 04 54 34	CC	Got that. Copy left to right: 0, 0.64, and 0.02 at 4 hours and 4 minutes. Thank you.
00 04 54 43	LMP	Roger. At 04:53, it was 0.01, 0.64, 0.03, and negligible on the survey meter.
00 04 54 53	CC	Roger. Thank you.
00 04 55 12	CDR	I have a beautiful view of the S-IVB and the earth here on one. I'll try and get a picture for you.
00 04 55 18	CC	Hope so.
00 04 55 27	CC	Apollo 8, Houston. We've got you about a minute away from the continuous vent open and 14 minutes away from the big dump, and we would like an estimate on your distance now if you can give it.
00 04 55 46	CDR	Stand by. Our distance is about 3000 feet we would estimate.
00 04 55 50	CC	Thank you.
00 04 56 38	CDR	And we can see the vent.
00 04 56 44	CC	Apollo 8, Houston. Say again.
00 04 56 47	CDR	We can see the vent.
00 04 56 49	CC	Roger. Thank you.
00 04 58 31	CMP	Houston, Apollo 8.
00 04 58 33	CC	Go ahead, Jim.

00 04 58 35	CMP	Boy, it's really hard to describe what this earth looks like. I'm looking out my center window, which is a round window, and the window is bigger than the earth is right now. I can clearly see the terminator. I can see most of South America, all the way up to Central America, Yucatan, and the peninsula of Florida. There is a big swirling motion just off the east coast, and then going on over toward the east, I can still see West Africa, which has a few clouds right now. We can see all the way down to Cape Horn in South America.
00 04 59 21	CC	Good grief, that must be quite a view.
00 04 59 24	CDR	Yes. Tell the people in Tierra Del Fuego to put on their raincoats; looks like a storm is out there.
00 04 59 31	CC	Roger. Will do. Do you care to give them a 24-hour forecast?
00 04 59 41	CDR	Probably as good as any other.
00 05 05 13	CDR	Houston, Apollo 8.
00 05 05 17	CC	Apollo 8, Houston. Go ahead.
00 05 05 22	CDR	Roger. You might be interested to know the center window is pretty well fogged up, but the other four seem to be in pretty good shape.
00 05 05 29	CC	Glad to hear you've got four out of five, and your big dump will be coming up in 2 minutes or so.

00 05 05 35	CDR	Roger. We're standing by.
00 05 06 48	CDR	The S-IVB has started dump.
00 05 07 19	CMP	Houston, Apollo 8.
00 05 07 20	CC	Go ahead, Apollo 8.
00 05 07 22	CMP	Roger. Mike, did you say star 14 was good till about 05:30 or something?
00 05 07 27	CC	Yes. Stand by while I give you that time again. Star number 14 should be good for about another 8 minutes, Jim - 7 minutes.
00 05 07 41	CMP	Okay. Now be advised, the optics calibration is very difficult to do because of all the other little stars floating around here. I'm going to ..., bypass it and do it at the end of this.
00 05 07 59	CC	Roger, Apollo 8. Understand.
00 05 08 10	CC	You should have the LOX dump now, Apollo 8.
00 05 08 21	CMP	Houston, this is 8. I'm looking through the scanning telescope and that LOX dump and just blanked out completely the entire scanning telescope.
00 05 08 30	CC	Understand.
00 05 08 32	CDR	It's a fantastic sight, Bill. Looks like the S-IVB, a small attitude excursion while it's dumping.
00 05 08 38	CC	Roger. Understand.
00 05 11 31	CC	Apollo 8, Houston.
00 05 11 34	CDR	Go ahead, Houston. Apollo 8.

00 05 11 36	CC	Roger. I've got a flight plan update for Bill if he's ready to copy.
00 05 11 41	CDR	Stand by.
00 05 11 42	CMP	Stand by.
00 05 11 54	CMP	Ready to copy.
00 05 11 55	CC	Okay. We are about 05:10 GET where we will record the BLOCK data TLI plus four and TLI plus 11. The TLI plus four PAD that we gave you before is perfectly all right. We will not require that one, and we will have the TLI plus 11 hour PAD for you shortly, then at 05:45 or 6 hours on that high-gain antenna checkout. Roger. Standing by.
00 05 12 28	CDR	We are on OMNI D, and we heard - we lost you after - TLI plus four was okay.
00 05 12 32	CC	Okay. The TLI plus 4 hour PAD is okay. We will have the TLI plus 11 hour PAD for you shortly, and at 05:50, for your high-gain antenna checkout, we would like you to leave that switch in WIDE BEAM with reference to our conversation the other day; leave it in WIDE.
00 05 12 52	CDR	Roger. Don't want to zap your receivers.
00 05 12 55	CC	No, it has to do with some loss of tracking data, so it is better to leave it WIDE.
00 05 13 00	CDR	Okay.
00 05 16 41	CMP	Houston, Apollo 8. Are you recording what we are getting out of 23?

00 05 16 44	CC	Stand by one, Jim; I'll check.
00 05 17 27	CC	That is affirmative, Jim; we are copying your P23.
00 05 17 32	CMP	Pretty big numbers there.
00 05 17 34	CC	Well, we think that is because you bypassed the trunnion check.
00 05 17 40	CMP	Roger.
00 05 22 18	CMP	Houston, we are getting some really big numbers in DELTA-R and DELTA-V.
00 05 22 23	CC	Roger. Understand, Jim.
00 05 22 25	CMP	Do you want us to proceed with this, or should we just leave them alone?
00 05 22 32	CC	Apollo 8, say again.
00 05 22 34	CMP	Do you want us to accept these, or should we leave them alone?
00 05 22 37	CC	Stand by.
00 05 23 46	CC	Apollo 8, Houston.
00 05 23 49	CDR	Go ahead, Houston.
00 05 23 50	CC	Roger. We do not wish you to accept those marks. This is due to the fact t'.at in bypassing the trunnion bias check, you still have big numbers left in those registers, so you go ahead when - after you do the trunnion bias check. Those numbers will become small later, but do not accept them right now.
00 05 24 11	CDR	Understand, Houston.

00 05 24 13	CC	We have a TLI plus 11 hour update for you when you are ready to copy.
00 05 24 20	CDR	Stand by.
00 05 25 00	LMP	Roger. Ready to copy TLI plus 11.
00 05 25 04	CC	Roger, Bill. TLI plus 11, and this assumes no midcourse correction number 1: it's an SPS/G&N; 63330 minus 163 plus 129. Are you with me so far?
00 05 25 30	LMP	Roger.
00 05 25 32	CC	Okay. 013 56 4759 minus 00489 plus 00000 plus 47250 177 144 000, not applicable, plus 00197 47253 554 47050 12 1278 256 023, up 265, left 18. Are you with me so far?
00 05 27 03	LMP	Roger.
00 05 27 05	CC	Okay. Plus 1197 minus 16500 12681 35608 050 46 53, GDC align north set stars, roll 068, pitch 097, yaw 356, ullage none; other: one, fast return, P37, DELTA-V equals 7900 for Indian Ocean; number 2, high-speed procedure not required; number 3, assumes no midcourse corrections number 1. Over.
00 05 28 38	LMP	Roger. TLI plus 11, SPS/G&N 63330 minus 163 plus 129 013 56 4759 minus 00489 plus 0000 plus 47250. You copy so far?
00 05 29 06	CC	Yes, I'm with you so far.
00 05 29 11	CC	Apollo 8, Houston. Affirmative; I'm with you.

00 05 29 14	LMP	Roll 177 144 00 NA plus 00197 47253 554 47050 12 1278 26, correction 256 023, up 265, left 18. Copy so far?
00 05 29 49	CC	Yes, I'm with you so far, Bill; go ahead.
00 05 29 54	LMP	Plus 1197, minus 16500 12681 35608 0506, correction 050 46 53 north set 068 097 356, zero ullage. Note one: fast return, P37, DELTA-V 7900 Indian Ocean; two, high-speed procedure not required; three, PAD assumes no MCC 1. Over.
00 05 30 42	CC	That's all correct, Bill.
00 05 30 49	LMP	Roger.
00 05 31 08	CMP	Houston, Apollo 8.
00 05 31 10	CC	Go ahead, Apollo 8.
00 05 31 13	CMP	Roger, Mike. I'd like to give some comments on P23 data. The auto maneuver was quite accurate. Looks like we got some substellar point in the maneuver; auto optics put Canopus straight where it should be; minimum impulse control worked as advertised. At the altitudes at which I started to do the sightings, they have a definite hazy band line. The filter gives the earth a glow, sort of an orangey glow. It's very indefinite of where to put the star, but there does seem to be a solid line where you might expect the horizon to be that

appears through the haze where we expect the atmosphere to be. I followed the procedure which we had done up at MIT, about two lines atop the haze layer a definite line for these sightings. In regards to the optics calibration, it was very difficult to find a star in the landmark line of sight in the venting of the S-IVB.

00 05 32 33	CC	Roger, Apollo 8. We copied that, and we'd like for you to do that trunnion check, that calibration, prior to your next set of sightings.
00 05 32 44	CMP	Roger. Will do. Canopus just disappeared from view, and maybe when we get a little time here, I'll try to get a calibration the first time.
00 05 32 56	CC	Roger. Understand.
00 05 33 00	LMP	And, Houston, we've rewound the tape; you can dump it at your convenience.
00 05 33 07	CC	Roger, Bill. Thank you. Are you still picking up anything on the VHF?
00 05 33 15	LMP	Are you playing anything?
00 05 33 17	CC	Affirmative.
00 05 33 41	LMP	No, I'm not picking anything up.
00 05 33 43	CC	Roger. Thank you.
00 05 33 44	LMP	What's our altitude now?

00 05 33 50	CC	Well, you're about 22 000 miles.
00 05 33 55	LMP	Okay.
00 05 33 56	CC	Give or take a thousand feet.
00 05 33 59	LMP	I'll go ahead and turn VHF-A off and high gain.
00 05 34 03	CC	Roger, Bill. Thank you.
00 05 34 06	LMP	It was some pretty nice music while it lasted.
00 05 34 09	CC	Yes, I bet so.
00 05 35 01	CC	Apollo 8, Houston.
00 05 35 04	CMP	Go ahead, Houston.
00 05 35 07	CC	We're going to have to wait until we get the high-gain antenna locked on again to dump the tape.
00 05 35 15	CDR	Okay. And you are about ready for us to go to the PTC attitude?
00 05 35 23	CC	Stand by one.
00 05 35 26	CDR	Okay.
00 05 35 57	CC	Apollo 8, Houston.
00 05 36 00	CDR	Go ahead.
00 05 36 01	CC	We'd like to hold off on the PTC and get some more P23 information. We'll have some more details of that for you shortly.
00 05 36 09	CDR	Alright.
00 05 36 10	CMP	Mike, what I'm doing now, I'm going over to the star Sirius ...
00 05 36 28	CC	Apollo 8, Houston. You faded out completely, Jim. I heard Frank, but it faded when you began talking. Say again.

00 05 36 38	CMP	Roger. I have switched to Sirius, the second star in the first set, to see if I can't get an optics calibration on it, at least.
00 05 36 49	CC	Roger. That's fine. We'll have some more good words for you shortly.
00 05 38 15	CC	Apollo 8, Houston.
00 05 38 18	CMP	Go ahead.
00 05 38 19	CC	Jim, on your P23, we'd like to go ahead and do the calibration and then use star number 15 and take three sets, followed by star number 16, two sets. Over.
00 05 38 38	CMP	Roger, Houston. That's what we're trying to do. I'm trying to get 15 for an optics CAL. It's been very difficult with the bright earth to find a star that we can get into the sextant. I'm trying to use the auto optics in P23 to get the star. We have that now; we're trying to maneuver the spacecraft to bring the trunnion to zero so we can get the landmark line of sight.
00 05 39 01	CC	Roger. Understand. And I also have your PTC attitude, which is different than you have. I'll give that to you whenever you get a free moment.
00 05 39 16	CDR	Ready to copy.
00 05 39 18	CC	Alright. PTC attitude will be pitch 242; yaw is 020. Over.
00 05 39 29	LMP	Pitch 242, yaw 020. Copy.

00 05 39 33	CC	Very good; thank you.
00 05 50 56	LMP	Houston, Apollo 8. Over.
00 05 51 00	CC	Apollo 8, Houston. Go ahead.
00 05 51 03	LMP	Roger. We'll hold up on the high-gain check until we get out of P23.
00 05 51 07	CC	Roger, Bill. Thank you.
00 05 51 15	CC	You may have to delay your lunch a little bit. Are you hungry?
00 05 51 19	LMP	No.
00 05 51 22	CC	First time I ever heard you say that.
00 05 52 11	CC	Apollo 8, Houston.
00 05 52 13	CDR	Go ahead, Houston. Apollo 8.
00 05 52 14	CC	Roger. It looks to us like the S-IVB is behaving completely normally in regard to all the blowdowns and other sequential events that take place. It looks good.
00 05 52 24	CDR	Roger. How far away is it from us now?
00 05 52 29	CC	We were going to ask you.
00 05 52 31	CDR	(Laughter) Okay.
00 05 52 33	CMP	Fifty miles.
00 05 52 34	CC	Roger. Copy.
00 05 52 41	CDR	Let's make that 80 kilometers, since there are some international aspects to this flight.
00 05 52 49	CC	Roger.
00 05 53 52	CMP	Okay, Houston. We did an optics calibration; we get zeros all the time.

00 05 53 58	CC	Roger. Understand; optics calibration and zeros all the time. Good.
00 05 54 03	CMP	It takes a lot longer to do it, though. I had to go to a star like Sirius to finally see it.
00 05 54 09	CC	Roger. Understand. We are real glad you got that so we can get a horizon calibration to put in the computer.
00 05 54 55	CDR	Looks like the number 5 window is starting to fog up, Houston.
00 05 55 01	CC	Roger, Houston. Understand it's the number 5 that is fogging up.
00 05 55 48	CMP	Houston, P23 coming through with Sirius.
00 05 55 53	CC	Roger. Thank you.
00 05 55 54	CMP	A little better, these numbers are a little better.
00 05 55 57	CC	We would expect so.
00 06 07 16	CDR	Houston, how do you read? Apollo 8.
00 06 07 18	CC	Apollo 8, Houston. Go ahead.
00 06 07 21	CDR	Roger. Have you been getting the downlink on the P23?
00 06 07 25	CC	That is affirmative.
00 06 07 28	CDR	Okay. Now how much longer do you want us to hold off going to PTC?
00 06 07 33	CC	Stand by one, Frank.
00 06 13 16	CMP	Houston, Apollo 8.
00 06 13 18	CC	Apollo 8, Houston.

00 06 13 24	CC	Apollo 8, this is Houston. Over.
00 06 13 26	CMP	Roger. Are you recording all of the data from 23, or do you want some read down to you?
00 06 13 37	CC	Stand by, Jim. We think we are getting it all. We are confirming now. That is affirmative, Jim. We are getting all that is coming down. How is it going?
00 06 13 47	CMP	It's working very nicely. I finished - one set was Sirius, three stars, and one set with Procyon, or two sightings; three sightings with Sirius and two with Procyon.
00 06 14 03	CDR	Okay, Houston. This is Apollo 8. We are ready to go to the PTC attitude.
00 06 14 10	CC	Roger, Frank. Understand. And we understand you've completed all sets, three on one and two on another in P23. Is that right?
00 06 14 18	CDR	That's affirmative. But we've finished the five sightings, three on 15 and two on 16.
00 06 16 18	CC	Apollo 8, Houston.
00 06 16 20	CDR	Go ahead, Houston. Apollo 8.
00 06 16 22	CC	Roger, Frank. What we are doing down here is this. We'd really like the horizon calibration. We would like a total of 15 marks; you know, three sets on one star, two on the other. On the other hand, we are balancing that with the need to go to PTC, and we are not losing sight

of the fact that you want to go to PTC right away. So if you will bear with us another couple of minutes, we are trying to decide whether to ask you to go back and do some more of P23 or whether to clear you at this time tc go to PTC. Over.

00 06 16 50	CDR	Okay. We started maneuvering to PTC. We are getting kind of far behind, and what I am concerned about, Mike, Jim is now taking off his pressure suit.
00 06 17 00	CC	Roger. Understand. How about you and Bill?
00 06 17 03	CDR	Well, we are standing by till he gets through.
00 06 17 04	CC	Understand. And you are maneuvering to PTC. That's fine.
00 06 17 09	CDR	Well, I would prefer to do that, but we will --
00 06 17 14	CC	Okay. Stand by just one.

END OF TAPE

00 06 22 12	CC	Apollo 8, Houston.
00 06 22 14	CDR	Go ahead, Houston. Apollo 8.
00 06 22 17	CC	Roger. We would like to hold off on the passive thermal control until 7 hours GET and, in the meantime, to get as many more P23 marks as we can, starting with the first star and doing two sets of three marks each, and then going to the second star we gave you. And concurrent with that, if possible, we would like Bill to run this high-gain antenna check-out if Lovell's attitude is compatible with that.
00 06 22 49	CDR	Okay. But they have not been to date. We are almost to the passive thermal control attitude now, and Jim is just halfway through taking his suit off.
00 06 22 58	CC	Roger. Understand.
00 06 23 01	CDR	We'll have to hold off for a minute here.
00 06 23 10	CC	Roger, Frank. And the reason for this is the horizon calibration requires a number of points to give you good data for the onboard NAV coming on.
00 06 23 21	CDR	Roger. We understand. We will be right back with you; just have to wait a minute here.
00 06 23 26	CC	Roger. Thank you.
00 06 23 28	CDR	That failing to separate from the S-IVB kind of fouled us up a little.

00 06 23 32	CC	Understand.
00 06 27 21	CDR	Houston, Apollo 8. How do you read?
00 06 27 24	CC	Apollo 8. Go ahead.
00 06 27 27	CDR	Roger. We are standing by. Are you about ready for the high-gain antenna trial?
00 06 27 33	CC	Okay. Just a second; we will check on that. Then are you in a position where you can go back to the star sightings?
00 06 27 40	CDR	Well, we will be, but we can't until Jim gets ready.
00 06 27 44	CC	Okay. We will stand, and you give us a mark on that. In just a second, I will check on the antenna. Okay. It looks like we are ready to go on the high-gain antenna check. And we can either go with commands called out from the ground, and you can monitor it, or you can be talked through it, whichever you prefer.
00 06 28 11	CDR	Well, stand by. I guess we are not quite in a proper attitude yet.
00 06 28 15	CC	Roger.
00 06 28 17	CDR	We are slowly getting it.
00 06 32 42	CDR	Houston, Apollo 8.
00 06 32 52	CDR	Houston, Apollo 8.
00 06 32 56	CC	Apollo 8, Houston. Did you call?
00 06 32 59	CDR	Roger. There is the high-gain antenna on wide auto.

00 06 33 04	CC	Roger.
00 06 35 21	CDR	Houston, Apollo 8.
00 06 35 24	CC	Go ahead, Apollo 8.
00 06 35 26	CDR	Are you getting the results you want from our high-gain antenna?
00 06 35 44	CC	Apollo 8, Houston. Affirmative. We are getting your data, and we may have a beam width change, but stand by on that.
00 06 35 53	CDR	Alright. We're standing by. Jim's about ready to go back to the P23.
00 06 35 57	CC	Roger. We have a GO until 7 hours on the start of the PTC.
00 06 36 05	CDR	Roger. Seven.
00 06 36 54	CDR	Houston, Apollo 8.
00 06 36 57	CC	Go ahead, Apollo 8.
00 06 36 59	CDR	We're on the PTC mode now waiting for Jim, and I noticed that out my window now I can see Orion very clearly, even though the sun is bright in the other window.
00 06 37 13	CC	Roger.
00 06 37 14	CDR	It almost pained me to say that, but it's true.
00 06 37 19	CC	Roger.
00 06 37 22	CDR	Speaking of the windows, the number 5 window is getting pretty well obscured and the number 3 window is unusable.
00 06 37 29	CC	Roger. Understand; number 3 is unusable and number 5 is obscured. Can you make out any

definition at all, or do you have a target to look at?

00 06 37 39	CDR	Well, I can see the sun. Wait till it comes around the earth, and I'll give you a better back on that.
00 06 37 42	CC	Okay.
00 06 38 14	CC	Apollo 8, Houston. We're going to go ahead and try to dump your tape right now. Circuit margins aren't too good at our present configuration. We're going to take a look at it. If it doesn't work, we may have to dump it again at a later configuration.
00 06 38 30	CDR	Roger.
00 06 42 57	CDR	Houston, Apollo 8. We're maneuvering back now to do another P23.
00 06 43 02	CC	Roger. Thank you.
00 06 43 29	CMP	Houston, this is Apollo 8. I'll do two more sets on 15, and then we'll do one set on 16.
00 06 43 35	CC	Roger. Thank you.
00 06 44 37	CC	Apollo 8, Houston.
00 06 44 40	CDR	Go ahead, Houston. Apollo 8.
00 06 44 41	CC	Okay, Apollo 8. I'd like to fill you in on things we're thinking about doing in the next couple of hours, first chance you get there.
00 06 44 51	CDR	Go ahead.

00 06 44 52	CC	Okay. In relationship to the midcourse correction, we'd like to put that one off until about 11 hours, and it will be approximately a 25-foot-per-second burn. The reason we're delaying the burn time is to allow for better tracking as a result of the 7-1/2-foot per second you put in on the separation. We'd like to take a little more time to look at the tracking data. And the dispersions in your correction aren't going to be growing very fast here. What we'll do then is to delete the NAV sightings that occur about 09 plus 10 in the flight plan, and this will be getting us back on to the normal flight plan sequence. So we'll go ahead and finish the P23, and the 7-hour limit on that P23 is due to the range limits on this test. Over.
00 06 45 46	CMP	Is due to the what did you say?
00 06 45 47	CC	The 7 hours on the P23 problem is due to the fact that we want to get these sightings in at a certain range. Over.
00 06 45 56	CMP	Roger. Understand.
00 06 45 59	CC	If you have any comments on that proposal, why, go ahead and pass them down, and we'll feed them in.
00 06 46 06	CDR	No, I think that's fine. We need to get out of the suits and get something to eat here too.

00 06 46 11	CC	Roger. Looks like we'll be back on the flight plan by 11 hours. We'll be holding up on the updates and PAD's because of the later burn.
00 06 47 35	CMP	Houston, Apollo 8.
00 06 47 37	CC	Go ahead, Apollo 8.
00 06 47 40	CMP	Roger. I believe we have the S-IVB in sight. It would appear to be tumbling, and every once in a while, we are getting very bright reflections from it off the star, off the sun.
00 06 47 51	CC	Roger.
00 06 50 00	CMP	Houston, 8. Are you getting the data from the P23?
00 06 50 08	CC	Stand by one.
00 06 50 12	CC	Affirmative, Apollo 8.
00 06 50 13	CDR	Okay.
00 07 00 13	CC	Apollo 8, Houston.
00 07 00 15	CDR	Go ahead, Houston. Apollo 8.
00 07 00 18	CC	Roger. We're copying your P23 progress. FAO advises that it looks like you are finishing your first star, and we'll need one more set on the second star, and this 7-hour cut-off isn't that firm, so we would like for you to go ahead and complete the second star if you can.
00 07 00 39	CDR	We're on the last setting of the second star right now.

00 07 00 41	CC	Okay. Real fine. And we've got a - it's about time for a cryo fan cycle.
00 07 00 51	CDR	Okay. We'll do them one at the time for about 4 minutes on each of them.
00 07 00 59	CC	Roger.
00 07 01 50	LMP	We've got the cryo fan on in H_2 tank number 1.
00 07 01 57	CC	Roger, Bill.
00 07 02 03	CMP	Houston, Apollo 8. We've just got finished taking two sets, six sightings on Sirius, and one set on Procyon.
00 07 02 17	CC	Roger. I understand that's six on Sirius and one on Procyon.
00 07 02 23	CMP	Two sets on Sirius, one set on Procyon.
00 07 02 25	CC	Roger.
00 07 02 37	CDR	And we're maneuvering now to PTC attitude.
00 07 02 46	CC	Oh. Roger, Apollo 8.
00 07 03 26	CC	Apollo 8, when you get a chance down in the lower equipment bay, it looks like you're using the floodlights in the dim 2 position, and that one is a time-limited item. We would like for you to do your standard running in the dim 1 position. Over.
00 07 03 44	CDR	Roger. Just turned them off.
00 07 03 47	CC	Okay. Anytime you have them on, running dim 1 position is preferred to the LEB.
00 07 03 52	CDR	Thank you.

00 07 04 39	LMP	Houston. We have the cryo fan on - the number 1 H_2 tank was on at 07:01. You can give us a hack when you want it - when you're ready for it to be turned off.
00 07 04 50	CC	Wilco.
00 07 04 57	CC	Okay, Apollo 8. You can terminate that one and go to the other tank.
00 07 05 01	LMP	Roger.
00 07 05 10	LMP	Okay. O_2 gage number 2 is on.
00 07 05 14	CC	Roger.
00 07 06 21	CMP	Houston, Apollo 8.
00 07 06 22	CC	Go ahead.
00 07 06 23	CMP	Are you having any problem on the ground with your COMM?
00 07 06 27	CC	Negative. You're coming in loud and clear.
00 07 06 30	CMP	Okay. We seem to be breaking lock intermittently up here once in a while.
00 07 06 35	CC	Roger. We'll keep our eye on it. It sounds good, though.
00 07 08 46	CMP	Okay. Houston, Apollo 8. We've initiated the PTC.
00 07 08 51	CC	Roger.
00 07 09 32	CC	Okay. Apollo 8, you can terminate the fans in the hydrogen, and we're ready to start on the oxygen tanks.
00 07 09 41	CMP	Okay. Stand by.

00 07 11 59	CC	Apollo 8, we are through with the dump; you can have the tape recorder back.
00 07 12 02	CMP	Roger. Thank you.
00 07 15 10	CC	Apollo 8, Houston. We are ready to go to the second O_2 tank.
00 07 15 15	CMP	Okay.
00 07 15 19	CC	And for your information, it's Cleveland 24 to 10, and what we plan to do --
00 07 15 27	CMP	Say again.
00 07 15 30	CC	That's Cleveland 24 to 10, not over yet.
00 06 15 42	CDR	Thank you.
00 07 20 49	CC	Okay, Apollo 8. Looks like you can terminate your cryo fans now, and we're going to leave you alone for a while and let you get caught up. Things we have onboard, the high-gain antenna check, COMM mode check that you have listed at 7 hours, we'll put off and do whenever you are ready for it. So that's at your convenience. During the high-gain dump that we performed using a wide band, we were still getting real good data at 36K, which is a little bit further than circuit margins that were predicted for you. And we've got our SPS burn coming up somewhere around 11 hours, and we'll give you more information on that later.

00 07 21 31	LMP	Roger. We're doing the PROGRAM 21 now, determining ground track for LOI that we did not make at 5 hours.
00 07 21 44	CC	Roger. Thank you.
00 07 27 20	CDR	Houston, Apollo 8.
00 07 27 21	CC	Go ahead, Apollo 8.
00 07 27 22	CDR	Okay. We just broke lock on S-band high-gain. We're on OMNI B now.
00 07 27 29	CC	Roger. OMNI B.
00 07 27 36	CC	Apollo 8, is that Bravo or Delta?
00 07 27 40	CDR	Dog, Delta.
00 07 27 41	CC	Roger.
00 07 27 43	CDR	We can't get the PROGRAM 21 to integrate up to LOI; just stalled out around 69 hours and 2 minutes.
00 07 28 02	CC	Roger. They are watching it.
00 07 28 35	CDR	Houston, Apollo 8.
00 07 28 38	CC	Go ahead, Apollo 8.
00 07 28 41	CDR	Roger. Do you want us to stop the integration via VERB 96? Over.
00 07 28 54	CC	That is affirmative; VERB 96.
00 07 28 57	CDR	Roger. Will do.

END OF TAPE

00 07 56 51	CDR	Houston, this is Apollo 8.
00 07 56 54	CC	Apollo 8, Houston.
00 07 56 55	CC	Go ahead, Apollo 8.
00 07 56 58	CDR	Roger. Do you want us to hold off on this P52 realignment, also?
00 07 57 04	SC	Yes, that is affirmative, CAP COMM. We want to do that a couple of hours when it is related to the maneuver, midcourse.
00 07 58 10	CC	That is affirmative, Apollo 8. Let's time the maneuver and we will hold off and do that all in normal premaneuver sequence. And - We have got a score here - in the fourth quarter, 31 to 13. And I've got some words on your P21 discrepancy any time you are interested. And I'd like to confirm - -
00 07 57 30	CDR	Go ahead.
00 07 57 33	CC	Okay. Before I get off on that one, I'd like to confirm that you use the VERB 37 procedure to go to P00.
00 07 57 41	CDR	Roger.
00 07 57 43	CC	Okay. On P21, the thinking runs that you had a slight error in your state vector at the time you started, and when that was integrated out, it intercepted the lunar surface where it locked up and this is contained in a fairly recent program note.

00 07 58 06	CDR	Okay. Now, we've closed the - the waste vent, so we should see this O_2 come down now.
00 07 58 15	CC	Okay. Understand you closed the waste vent, and how about the lithium change? Have you done that one?
00 07 58 23	CDR	Roger. That's done.
00 07 58 24	CC	Okay. Thank you.
00 07 58 30	F	T-COMM, FLIGHT. Did you copy that?
00 07 58 33	CMP	This conference communication is great. We won't have to have any debriefing.
00 07 58 37	CC	(Laughter) That's pretty outstanding.
00 07 58 38	CT	Right.
00 07 58 43	CC	Did you copy that?
00 08 13 39	CDR	Houston, Apollo 8.
00 08 13 42	CC	Go ahead, Apollo 8.
00 08 13 44	CDR	Roger. With the delay in burn, do you mind if we have a urine dump the - before the burn? Will that foul your tracking up?
00 08 13 52	CC	Okay. Stand by. Let me run that one by.
00 08 14 53	CC	Apollo 8, Houston. We don't have any objections to going ahead with the urine dump now. And for your information, the waste water dump - our schedule, we plan to put it off until about 11:30, and this will get you up to approximately 90 percent in your waste tank. It's a little higher than normal, but we wanted to put this

off until after the burn was completed; and some of the other things that we've got coming up, about 9 hours you have oxygen fuel cell purge; and we've already mentioned the deletion of the star landmark sightings. From 10 to 11 we have put acide for the burn preparations. And a final score is 31 to 20.

00 08 15 40	CDR	Cleveland won over Dallas, huh?
00 08 15 43	CC	How about that?
00 08 15 49	CDR	Houston, how do the circuit margins on the S-band look as compared to your preflight calculations?
00 08 16 35	CC	Okay, Apollo 8. It's a little bit early to give you any real numbers on your COMM performance. Looks like it's working as good as predicted, and everything else seems to be doing better, so this may be doing better, too, after we have done our next COMM checks some of these other things will have a better hack on; I can give you a quantitative answer to your question.
00 08 16 56	CDR	Roger.
00 08 24 23	LMP	Houston, Apollo 8. How do you read?
00 08 24 26	CC	Loud and clear, Apollo 8.
00 08 24 29	LMP	Roger. Sure got a nice view of the earth from here. We can see Baja California and about where San Diego ought to be.

"flight pool" in PAO Commentary

00 08 24 40	CC	Very good.
00 08 24 44	LMP	I can't see my dad's flagpole out there today, though.
00 08 24 48	CC	We'll tell the doctors about that.
00 08 48 40	CC	Apollo 8, Houston.
00 08 48 43	CDR	Go ahead, Houston.
00 08 48 45	CC	Okay. We dropped off of high gain on the OMNI there for a bit and went to a low bit rate, and we're getting ready to command you back to a high bit rate. Do you want us to keep you posted every time we change tape speeds?
00 08 49 05	CDR	We're not recording now anyway, Houston.
00 08 49 08	CC	Roger. Understand; but when we got to high bit rate, do you want to be kept informed every time we transfer? We hadn't planned on it.
00 08 49 20	CDR	If we think if we need to recorder, we'll ask you on that deal.
00 08 49 24	CC	Okay.
00 09 09 34	CDR	Apollo 8.
00 09 09 37	CC	Go ahead.
00 09 09 40	CDR	Roger. How does your tracking look on us?
00 09 09 44	F	Fido, FLIGHT.
00 09 10 13	CC	Apollo 8, tracking still in progress and a little too soon to give you a firm answer on the results, but everything looks nominal so far.
00 09 10 26	LMP	Is it working okay?

00 09 10 28	CC	Seems to be.
00 09 12 05	CC	Apollo 8.
00 09 12 07	LMP	Go ahead.
00 09 10 09	CC	Okay. Sometime when it's convenient for you now, I would like to see an oxygen fuel cell purge. And do you have any estimate on when you might be getting around to this COMM test?
00 09 10 24	LMP	Right now we're right in the middle of trying to get something to eat, Ken. We can - I guess we can do the fuel cell purge.
00 09 10 36	CC	Apollo 8, there's no rush. Just didn't know what you were doing at the time and - Give us a call when you have a free moment; we'll pick up.
00 09 10 50	LMP	We can start the O_2 purge now, if you wish.
00 09 10 57	CC	Okay. That'd be fine, and I'll keep track of the time for you.
00 09 13 00	LMP	Okay. That'd be good. Now I'll turn on O_2 now on fuel cell 1.
00 09 13 05	CC	Okay. Thank you.
00 09 15 41	CC	Apollo 8, Houston. That's about 2 minutes on your first fuel cell.
00 09 15 47	CDR	Roger. It's up, and number 2 is on now.
00 09 15 50	CC	Roger.
00 09 17 31	CMP	Houston, Apollo 8.
00 09 17 33	CC	Houston. Go ahead.

00 09 17 35	CMP	While I'm waiting for my turn at the water gun, I might give some comments on the optics. There seems to be quite a band of light that goes all way across the scanning telescope anywhere in the vicinity of the sun. Just a little while ago we were in the position where I could pick up the moon in the scanning telescope. And then I looked at it in the sextant and the sky - the space around the moon was a very light blue, just about as light blue as we have it back on earth. And it's not black - that sun angle with the moon.
00 09 18 20	CC	Understand. This light blue was - showed up in the sextant.
00 09 18 25	CMP	That's affirmative. I maneuvered the optics so I could pick up the moon in the sextant, and the - the space around the moon is light blue.
00 09 18 37	CC	Roger. Can you make any kind of estimate about the proportion of the radius, how far out that seems to extend?
00 09 18 46	CMP	Well, it extends the full length of the sextant. Actually, I could see us coming as we moved across, because the band of light in the scanning telescope cut across where the moon was, and it moved in this area. I believe it's caused by the refractional light inside the optics themselves.
00 09 19 05	CC	Roger.

00 09 19 09	CMP	Also, I've been occasionally looking out to see if I could see stars at various sun angles, and at this particular altitude, it's very difficult. In the scanning telescope the sun is very bright and the earth is very bright. And if I looked at the earth and try to look for stars, I lose my dark adaptation very quickly.
00 09 19 35	CC	Roger. Do you have any problems seeing the moon?
00 09 19 41	CMP	No problem seeing the moon. When I looked for the star landmark line of sight, I - It's a very thin crescent, but it was very visible.
00 09 19 53	CC	Roger. Does the area illuminated in earthshine show up?
00 09 20 00	CMP	Not at this altitude, and that's strange. I thought I could see that. At this altitude, the refraction of the light in the optics themselves, due to the reflection of the sunlight I suspect, or earth's light, completely blanked out the dark side of the moon to this altitude.
00 09 20 17	CC	How about that.
00 09 20 23	CDR	Maybe we have an atmosphere around the moon.
00 09 21 11	CC	Okay, Apollo 8. Looks like that ought to terminate the fuel cell purging.
00 09 21 16	LMP	Roger.

END OF TAPE

00 09 44 40	CDR	Houston, Apollo 8.
00 09 44 45	CC	Go ahead, Apollo 8.
00 08 44 47	CDR	Do you want to get started here around 10 hours? Is that what you said?
00 08 44 54	CC	Well, what we had planned was to use the 10- to 11-hour period as your preburn preparation just as we would have done normally, and - -
00 09 45 04	CDR	That's fine. We can go ahead and do that.
00 09 45 13	CC	- - and if you can work in this COMM check before that, it would be desirable, but that's not a constraint.
00 09 45 20	CDR	What do you want in the way of a COMM check, George?
00 09 45 27	CDR	Again, what do you want?
00 09 45 29	CC	Okay. What we've got here is a couple of DTO COMM checks. We'll be switching around to five different modes, and only one of them will interrupt your activities. In that case, we'll be switching to the uplink backup voice, and that's the one time that you might lose temporary uplink voice COMM. You'll have downlink voice COMM throughout the entire procedure, and it ought to take you, I guess, 10 to 15 minutes MAX, the only requirement being that we should stay on a high-gain antenna.
00 09 46 05	CDR	Why don't we go ahead and start now then?

00 09 46 07	CC	Okay. That sounds pretty good.
00 09 46 08	CDR	- whenever -
00 09 47 20	CC	Okay, Apollo 8. Another couple of minutes and we'll be ready to go into our - our COMM check. And, for your information, looks like the signal strength is 3 to 4 dB better than expected on the wide range, on the WIDE BEAM mode, and approximately that gives you 1.4 increase in your range.
00 09 47 46	CDR	Roger. Let's not increase it by 1.4 more, though.
00 09 47 50	CC	Okay.
00 09 48 08	CC	Something else you might take a look at: as you go through the PTC, we have some who would like to know if you can see any detectable effect on the windows in the form of their fogging. Particularly, does the sun seem to vary fog intensity or does it increase it or decrease it or make it go in patches or anything like that that you might be able to notice?
00 09 48 40	CDR	The sun doesn't seem to change it much; however, the different incidences of the sun's rays magnify the - the fogging, or at least change it.
00 09 49 04	CC	Okay, Apollo 8. I'm sorry. Would you say again, please?
00 09 49 08	CDR	The sun doesn't seem to have any effect on the windows themselves, but the different inci -

		angles of incidence of the sun rays change the relative amount of obscuration caused by the fogging.
00 09 49 24	CC	Okay.
00 09 50 05	CC	Okay, Apollo 8. We're ready to go into the COMM check now, and it's your option. We can call out switches and let you position them, or we can command it from the ground. In either event, there will be a couple of switches that you'll have to throw for us.
00 09 50 24	CDR	We'll have to command them, and we'll throw what we have - what you want.
00 09 50 29	CC	Okay. And I'll keep you posted on what we're doing. The first test is an uplink voice and ranging with full downlink which is essentially what you're doing right now, is to be used for a baseline.
00 09 50 44	CDR	Roger.
00 09 51 12	CC	Okay. We're starting on test number 1, and if you would verify that S-band NORMAL mode switch is in VOICE.
00 09 51 22	CDR	Roger. We're in VOICE.
00 09 51 24	CC	Okay.
00 09 51 25	CDR	... Charlie.
00 09 51 31	CC	And the up-telemetry DATA to DATA.
00 09 51 36	CDR	Roger. DATA.

00 09 51 49	CC	Okay. And up-telemetry COMMAND to NORMAL.
00 09 51 55	CDR	Normal.
00 09 51 57	CC	Roger. How about high-gain antenna track to AUTO?
00 09 52 04	CDR	We're on OMNI D now; we've got to wait till we get around the other way.
00 09 52 10	CC	Okay. What's your estimate?
00 09 52 19	CDR	We're at 15 minutes from it.
00 09 52 25	CC	Okay.
00 09 52 34	CDR	Maybe we'd better hold the COMM check till after the midcourse, because we'd better get fired here at 10 if we want to burn at 9.
00 09 52 43	CC	That's affirm. We're viewing that right now.
00 09 52 47	CDR	... means we're on two vertical level.
00 09 52 55	CC	Okay, Apollo 8. We're postponing the COMM test until after the burn.
00 09 53 02	CDR	Thank you.
00 09 54 20	CDR	Houston, Apollo 8. Are you ready to go - for us to go through with the P52 now?
00 09 54 35	CC	That's negative, Apollo 8. We would like to update things first, and we're going to give you a LM state vector and then an external DELTA-V.
00 09 54 43	CDR	Roger.
00 09 54 44	CC	And with POO in ACCEPT while we'll go ahead and work on that.
00 09 54 50	CDR	Roger.

00 09 57 18	CC	Apollo 8, Houston.
00 09 57 20	CDR	Go ahead.
00 09 57 22	CC	Okay. We've got your PAD's. We're ready to read up to you. And we're standing by to flank your state vector and external DELTA-V whenever you're ready to give us ACCEPT.
00 09 57 36	CDR	Roger. Just stand by one, and we will get the PAD from you.
00 09 57 48	CDR	And we will put in - TM in ACCEPT now - at this time.
00 09 57 53	CC	Roger.
00 09 58 10	CDR	We're ready to copy the PAD.
00 09 58 21	CC	Okay, Apollo 8. I didn't copy that last one. We are sending you state vector up now.
00 09 58 26	CDR	Roger. We say we are ready to copy the PAD.
00 09 58 29	CC	Okay. The first PAD will be a maneuver PAD, MCC one, and this will be an SPS/G&N beginning with the weight, 63295 minus 163 plus 129 010 59 58 30 plus 001 36 minus 00 045 plus 002 02 345 188 343 999 99 plus 016 85 002 48 002 001 86 23 2013 164 012 up 276, left 04, November Alfa for the remainder of that column. In the comments: north stars; 068 097 356, a no ullage start, and a single bank burn on bank Alfa. Over.
00 10 01 10	CDR	Houston, Apollo 8. MCC 1 maneuvers: SPS/G&N 63295 minus 163 plus 129 010 59 5830 plus 00136

		minus 00045 plus 00202 345 188 343 all 9's plus 01685 000248 002 00186 23 2013 164 012, up 27-6, left 04 November Alfa for the remainder. North set stars, roll 068, pitch 097, yaw 356, no ullage single bank - bank Alfa.
00 10 02 29	CC	Roger, Apollo 8. That's correct. And I have a TLI plus - 11 PAD for you.
00 10 03 02	CDR	Roger. Go ahead.
00 10 03 16	CDR	Houston, Apollo 8. Go ahead.
00 10 03 18	CC	Roger, Apollo 8. Loud and clear now. Are you ready to copy?
00 10 03 23	CDR	Roger. Ready to copy.
00 10 03 24	CC	Okay. This is a TLI plus 11, SPS/G&N. This assumes a midcourse correction number 1: 631 40 minus 163, plus 129 013 56 48 97, minus 005, 99, plus 00 00 0, plus 47016, 177 143 000 November Alfa, plus 001 97 47 020 5 51 468 18 12 12 83 257 023, up 263, left 17, plus 11 95, minus 165 00 126 83 356 08 050 47 05, north stars; 068 097 356, no ullage. For the fast return P37 DELTA-V, 7900 for the Indian Ocean, high speed procedure not required for the MS. This assumes midcourse correction 1. Over.
00 10 06 22	CDR	Stand by.
00 10 06 23	CC	Roger.
00 10 06 40	CDR	Houston, Apollo 8. To the readback. Are you ready?

00 10 06 43	CC	Go ahead.
00 10 06 44	SC	TLI plus 11 SPS/G&N 63140, minus 163, plus 129 13 56 4897, minus 00599, plus 00000. And I believe it's plus 47016.
00 10 07 14	CC	Affirmative.
00 10 07 20	CDR	177 143 000 NA, plus 00197, 47020 551 46818 12 128.3 257 023, up 263, left 17, plus 1195, minus 16500, plus 126 23 35608 0504705, the north set, roll 68, pitch 97, yaw 356, no ullage, P37 high speed, 7900 Indian Ocean, and high speed procedures for the MS are not required; assumed MCC 1.
00 10 08 42	CC	Roger, Apollo 8. Two corrections on the GETI. The hour's 013. Range to go EMS.
00 10 08 57	CDR	013.
00 10 09 00	CC	Roger. Copy that and the rings to go in the EMS 126 83. Over.
00 10 09 11	CDR	12683.
00 10 09 13	CC	That's correct.
00 10 09 16	CDR	Houston, this is Apollo 8. Be advised that we doubted that it would be possible to use the stars to get our backup alignment. We haven't been able to see any stars through the scanning telescope yet.
00 10 09 30	CC	Roger.
00 10 09 40	CC	Okay. And another comment for you, Apollo 8; like for you to use VERB 37 to select P00 and

		then wait for your computer activity light to go off prior to unzap of the LM NAV to CSM SLA.
00 10 09 55	CDR	Roger. You ready for us to do that now?
00 10 10 00	CC	That's affirm.
00 10 11 00	CDR	Houston, this is Apollo 8.
00 10 11 03	CC	Go ahead.
00 10 11 05	CDR	Okay. Now we'll go ahead and start back towards the flight plan around 8 hours here of T52, right?
00 10 11 14	CC	That's affirm.
00 10 11 19	CDR	Well, we - we have transferred - wait - we've transferred the state vector to the LM SLA already before we did a 52. So we're going to do the 52 now.
00 10 11 43	CC	Okay, Apollo 8. That's good procedure and -
00 10 16 13	CC	Apollo 8, Houston.
00 10 16 16	CDR	Go ahead, Houston.
00 10 16 18	CC	Roger. Will you check your up-telemetry switch to BLOCK, please?
00 10 16 24	CDR	Thank you. It's in BLOCK.
00 10 29 24	CC	Apollo 8, Houston.
00 10 29 27	CDR	Go ahead, Houston. Apollo 8.
00 10 29 30	CC	Okay. We've got a telescope alignment if you'd like to give it a try. Your sextant star is still good, but if you had problems with that, folks have worked out that if you look through the telescope at 10:35, we have a shaft and

		trunnion that should point you at the center of the earth, if you would like to give that one a try.
00 10 29 52	CDR	Okay.
00 10 29 55	CC	Okay. At 10:35, the shaft angle 006.2, trunnion 18.9. Over.
00 10 30 15	CDR	Roger. 10:35: shaft 006.2, trunnion 18.9.
00 10 30 20	CC	That's affirmative.
00 10 32 28	CC	Apollo 8, Houston.
00 10 32 32	CDR	Go ahead.
00 10 32 34	CC	Okay. We'd like to get a fan - a cryo fan cycle in here before the burn. About 1 minute on each should be fine.
00 10 32 44	LMP	Roger. I've already given 2 minutes on H_2 1 and 2 and O_2 1, and I've just started O_2 2.
00 10 32 52	CC	Roger. Thank you.
00 10 34 17	CC	Apollo 8, Houston. We'd like to dump your tape prior to the burn.
00 10 34 26	LMP	Roger. It's only been running here about 15 minutes.
00 10 34 43	CC	Okay, Apollo 8. That's - that's correct. You're on high bit rate, and we're afraid you may run out before the burn, so we'd like to dump it, and give it back to you with a full load before the burn.
00 10 35 00	LMP	Roger. And give us a comment on the voice quality.
00 10 35 04	CC	Wilco.

00 10 36 49	LMP	Houston, Apollo 8.
00 10 36 51	CC	Go ahead.
00 10 36 54	LMP	Roger. We plan to stop charging battery B about another 5 minutes. You concur?
00 10 37 05	CC	That's affirmative.
00 10 37 07	LMP	Okay. You might just remind us.
00 10 37 10	CC	Wilco.
00 10 43 08	CC	Apollo 8.
00 10 43 12	CDR	This is 8. Go ahead.
00 10 43 20	CDR	Go ahead, Houston. You were cut out.
00 10 43 22	CC	Okay, Apollo 8. All your systems are GO, and we were about to tell you you can go ahead and terminate the battery charge, and you beat us to the punch.
00 10 43 35	CDR	I read your mind, and it's showing 37 volts right now.
00 10 43 40	CC	Okay.
00 10 53 57	CC	Apollo 8, Houston. If you'll go high bit rate, we'll give you a tape recorder back to your command.
00 10 54 43	CC	Apollo 8, Houston. If you'll put your high bit rate on, we'll give you a tape recorder back.
00 10 54 49	CDR	Roger.
00 10 56 50	CDR	Houston, did you give us a tape back? Over.
00 10 57 06	CC	Affirmative, Apollo 8.
00 10 57 09	CDR	Apollo 8's COMMAND RESET to get tape motion, we're now in NORMAL.

00 10 57 20	CC	Roger.
00 10 58 42	CC	Apollo 8, stand by for a mark at 1 minute.
00 10 58 48	CDR	Roger. Apollo 8 standing by.
00 10 58 49	CC	Ten seconds.
00 10 58 54	CC	Five seconds.
00 10 58 57	CC	2, 1 -
00 10 58 59	CC	MARK.
00 10 59 00	CC	One minute.
00 10 59 01	CDR	Roger.
00 11 02 43	CDR	Houston, Apollo 8.
00 11 02 45	CC	Go ahead.
00 11 02 48	CDR	Roger. The burn time was on time - about 2 seconds; we have residual 4.4 X. We burned it out to 0.2. Attitudes are nominal. The DELTA-V_C before the residuals were taken out was a minus 2.4. I have transferred the state vector to the LM's slot in VERB 66.
00 11 03 14	CC	Roger. Copy 4.4 for X and 2.4 on Z. And negative residual on Y prior to the trim. Is that affirm?
00 11 03 24	CDR	That's affirmative, and we took out the 4.4 residual down to 0.2.
00 11 03 29	CC	Roger.
00 11 04 13	LMP	Houston, Apollo 8. Do you want us to start charging battery A, now?
00 11 04 20	CC	Stand by.

00 11 04 35	CC	Apollo 8. Let's go back to battery Bravo, and we'll finish that one off before we start in on Alfa.
00 11 04 43	LMP	Roger. Battery Bravo.
00 11 04 52	CDR	Houston, Apollo 8. Do you want us to maneuver to any particular attitude for a water dump, or do you want us to go to PTC attitude?
00 11 05 02	CC	Okay. Let's go PTC.
00 11 05 04	CDR	And give me the angles, please.

END OF TAPE

-- -- -- --	CC	Okay, Apollo 8. Let's do the same angles we had before: that's pitch 242 and yaw 20 on the PTC attitude.
00 11 05 40	CMP	242, yaw 20. Roger.
00 11 07 50	CMP	Houston, we're preparing to dump our waste water now.
00 11 07 54	CC	Roger.
00 11 10 41	CDR	Houston, Apollo 8.
00 11 10 44	CC	Go ahead, 8.
00 11 10 47	CDR	We noticed on our systems test battery vent pressure that when we opened the battery vent valve, we get an immediate drop-off to pressure which nulls out at about two-tenths of 2 - to three-tenths of a volt. And we think this is zero and the battery manifold. Do you concur?
00 11 11 08	CC	Okay. Stand by. ... stand by one, and let's check it out.
00 11 11 17	CC	Apollo 8, I cut you out there. What did you say on the last one?
00 11 11 22	CDR	It looks like probably that zero psi corresponds to about three-tenths of a volt on the test meter. We've had it happen a couple of times, where the pressure would drop rapidly to this setting, as if it were zero. Over.
00 11 11 37	CC	Roger. We'll look at our data here and let you know what we see. Are you going ahead with the water dump now?

00 11 11 49	CDR	Roger. We'd - we're pausing here on the water dump, though, just to verify that the battery vent - the line is clear as indicated by a battery vent pressure of zero.
00 11 12 03	CC	Okay. Stand by.
00 11 20 10	CC	Apollo 8, Houston.
00 11 20 13	CDR	Go ahead, Houston.
00 11 20 15	CC	Okay. Number one on the list of things is that the flight plan shows CDR should hit the sack. Number two, kind of a summary of your burn. All your SPS and systems look GO. The trajectory shows that you have a CPA with a mode of 69.67 miles and the time of pericynthion is 69 plus 10. You do have a capture on a good free return. It's a little bit early to completely evaluate the trajectory for corridor control. You'll have no update to the TLI plus 11 block data. After looking through the CAL curves, it looks like the battery-vent pressure is actually zero at 0.2 to 0.3 volts, so that - we agree with you there, and you can go ahead with the water dump. We still have the COMM check to do whenever we get ourselves in a good high gain look angle and whenever it's convenient for you. Over.
00 11 21 26	CDR	Thank you very much. That was a very fine resume you sent in. We're right now in the process of

		trying to dump out the water and the UCDA's and so on and so on. So we'll get with you on the high gain as soon as we can.
00 11 21 41	CC	Okay. Good burn.
00 11 21 44	CDR	Houston, what do you want to dump the waste tank down to?
00 11 22 01	CC	Apollo 8, I would like you to dump the waste tank to 25 percent.
00 11 22 08	CDR	Okay.
00 11 27 07	LMP	Hey, we're dumping now, Houston.
00 11 27 09	CC	Okay. Thank you.
00 11 27 12	LMP	We finally got some stars to see.
00 11 32 00	CC	Apollo 8, Houston.
00 11 32 03	CDR	Go ahead, Houston. Apollo 8.
00 11 32 05	CC	Roger. Do you folks have your WATER QUANTITY switch in the POTABLE or the WASTE WATER TANK position now?
00 11 32 14	CDR	We're in the WASTE TANK position now, and we're dumping UCDA's first, Houston.
00 11 32 20	CC	Okay. We weren't watching any waste quantity decrease, and it looked like the nozzle temps indicated that something was going on, and we were trying to dope out what was going on.
00 11 32 30	CDR	Well, there's a lot of stuff going out I'll tell you. How do nozzle temps look?

00 11 32 41	CC	Oh, about 81.
00 11 32 44	CDR	Okay. We'll keep on going then.
00 11 40 37	LMP	Okay, Houston. We're going to dump the waste tank on down to about 25 percent.
00 11 40 44	CC	Okay. Thank you.
00 11 40 57	LMP	Houston, Apollo 8. Do you copy?
00 11 40 59	CC	Affirmative, Apollo 8.
00 11 41 02	LMP	Okay. Tell Zeke Thomas to wake up and keep an eye on the waste tank servicing.
00 11 41 16	CC	It'll take a minute to think of something appropriate.
00 11 41 23	LMP	You're slowing down.
00 11 41 28	CC	So are you guys.
00 11 46 53	LMP	How are the nozzle temperatures looking, Houston?
00 11 46 59	CC	Stand by.
00 11 49 16	LMP	Man, you're looking pretty small down there now, Houston.
00 11 49 24	CC	We're carrying a big stick, though.
00 11 49 30	LMP	Just barely make out Clear Lake.
00 11 49 40	CC	Your nozzle temperatures have dropped from about 94 to around 66.
00 11 49 49	LMP	Okay. I'm showing just a little bit above 50 percent here, and we'll keep on going, and if it looks too cold, give us a call.
00 11 49 59	CC	Okay. We'll do that.

00 11 50 30	LMP	Houston, we had a momentary O_2 high flow, but we think it's due to all the purging of the water lines we're doing here in the cabin.
00 11 50 40	CC	Roger. We concur.
00 11 53 20	CC	Apollo 8, Houston. We show you down to 25 percent of your waste water.
00 11 53 26	LMP	Okay. I'm just about 28, Houston. Stand by just a bit.
00 11 54 02	LMP	Okay. Waste dump stopped and then purge again.
00 11 54 05	CC	Understand. Roger. Waste dump stopped.
00 11 54 08	LMP	Roger.
00 11 59 50	LMP	Houston, we're on a high gain, and it might be a good time to try your COMM check.
00 12 00 59	CC	Apollo 8, we're going to go ahead and crank up to a COMM test now, and we will be a little bit late on your update for 12 hours.
00 12 01 10	LMP	Okay.
00 12 01 11	CC	Do you still want our - have us command as much as we can on the ground, or would you like to move the switches yourself?
00 12 01 20	LMP	Oh, you can have the fun of doing it.
00 12 01 23	CC	Sounds like you're dragging there.
00 12 01 30	LMP	... you suggest a ... We're using 1/250 on at f:11 on CEX and CMAX for earth shots. Do you verify? Over.
00 12 01 43	CC	Okay. You got going before I got my pencil up. How about saying it again?

00 12 01 49	LMP	f:11 and 1/250 for CEX 16mm and C 70mm.
00 12 01 58	CC	Okay. Thank you.
00 12 02 01	LMP	How about running in by the back room boys. My light meter doesn't seem to be helping out too much.
00 12 02 07	CC	Okay.
00 12 03 01	CC	Okay, Apollo 8. We're starting in - setting up for our first COMM test. This is going to be an uplink voice, ranging, and full downlink, which is not anything really different than what you have on board. I would like for you to verify that the S-band NORMAL MODE VOICE switch is in VOICE.
00 12 03 22	LMP	Roger. VOICE.
00 12 03 24	CC	Okay. And the up-telemetry DATA to DATA.
00 12 03 28	LMP	Roger. DATA.
00 12 03 33	CC	Up-telemetry COMMAND in NORMAL.
00 12 03 36	LMP	Roger. NORMAL.
00 12 03 38	CC	High-gain antenna to AUTO TRACK.
00 12 03 42	CC	Correction. That's --
00 12 03 43	LMP	AUTO.
00 12 03 46	LMP	We're in AUTO WIDE BEAM, and you can go ahead and dump the tape.
00 12 03 50	CC	Okay. I'd like for you to go to NARROW BEAM.
00 12 03 54	LMP	Okay. Going to NARROW BEAM now.
00 12 03 57	CC	Roger.

00 12 04 01	CC	And I'll give you a call when we get ready to work on the tape.
00 12 04 05	LMP	Okay. We're still in PTC, so you're only going to have it for about 10 or 15 minutes.
00 12 04 12	CC	Okay. We've had some problems with our displays, and I think they're straightened out now, but you may have to keep us advised if we run out of limits in case we display again.
00 12 04 22	LMP	Roger.
00 12 04 38	CC	Say, while we're standing by here, Apollo 8, the service module quantities that we had listed - we're going to try to update them, if you want to call out your quantities. Have you checked them with your charts?
00 12 04 54	LMP	Negative. I haven't gotten around to that. Stand by.
00 12 04 56	CC	Okay. There's no hurry on that. Just wondered if you had done it; we will check it against what we've got on our norma-gram.
00 12 05 17	LMP	I'm showing a SPS helium pressure, about 3570, indicated on board.
00 12 05 29	CC	Roger.
00 12 05 31	LMP	And fuel LOX tank pressures are 177 and 176, respectively.
00 12 05 40	CC	Okay.
00 12 05 44	LMP	M2 A is 2400, B 2500.
00 12 05 52	CC	Okay.

00 12 06 12	CC	Okay. And our back room tells you that you've got the right F stop.
00 12 06 19	LMP	Okay. Then we'll keep using it.
00 12 06 27	LMP	This PTC attitude really isn't the greatest for taking pictures of the earth.
00 12 06 32	CC	Roger.
00 12 06 34	LMP	Or of the moon.
00 12 06 46	CC	Apollo 8, kinda stand by for a burst of noise as we change configurations on the ground. We're going into test 1. You'll still have up and downlink, and we'll be in this mode for 2 minutes, but you may hear some burst of noise as we change.
00 12 07 03	LMP	Roger.
00 12 08 46	CC	Okay, Apollo 8. We're in the middle of our first test, and how about giving me a voice check.
00 12 08 53	LMP	Roger, Houston. This is Apollo 8. One, two, three, four, five, five, four, three, two, one. Apollo 8, out.
00 12 08 59	CC	Roger. And read you loud and clear. This COMM is unbelievably good.
00 12 09 05	LMP	Good.
00 12 10 21	CC	Okay, Apollo 8. We've finished the first test, and we're now going to change the uplink mode to UPLINK COMMAND AND RANGING, and we'll be going without upvoice. We'll be in this mode for 2-1/2 minutes and will be sending a test

message. It'll have no effect on either your computer or your panel switch configuration. What you might see will be the S-band noise that's associated with the break lock. However, you should still have a good signal on your power meter. This is not a loss of signal, but rather just a loss of the voice modulation, and I'll do you a mark just before we do that so that you can turn your S-band volume down if you so desire, and we'll be back up in this mode that we're in now in 2-1/2 minutes.

00 12 11 13	LMP	Roger.
00 12 11 31	CC	Apollo 8, Houston. We're about to disable the voice modulation on uplink, and we'll be back up no later than 12:13.
00 12 14 26	CC	Apollo 8, Houston. Voice check.
00 12 14 29	LMP	Read you five-by, Houston.
00 12 14 37	CC	Apollo 8, Houston.
00 12 14 40	LMP	Roger, Houston. Read you loud and clear and am with you. Completed our second test.
00 12 14 47	LMP	Okay.
00 12 14 57	CC	Okay. Our next test will be a test of the uplink voice and ranging with downlink voice and ranging and on low bit rate, so we'll be changing bit rate on you, and we'll be making a voice check in the middle.

00 12 15 12	LMP	Okay. You've about had it on the high gain. You might try to get it in, but it's going to hit the scan limit at any second.
00 12 15 28	CC	Okay, Apollo 8. Looks like we'll get our information before we lose the high gain.
00 12 15 34	LMP	Okay. We'll just leave it go.
00 12 15 36	CC	Roger.
00 12 16 21	LMP	They got the scan limit. We'll let it go, Houston, until it breaks lock.
00 12 16 33	CC	Okay, Apollo 8. Go ahead and switch to the OMNI.
00 12 16 38	LMP	How're you doing with your test?
00 12 16 40	CC	Okay. We've got three-fifths of the test. We'll have to pick up the rest next time we get a look at high gain.
00 12 16 47	LMP	Okay.
00 12 26 56	CMP	Houston, Apollo 8.
00 12 26 59	CC	Go ahead, Apollo 8.
00 12 27 01	CMP	Roger. Reading on P21 at 269 10 indicates a parallel of about 67.4 miles. I guess we can carry her.
00 12 27 12	CC	You guys are getting pretty good.
00 12 27 16	CMP	That's a lot better than our first answer.
00 12 27 23	LMP	We don't care if we're right, just so MPAD is right.
00 12 38 20	CMP	Houston, Apollo 8.
00 12 38 23	CC	Go ahead, Apollo 8.

00 12 38 26	CMP	Roger. I'd like to ask a question about this TLI plus 11 maneuver that we copied. In the remarks, you have P37, DELTA-V 7900. Is this the DELTA-V that we would use with P37?
00 12 38 43	CC	Okay. That's the option that you use with minimum time.
00 12 38 51	CMP	Roger. What I'd like to do is check on our P37 with your TLI maneuver update.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(0088 MST 1)

-- -- -- --	CC	Okay, Apollo 8. We'd like to make sure that we don't have a misunderstanding that this 7900 feet per second is the DELTA-V. It's not associated with the high speed per feet work around procedure. This is just a standard P37 DELTA-V.
00 12 40 22	LMP	Roger. But was that the DELTA-V that you used to give us the TLI plus 11? Okay.
00 12 40 32	CC	Okay. That's not the one that the maneuver PAD was based on. That's the number you put in for the minimum time.
00 12 40 44	LMP	Roger. Understand.
00 12 40 46	CC	Okay. Sounds like a good idea if you want to go ahead and check out the 37. And we're standing by to work on COMM as soon as that high gain is available.
00 12 40 54	LMP	Roger.
00 12 44 54	LMP	Okay. Houston, you got the high gain.
00 12 46 03	LMP	Houston, do you read? Apollo 8. Over.
00 12 46 22	CC	Apollo 8, Houston.
00 12 46 25	LMP	Roger. High gain yours.
00 12 46 29	CC	Okay. And if you're ready, we are. We'll go right ahead with our COMM checks.
00 12 46 34	LMP	Go ahead.
00 12 46 40	CC	We're starting in now on our fourth test. Like for you to put your TELEMETRY INPUT switch to PCM HIGH.

00 12 46 59	LMP	It's in HIGH.
00 12 47 01	CC	Okay. And now we're going to switch uplink to the upvoice backup for about 2 minutes, and it may take a couple of seconds when you hear the upvoice lost. So you can place your up-telemetry switch to upvoice backup, and in the event that all of this doesn't work out too well, I'm reading 12:47 on my clock now, and let's meet back in our present configuration no later than 12:50.
00 12 47 33	LMP	Roger. On upvoice backup.
00 12 47 35	CC	Okay. Thank you.
00 12 48 16	CC	Apollo 8, Houston.
00 12 48 20	LMP	Roger, Houston. Read you loud and clear.
00 12 48 22	CC	Okay. That's pretty good. That's upvoice backup, and will you confirm that you're in NARROW BEAM on high gain?
00 12 48 31	LMP	Roger. NARROW BEAM.
00 12 48 33	CC	Okay. Thank you. We're going to continue tracking and watching high-gain antenna for a couple of minutes. Then I'll give you a call when we're ready to go back.
00 12 48 50	LMP	Roger.
00 12 50 03	CC	Apollo 8, Houston. We have completed this test. We'll be switching back to full uplink. When you hear the noise associated with the loss of modulation, you can go back from the up-telemetry switch to DATA.

00 12 50 16	LMP	Thank you.
00 12 50 51	LMP	All the way.
00 12 50 52	CC	Okay. Loud and clear.
00 12 50 59	LMP	How's everything looking down there?
00 12 51 01	CC	Real fine. We've just got one to go here if you'll put your telemetry input PCM switch to LOW.
00 12 51 09	LMP	Roger. Go in LOW.
00 12 51 12	CC	Okay. We'll be in that configuration for about 2 minutes, and then we'll be completed with the CONM test.
00 12 51 19	LMP	Roger.
00 12 51 20	CC	I have some service module RCS quantities if you would like to take them sometime and check them against your onboard calculations.
00 12 51 31	SC	Stand by.
00 12 52 20	SC	Roger. Ready to copy. Could you give quad A, B, C, and D in that order?
00 12 52 24	CC	Okay. Will do. And I'll give you weights in pounds and percentages. Quad A 231 for 76 percent.
00 12 52 37	LMP	Roger. Stand by. What time is that for?
00 12 52 41	CC	Oh, 12 plus 15.
00 12 53 06	LMP	Okay. Got it.
00 12 53 08	CC	Okay. Quad Bravo 251, 82 percent. Quad Charlie 240, 79 percent.
00 12 53 20	LMP	Slow down.

00 12 53 29	CC	Quad Delta 245, 81 percent. P and C advises that these numbers are still good even though it is a 12:15 time. And we are completed with the COMM test. You can take your high-gain antenna and go back to MEDIUM.
00 12 53 57	LMP	Roger. MEDIUM.
00 12 54 36	CC	Apollo 8, we would like to dump your tape again, if you are not using it. And the reason we want to do this is we have some - we didn't completely get dumped before the burn. We would like to get that and get the rest of the burn data. There is no hurry on it. We can do it whenever it is convenient for you.
00 12 54 54	LMP	You got it.
00 12 54 57	CC	Okay. Thank you.
00 12 56 18	CC	Apollo 8, Houston. Do you call?
00 12 56 22	LMP	Negative, negative. Negative, Houston.
00 12 56 26	CC	Okay. Thank you. Say, we're curious about what you did with your Mae West?
00 12 56 52	LMP	We thought we might bleed the CO_2 out into the vacuum connector here in our next water dump. We forgot it the last time. Did you copy?
00 12 57 10	CC	Roger. Doesn't seem like there is any problem with going ahead and dumping it in the cockpit if you like.
00 12 57 37	LMP	It is CO_2, isn't it?

00 12 57 39	CC	That's affirm.
00 12 58 15	CC	Apollo 8, Houston. We asked it again, and it looks like no problems at all with going ahead and bleeding it down in the cockpit. And then if you need it again on entry or after entry, well, we can blow it up with oral tube.
00 12 58 33	LMP	Roger. Understand.
00 13 02 11	CC	Apollo 8, Houston.
00 13 03 10	CC	Apollo 8, Houston.
00 13 04 18	CC	Apollo 8, Houston.
00 13 06 12	CC	Apollo 8, Houston.
00 13 06 16	LMP	Houston, Apollo 8. Read you loud and clear. How us?
00 13 06 19	CC	Okay. Loud and clear. Didn't get you there for a while.
00 13 06 24	LMP	We have been reading you all along, Houston.
00 13 06 28	CC	Roger. Did you attempt to transmit, or were you just not getting through?
00 13 06 35	LMP	Roger. We attempted to transmit, and it sounded like you had a stuck mike there for a little while.
00 13 06 46	CC	Okay. That shouldn't make any difference to us on that Duplex mode. Okay. What I was calling for, Apollo 8 - we have got a maneuver PAD that is TLI plus 25. I would like to read up to you when you are ready for it.

00 13 07 24	LMP	Go ahead, Houston. TLI plus 25.
00 13 07 28	CC	Okay. TLI plus 25, and this will be an SPS/G&N. 63087, minus 162, plus 129 027 56 29 64, minus 001 63, plus 00001, plus 527 59 177 137 001, November Alfa, plus 00201 527 59 623 525 43 14 2347 337 023 up 195 left 17, plus 11 45, minus 165 00 127 80 358 90 074 3816, north stars 068 097 356, no ullage. For the fast return P37 DELTA-V, 7900 to the Indian Ocean. High-speed procedures are not required. Over.
00 13 10 35	CMP	Houston, Apollo 8. Maneuver PAD as follows. How do you read? Over.
00 13 10 40	CC	Loud and clear.
00 13 10 43	CMP	Roger. TLI plus 25, SPS/G&N 63087, minus 162 plus 129 027 56 2964, minus 00163, plus 00001, plus 52759 177 137 001, not applicable, plus 00201 52759 623 52543 14 2347 337 023 up 195 left 1.7, plus 1145, minus 16500 12780 35890 074 38 16. North set 068 097 356, no ullage, P37 fast return of 7 - 700 and 7900 DELTA-V Indian Ocean. High speed not required.
00 13 12 12	CC	That's correct, Apollo 8. And we'll have a couple more things for you before too long. We're working on a flyby PAD at this time. And we're going to be talking some more to you about the problems of looking at stars in the sextant and

telescope. And what we'd like to do as soon as the black team comes on the MOKR, while we have two teams here, we would like to get a rehash from you on exactly what you see and what you don't see and under what conditions, and see if we can define it so that everyone here understands what you've been telling us. And if you have any comments concerning the timeline - knowing that we got off our timeline before the burn - if you have any comments about that method of getting back on schedule, we'd like to hear those, too.

00 13 13 06	CDR	Roger. We have one request. CDR would like to get clearance to take a Seconal.
00 13 13 21	CC	Okay, Apollo. That's a GO.
00 13 13 29	LMP	Roger. And, Houston, this is 8. We might go over our future NAV sighting schedule if it's going to be revised at all.
00 13 13 45	CC	Okay, Apollo 8. No planned revisions.
00 13 13 50	LMP	Roger.
00 13 20 02	CC	Apollo 8, Houston.
00 13 20 05	CMP	Go ahead, Houston.
00 13 20 07	CC	Okay. Have your flyby PAD now so I can give that to you whenever you're ready for it.
00 13 20 18	CMP	Stand by. Ready to copy.
00 13 20 36	CC	Okay, Apollo 8. Here we go on a flyby maneuver PAD. This will be an SPS/G&N 63087, minus 162, plus

		129 060 59 4804, plus 009 62, plus 005 68, minus 020 77 000 000 000, November Alfa, plus 00202 02359 022 02282 03 0399 314 013 up 048 right 37, plus 1418, minus 16500 129 04 361 60 146 2911. North stars 323 090 056, no ullage. Remarks: number one, this requires realignment to preferred REFSMMAT. Two, this will raise the perilune to 550 nautical miles. Over.
00 13 23 30	CMP	Roger. Read back.
00 13 23 35	CC	Go ahead.
00 13 23 38	CMP	Flyby SPS/G&N 63087, minus 162, plus 129 060 59 4804, plus 009 62, plus 00568, minus 02077, 000 000 000, NA. Are you with me so far?
00 13 24 07	CC	Keep going.
00 13 24 09	CMP	Plus 00202 02359 022 02282 03 0399 314 013 up 048 right 37, plus 1418, minus 16500 129 04 361 60 146 2911, north 323 090 056, no ullage. Realign for preferred REFSMMAT at perigee is 50.
00 13 25 01	CC	That's a perilune to 550.
00 13 25 05	CMP	Understand. 550.
00 13 25 08	CC	That's affirm, and that's perilune.
00 13 24 12	CMP	Roger.
00 13 27 13	CC	Apollo 8, Houston.
00 13 27 17	CMP	Go ahead, Houston.
00 13 27 19	CC	Okay. We've completed the dump and the tape recorder is yours, and we listened to the call

		data voice playback, and you've been given a GO for your first test in creative writing.
00 13 27 36	CMP	Roger. Are we in low bit rate now?
00 13 27 43	CC	That's negative. You're in high bit, and you understand that it's your tape recorder?
00 13 27 53	CMP	Roger. Are you going to stay in high bit all along, or are you going to be back to low here soon, not that it matters much to us, really.
00 13 28 12	CC	Okay. We plan to stay in high bit rate. We're going to ask you if it made any difference, and you read our minds. That's pretty good for 63K.
00 13 28 22	CMP	Roger. That's an altitude record for mind reading.
00 13 30 59	SC	Houston, Apollo 8.
00 13 31 01	CC	Go ehead, Apollo 8.
00 13 31 04	LMP	Roger. Onboard calculations indicate that at 13 hours 30 minutes GET we are not 64 200 miles above the earth. That's using alternate slide rule.
00 13 31 24	CC	We've got 63 855.
00 13 31 37	LMP	Houston, this is Apollo 8. We're going to try to keep the conversation down here for a while so the CDR can go to sleep.
00 13 31 45	CC	Okay. We would like to get some comments from you before you sign off concerning the telescope, sextant, and verification that you have done something with the CO_2 in your Mae West and comment on the window status.

00 13 32 06	CMP	Roger. Is it a requirement that we do something with the CO_2 at this time? Over.
00 13 32 11	CC	No. That is negative.
00 13 32 14	CMP	Roger. We have maintained the same condition. We have left it as it was, and we will take care of it later.
00 13 32 21	CC	Okay.
00 13 32 32	CMP	Let me at this time go over the comments about the navigation as I see it so far.
00 13 32 37	CC	Go.
00 13 32 42	CMP	In the beginning, the operation with the S-IVB precluded immediate starting up of our sightings as we had scheduled since we had another evasive maneuver. The dumping of the S-IVB caused a tremendous amount of - of psuedo stars in the area which made an optics calibration practically impossible. The method which we had worked out did not seem to work too well. The method which I finally used was to go into P23, go to Sirius, which was our brightest star, get the shaft and trunnion, and then fly the spacecraft up to Sirius to use that for the optics CAL, which we did at a later time. With regards to light scatter, it appears that at almost any attitude during our passive thermal control, we are receiving light scattering in the scanning telescope. It takes

the form mostly of a wide band of light right across the center of the scope about 10 degrees either direction of zero. It is very difficult to see stars in this area. The realignments have been good. I have been able to pick up the star in the sextant to do the alignment, but I was not able to identify the star which we used in such cases as Regor or Menkent in the scanning telescope. The first star sighting which I took of the earth showed a very indistinct horizon. But there did appear to be a very - or somewhat sharp line between what appeared to be the earth's horizon and the atmosphere. The landmark line-of-sight filter appeared to help out this horizon definition. There is a very hazy and indistinct horizon through - between the space and the top of the atmosphere itself, and this is a very difficult one to use. As I said before, at times, looking at the moon with the sun in the near vicinity, the area around the moon, the space around the moon is not dark, but is a light - appears as a light blue. And this is also the same case as looking into the sextant during alignments with the star - with the sun in somewhat vicinity of the optics. However, I have no difficulty in finding these stars in the sextant. I also had no difficulty in spotting the stars I used, such

as Sirius, Procyon, or Canopus against the earth during our star-horizon measurements. I can see all three of those stars against the earth background. I believe it will be very difficult to do a backup GDC alignment using the north set stars, since Navi is not too bright of a star. I was able to spot star constellations in the scanning telescope if they were very bright and well known, such as Cetus and Orion, stars of this nature. I was not able to percieve other constellations. That's about the only comments I have at this time. Over.

00 13 36 48	CC	Okay. Fine; thank you very much.
00 13 36 55	CMP	We are going to do - Houston - future maneuvers for P53 in a lower - slower mode of AUTO maneuver. Essentially, we are going to load the DAP with 11101 to save fuel.
00 13 37 16	CC	Roger. That will be a 11101 DAP load.
00 13 37 20	CMP	Roger. We are going to try to save fuel that way.
00 13 37 23	CC	Good show.
00 13 37 29	LMP	With respect to the window, Houston: the windows 1 and 5 have moderate haze on them. Satisfactory for visual observation, but possibly not for photography. Windows 2 and 4 are clear. Window 3 is almost opaque. Over.
00 13 37 53	CC	Okay. Thank ycu.

00 13 37 57	LMP	And how is battery B looking to you?
00 13 38 27	CC	Apollo 8, Houston. It looks like it may take another 6 hours on this battery B charge. It turns out that the charge rate is less than what we are getting on our ground curves, but it is still above the Apollo 7 curves, and it looks like it is going along now in good shape. And I would like to have verification that the timeline leading up to the midcourse correction was satisfactory from your point of view.
00 13 38 57	LMP	Roger. Seemed quite satisfactory.
00 13 38 59	CC	Okay. Thank you. And we will stay off the loop until you give us a call.
00 13 39 04	LMP	Roger. You don't bother us, but our replies make a lot of noise.
00 13 39 13	CC	Okay.

END OF TAPE

00 14 43 00	LMP	Houston, Apollo 8. How do you read?
00 14 43 14	CC	Apollo 8, Houston. Go ahead.
00 14 43 26	CC	Apollo 8, Houston. You're very weak. You got the proper OMNI?
00 14 44 02	LMP	Houston, Apollo. How do you read?
00 14 44 04	CC	Loud and clear, Bill. Go ahead.
00 14 44 06	LMP	Okay. I'm just wondering how your tracking's doing.
00 14 44 14	CC	Okay. We're still tracking you. We don't have any firm solutions, yet.
00 14 44 25	LMP	Okay. Things looking nominal up here. How about down there?
00 14 44 33	CC	Okay. The systems basically look good, Bill. We're going to be coming up on a cryo fan cycle period in another few minutes, and you can go ahead and do that when you get ready.
00 14 44 46	LMP	Okay.
00 14 44 51	CC	And I guess we picked up some suspicions about the fuel cell 2 radiator out tab. How does that compare on board?
00 14 47 56	LMP	Houston, Apollo 8.
00 14 48 09	CC	Apollo 8, you called?
00 14 48 13	LMP	Roger. We're showing RAD OUT temp on fuel cell 2 would be about 90 degrees, and on 1 and 3 it would be slightly lower - maybe 75 or 80 degrees. About an hour ago you wondered about fuel cells performance; it looks like 1 and 2 are lower in performance than 3. Over.

00 14 48 45	CC	Roger. We show the same numbers on your outlet temperatures and thought that was a sensor failure. We've been watching the thing and we'll keep you advised of anything we see.
00 14 49 01	LMP	Okay.
00 14 49 11	CC	And on the performance, you're right - they are not quire the same, 1 and 2 are a little bit lower but all of these are sitting within the ballpark.
00 14 49 24	LMP	Roger. Fuel cell 1 has shown slightly a proportionately higher H_2 flow than O_2 flow all day long.
00 14 49 35	CC	Okay.
00 14 49 41	LMP	I'm showing 0.062 H_2 and 0,48 O_2.
00 14 49 53	CC	Roger. We'll take some CAL curves on those.
00 14 50 23	LMP	Okay. These things look reasonable to us and we'll keep looking at them. Our RAD OUT shows about 0.43 as opposed to your 0.48 on the oxygen, and we'll keep an eye on the CAL curves and just sort of watch it for you.
00 14 50 39	LMP	Okay. Thank you.
00 14 50 46	CC	If you'd like to set up some kind of a COMM check or specified time like every 30 minutes or so on these quiet periods, that would be okay with us. Might help to let us know that we're still in business.
00 14 51 03	LMP	All right. Just give me a call every now and then.
00 14 51 06	CC	Okay.

00 15 03 30 CC Apollo 8, Houston. Sometime when it's convenient, get your BIOMED switch over to the right, and you don't need to answer; just pass it up to you.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

00 16 00 27	CC	Apollo 8, Houston. How about a COMM check, and did you get that fuel cell purge - correction, the cryo fans ON?
00 16 00 37	CMP	Roger. We've had the cryo fans ON each for about 3 or 4 minutes.
00 16 00 41	CC	Okay. Real good. We weren't real sure that's what we were watching, and you're coming through loud and clear.
00 16 00 48	CMP	Roger.
00 16 14 06	CC	Apollo 8, Houston.
00 16 14 08	CMP	Go ahead, Houston. Apollo 8 here.
00 16 14 13	CC	Okay, Jim. Got an update here to the flight plan. You've got the 16:55 star visibility check, and what we've got on that looks like Navi is still our star, and the numbers associated with that are roll 102.6, pitch 328.9, yaw 346.3. That gives you a shaft and trunnion of zero. And if you think you can - if you think you can do something with this, why we would like to go ahead and give it a try and see if we can either verify it or maybe we'll both learn something if we verify it if you can do it with Navi.
00 16 15 03	CMP	Roger. Stand by one.
00 16 19 52	CMP	Houston, Apollo 8. Over.
00 16 19 57	CC	Apollo 8, Houston. Go.

00 16 20 04	CMP	Roger. We'll maneuver at this present time and try to pick up that attitude and get Navi, although I think it's a waste of time, but we will give it a try.
00 16 20 13	CC	Roger. Standing by for results.
00 16 38 10	CMP	Houston, Apollo 8.
00 16 38 15	CC	Apollo 8, Houston. Go.
00 16 38 17	CMP	Roger. We're at that attitude right now and looking through the scanning telescope. I can barely see any stars at all, and every time that the thruster will fire, you know, just completely blanks out my vision.
00 16 38 35	CC	Roger, 8. Understand.
00 16 38 43	CMP	Now the attitude is good, Houston, as far as not having glare on the optics, and it might be a certain amount of data adaptation is required here.
00 16 39 01	CC	8, Houston. Roger. Copy.
00 17 08 57	CC	Apollo 8, Houston.
00 17 09 15	CC	Apollo 8, Houston. Over.
00 17 10 29	CC	Apollo 8, Houston. Over.
00 17 13 33	CC	Apollo 8, Houston. Over.
00 17 13 36	CMP	Go ahead, Houston. Apollo 8 here.
00 17 13 41	CC	Apollo 8, this is Houston. I've got a new PTC attitude for you when you finish P23. Give you a better look at the earth. Over.

00 17 13 53	CMP	Roger. Ready to copy.
00 17 13 55	CC	Okay. Pitch 224, yaw 20.
00 17 14 09	CMP	New PTC is pitch 224, yaw 20.
00 17 14 13	CC	Affirm.
00 17 15 53	CMP	Houston, Apollo 8.
00 17 15 55	CC	Apollo 8, Houston. Go.
00 17 16 28	CC	Apollo 8, this is Houston. Over.
00 17 16 42	CC	Apollo 8, Apollo 8, Houston. Over.
00 17 16 58	CC	Apollo 8, Apollo 8, Houston. Go ahead.
00 17 17 04	CMP	Roger. We are taking our time going to this new P23 attitude; going to Navi is quite a ways away from the attitude we need for P23. I have a correction to make on 20 - on Navi after getting dark adapted; you can pick out Cassiopeiae and you can pick out Navi itself. It is difficult to see what stars are around. We still have quite a bit of particles that are floating with the spacecraft, especially when we move the optics and shaft. It seems to throw off a lot of particles.
00 17 17 43	CC	Roger. We copy that. What's your spacecraft lighting situation inside now?
00 17 17 53	CMP	We have the center window - the round window covered, and we have - the other windows are opened.
00 17 18 04	CC	Roger, 8. Copy.

END OF TAPE

00 17 24 15	CC	Apollo 8, Houston.
00 17 24 17	CMP	Go ahead, Houston.
00 17 24 19	CC	Apollo 8, Houston. While you're maneuvering for your P23, we have an update for DELTA-H for you if you're ready to copy.
00 17 24 28	CMP	Roger. Stand by.
00 17 25 04	CMP	Roger, Houston. You say you have a DELTA-H update for us? Just what do you mean?
00 17 25 08	CC	Roger. DELTA horizon update.
00 17 25 14	CMP	Roger. Go ahead.
00 17 25 16	CC	This is as a result of your P23 calibration; the update follows: VERB 24, NOUN 01, ENTER 1354, ENTER all balls, ENTER 214 50 ENTER; comment: continue to mark on the horizon destination that you've used previously. Your marks are looking very good.
00 17 25 57	CMP	Roger. DELTA-H update as follows: VERB 24, NOUN 01, ENTER 1354, ENTER all zeros, ENTER 214 50 ENTER. Understand those are two octal numbers.
00 17 26 18	CC	That's affirmative; both octal.
00 17 26 25	CMP	Roger. When do we get the maneuvers here? I'll go out on 23, and I'll put these in; then I'll continue.
00 17 26 31	CC	Okay.
00 17 27 19	CC	Apollo 8, Houston. There's no requirement for you to leave P23; you can enter those right now if you want to.

00 17 27 30	CMP	Roger.
00 17 49 25	LMP	Houston, are we in low bit rate now?
00 17 49 33	CC	Apollo 8, Houston. You're in high bit rate.
00 17 49 38	LMP	Roger. We'd like to record you this P23 stuff.
00 17 49 43	CC	Okay.
00 17 49 49	LMP	How about commanding low bit rate record FORWARD.
00 17 49 53	CC	Roger. Low bit rate, record FORWARD.
00 17 50 25	LMP	All right, Houston. Have you sent those commands yet?
00 17 50 28	CC	Apollo 8, Houston. They have been sent.
00 17 50 32	LMP	All right, Roger. Thank you. I am on the other side, too lazy to go over and get it.
00 17 52 09	CC	Apollo 8, Houston. We'd like to go back to high bit rate in order to get this P23 data recorded. Over.
00 17 52 36	LMP	Our checklist says low bit rate, Houston. If you want high, you can have it.
00 17 52 40	CC	Roger. We're going high bit rate.
00 17 52 46	LMP	Okay.
00 18 09 15	CC	Apollo 8, Houston.
00 18 09 20	CDR	Go ahead, Houston.
00 18 09 22	CC	Apollo 8, Houston. Do you want us to turn off your DSE for you? It's probably about half full. We're getting good high bit rate down.
00 18 09 31	CDR	Do you want to get the rest of this data?
00 18 09 34	CC	We're getting good high bit rate down.

00 18 09 39	CDR	Roger. Go ahead.
00 18 09 41	CC	Okay. And, also, we're - your state vector is now based on about 5 hours of tracking. We have you on a pericynthian of 69.7 miles with a free return. Your entry flight path angle looks like about minus 14. You will need only a few feet per second to get you back on a nominal entry angle.
00 18 10 43	CC	Apollo 8, Houston. Did you get the words on the state vector?
00 18 11 14	CDR	Houston, did you read? Apollo 8. We got a lot of noise.
00 18 11 20	CC	Apollo 8, Houston. Go ahead.
00 18 11 40	CDR	Houston, Apollo 8.
00 18 11 43	CC	Apollo 8, Houston. Go.
00 18 11 54	CC	Apollo 8, this is Houston reading you fairly weak. I'll repeat the state vector information. Your state vector is now based on 5 hours, more than 5 hours of tracking. We show you on a pericynthian of 69.7 miles with a free return with entry path flight angle of minus 14 degrees. Will only need a few feet per second at the lunar distance to get you back on a nominal entry angle. Over.
00 18 12 31	CDR	Roger. Copy.
00 18 12 33	CC	Roger.

00 18 22 15	CDR	Houston, Apollo 8.
00 18 22 18	CC	Apollo 8, Houston. Go. Reading you weak, but clear.
00 18 22 22	CDR	Roger. Our sighting schedule is complete, and I'm maneuvering to PTC attitude.
00 18 22 28	CC	Roger. Copy.
00 18 42 03	CDR	Houston, Apollo 8. Over.
00 18 42 05	CC	Apollo 8, Houston. Go.
00 18 42 09	CDR	Roger. I'm at the PTC maneuver now. Like a distance status from you - how the battery looks and how the fuel cells look and et cetera. Over.
00 18 42 23	CC	Roger.
00 18 43 21	CC	Apollo 8, Houston.
00 18 43 24	LMP	Go ahead.
00 18 43 26	CC	Apollo 8, this is Houston. We figure battery B will be charged in about 2 to 3 hours. All your systems look GO; your RCS usage so far is about 60 pounds, six-zero pounds over nominal. Over.
00 18 43 45	LMP	Roger. How about fuel cell 2; is that looking all right now?
00 18 43 50	CC	Roger. Fuel cells are all looking good.
00 18 43 54	LMP	Okay. We're going to have two of us hit the hay now and one man minding the store so you might have everybody keep an extra sharp eye on ...
00 18 44 09	CC	Roger, Bill. You think you're going to be able to sleep okay?

00 18 44 12	LMP	Yes. I think we kinda warmed up to a good sleep here by now.
00 18 44 20	CMP	Houston, Apollo 8.
00 18 44 22	CC	Go ahead.
00 18 44 24	CMP	Onboard navigation indicates a pericynthian altitude of 38.4 miles.
00 18 44 32	CC	Understand; 38.4 miles.
00 18 44 38	CMP	That's affirmative. It's on the DSKY right now, if you're reading it.
00 18 44 42	CC	Roger. Copy.
00 18 47 37	CC	Apollo 8, Houston.
00 18 47 42	LMP	Go ahead, Houston.
00 18 47 43	CC	Apollo 8, Houston. Be advised your downlink now is getting very noisy.
00 18 49 52	CC	Apollo 8, this is Houston with some comments on navigation.
00 18 49 59	CDR	Go ahead, Houston.
00 18 50 02	CC	Good morning, Frank. Apollo 8, this is Houston. We're wondering about your GDC backup align; we'd like your opinion on the possibility of doing this align using Sirius and Rigel rather than Navi, as it's in the north set at this time. Over.
00 18 50 31	CMP	Stand by one.
00 18 50 33	CC	Roger.

00 18 51 06	CMP	Houston, this is Apollo 8. We concur. Sirius and Rigel would be two stars that would be much better than Navi and Polaris. However, I did Cassiopeiae after I became adapted, but I'm afraid that the time required to do that type of alignment would be extensive if we ever had to go to that alignment.
00 18 51 33	CC	Roger, Jim. We understand. We'll go ahead and work in that direction, and we'll quit bothering you. Good night.
00 18 53 02	CC	Apollo 8, this is Houston.
00 18 53 07	CDR	Go ahead, Houston. Apollo 8.
00 18 53 10	CC	Apollo 8, Houston. At 19 GET, we're due for another cycle through on the cryo fans. Over.
00 18 53 19	CDR	Roger.
00 18 53 23	CC	Roger. Give us a call when you're complete.
00 18 53 30	CDR	Roger.

END OF TAPE

00 19 02 33	CDR	Houston, Apollo 8.
00 19 02 35	CC	Apollo 8, Houston. Go.
00 19 02 40	CDR	Give me a call when it is time to quit charging the battery, will you? I can't watch it very well over there.
00 19 02 44	CC	Wilco.
00 19 02 50	CDR	And I'm starting with the fans now.
00 19 02 53	CC	Roger. Copy.
00 19 02 55	CDR	Hydrogen 1 first.
00 19 02 58	CC	Roger.
00 19 11 23	CDR	Okay, Houston. We cycled through the fans 2 minutes each, and we'll stand by for the call for battery charges.
00 19 11 28	CC	Roger.
00 19 11 40	CC	Apollo 8, Houston. The battery charge will be complete around 21 hours.
00 19 11 46	CDR	Okay. Just give me a call.
00 19 11 48	CC	Okay.
00 19 30 38	CDR	Houston, Apollo 8.
00 19 30 41	CC	Apollo 8, Houston. Go.
00 19 30 51	CC	Apollo 8, Houston. Go.
00 19 30 55	CDR	Houston, Apollo 8.
00 19 30 58	CC	Apollo 8, Houston. Go.
00 19 31 08	CC	Apollo 8, Apollo 8, Houston. Go.
00 19 31 40	CC	Apollo 8, Houston. Go ahead.
00 19 32 00	CDR	Houston, Apollo 8.

00 19 32 23	CC	Apollo 8, this is Houston. Go ahead.
00 19 32 37	CC	Apollo 8, Houston. Go ahead.
00 19 33 00	CC	Apollo 8, Houston. Go ahead.
00 19 33 03	CDR	Roger, Houston. Crew status report here. We're behind on water and food, and we don't seem to have too much of an appetite. We're trying to stay up with the water, but the food is - not that there's anything wrong with the food, but we're just not very hungry.
00 19 33 25	CC	Roger. Understand, Frank.
00 19 33 29	CDR	The CDR got 5 hours of fitful sleep and rest, and the other two people are trying to sleep now.
00 19 33 36	CC	Roger.

END OF TAPE

00 20 57 46	CC	Apollo 8, Houston.
00 20 57 52	CDR	Go ahead, Houston. Apollo 8.
00 20 57 54	CC	Apollo 8, this is Houston. At 21 hours, we'd like you to terminate the battery B charge and start battery A charge and then begin an O_2 purge. Over.
00 20 58 10	CDR	Roger. Understand; terminate battery B, start battery A, and an O_2 purge.
00 20 58 13	CC	Roger. O_2 fuel cell purge.
00 20 58 17	CDR	Thank you.
00 21 00 47	CDR	Houston, Apollo 8. We are now charging battery A, and say again about the purge.
00 21 01 03	CC	Apollo 8, Houston. Roger. Copy your battery charge setup; now begin a fuel cell O_2 purge. Over.
00 21 01 13	CDR	Fuel cell O_2 purge. Roger.
00 21 09 09	CDR	Houston, the fuel cells are all purged.
00 21 09 15	CC	Roger, Frank.
00 21 09 27	CDR	How's the tracking coming, Jerry?
00 21 10 23	CDR	Houston, Apollo 8.
00 21 10 28	CC	Apollo 8, Houston.
00 21 10 31	CDR	How's the tracking looking?
00 21 10 33	CC	It's looking good, Frank. We just took in another batch of data, and we are processing it. It looks initially like we won't even need a midcourse number 2. As soon as we

process this data, we will have some confirmation for you. It should take anywhere from 15 to 30 minutes to finish the job.

00 21 10 53 CDR Thank you.

00 21 13 39 CC Apollo 8, Houston.

00 21 13 43 CDR Go ahead.

00 21 13 45 CC Apollo 8, this is Houston. We are showing your pericynthian 64 nautical miles. Your next midcourse at 28 will be less than 1 foot per second. We will have a firm confirmation on this in about 2 hours.

00 21 14 02 CDR Roger.

END OF TAPE

00 22 41 24	CDR	Houston, Apollo 8.
00 22 41 26	CC	Apollo 8, Houston. Go ahead.
00 21 41 29	CDR	How do you read?
00 21 41 31	CC	Reading you loud and clear, Frank. Good morning. How are you doing?
00 21 41 34	CDR	Just fine. We just broke lock for a minute, and I wondered why.
00 21 41 38	CC	Roger.
00 21 43 14	CC	Apollo 8, Houston.
00 21 43 17	CDR	Go ahead.
00 21 43 20	CC	Roger. Your break lock is due to the fact we switched our antennas over from Honeysuckle to Madrid. Over.
00 21 43 28	CDR	Roger. Thank you.
00 23 11 48	CC	Apollo 8, this is Houston. Over.
00 23 11 53	CDR	Go ahead, Houston. Apollo 8.
00 23 11 55	CC	Roger, Frank. We would like to bring you up to date on your trajectory. This midcourse coming up at 28 hours GET turns out to be very small, 0.7 feet per second, and we would like not to do it. Our data is looking extremely good and extrapolating it forward; it shows the midcourse number 4 at LOI minus 8 hours would be about 4 feet per second. In the meantime, the free return trajectory is looking very good with a water splash point off the

coast of Africa. So it looks like you are right down the old center line, and we propose not to do the next midcourse. Over.

00 23 12 37	CDR	Fine with us.
00 23 12 40	CC	Okay. And in regard to your timeline here, we suggest that you let Bill and Jim sleep for an extra period of time and don't wake them up until 26:30 GET, and that would cause deletion of P52 and P23 at 26 hours GET. Over.
00 23 13 08	CDR	Roger. Understand. Delete P52 and P23.
00 23 13 12	CC	Affirmative. Delete those at 26 hours, wake the other two guys up at 26:30 at which time they can eat, and then chlorinate the water supply after they have eaten.
00 23 13 29	CDR	Roger.
00 23 13 30	CC	That would put us back on our nominal flight plan at 28 hours GET. Over.
00 23 13 38	CDR	Roger.
00 23 13 43	CC	How's all that grab you?
00 23 13 47	CDR	Fine.
00 23 13 50	CC	Okay.
00 23 38 39	CC	Apollo 8, Houston. Over.
00 23 38 43	CDR	Go ahead, Houston.
00 23 38 45	CC	Roger. We're switching antennas again at 23:40 GET. You can expect a momentary break lock, and also we would like to bring you up to date on the passive thermal control. We

expect to keep the same PTC attitude until 28 hours GET. Over.

00 23 39 05 CDR Fine; thank you. How is the thermal control working?

00 23 39 10 CC Working good, Frank. I can give you some details if you want it.

00 23 39 18 CDR Go ahead.

00 23 39 39 CDR I am all ears, Houston. Go ahead with the details.

00 23 39 42 CC Okay. Stand by one until we switch our antennas, Frank. We'll be right with you.

00 23 39 50 CDR Roger.

00 23 40 41 CC Apollo 8, Houston. Over.

00 23 40 43 CDR Go ahead.

00 23 40 45 CC On your PTC, quads A, C, and D seem to be just about identical. Quad B is running slightly cooler, but only very slightly so. The temperature readouts in all respects are normal, so apparently the PTC is working well from a thermal viewpoint. And as far as the fuel consumption goes, it's minimal, just about like we expected. Have you got any comments about PTC? How does it seem to you?

00 23 41 13 CDR Seems fine. Seems to be working all right, just like you said. I was just wondering how the readouts from the SPS were, too.

00 23 41 48	CC	Apollo 8, Houston. The SPS temperature is normal. If anything, it's slightly warmer than we expected, so you are in real good shape in that respect.
00 23 41 59	CDR	Thank you.
00 23 42 19	CC	Frank, the PU valve temperature is running about 72 degrees, which is better control that we got here in this room.
00 23 42 29	CDR	Roger.

END OF TAPE

00 23 47 21	CC	Apollo 8, Houston. Over.
00 23 47 25	CDR	Go ahead, Houston. Apollo 8.
00 23 47 28	CC	Roger. It is time to do a cryo fan cycle, Frank, on all four fans, a short burst from each of them as you did before.
00 23 47 37	CDR	Understand; 2 minutes each on all cryo fans.
00 23 47 39	CC	Roger.
00 23 55 12	CDR	Cryo fans OFF and cycled, Houston.
00 23 55 24	CC	Apollo 8, Houston. Go ahead. Over.
00 23 55 29	CDR	I said the cryo fans are OFF and completed the cycle.
00 23 55 35	CC	Okay. Thank you, Frank.
01 00 24 18	CC	Apollo 8, Houston. Over.
01 00 24 22	CDR	Go ahead, Houston. Apollo 8.
01 00 24 24	CC	Roger. Just a COMM check, Frank. Do you read me all right?
01 00 24 28	CDR	Loud and clear.
01 00 24 30	CC	Same here.
01 00 24 32	CDR	Thank you.
01 00 42 55	CDR	Houston, Apollo 8.
01 00 42 59	CC	Apollo 8, this is Houston. Go.
01 00 43 03	CDR	How've you been reading our tape dumps?
01 00 43 06	CC	Stand by one, Frank. We noticed that you've got your PTC attitude peaked up a bit, and I'll check on your tape dump.

01 00 43 41	CC	Apollo 8, Houston. The quality of the tape dumps has been very good. We have about 15 minutes to dump, which we will do the next time we get high gain. Over.
01 00 43 52	CDR	How's the voice quality been?
01 00 43 56	CC	It's been very good, Frank.
01 00 44 00	CDR	Okay. We'll send you something down here shortly.
01 00 47 15	CC	Apollo 8, Houston. Over.
01 00 47 18	CDR	Go ahead, Houston.
01 00 47 21	CC	Frank, on this tape recorder, we have the tape motion stopped right now. If you would like to record some, we will give you the tape in motion so that you may do so. Is that what you would like? Over.
01 00 47 31	CDR	Roger. Houston, why don't you just give us salvo so we can control the switches here.
01 00 47 40	CC	Okay. Stand by.
01 00 47 41	CDR	... PCM LOW and stop.
01 00 47 53	CC	You should have it now. Over.
01 00 47 59	CDR	Roger.
01 00 53 52	LMP	Houston, Apollo 8.
01 00 53 59	CC	Apollo 8, Houston. Over.
01 00 54 02	LMP	Houston, Apollo 8. Over.
01 00 54 05	CC	Apollo 8, this is Houston. Over.
01 00 54 09	LMP	Roger. Are you capable of taking a high-bit FM dump for voice on the OMNI's?

01 00 54 19	CC	That is negative, Bill. Not quite, on the OMNI's.
01 00 54 26	LMP	Okay. We will catch you next time around then.
01 00 54 29	CC	Roger. Thank you.
01 00 54 32	CMP	Good morning, Mike. How are things going down there?
01 00 54 35	CC	Hi, Jim. Things are going real fine. How are you doing up there? Did you get a good night's sleep?
01 00 54 41	CMP	Oh, you know. The first night in space all the time; it's a little slow.
01 00 54 46	CC	The old man woke you up earlier than he needed to.
01 00 54 51	CMP	Well, we just couldn't sleep any longer.
01 00 54 55	CC	Roger. Understand.
01 00 55 07	CC	Apollo 8, Houston. The next time you are locked up on the high gain, give us a call, and we will configure for a dump. Over.
01 00 55 16	LMP	Roger. We would like an evaluation of the voice comments. Over.
01 00 55 21	CC	Roger. Understand. So far, it's been very good. We will evaluate this one as soon as we can.
01 00 55 44	LMP	How are the systems looking down there, Houston?
01 00 55 48	CC	Apollo 8, Houston. Go ahead.
01 00 55 53	LMP	Roger. I've been in the sack. How do the systems look?
01 00 55 56	CC	Everything is looking real good, Bill.
01 00 56 00	LMP	Okay. How much longer do you expect on charging battery A?

01 00 56 11	CC	Stand by, Bill. We will get you an exact number on it.
01 00 56 16	LMP	Just a rough estimate. And also, have you seen any more hints on that sensor problem on fuel cell 2?
01 00 56 28	CC	Stand by one. I'll get the latest scoop on it for you, Bill.
01 00 56 56	CC	Bill, there is nothing new on fuel cell number 2. We don't think there is anything at all wrong with the fuel cell. It's some sort of a sensor problem, but we don't have any new information on it.
01 00 57 06	LMP	Okay. They all look pretty good from here, Mike.
01 00 57 11	CC	Roger. Thank you.
01 00 57 18	CC	I've got some updates for you whenever you are ready to copy.
01 00 57 24	LMP	Stand by.
01 00 57 26	CC	Okay.
01 00 57 31	LMP	What kind?
01 00 57 33	CC	Well, I've got a TLI plus 35 hour update, and then I have an update to Jim's checklist.
01 00 57 49	LMP	Let's have the TLI plus 30 before we get the checklist update.
01 00 57 54	CMP	They never give up on the checklist, do they?
01 00 57 57	CC	Okay. This - when you get your maneuver PAD book out - the last maneuver PAD we gave you

for the flyby PAD still remains valid. We would just like to remark that the entry angle, the Gamma, is slightly steeper than we consider ideal, but it's within our - sort of the noise level of our ability to predict at this time. So that flyby maneuver PAD remains valid. Over.

01 00 58 28	CMP	Roger, Houston.
01 00 58 30	CC	Okay. Now on that page with the flyby maneuver, under your north set of stars, I have some new numbers for you because we've changed those stars from Navi and Polaris. As you recall, we changed to Sirius and Rigel, so - And that also, by the way, is the checklist update which I will give you later - but on that maneuver PAD, I have got three new angles for you using Sirius and Rigel when you are ready to copy those.
01 00 59 56	CC	Apollo 8, Houston. How do you read? Over.
01 01 01 01	CC	Apollo 8, Houston. Over.
01 01 01 21	LMP	Houston, Apollo 8. Over.
01 01 01 23	CC	Roger, Apollo 8. Houston. You are loud and clear now. We had a lot of background noise there for a few minutes. How are you reading me?
01 01 01 31	LMP	Roger. I'm reading you okay, Mike, and I read you the last time you asked me that, so I guess maybe I wasn't getting through to you.

01 01 01 39	CC	Okay. Well, did you copy on this flyby maneuver PAD? We've got three new angles. Are you ready to copy those?
01 01 01 47	LMP	I'm ready to copy the flyby angles.
01 01 01 49	CC	Okay. Roll 137, pitch 310, yaw 340. Over.
01 01 02 05	LMP	Roger. Roll 137, pitch 310, yaw 340.
01 01 02 11	CC	That's affirmative, and I have the TLI plus 35 hour PAD when you are ready for it.
01 01 02 19	LMP	Roger. Ready for the TLI plus 35.
01 01 02 23	CC	Roger. TLI plus 35 hours, SPS/G&N, 63023 minus 162 plus 129. Are you with me so far?
01 01 02 46	LMP	Loud and clear.
01 01 02 49	CC	Good. 037 56 5138, plus 00068, plus 00000, plus 46420 178 134 001, not applicable, plus 00202 46420 547 46211. Are you with me? Over.
01 01 04 01	LMP	Roger. Loud and clear.
01 01 04 03	CC	Good. 12 1383 327 023 up 172 left 22, plus 1293, minus 16500, 12905 36180 074 11 16. Comments: on your stars Sirius and Rigel, roll 010, pitch 294, yaw 320, no ullage. Other: one, fast return P37, DELTA-V equals 7821, for mid-Pacific landing for MTL; two, high speed procedures not required. Over.
01 01 05 58	LMP	Roger. Are you ready for the readback?
01 01 06 01	CC	All set.

01 01 06 04	LMP	TLI plus 35, SPS/G&N 63023, minus 162, plus 129 037 56 5138, plus 00068, plus 00000, plus 46420 178 134 000, NA. Are you with me?
01 01 06 35	CC	Yes, I'm with you, Bill. That last one should be 001.
01 01 06 42	LMP	Roger. Y 001, NA, plus 00202 46420 547 46211 12 1383 327 023 up 172 left 22, plus 1293, minus 16500, plus 12905, plus 36180 074 11 16. Sirius, Rigel: 010 294 320, no ullage, fast return P37, 7821 mid-PAC; high speed not required. Over.
01 01 07 44	CC	That's about the size of it. You're getting pretty good at this thing, Bill, for a rookie.
01 01 07 51	LMP	Not bad. I just learned to read about a year ago.
01 01 07 55	CC	Roger. Hey, I've got a flight plan update for Jim. It's on page G, George, 82 Able of his checklist. Over.
01 01 08 06	CMP	Roger. I've got it open. Go ahead, Mike.
01 01 08 08	CC	Okay. It's simply changing these north set of stars around. For Navi substitute Sirius, which is number 15, and for Rigel - correction - for Polaris substitute Rigel, number 12.
01 01 08 31	CMP	Roger. Substitute Rigel for Polaris and Sirius for Navi. How about shaft and trunnion; remain the same?

01 01 08 38	CC	Your shaft and trunnions remain the same. Sirius remains on the 50-degree line just like Navi used to be. Rigel is down 1.3 degrees from your horizontal, from your M-line. Over.
01 01 08 56	CMP	Roger. Understand.
01 01 08 59	CC	Okay. And let me know when it gets to be breakfast time. I've got a newspaper to read up to you and a few other things.
01 01 09 06	LMP	We're ready.
01 01 09 11	CC	Okay. I've got a Haney special here for you. The Interstellar Times latest edition says the flight to the moon is occupying prime space on both paper and television; it's THE news story. The headlines of the Post says "Moon, here they come". We understand that Bill Anders will be in private conversation or communication today with an old man who wears a red suit and lives at the North Pole. A suspect in the Miami kidnapping was captured late yesterday, and the 11 GI's that have been detained 5 months in Cambodia were released yesterday and will make it home in time for Christmas.
01 01 09 57	LMP	Roger. With reference to the first, we saw him earlier this morning, and he was heading your way.

01 01 10 03	CC	Roger. We'll pass the word along. David Eisenhower and Julie Nixon were married yesterday in New York. He was described as "nervous".
01 01 10 15	LMP	Right.
01 01 10 18	CC	The Browns took Dallas apart yesterday 31 to 20. We're sort of curious, who do you like today, Baltimore or Minnesota? Over.
01 01 10 29	CMP	Baltimore.
01 01 10 31	CC	How many points are you giving?
01 01 10 34	LMP	(Laughter) He's not making many points at home with that comment.
01 01 10 40	CC	Roger. Understand. Oh, I've got another score for you when you are ready to copy. Are you ready to copy?
01 01 10 51	LMP	Stand by. Go ahead.
01 01 11 06	CC	Roger. Navy 14, Army 21. Would you like for me to repeat that? Over.
01 01 11 14	LMP	You are very garbled, Houston; I'm unable to read. Will call you back in another year.
01 01 11 21	CC	Okay. We also notice the University of Houston lost their first home basketball game in 3-1/2 years last night. Illinois edged them out 97 to 84. And some really big news: the State Department announced only a few minutes ago that the Pueblo crew will be released at 9 p.m. tonight.

01 01 11 48	CMP	Sounds good. Outboard calculations indicate that Apollo 8 at 25 hours is 104 000 miles from home.
01 01 12 00	CC	Yes. Our plot board shows a similar number.
01 01 12 07	CDR	Mighty nice view from here.
01 01 12 12	CC	We're showing about 104 800 miles, and we're guessing another 8 to 10 hours on your battery charge.
01 01 12 23	LMP	Okay.
01 01 12 35	CC	Frank, say again about the view. You were blocked, I think.
01 01 12 41	CDR	This is a mighty nice view we have down there today. A little bit more than a half earth. Looks like Africa and the Red Sea is visible; we're not quite sure as there is quite a bit of cloud cover; but even through the hazy windows, it's mighty nice.
01 01 12 58	CC	How are your windows? Do you have a couple left that are real clear?
01 01 13 02	CDR	The rendezvous windows are good. The others are all about the same as they were when we last reported. One and five have a slight haze and a little fog on the inside.
01 01 13 16	CC	Roger. Understand.
01 01 16 55	CC	Apollo 8, Houston. Over.
01 01 16 59	CMP	...

01 01 17 01	CC	Roger. Just as a matter of curiosity for Bill, we can say a few words about the heaters for the cryo tanks, and also for the fans. We've noticed that the heaters are doing their thing normally, cycling on and off; and as time goes by, this cycle rate increases, indicating a little bit of stratification in the tanks. And then when we've been burning the fans on every 4 hours for a couple of minutes, this stirs things up and the heaters then cycling on and off again more slowly for a while, until again a little bit of stratification occurs, and the cycling becomes slightly more rapid. This is, of course, normal; we just point it out as a curiosity to you. Over.
01 01 17 45	LMP	Roger. I haven't really been following it that close. One thing I have noticed is when you turn the fans on you get a glitch in the quantity, which might correspond to a glitch in ac. Maybe the next time we'll look at the ac volts and see what happens.
01 01 18 14	CC	Our experts say that's not the reason for the glitch. They say the stratification fakes out the capacitants sensor there for a second.
01 01 18 25	LMP	I knew they would have some big deal answer for me.
01 01 18 31	CC	... got you today.

01 01 18 32	LMP	I'll buy that.
01 01 18 33	CMP	Roger.
01 01 18 36	CC	Any other information you want us to send up to you?
01 01 18 43	LMP	No, we're going to zap you with the high gain here shortly.
01 01 18 46	CC	Okay.

END OF TAPE

01 01 19 36	LMP	Houston, this is Apollo 8. How do you read on the high gain?
01 01 19 39	CC	Reading you loud and clear, Bill. How me?
01 01 19 44	LMP	I'm reading you loud and clear. I'll go ahead and dump this. You might want to listen to it in real time to evaluate the voice.
01 01 19 54	CC	Okay. We'll do that as soon as we can.
01 01 19 57	LMP	Give me a call when you are ready.
01 01 20 08	CC	Do you want to dump it by your command, or would you like us to command the dump on it? Over.
01 01 20 15	LMP	Oh, you can go ahead and command whenever you are ready.
01 01 20 18	CC	Okay. We are starting now; thank you.
01 01 20 19	LMP	I've already rewound.
01 01 20 20	CC	Roger.
01 01 20 21	LMP	Roger. I've already rewound.
01 01 21 02	LMP	There is only about 5 minutes worth on the tape, Houston.
01 01 21 07	CC	Roger. Understand, Bill. You promised me you would wait 3 days before you started doing this, Bill.
01 01 21 31	LMP	It has been a long trip.
01 01 26 48	CC	Apollo 8, Houston.
01 01 26 52	LMP	Go ahead, Houston.
01 01 26 53	CC	Roger, Bill. We've got your dump, and the voice quality is very good. We are going to take about

		20 minutes or so to get it back to Houston to play it.
01 01 27 11	LMP	Roger. Where are you taking it through, Houston?
01 01 27 15	CC	It comes through Madrid and then Ascension, Bill.
01 01 27 21	LMP	Okay.
01 01 40 56	CC	Apollo 8, Houston.
01 01 41 13	CC	Apollo 8, Houston. Over.
01 01 41 30	CC	Apollo 8, Houston. Over.
01 01 42 41	CC	Apollo 8, Houston. Over.
01 01 42 55	CC	Apollo 8, this is Houston. Over.
01 01 43 27	CC	Apollo 8, this is Houston. Over.
01 01 43 20	LMP	Houston, Apollo 8. How do you read?
01 01 43 32	CC	Roger, Bill. We are reading you loud and clear now. We had an antenna problem down here. We had an unexpected switch of antenna, which probably caused your high gain to quit.
01 01 43 47	LMP	Roger.
01 01 45 02	CC	Apollo 8, Houston. Over.
01 01 45 16	LMP	Go ahead, Houston. Apollo 8.
01 01 45 18	CC	Roger, Jim. When we lost our antenna down here, we interrupted your tape dump, so we are in the process of doing some rewinding and continuing the dump, in case Bill is wondering what is going on with the tape recorder.
01 01 45 33	CMP	Okay. No strain.
01 01 56 53	CC	Apollo 8, Houston. Over.

01 01 56 56	LMP	Go ahead, Houston.
01 01 56 58	CC	Roger. At 26 hours GET, we'll be switching our antennas back again at Madrid, and you can expect a glitch on your COMM system.
01 01 57 12	LMP	Roger.
01 01 57 17	CMP	Houston, Apollo 8.
01 01 57 18	CC	Go ahead, Jim.
01 01 57 21	CMP	I noticed that you skipped the IMU alignment for about 26 hours because we were still asleep. Do you want to include that again, or do you think it is required?
01 01 57 33	CC	Roger, Jim. We think it is going to be required prior to the next set of P23 sightings, and we're suggesting that it be put in at 27:45. We'll have a flight plan - a more complete flight plan update in here shortly.
01 01 57 51	CMP	Okay. Fine. We're in the process of having breakfast.
01 01 57 57	CC	Roger. Understand.
01 02 04 06	CC	Apollo 8, Houston.
01 02 04 11	CMP	Go ahead, Houston.
01 02 04 12	CC	The tape dumps are complete; it's rewound. You can go ahead and record in low bit rate if you ...
01 02 04 20	CMP	Roger. Will do.
01 02 41 22	CC	Apollo 8, Houston.
01 02 41 27	LMP	Go ahead, Houston. Apollo 8 here.

01 02 41 28	CC	Disregard. We were going to talk about the high gain, but you beat us to it.
01 02 41 35	LMP	Okay.
01 02 42 47	CC	Apollo 8, Houston.
01 02 42 50	CMP	Go ahead, Houston.
01 02 42 52	CC	Roger, Jim. We would like to take control of the tape for a few minutes to make sure that we got all that last dump. Over.
01 03 43 00	CMP	Okay. Stand byone.
01 02 43 02	CC	Roger.
01 02 43 03	CMP	You've got it.
01 02 43 04	CC	Thank you, sir.
01 02 44 14	LMP	Houston, Apollo 8.
01 02 44 16	CC	Apollo 8, Houston. Go ahead.
01 02 44 22	LMP	Roger. I just noticed that I can hear those RTC's coming through on normal voice.
01 02 44 44	CC	What does it sound like, Bill?
01 02 44 48	LMP	A little squeak.
01 02 46 34	CC	Apollo 8, Houston. Over.
01 02 46 39	LMP	Go ahead.
01 02 46 41	CC	Roger. I have a flight plan update for you sometime at your convenience.
01 02 46 47	LMP	Alright.
01 02 47 50	LMP	Ready to copy.
01 02 47 53	CC	Apollo 8, Houston. Were you calling? Over.
01 02 47 56	LMP	Roger. Ready to copy.

01 02 47 58	CC	Okay, Bill. This will be on page 2 dash 22 of your flight plan. For the command module pilot - I've already mentioned it to him - but at the top of the page, at about 27:45, actually, we would like him to do a P52, an IMU alignment, and then the P23 should be done as scheduled. Those four stars, Procyon, Regulus, Alphard, and Spica: we realize Alphard may not be too good a star, Regulus is about 3 degrees above the horizon, and Spica is at a 48-degree trunnion angle; so I guess what we are saying is if Jim has difficulty doing one set on each of those four stars, we suggest that he omit whichever one he is having difficulty with and pick it up by doing two sets on some other star that he likes. Over.
01 02 49 09	LMP	Roger. Understand.
01 02 49 10	CC	All right. In the lower right hand corner of page 2-22, the passive thermal control attitude should read "pitch 224 degrees, yaw 020."
01 02 49 29	LMP	Roger. Copy.
01 02 49 31	CC	And on the next page, at about 29 hours, you can resume the normal flight plan. We would like to make one addition; at 29:30, add a waste water dump. Even though one is not really required at that time, we would like to get the

		dump out of the way so we can track you uninterruptedly without any dumping, you know, as we are coming up on midcourse correction number 3. Over.
01 02 50 03	LMP	Roger.
01 02 50 06	CC	That's about all, Bill. You got any questions on this?
01 02 50 11	LMP	No, it looks pretty good. We've been saving up some water of our own to dump here, so that will work out all right.
01 02 50 18	CC	Very good. And don't ruin Jim's optics.
01 02 50 24	LMP	Right.
01 02 50 48	CC	Apollo 8, Houston.
01 02 50 51	LMP	Go.
01 02 50 52	CC	Roger. We would like POO in ACCEPT, please. We would like to send you up a P27. It's a LM state vector, going into the LM slot only, and we do not want you to transfer it over to the CSM.
01 02 51 24	CC	Apollo 8, Houston. Did you copy?
01 02 51 28	LMP	Roger. You got it.
01 02 51 34	CC	Okay. We got it. We're sending you a LM state vector, and we would like you not to transfer that vector over to the CSM slot.
01 02 51 40	LMP	Roger.
01 02 51 42	CC	Thank you.

END OF TAPE

01 02 55 36	CC	Apollo 8, Houston.
01 02 55 40	LMP	Apollo 8. Roger. Are you still planning an MCC 2 at 28 hours? Over.
01 02 55 48	CC	Stand by one, Bill. Bill, negative. Now that midcourse correction number 2 has been cancelled. It's magnitude was less than 1 foot per second, so we decided not to do it. Over.
01 02 56 12	LMP	Okay. Thank you.
01 02 56 14	CC	And you've got the computer again, if you go to BLOCK.
01 02 56 22	LMP	Okay.
01 02 58 29	LMP	Houston, Apollo 8.
01 02 58 32	CC	Apollo 8, Houston. Go ahead.
01 02 58 36	LMP	Are you still computing the pericynthian time of 6910.
01 02 58 45	CC	Stand by. We will get an update for you.
01 02 58 48	LMP	Okay.
01 02 59 40	CC	Apollo 8, Houston. Your 6910 pericynthian is still good plus or minus a minute, and we will get it down to a fine map measurement ...
01 03 26 08	CC	Apollo 8, Houston.
01 03 26 15	LMP	Roger. This is Apollo 8.
01 03 36 17	CC	Okay, Bill. We just got your readout on your voice tape, and we will be back with you on it shortly. Over.
01 03 36 27	LMP	Okay.

01 03 36 28	CMP	Houston, I'm going to be doing my alignment at this time. I'm in a good position for viewing the stars.
01 03 26 39	CC	Roger, Apollo 8.
01 04 18 13	CC	Apollo 8, this is Houston with voice check. Over.
01 04 18 19	CMP	Houston, Apollo 8. Read you loud and clear now. How us?
01 04 18 22	CC	Oh, good. Reading you loud and clear. One, two, three, four, five, five, four, three, two, one. Am I cutting in and out still? Over.
01 04 18 31	CMP	Nope. All the numbers are coming up nicely.
01 04 18 34	CC	Okay. Thank you, Jim.
01 04 19 27	CC	Apollo 8, Houston. We are going to switch antennas at 28:20. Stand by for our blitz.
01 04 19 36	CDR	Roger, Houston. And we will start passing thermal control, and we are maneuvering to P23.
01 04 19 42	CC	Roger. Understand; maneuvering to P23; I understand.
01 04 23 31	LMP	Houston, Apollo 8.
01 04 23 34	CC	Apollo 8, Houston. Go.
01 04 23 38	LMP	Roger. You copy high bit rate now for this P23?
01 04 23 43	CC	Negative, Bill. We are getting low bit rate now.

01 04 23 48	LMP	If you go high bit rate, we will not bother recording it.
01 04 27 52	CC	Roger. We just went to high bit rate.

END OF TAPE

01 05 03 39	CMP	Houston, Apollo 8.
01 05 03 44	CC	Apollo 8, Houston. Over.
01 05 03 51	CC	Apollo 8, this is Houston. Over.
01 05 03 55	CMP	Roger. Cislunar NAV accomplished. We did two sets on star 16, two sets on 22, and one set on 21.
01 05 04 07	CC	Roger. Understand P23 completed, two sets on 16, two on 22, and one on 21.
01 05 04 15	CMP	Roger. It was getting a little late, so we didn't want to start on 26.
01 05 04 19	CC	Roger. Understand, Jim.
01 05 07 18	LMP	Houston, Apollo 8.
01 05 07 22	CC	Apollo 8, Houston. Go ahead.
01 05 07 26	LMP	Is our previous PTC attitude okay for the next session?
01 05 07 32	CC	Roger, Bill. The one that we updated an hour or so ago, (i.e., pitch 224, yaw 020) is a good one.
01 05 07 43	LMP	224 20. Roger.
01 05 07 46	CC	Roger.
01 05 07 52	CC	Apollo 8, Houston. We will change antennas in about 2 minutes. You can expect a glitch in your COMM.
01 05 08 02	LMP	Roger.
01 05 08 03	CC	Roger.
01 05 08 04	LMP	How are all of the systems looking down there, Houston?

01 05 08 19	CC	Apollo 8, Houston. You are looking good here in all respects.
01 05 08 24	LMP	Okay.
01 05 17 52	CC	Apollo 8, Houston. Over.
01 05 18 01	CC	Apollo 8, this is Houston. Over.
01 05 18 14	CC	Apollo 8, this is Houston. Over.
01 05 23 26	CDR	Houston, Apollo 8. How do you read?
01 05 23 40	CDR	Houston, Apollo 8.
01 05 32 10	CDR	Houston, Apollo 8.
01 05 32 12	CC	Roger. Apollo 8, Houston. Go ahead.
01 05 32 17	CDR	Roger. We are dumping some water we collected here, and we are ready to dump the waste water down to 25 percent. Do you concur?
01 05 32 23	CC	Roger. We concur. We are standing by for your dump.
01 05 32 29	CDR	Alright. We've already started the other.
01 05 32 31	CC	Roger. Thank you.
01 05 36 40	CC	Apollo 8, Houston.
01 05 36 47	CC	Apollo 8, this is Houston. Over.
01 05 38 21	CC	Apollo 8, this is Houston. Over.
01 05 38 26	CDR	Roger. This is Apollo 8.
01 05 38 28	CC	Roger. We are getting geared up down here to do the first of the COMM checks. We will be doing an OMNI COMM check, which is on your flight plan, listed mode 7.8, and we will let you know when we are ready to proceed.

01 05 38 50	CDR	Roger.
01 05 40 01	CC	Apollo 8, Houston. Over.
01 05 40 05	LMP	Roger, Houston. We are dumping waste water now out of these nozzle template.
01 05 40 11	CC	Stand by. Looks good, Bill; 64 degrees. Over.
01 05 40 24	LMP	Roger. We just got an O_2 flow high from purging to vent line on the cabin.
01 05 40 32	CC	Roger. Understand.
01 05 40 47	CDR	How is everything in Houston.
01 05 40 51	CC	Oh, just fine, Frank. Everything down here is GO. How are you?
01 05 40 56	CDR	Fine. What is the news?
01 05 41 01	CC	Well, did you get the intergalactic news summary we sent up to you a couple of hours ago? It might have been during your rest period. We gave you a couple of football scores. One of them in particular was - I don't know if you copied that - Army 21, Navy 14. Over.
01 05 41 21	CDR	One, two, three, four, five, six, seven; testing out.
01 05 41 24	CMP	I got that one.
01 05 41 30	CC	Roger. The Cowboys were destroyed by the Cleveland Browns yesterday. The Pueblo crew is expected to be released. And I now hear our air-to-ground has got a lot of background noise. Stand by; we are going to go through these COMM test modes on page 223 of the flight plan. Over.

01 05 41 57	CDR	Roger.
01 05 42 03	CC	Apollo 8, Houston. Would you go S-band AUX switch to DOWN-VOICE BACKUP. Over.
01 05 42 11	CDR	DOWN-VOICE BACKUP. Roger and out.
01 05 42 13	CC	Thank you.
01 05 42 17	CDR	Houston, be advised that it looks like your twin bars are clipping your voice during your transmission.
01 05 42 25	CC	Roger. Understand. Are we still experiencing this intermittent condition that was there a few minutes ago?
01 05 42 33	CDR	Not always, but often in the beginning and in the end of your transmission.
01 05 42 39	CC	Roger. Understand. I'll give it a little extra time.
01 05 45 44	CC	Go.
01 05 45 52	CC	Apollo 8, Houston. Over.
01 05 46 01	CC	Apollo 8, Houston. Could you try to find us a better OMNI antenna? Over.
01 05 46 10	CDR	...
01 05 46 22	CC	Apollo 8, Houston. We are unable to read you on this OMNI antenna. Over.
01 05 46 54	CDR	Houston, Apollo 8. ...
01 05 47 07	CC	Apollo 8, this is Houston. Over.
01 05 47 47	CC	Apollo 8, Houston. We understand you are copying us. While we are trying to reestablish contact with you, would you put your optics

switch to zero? We show you are drifting off in trunnion and request that you zero your optics.

01 05 48 26	CC	Apollo 8, Houston. We copy your optics zeroed, and how are you reading us now? Over.
01 05 49 37	CC	Apollo 8, Houston. We are down to 25 percent on your waste water dump and ready to terminate. Over.
01 05 49 45	CDR	Roger.
01 05 51 01	CC	Apollo 8, this is Houston. Over.
01 05 51 06	CDR	Go ahead, Houston. Apollo 8.
01 05 51 08	CC	Roger. Our next COMM test is ranging only test. I have four switches I would like you to throw, which will cause you to lose voice communications for approximately 3 minutes. Over.
01 05 51 23	CDR	Roger. Go ahead.
01 05 51 26	CC	Alright. The first one is S-band NORMAL mode voice, OFF; the second, S-band NORMAL mode PCM, OFF; the third, S-band NORMAL mode RANGING switch to RANGING; and fourth, the S-band AUX tape switch, OFF. Over.
01 05 55 48	CC	Apollo 8, Houston. Request S-band NORMAL mode RANGING to OFF and S-band NORMAL mode PCM to PCM. I say again, S-band NORMAL mode RANGING, OFF; S-band NORMAL mode PCM to PCM.
01 05 56 17	CC	Apollo 8, Houston. We'll stand by in this configuration for a moment.

01 05 58 30	CC	Apollo 8, Houston. Three communication switch positions. First, S-band AUX tape to DOWN-VOICE BACKUP; S-band NORMAL mode PCM, OFF; TELEMETRY INPUTS PCM, HIGH. I say again, S-band AUX tape to DOWN-VOICE BACKUP; S-band NORMAL mode PCM to OFF; TELEMETRY INPUTS PCM to HIGH.
01 05 59 05	LMP	Roger. Houston, this is Apollo 8. How do you read?
01 05 59 08	CC	Reading you weak but clear now, Bill.
01 05 59 14	LMP	Roger. We still have a bad look angle on this antenna.
01 05 59 28	CMP	Apollo 8, Houston.
01 05 59 30	CC	Apollo 8, Houston. Go ahead.
01 05 59 34	CMP	Please be informed that the ... Over.
01 05 59 41	CC	Apollo 8, Houston. Unable to copy. After about a minute of this configuration, we're going to return to normal voice, and at that time, we should be able to hear you better.
01 05 59 58	CDR	Roger. What ... are we going through right now?
01 06 00 17	CC	Roger. We are in Mode 7 dash 10, and the COMM test mode is on page 223. Over.
01 06 00 41	CC	Apollo 8, Houston. Three switch positions. TELEMETRY INPUTS PCM switch to LOW; S-band NORMAL mode VOICE to VOICE; S-band NORMAL mode PCM to PCM. I say again, TELEMETRY INPUTS PCM

switch, LOW; S-band NORMAL mode VOICE to VOICE; S-band NORMAL mode PCM to PCM. Over.

01 06 01 33	CDR	Roger. We're switching over to backup now.
01 06 01 35	CC	Reading you very weak.
01 06 01 46	LMP	We are reading you loud and clear, Houston.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION SPAN Room

(GOSS NET 1)

01 06 02 41	CC	Apollo 8, Houston. Requesting S-band NORMAL mode ranging to RANGING. I say again. S-band NORMAL mode ranging to RANGE. Over.
01 06 04 50	CC	Apollo 8, Houston. Requesting S-band NORMAL mode ranging to RANGING. Over.
01 06 05 04	CC	Apollo 8, Houston. Over.
01 06 05 17	CDR	Houston, Houston, Apollo 8. How do you read?
01 06 05 20	CC	Beautiful, Frank. I'm reading you loud and clear. How me?
01 06 05 39	CC	Apollo 8, Houston. How do you read? Over.
01 06 06 06	CC	Apollo 8, this is Houston. Over.
01 06 06 49	CC	Apollo 8, this is Houston. Over.
01 06 06 53	CDR	Go ahead, Houston. Apollo 8.
01 06 06 56	CC	Roger. Reading you loud and clear. How me?
01 06 07 00	CDR	You're loud and clear, Michael.
01 06 07 02	CC	Okay. We're still looking for the S-band NORMAL mode ranging to RANGING.
01 06 07 12	CDR	I guess we didn't hear that one. Going to RANGING.
01 06 07 14	CC	Roger.
01 06 07 16	CDR	It's in RANGING now.
01 06 07 18	CC	Thank you.
01 06 07 39	CDR	And - Houston, Apollo 8 - what size antenna are you going to now?
01 06 07 54	CC	Apollo 8, Houston. We're working through Ascension, a 30-footer. Over.

01 06 08 03	CDR	Okay. We - our signal strength is ... AGC is pretty low up here.
01 06 08 08	CC	Roger. Understand.
01 06 09 32	CC	Apollo 8, Houston. Requesting S-band OFF state to OFF. This should put us back in the normal configuration. Over.
01 06 10 32	CC	Apollo 8, Houston. Over.
01 06 10 38	CDR	Go ahead, Houston. Apollo 8.
01 06 10 39	CC	Okay. S-band OFF state to OFF. That returns us to normal configuration, and we need a couple of items from you. First, the CMP and LMP status report (including PRD readings on all three crewmembers), and we'd like to know did you chlorinate the water after your last meal. Over.
01 06 11 10	CDR	No, we haven't chlorinated the water, yet. We'll get the other for you.
01 06 11 13	CC	Roger. Thank you.
01 06 11 14	LMP	Houston, do you show the FM - Houston, Apollo 8 - do you show the FM on now?
01 06 11 22	CC	Stand by and we'll check it, Bill.
01 06 11 26	LMP	Because our S-band off state has been OFF. Possibly - we don't have control of it.
01 06 12 29	CC	Apollo 8, Houston. We've switched on all the communications switch; functions are operating normally, Bill.
01 06 12 37	LMP	Okay, Mike. Thanks.

01 06 12 43	CDR	Mike, the PRD readings for the CDR are 4 - that's 0.04, for the CMP is 0.64, and for the LMP is 0.25.
01 06 12 59	CC	Good. I copy 0.04, 0.64, 0.25. Thank you.
01 06 13 06	CDR	Roger.
01 06 22 25	CDR	Houston, this is Apollo 8.
01 06 22 33	CC	Go ahead, Apollo 8.
01 06 22 37	CDR	Oh, hi, Ken, how are you doing?
01 06 22 39	CC	Roger. Fine. How you been?
01 06 22 41	CDR	Is this Jerry?
01 06 22 42	CC	This is Ken.
01 06 22 44	CDR	Hey, listen, we still have this TV coming up here - let's see - 31:20?
01 06 22 52	CC	Affirmative.
01 06 23 00	CDR	We're about in the right position for high gain; we wondered if you wanted to take a trial run and see if it will work. Or do you just want to wait and try it when they're supposed to go on the air with it?
01 06 23 18	CC	Okay. Stand by on that.
01 06 23 23	CDR	Okay.
01 06 30 25	LMP	Houston, Apollo 8. Over.
01 06 30 27	CC	Go ahead, Apollo 8.
01 06 30 33	LMP	Roger. Could you ask the GNC to give us an update on our prop quantity, please?
01 06 30 41	CC	Wilco. You're referring to the RCS?
01 06 30 46	LMP	Roger.

01 06 30 53	LMP	If you'll give it to me kinda slow, I'll plot it.
01 06 30 56	CC	Roger. It's coming now.
01 06 35 13	CC	Apollo 8, Houston.
01 06 35 19	CDR	Go ahead, Houston. Apollo 8.
01 06 35 20	CC	Okay. In reference the early TV, we're loosing the high-gain antenna now, and it looks like the only way we would have gotten the early TV pass in anyhow was to send it to remote site and look at it there. So we're going to scrub that idea and we'll just pick up with the scheduled TV. The COMM checks that are remaining are the high-gain dependent type, and we'll put those off until the TV session is completed, and we are working on the fuel propellant curve for you now.
01 06 35 53	CDR	Thank you.
01 06 41 50	CC	Apollo 8, Houston.
01 06 41 53	CDR	Go ahead, Houston. Apollo 8.
01 06 41 54	CC	Okay, Apollo 8. What we're going to do on the TV is to go ahead and let you crank it up as soon as we get back on the high-gain antenna, and it looks like - my guess is that this will be about 31:07, and we'll just use this to - as long as we have the coverage there. I have an update to your TLI plus 35 PAD. Now we have to correct a couple of times on there. So when you get that out, let me know and I'll read it to you.

01 06 42 38	CDR	Go ahead.
01 06 42 40	CC	Okay. On the TMI plus 35 pass, the update I want to give you is the last three lines in the block: the EMS range to go 13084 35985 0984217. Over.
01 06 43 11	CDR	Understand. Range to go 13084 35985 0984217.
01 06 43 21	CC	Affirmative.
01 06 44 54	CC	Apollo 8, Houston. We are about to have a hand-over to Goldstone, and our downlink isn't improved then. I don't know if you'll notice any difference in the uplink or not.
01 06 45 52	CC	Apollo 8, Houston.
01 06 46 44	CC	Apollo 8, Houston.
01 06 46 48	CDR	Go ahead, Houston. You are loud and clear.
01 06 46 51	CC	Okay. We have switched sites over to Goldstone now. I don't know if you can tell any difference in our uplink.
01 06 47 01	CDR	Negative. You're about the same.
01 06 47 03	CC	Okay. You have cleared up quite a bit. Sounds a lot better to us.
01 06 47 08	CDR	Okay.
01 06 49 35	CC	Apollo 8, Houston.
01 06 49 38	CDR	Go ahead, Houston. Apollo 8.
01 06 49 40	CC	I have some RCS quantity data for you. We are all set up to receive the TV whenever you get high gain looking at us.

01 06 49 51	CDR	Okay. Let me get the chart out here.
01 06 50 20	CDR	Go ahead with the quad propellant quantities, please.
01 06 50 25	CC	Okay, Apollo 8. Alfa, I have 225 pounds, 74 percent; Bravo 240 - -
01 06 50 41	CDR	Slower, please.
01 06 50 42	CC	Roger. I will repeat. Alfa 225, 74 percent; Bravo 240 pounds, 79 percent; Charlie 236, 78 percent; Delta 238, 79 percent. I would like to remind you on the TV that we need narrow beam width when you get up in high gain. Over.
01 06 51 45	CDR	Roger. Understand.
01 07 07 18	CDR	Houston, how do you read? Apollo 8.
01 07 07 20	CC	Loud and clear, Apollo 8.
01 07 07 24	CDR	Okay. Thank you.
01 07 09 57	CDR	Houston, Apollo 8. How do you read?
01 07 09 59	CC	Apollo 8. Loud and clear and standing by.
01 07 10 04	CDR	Say again.
01 07 10 05	CC	We read you loud and clear, and we're standing by.
01 08 10 09	CDR	Okay.
01 08 10 23	CDR	Are you receiving television now?
01 07 10 36	CC	Apollo 8, Houston. We just got it.
01 07 10 43	CDR	You are getting it?
01 07 10 52	CC	Okay, Apollo 8. We have a good picture.

01 07 10 54	CDR	We're rolling a -
01 07 10 57	CDR	Okay. We're rolling around to a good view of the earth, and as soon as we get to the good view of the earth, we'll stop and let you look out the window at the scene that we see. Jim Lovell's down in lower equipment bay preparing lunch, and Bill is holding a camera here for us both.
01 07 11 29	CDR	Bill's going to take the camera down to the lower equipment deck with Jim.
01 07 11 34	CC	Roger.
01 07 11 37	CC	Okay. We're getting a pretty good picture, but if you'd move it a little slower - every time you move it around, it breaks up the scan.
01 07 11 47	CDR	We gotcha.
01 07 11 49	CC	(Laughter)
01 07 11 54	CMP	This is known as preparing lunch and doing P23 at the same time.
01 07 12 18	CC	You've got everybody standing on their heads down here.
01 07 12 23	CDR	How go - Has he got it turned upside down? You've got the wrong REFSMMAT.
01 07 12 31	CC	Well, we all have our problems.
01 07 10 44	CDR	How is the picture now, Houston?
01 07 10 46	CC	They are really good.
01 07 10 52	CDR	Okay. Now we are coming up on the view that we really want you to see. That's the view of the

		earth, and if you will break for just a minute, Bill is going to put on the large lens. So we will be right back with you.
01 07 13 03	CC	Okay. Thank you.
01 07 13 54	CDR	Houston, we are now showing you a view of the earth through the telephoto lens.
01 07 14 00	CC	Okay. We are not receiving a picture right now.
01 07 14 08	CDR	How about now?
01 07 14 14	CC	Okay. We don't have a picture yet.
01 07 14 27	CDR	You seeing anything at all, Houston?
01 07 14 36	CC	Okay, Apollo 8. We don't have a picture yet.
01 07 14 46	CDR	Alright. We will put the other lens back on, and we will show you that.
01 07 14 50	CC	Apollo 8, how about standing by on that for just a minute. Let's check our ground link.
01 07 15 06	CC	Apollo 8, we have a picture now.
01 07 15 10	CDR	Okay. Let's try the other lens again then, once again.
01 07 15 13	CC	Okay. Thank you.
01 07 15 30	CDR	Do you have a picture now?
01 07 15 31	CC	That's negative.
01 07 15 45	CC	Apollo 8, ...
01 07 15 54	CDR	Okay. Do you have anything, Houston? We have it on the earth.
01 07 15 58	CC	We are having no joy.
01 07 16 02	CDR	Okay. Stand by.
01 07 16 04	SC	Okay. How about now, Houston?

01 07 16 10	CC	Still no joy.
01 07 16 18	CC	You don't have a lens cover on there, do you?
01 07 16 22	CDR	No, we checked that, as a matter of fact.
01 07 16 30	CDR	Anything?
01 07 16 32	CC	Still no joy.
01 07 16 56	CDR	How about now?
01 07 16 57	CC	Still no joy. There is a picture. We have a picture. Okay. It is a little difficult to see what we have.
01 07 17 17	CDR	That is the earth, but it is not the telephoto lens, unfortunately. It is just a regular inside lens.
01 07 17 23	CC	Okay. It is coming in as a real bright blob on the screen. It is hard to tell what we are looking at.
01 07 17 31	CDR	You are looking through some haze on the windows too, unfortunately.
01 07 17 37	CMP	And the earth is very bright, besides.
01 07 17 41	CC	Okay. We got the earth in about the center of the screen and a little bit low, and it looked like there were some objects that moved across it - the screen at the same time. Do you have any comment on those?
01 07 17 54	CDR	That is some of the water - ice coming off the vent nozzle.
01 07 17 59	CC	Roger.

01 07 18 05	CDR	How does it look now?
01 07 18 06	CC	Still the same thing; it is - the target is extremely bright, and it is very difficult to make out what we are looking at.
01 07 18 16	CDR	It is unfortunate that we do not have - we can't make the other lens work here. I don't know what the problem is.
01 07 18 24	CC	Okay. Apollo 8, would you verify that the ALC is on?
01 07 18 33	CDR	We have tried it both ways.
01 07 18 35	CC	Oh, okay; thank you. What we are getting now is a good picture.
01 07 18 39	CDR	Say again.
01 07 18 44	CC	Okay. That's a - that's a real good picture. That is the best one that we have had. And how about going ahead and just leaving your pictures inside until we can think some more of what we can do to adjust for that light?
01 08 18 58	CDR	Roger. Jim, what are you doing here? Jim is fixing dessert. He is making up a bag of chocolate pudding. You can see it come floating by. Bill is coming up from the lower equipment bay. It is unfortunate that this telephoto lens doesn't work. Show them the lens that's the culprit here, Jim. This lens doesn't seem to be working; I can't understand why we're not -

perhaps it's a problem of light transmission through it.

01 07 19 56 CDR This transmission is coming to you approximately halfway between the moon and the earth. We have been 31 hours and about 20 minutes into flight. We have about less than 40 hours to go to the moon. You can see that Bill has his toothbrush here. He has been brushing regularly. To demonstrate how things float around in zero g. It looks like he plays for the Astros, the way he tries to catch those things. I certainly wish that we could show you the earth. It is a beautiful, beautiful view, with predominately blue background and just huge covers of white clouds, particularly one very strong vortex up near the terminator. Very, very beautiful. Perhaps we will get some assistance from the people on the ground and be able to deter - to determine why this other lens is not transmitting properly.

01 07 21 11 LMP Houston, did you get any light at all coming through that telephoto lens?

01 07 21 18 CC Apollo 8, we were getting what you were showing us on your normal lens, and I don't think we got anything on the telephoto. We are working on this now. One of the problems seems to be that

it is a low light level lens; we're afraid that you might burn it out pointing it at something too bright.

01 07 21 40 CDR Well, the earth is very, very bright. There is nothing in the lens you can burn out. The camera still seems to be working. We can give you a luminous reading of the earth right now if you like.

01 07 21 54 CC Hey, Frank, how about a couple of words on your health for wide world.

01 07 22 03 CDR Well, we are all in very good shape. Jim is busy working preparing lunch. Bill is playing cameraman right now, and I am about to take a light reading on the earth. We all feel fine. It was a very exciting ride on that big Saturn, but it worked perfectly, and we are looking forward now, of course, for the day after tomorrow when we will be just 60 miles away from the moon.

01 07 22 33 CC Roger. You all look great on candid TV.

01 07 22 44 CDR Okay. I just got a reading on the earth, Houston. It is 320. The earth is showing 320 lumens now. If you get a closeup of Jim Lovell, Bill, you can let everyone see he has already outdistanced us in the beard race. Jim has got quite a beard going already.

01 07 23 28	CMP	Happy birthday, Mother.
01 07 23 49	CDR	Okay. Jim is going to take a shot of us from the lower equipment bay, and then we have to get back to our passive thermal control in the bar-b-que mode so that we don't get one side of the spacecraft too hot for too long at a time. So we will be signing off here, and we will be looking forward to seeing you all again shortly.
01 07 24 10	CC	Roger.
01 07 24 13	CDR	Goodbye from Apollo 8.
01 07 24 17	CC	Thank you. That's a good show.
01 07 24 24	CDR	I hope we can get that other lens fixed or some reading on it.
01 07 24 31	CC	Roger. We are going to work on that one. The one that is sensitive to light is the lens that you were just using. You want to be careful about pointing that at some bright object.
01 07 24 43	CDR	Roger. We are starting PTC again.
01 07 24 45	LMP	I believe that's only if it hasn't been used for quite a while, Ken.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

01 07 40 04	CC	Apollo 8, Houston.
01 07 40 08	CDR	Go ahead Houston, Apollo 8.
01 07 40 10	CC	Okay, I've got a few items for you I'd like to clear up and then we'll let you alone for a while. The first thing is we would like for you to confirm that your spot meter had an ASA setting of 100.
01 07 40 27	CDR	That is confirmed.
01 07 40 30	CC	Okay, we thank you. That's one of the first questions that came to mind. We are ready for a cryo fan cycle at any time and use your normal procedures.
01 07 40 47	CDR	Okay.
01 07 40 49	CC	All right. You can anticipate a fuel cell purge at 35 hours, and we ought to be through with battery A charging somewhere after 34 hours; and looks like you'll have just about a full battery there. And we will give you a call on the exact time to cut it off. We would like to get some confirmation from you on the chlorine procedures. Did you get some in last night or not? Just a quick summary of how much sleep you got on Lovell and Anders?
01 07 41 26	CDR	Okay. We got the chlorine in and the water has been chlorinated and just a minute I will check with them on their sleep.

01 07 41 40	CC	I am sorry I didn't copy that sleep.
01 07 41 44	CDR	Say again, Ken.
01 07 41 46	CC	I am sorry I didn't copy your last, Frank.
01 07 41 50	CDR	I was asking you to say to say what you said. Jim had about 4 hours sleep, and Bill had about 3 hours sleep.
01 07 42 07	CC	Okay. Thank you very much.
01 07 42 12	CDR	We feel pretty good today. We would like to see, in looking over the flight plan - perhaps we ought to put the rest periods a little bit shorter and more frequent. It seems it might work out better. We got all out of kilter on it yesterday. We are sort of trying to get back in a normal cycle.
01 07 42 32	CC	Okay. We will look into that.
01 07 42 44	CDR	You all are doing good work. Keep it up.
01 07 42 46	CC	Okay. Thank you. Looks like the only other thing we have left over is a COMM check and if we can work that in without interrupting your present schedule we would like to.
01 07 42 58	CDR	Okay. Right now we are stopping for a break, but we will go ahead and do that. What does it involve?
01 07 43 06	CC	Okay. We will need the high-gain antenna, and there should be no COMM loss during this mode.
01 07 43 22	CDR	Okay, Ken. I think we are going to lose the high gain here shortly. Why don't we pick it up next time it comes around?

01 07 43 27	CC	Real fine.
01 07 43 31	CDR	Remember, the most important part of the trip occurs in two days when we start back. So you all get better rested too.
01 07 43 40	CC	We'll do that.
01 07 43 41	CC	Affirmative, Apollo 8.
01 07 52 41	CDR	Houston, we're starting the H_2 fan now.
01 07 52 51	CC	Roger, thank you.
01 07 54 48	CDR	Houston, you just wanted 2 minutes cycling on those fans don't you? Two minutes each?
01 07 55 04	CC	That's affirmative, Apollo 8.
01 07 55 08	CDR	Roger.
01 08 06 07	CDR	Houston, Apollo 8 on high gain stand by for your communications check.
01 08 06 12	CC	Okay, standing by.
01 08 11 26	CC	Apollo 8, Houston.
01 08 11 31	CDR	Go ahead Houston, Apollo 8.
01 08 11 33	CC	Okay, Apollo 8. Looks like we're going to have to put this COMM test off because of some tracking requirements. We can do it in about an hour if this will not interfere with your present operations too much. It'll take maybe 15 to 20 minutes, and it will involve some conversation on the part of the people onboard the spacecraft. So if that's going to interfere with your sleeping and all, why go ahead and we'll defer to that and we'll pick

		these requirements up at another time. And, I've got a score here, looks like Baltimore 21 to nothing.
01 08 12 16	CDR	Who were they playing?
01 08 12 26	CC	How about Minnesota.
01 08 12 30	CDR	That's from that other league.
01 08 12 33	CMP	How did last year's Army-Navy game come out?
01 08 22 47	LMP	Houston, Apollo 8. Over.
01 08 22 49	CC	Go ahead, Apollo 8.
01 08 22 53	LMP	Roger. We've stirred up all the cryos. Could you give me your quantities, please?
01 08 23 00	CC	Okay. Stand by.
01 08 23 04	LMP	Roger. Be advised the CMP just hit the hay for awhile, and the LMP will go down in a little while.
01 08 23 12	CC	Okay. And our guys down here are watching high-gain antenna pointing program, so anytime you're not using the DSKY for anything else, they'd like to watch it for a couple of cycles, so if you would leave that NOUN 51 on the display it will help a lot down here.
01 08 23 31	LMP	Okay. Why don't you give us react angles, and we'll try that for the next time.
01 08 23 44	CC	Okay.
01 08 24 37	CC	Apollo 8, are you ready to copy some cryo quantities?
01 08 24 45	LMP	I'm ready. How about O_2 first.

01 08 24 47	CC	Okay. O_2 tank 1, I show 88.1 percent.
01 08 24 55	LMP	Okay. Could you give it to me in pounds, please?
01 08 25 02	CC	Okay. You'll have to stand by while we convert that.
01 08 25 05	LMP	Thank you.
01 08 25 15	LMP	That's okay, Gene, go ahead, I'll take the percent.
01 08 25 19	CC	Okay. We will try and get the pounds for you, too, Bill. Tank 1, oxygen 88.1.
01 08 25 29	LMP	What time is that for?
01 08 25 30	CC	This is present.
01 08 25 34	LMP	32:30, okay.
01 08 25 38	CC	Okay, I've got 32:35. And O_2 - -
01 08 25 45	LMP	In weight not percentage.
01 08 25 46	CC	Okay, O_2 tank 1, 88.1, O_2 tank 2, 87.37.
01 08 26 14	LMP	Is that 0.37 or 0.36?
01 08 26 17	CC	0.37.
01 08 26 22	LMP	Roger, 2. Got it.
01 08 26 23	CC	Okay, H_2 tank 1, 75.97. Tank 2, 78.06. Over.
01 08 26 50	LMP	Okay, thank you very much. It looks good.
01 08 26 52	CC	Okay, thank you.
01 08 40 03	CC	Apollo 8, Houston.
01 08 40 07	CDR	Go ahead, Houston, Apollo 8.
01 08 40 10	CC	Okay. I've got a couple of things we need from you. I would like to get a battery C voltage. I would like to check a battery manifold pressure. Your high gain - -

01 08 40 25	CDR	Battery C is 37 volts.
01 08 40 28	CC	Understand 37 volts on battery C. Is that affirm?
01 08 40 32	CDR	3, 7.
01 08 40 34	CC	Okay, thank you. And if you can get to the battery manifold pressure, like to read that one.
01 08 40 42	CDR	0.6 volts.
01 08 40 44	CC	All right understand 0.6 volts. The angles you asked for on the high-gain antenna are pitch minus 45, and yaw 90.
01 08 41 43	CDR	Okay. Houston, this is Apollo 8. I'm going to just go into high gain now, and we're about ready to pick you up ... works on react.
01 08 41 50	CC	Okay, and I have a scanning telescope star visibility item for you to pick up, when you're ready to copy that.
01 08 42 06	CDR	Roger, we'll get that on high gain when we get back to you.
01 08 42 10	CC	Okay, thank you.
01 08 42 11	CDR	We'll come back on high-gain.
01 08 42 12	CC	Roger.
01 08 42 23	CDR	That's not fair, we're there already.
01 08 42 28	CC	That's pretty good acquisition, huh?
01 08 42 34	CDR	You guys are reading the DSKY. Go ahead Houston.
01 08 42 40	CC	Okay, Apollo 8. Maybe we ought to try that one again next time, and the scanning telescope star visibility is scheduled for a 34 10 in the flight

		plan, and it'll be star number 31. The angles are roll 184.7, pitch 23.4, yaw 14.3, shaft and trunnion zero. Over.
01 08 43 28	CDR	Understand; star 31, roll 184 7, pitch 23 4, yaw 14 3, and star shaft and trunnion at zero.
01 08 43 38	CC	That's affirm, and that's copy star 31.
01 08 43 45	CDR	That's Roger, 31.
01 08 43 47	CC	Okay, thank you.
01 08 44 18	CDR	Houston, Apollo 8.
01 08 44 20	CC	Go ahead.
01 08 44 24	LMP	The LMP would like to take a Seconal and hit the hay.
01 08 44 36	CC	Okay. That's a GO.
01 08 44 41	LMP	Okay, thank you.
01 08 44 45	LMP	And that ...
01 08 50 06	CC	Apollo 8, Houston.
01 08 50 10	CDR	Go ahead, Houston.
01 08 50 12	CC	Okay. We'd like to go ahead and get into this COMM check here, on the last of this high-gain period. If you're ready to go on it I'll read you some switches.
01 08 50 27	CDR	Stand by. We're ready. Go ahead.
01 08 50 29	CC	Okay. Number 1. S-band normal mode voice to VOICE.
01 08 50 43	CDR	Go ahead - keep going.
01 08 50 44	CC	Uptelemetry data to DATA.

01 08 51 08	CDR	Normal mode voice to VOICE. Uptelemetry data to DATA.
01 08 51 12	CC	Okay, uptelemetry command to NORMAL.
01 08 51 17	CDR	NORMAL.
01 08 51 18	CC	High-gain antenna track, AUTO.
01 08 51 25	CDR	Roger. Going AUTO.
01 08 51 27	CC	High-gain antenna beam width to NARROW.
01 08 51 30	CDR	Beam-width NARROW.
01 08 51 33	CC	Okay, this will be our base-line data check. This will be a full uplink voice with ranging and full downlink.
01 08 57 53	CC	Apollo 8, Houston. We are going to have to delay the COMM check again.
01 09 01 09	CDR	Houston, Apollo 8. How do you read?
01 09 01 13	CC	Apollo 8, Houston. Did you call?
01 09 01 18	CDR	Roger. We lost you for a while there. Are you reading us there now?
01 09 01 20	CC	Loud and clear now.
01 09 01 24	CDR	Okay. Thank you. So are we.
01 09 01 36	CC	Okay, Apollo 8. Do you want to try that AUTO REACT 33 plus 24 looks like a good time and the angles are the same. And the late ball scores is 24 to 14 - -
01 09 01 48	CDR	...
01 09 01 51	CC	All right.
01 09 01 53	CDR	Say it again.

01 09 01 54	CC	I say a late ball score there is - -
01 09 01 55	CDR	... the ball score?
01 09 01 56	CC	2, 4 to 1, 4.
01 09 02 02	CDR	Baltimore over the Vikings?
01 09 02 05	CC	Affirm.
01 09 05 56	CDR	Houston, Apollo 8.
01 09 05 58	CC	Go ahead, Apollo 8.
01 09 06 02	CDR	We have reached the scan limit on the high gain. What do you want us to do about it now?
01 09 06 39	CC	Apollo 8, what we would like to do with these angles is to set it in AUTO REACT over on panel 2, and it is under the tracking for the high-gain antenna, and it'll - the lower position will say REACT, and on the position dials we would like to set pitch to minus 45 and the yaw to 90.
01 09 07 08	CDR	Pitch minus 45, yaw 90.
01 09 07 10	CC	Okay. Stand by 1.
01 09 07 15	CDR	Roger. If we could leave it in REACT if you want to use the high gain, it would keep from waking us up every REV.

END OF TAPE

01 09 10 32	CC	Apollo 8, Houston. I think we may have gotten off on a tangent. These pitch and yaw angles that we called up to you for the high-gain antenna were in response to Bill's request to know what positions we could put on there for a - for the AUTO REACT position. The constraint still remains if we don't want to be on an OMNI antenna at the same time. We are in the AUTO REACT position; we should be in one or the other. So you can use that information if you want to try it out. Otherwise, the procedures you've been using all along will be just fine. Over.
01 09 15 41	CC	Apollo 8, Houston. I am transmitting in the blind right now. Our downlink isn't working so well; I'm just going ahead on an uplink.
01 09 20 00	CDR	Houston, do you read? Apollo 8.
01 09 20 03	CC	Apollo 8, read you weak but clear now.
01 09 20 08	CDR	Roger. Thank you.
01 09 20 10	CC	Okay. Looks like we had a growl problem there.
01 09 20 18	CDR	Roger.
01 09 33 31	CC	Apollo 8, Houston.
01 09 33 34	CDR	Go ahead.
01 09 33 38	CC	Okay. Looks like we're - -
01 09 33 39	CDR	Go ahead, Houston. Apollo 8.
01 09 33 40	CC	- - Looks like we're in a good attitude to try this high-gain antenna on the COMM check one

		more time. I believe you're still on an OMNI. Is that correct?
01 09 33 52	CDR	Roger.
01 09 33 55	CC	Okay. If we could try the high gain and maybe we can get started on this COMM check. I'd also like to verify that you've got the LMP and the CMP trying to get some sleep here, and we could use an oral temp from you, too.
01 09 34 16	CDR	Roger. My temperature is 97.5.
01 09 34 20	CC	Okay. Thank you.
01 09 34 24	CDR	That's what it was this morning when I felt badly.
01 09 34 26	CC	Alright; thank you.
01 09 35 24	CDR	Do you want me to go to OMNI now, Ken?
01 09 35 26	CC	I'd like for you to go to high gain.
01 09 35 28	CDR	High gain?
01 09 35 29	CC	Yes, sir.
01 09 35 33	CDR	High gain.
01 09 35 40	CDR	This is Apollo 8 on high gain.
01 09 35 44	CC	Roger. Reading you kind of weak now, but we're gonna take a look at it.
01 09 36 24	CDR	Houston, Apollo 8 on high gain.
01 09 36 27	CC	Okay. I'm reading you loud with just a little background noise.
01 09 36 33	CDR	Roger.
01 09 39 24	CC	Apollo 8, Houston. We're not getting a good lock. I wonder if we could try making sure that we're in

		AUTO on the tracks and that we're in narrow beam width?
01 09 39 39	CDR	Stand by.
01 09 40 00	CDR	How's that, Houston?
01 09 40 04	CC	Okay. That works real good.
01 09 42 07	CC	Apollo 8, this is Houston. What we're doing right now is collecting baseline data, and we'll be in this mode for another couple of minutes and then we'll be moving out to the second signal.
01 09 43 55	CC	Apollo 8, Houston. How do you read?
01 09 44 22	CC	Apollo 8, Houston.
01 09 44 27	CDR	Houston, Apollo 8. Read you five-by.
01 09 44 30	CC	Okay. We are ... we have some ground problems, and we're reading you weak but clear. We're ready to start into our test. We're going to be changing our modes so you'll probably hear a burst of noise as we make the change. This will be a noise that sounds like an S-band onlock. However, your AEC leader will lock that off. This is due to the loss of modulation on the up-link. There will be about 2 minutes, and during this time, you will hear one burst of noise.
01 09 45 39	CC	Apollo 8, Houston. Voice check. Over.
01 09 45 57	CC	Apollo 8, Houston. Ready to check.
01 09 46 20	CC	Apollo 8, Houston.
01 09 46 38	CC	Apollo 8, Houston.

01 09 46 43	LMP	Go ahead, Houston.
01 09 46 48	CC	Apollo 8, this is Houston. Do you read?
01 09 46 53	LMP	That's affirmative.
01 09 46 54	CC	Okay. Thank you. Were you reading all along? We just - This is the first time we've heard you call back.
01 09 47 02	LMP	We've been reading you; we're trying to hold the noise down so we can get some sleep.
01 09 47 09	CC	Roger. We'll be through with this in just a minute, I think.
01 09 47 13	LMP	Roger. I will answer you, but I'll try to do it quietly.
01 09 47 18	CC	Okay, Bill.
01 09 47 45	CC	Okay, Apollo 8. The next portion of our test is like we did yesterday. We'll be changing the uplink modes to uplink command and ranging with no upvoice. We'll be in this mode for approximately 2 and 1/2 minutes and send two test messages. During this time, we will not have uplink. We are going to this mode at time 33:48:30, and we'll be back in this configuration at 33:50:00. Over.
01 09 50 59	CC	Apollo 8, Houston. Radio check.
01 09 51 05	LMP	Loud and clear, Houston.
01 09 51 07	CC	Okay, fine. How about telemetry inputs PCM switch to LOW, please?

01 09 51 17	LMP	They're in LOW, Houston.
01 09 51 24	CC	Roger.
01 09 52 53	CC	Apollo 8, we've completed the third test; we're going into the final test now. PCM switch to HIGH, please.
01 09 54 01	CC	Apollo 8, Houston. We're going to switch uplink to the upvoice backup for about 2 minutes, and may take a few seconds to link the transition. And we'll be back up at 33:56 in our normal mode to place the up-telemetry data switch to upvoice backup at this time. Over.
01 09 54 28	LMP	Roger.
01 09 55 54	CC	Apollo 8, Houston on backup voice.
01 09 56 00	LMP	Loud and clear, Houston.
01 09 56 02	CC	Okay, fine; thank you.
01 09 56 21	CC	Apollo 8, let's go back up-telemetry data switch to DATA.
01 09 57 12	CC	Apollo 8, Houston.
01 09 57 29	CC	Apollo 8, Houston.
01 09 58 56	CC	Stand by; guess we've got 85-foot site voice back now; the noise went away.
01 09 59 02	CC	Apollo 8, Houston.
01 09 59 10	LMP	Go ahead, Houston.
01 09 59 17	LMP	Go ahead, Houston.
01 09 59 19	CC	Okay, Apollo 8. That completes our COMM test. Thanks for your cooperation. And I've got a

		change here to NAV sightings that will come up at 32:20. And we want to change your star a little bit there. Are you ready to copy?
01 09 59 38	LMP	Ready to copy.
01 09 59 40	CC	Okay.
01 09 59 41	LMP	Ready to copy.
01 09 59 43	CC	Okay, Apollo 8. We would like to change the NAV sighting as follows: we would like to use star 26, that is, two-six; we would like to make it earth-near horizon for two sets, two sets. Then we would like to take star 16 earth-far horizon, one set. If star 26 earth-near horizon is not possible, star 16 earth-far horizon, one set, and star 22 earth-far horizon, one set. Over.
01 10 00 36	CDR	Roger, Houston. Be advised the CMP is asleep ... putting those on for a while.
01 10 00 45	CC	Okay. Stand by.
01 10 01 34	CC	Apollo 8, okay; we can put this off. What we will probably need from you is some kind of an estimate of when you think somebody will be available to work on it, and we are working on how much lead time we need now.
01 10 01 56	LMP	Stand by ...
01 10 01 58	CC	Roger.

01 10 02 08	CDR	Houston, why don't you figure the CMP will sleep another couple of hours, then the LMP, and then the CDR up to about 43 hours equally. Over.
01 10 02 20	CC	Okay.
01 10 02 25	CDR	Then we will start off with the CMP again at about 44.
01 10 06 58	CC	Apollo 8, Houston.
01 10 07 03	CDR	Go ahead, Houston.
01 10 07 05	CC	Okay. We can put off this NAV sighting. It was scheduled here at 34:20, and we can put it off, judging from your comments about sleeping, we would like to get it as soon as we can, and right now, our plans are to slide it 2 hours. We will do the P52 by sliding it back to the same thing since it is associated with the P23. So if that's a convenient time for you, why we will plan on that.
01 10 07 38	CDR	We are doing the P52 now. Do you want us to continue?
01 10 07 43	CC	Well, as far as we are concerned, that isn't going to help us any. We will have to do it over again anyhow.
01 10 07 54	CDR	Okay. And what time do you want to do it?
01 10 07 57	CC	Well, if you think Jim's going to be up in a couple of hours, why that will slide us 2 hours to 36:20.

01 10 08 08	CDR	Okay. We will go ahead and make another one there and pick it up then if that's okay.
01 10 08 12	CC	Okay. That will be real fine. Thank you.
01 10 08 17	CDR	What we are going to try to do is get back on the sleep cycle to those sleep periods just prior to LOI by taking shorter cycles for each man.
01 10 08 29	CC	Real fine.
01 10 13 52	CDR	Houston, Apollo 8.
01 10 13 57	CC	Apollo 8, go ahead.
01 10 14 01	CDR	How about giving us some REACT angles, and we'll stay in REACT.
01 10 14 05	CC	Say again, please.
01 10 14 11	CDR	Could you give us some REACT angles?
01 10 14 14	CC	Wilco.
01 10 14 24	CDR	Say again.
01 10 14 29	CC	Apollo 8, this is Houston. I hadn't said anything at that time. We're digging some angles out for you now. In reference to your earlier question about the sleep cycle juggling and so forth: we agree with your comment. We would like to get back on the flight plan as far as the sleep cycles and so forth are concerned by the time we get into lunar orbit. So we'd like for you to use your own judgment about the most efficient way to accommodate the sleep cycles and proportion it up among yourselves. We would like

to have you keep us informed of who's doing what and what your plans are. We have the one P23 that we had slipped 2 hours. We'd like to get the other one in. We can also adjust the time for the other P23, if it's going to conflict - I guess that's two more P23's. We can adjust the time for those if you'll let us know what your forecast is for when Jim will be available to take some sightings. So the big message is that we'd like to work around whatever your desires are. If you'll let us know, we'll pick some stars and some angles and have them ready for you.

01 10 15 44	CDR	Okay, Houston. The CMP will be up at 36 hours. The LMP is going to sleep now, and he'll sleep through until 40 and then I'll stagger that in and try to go to sleep around 30 to 37 so that by the time we get to day 3 we'll all be back on the same direct sleep cycle.
01 10 16 12	CC	Okay, real fine. Thank you.
01 10 16 28	CC	Apollo 8, Houston. REACT angles look like minus 45 in pitch, plus 90 in yaw, and 34 23 for the time.
01 10 16 41	CDR	Roger. Copy. This is good users REACT because it keeps the caution warning from going off again.
01 10 16 48	CC	Roger. I understand that. Are you leaving the high-gain antenna on after it swings over to the reset position?

01 10 17 04	CDR	Do you have any reason for us to use the high-gain antenna?
01 10 17 10	SC	ECOMM, do you think we need that, really, very much?
01 10 17 13	CC	Stand by.
01 10 17 15	SC	Why can we just not use the high-gain antenna for a while? Getting high bit rate on the OMNI's. Okay, let's tell them that we'll just not worry about the OMNI for a while.
01 10 18 30	LMP	Houston, this is the LMP. Before I hit the sack, could you give me a rundown on our systems the way you see them?
01 10 18 37	CC	Okay, we'll put that together for you and we were just talking about the redundant ECS components check and we were going to put that off until everybody's had a chance to get some sleep. Trying to keep you from having going to the left-hand couch.
01 10 18 54	LMP	Oh, that would be nice. I sent Lovell under the couch, though. I've got one man sleeping under the left couch here - right couch and one man sleeping on our right couch.
01 10 19 33	CC	Okay. I understand you've got one under and one on the right couch.
01 10 19 39	LMP	Roger. That's affirmed.

01 10 19 41	CC	Okay. And in reference to the OMNI versus the high gain, it looks like we can live with the OMNI antennas here for several more hours, if you would like to delete the use of the high gain.
01 10 20 10	LMP	Okay. Goodnight, Houston.
01 10 20 16	CC	Okay. Before you pitch your eyeballs there, we'd like to terminate the battery charge.
01 10 20 25	LMP	I knew you guys would get me.
01 10 20 27	CC	Got you.
01 10 20 35	LMP	Okay. The battery A charge is terminated at 37.3 volts.
01 10 20 41	CC	Okay. Thank you.
01 10 20 54	LMP	Standing by for your systems status.
01 10 20 56	CC	Okay. We're pulling that together now.
01 10 21 01	LMP	How are the PU valve and SPS line temps looking?
01 10 21 05	CC	Okay, I'll test that.
01 10 21 06	LMP	We just had ... I understand.
01 10 25 53	LMP	Systems look okay to you Houston?
01 10 26 09	CC	Okay, Apollo 8. All the systems - giving a quick look around the room - look real fine. You've got an RCS quad update on the quantity, so you have that information. The SPS oxidizer feed-line temperature and the fuel temperature are both at 73 degrees. The cryo profile is running right on the line. Battery A - our calculations have 39.63 amp hours. Battery B, 37.94, and

battery Charlie, 38.46. The COMM continues to be running ahead of predictions in quality and circuit margins. Everything else looks like it's real fine.

01 10 27 06 LMP Roger. Do you expect to have a low bit rate voice on the DSE of the OMNI's at lunar distances?

01 10 27 23 CC That's negative on DSE of the OMNI's. Not looking forward to that much improvement.

01 10 27 32 LMP Roger. We need about a 30-foot dish, I figure, for that on the spacecraft.

01 10 27 47 CC Roger. It runs up the fuel require for PTC, though, Bill.

01 10 27 56 LMP Roger.

01 10 39 36 CC Apollo 8, Houston.

01 10 39 40 CDR Go ahead, Houston, Apollo 8.

01 10 39 42 CC Okay. I know you're trying to be quiet, so I'll just read up some information to you. One of the things that we just turned up that might give you some confidence, if you lose oxygen cryo tank now: you have 80 pounds remaining now at CMSM sub. The limiting factor on single tank operation right now is the hydrogen tank which has a positive margin at CMSM sub, assuming our standard profile gives you about 143 hours. So it looks like you are over the hill on those. Notice that you're flying in the rate 2 position for you BMAGS

which is fine. Only make sure that you still were maintaining a PTC attitude. Looks like you're pretty close to it.

01 10 40 41 CDR Roger. We are flying PTC, and I was wondering why it was going out of the deadband; now I know. Thank you.

01 10 40 47 CC Okay. Thank you.

01 10 40 51 CDR That's what happens when you let Anders fly. He's asleep so he can't defend himself.

01 10 41 12 CC Roger. But we've got it on tape though.

01 10 41 17 CDR Good. They're both conked out; how about just filling me in on some news, and I'll keep quiet just to give me some words on what's going on in the world.

01 10 41 34 CC Okay. Give me a few minutes to collect some data, and we'll do that.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

01 11 09 20	CDR	Houston, Apollo 8. How do you read?
01 11 09 22	CC	Loud and clear, Apollo 8.
01 11 09 28	CC	I'm going to have a maneuver PAD and --
01 11 09 32	SC	Houston, Apollo 8. How do you read?
01 11 09 35	CC	I read you loud and clear, Apollo 8. How me?
01 11 09 45	CC	Apollo 8, Houston.
01 11 05 53	CDR	Hello, Houston. Apollo 8. Houston, Apollo 8. How do you read?
01 11 09 58	CC	Apollo 8, loud and clear.
01 11 12 20	CDR	Hello, Houston. Apollo 8. Go ahead.
01 11 12 24	CC	Apollo 8, Houston. I believe we've lost our uplink. I'm transmitting in the blind. Read you loud and clear.
01 11 13 30	CDR	Houston, Apollo 8. Houston, Apollo 8. How do you read?
01 11 13 38	CC	Apollo 8, Houston. Read you loud and clear. We may have some uplink problems; transmitting in the blind, at this time. Over.
01 11 15 30	CC	Apollo 8, Houston.
01 11 15 38	CC	Apollo 8, Houston.
01 11 16 10	CC	Apollo 8, Houston.
01 11 16 23	CT	Hawaii Network GOSS Conference. How do you read?
01 11 16 32	CDR	Houston, how do you read? Apollo 8.
01 11 16 34	CC	Apollo 8, I read you loud and clear. How me?
01 11 17 31	CDR	Houston, Apollo 8. How do you read?
01 11 17 35	CC	Apollo 8, Houston. Over.

01 11 18 20	CDR	Go ahead, Hawaii M&O. This is Apollo 8. How do you read?
01 11 18 25	CC	Apollo 8, Houston. Read you loud and clear.
01 11 18 37	CDR	Okay. Thank you, Hawaii. How do you read?
01 11 21 15	F	Hawaii, Houston Network. Voice check on GOSS Conference.
01 11 21 24	CC	Apollo 8, Houston.
01 11 26 41	CT	Hawaii LOS. Unable to find.
01 11 27 07	CC	Apollo 8, Houston.
01 11 27 14	CC	Apollo 8, Houston.
01 11 27 55	CC	Hawaii, this is Houston CAP COMM. Over.
01 11 28 16	CT	Houston CAP COMM, Hawaii.
01 11 28 13	CC	Hawaii, Houston CAP COMM. I would like to have a voice check.
01 11 28 18	CT	Roger. I read you loud and clear.
01 11 28 21	CC	Okay. I'm reading you loud and clear. I understand you have contact with the spacecraft. Is that affirm?
01 11 28 26	CT	I have uplink voice to the spacecraft; the downlink is too low in the mud.
01 11 28 32	CC	Okay. Understand that you have good uplink, but your downlink is in the mud. You don't have any way of copying it either, is that correct --
01 11 28 40	CDR	Houston, Apollo 8. ... again. How do you read?
01 11 28 41	CT	That is affirmative.

01 11 28 45	CC	Okay, Hawaii, we can hear Apollo 8, calling down. Would you answer and tell them that we did copy that?
01 11 28 53	CT	Roger.
01 11 28 57	CT	Apollo 8, Hawaii M&O. Houston reports they copied your last.
01 11 29 03	CDR	Okay. Thank you.
01 11 29 08	CC	Apollo 8, Houston. Over.
01 11 29 30	F	Hawaii, Houston Network, GOSS Conference.
01 11 29 37	F	Hawaii, Houston Network, GOSS Conference. Your NET 2.
01 11 29 41	CT	Houston Network, Hawaii.
01 11 29 43	F	Roger. Did you copy the CAP COMM?
01 11 29 46	CT	Affirm. We copied the CAP COMM.
01 11 29 49	F	Is he keying the transmitters out there?
01 11 29 58	CT	He did key it one time, Network.
01 11 30 01	F	Okay. I'm going to ask him to call the spacecraft again, and I would like for you to give me a report if he does not key the transmitters.
01 11 30 11	CT	Roger. Network is our NET 1 now conferenced up --
01 11 30 15	CC	Your NET 2 is conferenced to our GOSS Conference here.
01 11 30 21	CT	Roger. How about our GOSS Conference loop?
01 11 30 23	CC	Your GOSS Conference loop is dead.
01 11 30 26	CT	Roger. We are GO for command. We were unable to transmit before.

01 11 30 31	CC	Understand.
01 11 30 32	CT	We transmitted to the spacecraft as per CAP COMM and they acknowledged our transmission.
01 11 30 39	CC	Apollo 8, Houston.
01 11 30 43	CDR	Go ahead, Houston. Apollo 8.
01 11 30 45	CC	Okay. We got back together again. You're loud and clear. We've been reading you. We have a problem down here on the ground getting our signal from MCC out to remote site.
01 11 31 01	CDR	Roger. Understand.
01 11 31 52	CC	Apollo 8, Houston. I've got a ball score for you. It was Oakland 41, Kansas City 6 is the final score. That's 41 to 6, Oakland. We're trying to get some news releases over here for you. I suspect we're going to find that the staged TV show was probably the biggest news of the day.
01 11 31 20	CDR	I'm sorry that the TV lens broke down.
01 11 31 26	CC	Well, we're working on that some more. I'm not sure that the whole thing is lost yet. It appears that our problem is one where the light intensity which is sensed by our light meter in there is picking up an average field which is much larger than the earth, and so it's sensing a great deal of deep space environment which is dark, and we're suspicious that this is probably opening up the lens aperture as wide as it

will go, and then when you point the camera at the earth while the earth is only filling about 3 degrees of cone angle, whereas lens takes in 9. So it looks like you're probably just saturating the tube. Now we're playing around now with some --

01 11 33 14 CDR We just lost you again, Houston.

01 11 33 16 CC Say again.

01 11 33 20 CDR I just lost your last transmission; you were clipped.

01 11 33 24 CC Okay. Did you get any of my comments about the TV tube?

01 11 33 33 CDR Roger. Got them.

01 11 33 35 CC Okay. What I - what we've got in mind here is that we are looking at some of the lenses you have on board for cameras, and we are going to see if one of them can possibly be used to attenuate some of this light so that you will be able to take one of these pictures, and we are running some tests now, and we'll let you know about those. I also have a maneuver PAD that I need to read up to you whenever it's convenient.

01 11 34 04 CDR Let me get a pencil. Be fine right now.

01 11 34 07 CC Okay.

01 11 34 19 CDR Go ahead, Houston.

01 11 34 23	CC	Okay. The first one I will give you is a TLI plus 44 maneuver PAD. I will start reading down the left-hand column. TLI plus 44, SPS/G&N 62970, minus 162, plus 129 046 56 0431, plus 00197, plus all zeros, plus 607 01 180 133, 001 November Alfa, plus 002 03 607 01 704 604 51 12 1375 349.
01 11 36 31	CC	Boresight star is earth, down 037, right 22, plus 10 68, minus 165 00 128 56 361 18 098 27 17. The GDC alignment stars: the primary star is Sirius, secondary Rigel 010, 294, 320, no ullage, path return P37 DELTA-V, 8750. This goes to the Indian Ocean and requires a high-speed procedure, that is minus Mike Alfa, and that will refer to your checklist page November Charlie 1. Over.
01 11 38 14	CDR	Okay, Houston. How do you read?
01 11 38 16	CC	Loud and clear.
01 11 38 23	CDR	TLI plus 44, SPS/G&N 62970, minus 162, plus 129 046 56 0431, plus 00197, plus all zeros, plus 60701 180 133 001, plus 00203, plus 60701 704 60451 12 1375 349; earth, down 037, right 2.2, plus 1068, minus 165 12856 36118 098 2717; Sirius and Rigel. Hello, Houston. How do you read now?
01 11 40 13	CC	Loud and clear.

01 11 40 17	CDR	Sirius and Rigel, 010 294 320, no ullage, path return P37 DELTA-V 8750, Indian Ocean minus MA, checklist NC 1.
01 11 40 36	CC	That's affirmative, Apollo 8. And I have a flyby PAD for you, also.
01 11 40 46	CDR	Go ahead.
01 11 40 48	CC	Okay. This flyby PAD is an update to one that we gave you yesterday so you might want to note that this is the second one. And it will be a flyby SPS/G&N; 62970, minus 162, plus 129 060 59 4807, plus 00966, plus 00552, minus 02079. Roll, pitch, and yaw are all zeros, November Alfa, perigee height plus 00202 02358 022 02281 03 0407 317 013, up 047, right 39, plus 1418 minus 16505 12904 36160 146 2912. Primary star Sirius, secondary Rigel, 136 310 340, no ullage, requires realignment to preferred REFSMMAT. This burn will raise perilune to 550 miles. Over.
01 11 44 10	CDR	Okay. Houston. The second flyby SPS/G&N. Are you with me?
01 11 44 15	CC	Yes sir.
01 11 44 21	CDR	62970, minus 162, plus 129 06059 4807, plus 00966, plus 00552, minus 02079. Next three are all zeros, NA, plus 00202 02358 022 02281 03 0407 317 013, up 04.7, right 3.9, plus 1418, minus 16505, plus 12904, plus 36160 146 2912. Sirius,

Rigel, 136 310 340, none, requires realignment to preferred REFSMMAT. Pericynthian to 550 miles.

01 11 45 47 CC That's correct, Apollo 8.

01 11 45 52 CDR Thank you.

01 11 48 26 CDR Houston, Apollo 8.

01 11 48 29 CC Go ahead, Apollo 8.

01 11 48 32 CDR Okay. The CMP is now up. We'll proceed with the 52 option and start on the cislunar navigation.

01 11 48 43 CC Okay. Thank you, and we'll start looking for some star data.

01 11 53 58 CC Apollo 8, Houston.

01 11 54 02 CDR Go ahead, Houston. Apollo 8.

01 11 54 05 CC Okay. When you pick up your activities, I have a preferred alignment here that I want you to be in when you do your P52, and I'll have about four items to change on your time lines, so if you give me a call when you're ready for it.

01 11 54 23 CDR We're ready right now. We were doing the P52. You want to hold off and go to a particular alignment, is that right?

01 11 54 32 CC Affirmative.

01 11 54 33 CDR All right. I'm ready.

01 11 54 35 CC Okay. The attitude is pitch 23.4, roll 184.7, yaw 14.3. And the reason we're doing the alignment in this attitude is, the next thing we'll

be coming up with is the scanning telescope visibility test and that will be 70 degrees sun and Arcturus with a shaft and trunnion of zero. And then we can go ahead with the P52 and then a trunnion bias followed by P23 with the same stars we read to you before.

01 11 55 24	CDR	Okay.
01 12 00 32	CDR	Houston, Apollo 8. We're maneuvering to the angles you - you gave us.
01 12 00 35	CC	All right. Thank you.
01 12 09 45	CDR	Houston, we've reached the preferred attitude, and we're proceeding with the P52.
01 12 09 49	CC	Okay. Real fine, and I'll pass up some advice from your friendly flight surgeon. He says you're supposed to take one more Lomitil.
01 12 10 03	CDR	Okay. Everybody, or just me?
01 12 10 07	CC	Just Frank.
01 12 10 10	CDR	Thank you.
01 12 13 20	CMP	Houston, the P52 is completed. We're ready for your other data.
01 12 13 28	CC	Okay. Understand that you've done the P52. The next item on the flight plan should be a scanning-telescope visibility test, and this is the same one that was on your flight plan previously at 34 hours and about 12 minutes, and we'll be checking that 70 degree suns on Arcturus. Following that, we need to make a trunnion bias

check, and then we'll go into a P23, and I can read you those star numbers and sets if you don't have them from the last time I read them up.

01 12 14 13 CMP Okay. Stand by.

01 12 14 20 CMP Houston, Apollo 8.

01 12 14 22 CC Go ahead.

01 12 14 26 CMP Roger. With such good visibility or such good communications, we'll just give you a verbal description without seeing the scanning telescope right now. Your angles for maneuver tuning Arcturus were quite good. I've got Arcturus centered in the scanning telescope. At this sun angle, there is a shaft of light directly across the center of the scanning telescope and - band of light. It precludes seeing a lot of stars around us, and although I kept my eye glued to the telescope now for some time, it's very difficult to see any star patterns or anything. I couldn't recognize that with Arcturus unless I - the objects just drove me there. Now because I'm near zero shaft and zero trunnion, I'm getting quite a bit of shaft movement. Everytime the shaft moves, more particles leave the optics, and they're just as bright as the surrounding stars.

And they mingle in the stars, and you can't tell star patterns or constellations. With this particular attitude, the shaft of light precludes any indentification of constellations or individual stars.

01 12 15 47 CC Okay. Copy that. Can you tell us something about the orientation of this band? You mentioned that last night also - that you also had a band about 10 degrees wide that ran across. Is there an orientation that we can tie that to?

01 12 16 05 CMP I believe so, Ken. This band is parallel to the M-line, and I think it has something to do with the design of the optics, where we have that shaft or the rectangular entrance of the optics from the outside. At this particular sun angle, it cuts right across. Now I noticed that both the earth and the sun do this to the scanning telescope. In the sextant, the same light band is there, although it covers the entire sextant's field of view. However, the magnification brings out the stars quite well, and it is possible to mark on it. But the identification of the stars with the scanning telescope makes it very difficult. Now the attitude that I found the optics are best at are the attitudes which give the constellations

Gienah Major and Orion in the scanning telescope. At this this particular attitude of the spacecraft, the band is gone; we're at a position whereby the sun is behind us, and I can see quite a few stars. Now yesterday I could also, after getting dark-adapted, see quite a few stars around the constellation Cassiopeiae which at first I couldn't. But right now this band precludes you see anything at all Arcturus which, of course, I know we're aiming at right now.

01 12 17 34 CC Okay. Thank you very much.

01 12 18 08 CDR Ken, what stars did you want to use? Did you want to read them off?

01 12 18 12 CC Okay. First star will be 26, and we'll be making two sets of measurements, earth near-horizon using star 26. Then we would like to have one set on star 16, that's 16, using the earth far-horizon. If it turns out that star 26 earth near-horizon is not possible, then we'd like to have star 16 on the earth far-horizon for one set, and star 22 earth far-horizon one set. Over.

01 12 19 04 CDR You want star 26, earth near-horizon, two sets; star 16, earth far-horizon, one set; and star 22, earth far-horizon, one set.

01 12 19 18	CC	Okay. That's star 22 only in the event that 26 on the earth's near horizon is not possible? Over.
01 12 19 27	CDR	We won't even do star 22 then unless we can't get 26 on the near horizon.
01 12 19 31	CC	That's affirmative.
01 12 20 25	LMP	COMM sure is good all of a sudden, isn't it?
01 12 20 28	CC	Yes, this is outstanding.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

01 12 50 52	CDR	Houston, Apollo 8.
01 12 50 54	CC	Go ahead, Apollo 8.
01 12 50 57	CDR	Okay, we have completed two sets on 26 and one set on 16.
01 12 51 02	CC	Roger. Getting pretty speedy there.
01 12 51 08	CDR	Jim is getting to know the objects.
01 12 51 11	CMP	Are you receiving the data, Houston?
01 12 51 13	CC	Affirmative.
01 12 51 16	CMP	Okay.
01 12 51 19	CC	Keeping you honest.
01 12 51 23	CMP	Right.
01 12 51 40	CC	Okay, Apollo 8. We have looked at the data and it looks good and they feel like you can go back to PTC attitude anytime you are ready to. And if you can - go ahead.
01 12 51 56	CDR	What attitude do you want to use? The same one?
01 12 52 00	CC	That's affirmative.
01 12 52 04	CDR	Thank you.
01 12 52 05	CC	Okay, if you can reach over Bill there and get to panel 3, I believe we would like to cycle the oxygen fans. And also like to get the BIOMED switch over to CMP.
01 12 52 24	CDR	Okay.
01 12 52 27	CC	If you have to bother Bill, to do that why we can hold off on the cryo fans.
01 12 52 31	CDR	No, he moved. We already chased him under the seat. Okay, now you want just the oxygen fans on?

01 12 52 38	CC	That's affirm. Turn one on for about 2 minutes and when we turn it off, then we will turn the next one on. We don't want to turn them on simultaneously though.
01 12 52 49	CDR	I know that. I mean you don't want hydrogen though?
01 12 52 53	CC	That's affirmative. Just the oxygen.
01 12 54 12	CMP	Houston, Apollo 8.
01 12 54 16	CC	Go ahead.
01 12 54 20	CMP	Ken, just recap a little explanation here on your maneuver PAD, something which I'm really not knowledgeable about, the way it was presented to us, you mentioned fast return P37 DELTA-V of 8750, just briefly clarify that, will you please?
01 12 54 42	CC	Okay, stand by.
01 12 57 43	CDR	Ken, can you give us a little report on how our trajectory looks and the tracking is going and things like that?
01 12 57 50	CC	Okay, sure will. I will put a summary together here.
01 12 57 55	CDR	And the pericynthion sign.
01 12 57 57	CC	Roger, we will get all that together for you in just a few minutes.
01 12 58 01	CDR	And we never did get the news.
01 12 58 05	CC	You are the news.
01 12 58 09	CDR	Come off it, come off it.

01 12 58 41	CDR	Okay, the fans have been cycled 2 minutes each and they are back off.
01 12 58 45	CC	Okay, thank you very much.
01 13 06 07	LMP	Houston, Apollo 8 is back in the PTC attitude, reads MHPTC.
01 13 06 12	CC	Okay, thank you. And in reference to your question about the P37 DELTA-V, 8750, that's the number that goes into option at P37 for your minimum time return. That gives you a target for the Indian Ocean. And in this case, we are going to have use the high-speed procedures that were worked out for you to use some minus number for the major axis.
01 13 06 47	CMP	Roger. Understand. I'm going to give that a try, Ken, in a run through. I tried it yesterday, I wasn't getting too much in the way of results. I will give it a try today.
01 13 07 02	CC	Okay. And on the - your tracking that we have now, it still looks like the time we gave you last night for time of pericythion is still good, 69 plus 10 and right now your flyby earth pericythion altitude is 65.8. Looks like the midcourse number 3 is going to be something less than 1 foot-per-second. And all trajectory parameters are still holding real fine.
01 13 07 36	CDR	That's the things we like to hear. We would like to keep those holding very much.

01 13 07 45	CC	Roger.
01 13 21 00	CDR	Houston, Apollo 8.
01 13 21 04	CC	Go ahead.
01 13 21 08	CDR	Roger, we're getting near - we're going to need to dump some urine overboard here. I wonder if that's going to foul your trajectory up. Or can we go ahead and do it?
01 13 21 18	CC	No, that's okay. Something that is kind of interesting though is that the last time you had your water dump, they noticed a change in the trajectory tracking at the same time and they got through correlating it, they found some fellow that thought he knew the characteristics of a nozzle and how much water you're dumping and his estimates of the effect on the trajectory seemed to coincide with the tracked results. So I guess you have to stay onto some of those things.
01 13 21 51	CDR	Roger. Okay, we'll go ahead and dump it.
01 13 21 55	CC	Okay.
01 13 23 29	CMP	Houston, Apollo 8.
01 13 23 31	CC	Roger. Go ahead.
01 13 23 35	CMP	You planning on using our computer any time in the near future, I thought I'd do a little P37.
01 13 24 50	CC	Apollo 8, Houston. You can go ahead and run that 37 and we'll going to kind of watch that from the ground, too, and see how it works out. A couple

of items that are just of general interest in the trajectory world. Looks like the uncertainty and position was about 12 miles. Your uncertainty in velocity is about a quarter of a foot per second. And the perigee altitude of uncertainty is 5 miles.

01 13 25 26	CMP	Roger. Understand. Just for information, perhaps you read it out on the ground. I ran our pericynthion altitude determination using first of all, P21. The star state vector that we navigated with, we have plus 84.7 mile altitude and then we ran out your state vector that you updated with us the last time. We got 64.2 and then I ran P30, using our state vector and got 82.6 nautical miles. These are all plus.
01 13 26 02	CC	That's good.
01 13 26 14	CMP	What I'm going to attempt to do on P37 is to input your DELTA-V on your TLI plus 44 and use that 44 burn time. I notice that the entry velocity is a little high. We might not be able to do a normal P37, but we'll give it a try.
01 13 26 35	CC	Roger.
01 13 27 36	CMP	Houston, one more question then before I start. Did you notice on this last update PAD, this minus MANZ 1. Was that referring to the P37 fast return or the nominal maneuver which you gave me?

01 13 27 52	CC	Apollo 8, that's referring to the fast return procedures.
01 13 27 58	CMP	Okay. Thank you.
01 13 31 55	CMP	Houston, Apollo 8.
01 13 31 57	CC	Go ahead.
01 13 32 00	CMP	Are you following my procedure?
01 13 32 02	CC	That's affirmative.
01 13 32 06	CMP	Okay. This happened yesterday, too. I'm trying to load the DELTA-V you gave us in the maneuver TLI plus 44 in P37, but I keep getting an operator error everytime I try to load zeros for the termination of the middle and corner. Do you know what I'm doing wrong in my procedure?
01 13 32 31	CC	Okay. Stand by.
01 13 35 24	CC	Apollo 8, Houston.
01 13 35 28	CMP	Okay, go ahead. I can take it.
01 13 35 31	CC	Okay, looks like the decimal point in R2 under NOUN 60 is on the extreme right-hand side so the proper load will be 06070. Over.
01 13 35 46	CMP	Ah, so. Okay, fine. Thank you. I'll update my checklist. Don't know what I want to update it for, I can't read.
01 13 54 24	CC	Apollo 8, Houston. We are about to hand over to another site so you may lose lock momentarily.
01 13 54 36	CMP	Roger, Houston. Did you receive the results of the P37?

01 13 54 40	CC	Sure did. Looks pretty good here.
01 13 54 45	CMP	I concur.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

01 13 57 14	CC	Apollo 8, Houston through Honeysuckle. The switch is completed.
01 13 57 19	CT	You are loud and clear.
01 13 57 21	CC	Roger.
01 13 58 23	CMP	Houston, Apollo 8.
01 13 58 25	CC	Go ahead.
01 13 58 28	CMP	Another comment on the optics. We're in PTC right now. We are passing the - we have the roll of about 182; we're about in 226 pitch and 18 in yaw. I can rotate the shaft all the way around at this particular attitude, and I get this band of light at about 10 degrees of this side of the up-line. It - it varies in intensity with the shaft position. However, it is there at this particular attitude.
01 13 59 06	CC	Okay. Thank you.
01 13 59 32	CC	Jim, we have just been looking at your marks with respect to accuracy and they figure they are within a couple of thousandths of a degree of the theoretical optimum. The integrater seems to bear that out.
01 13 59 53	CMP	Well, I hope that they are enough to get us home if we have to use them.
01 13 59 57	CC	Well, I am getting a lot of confidence in your ability to run that mystery show now.
01 14 00 06	LMP	Hey, Jim, we have to spend four more days up here with him, will you take it easy. He is

		already talking about going back to MIT as a professor.
01 14 00 08	CC	(Laughter)
01 14 41 37	CDR	Hello, Houston. How do you read Apollo 8?
01 14 41 40	CC	Oh, loud and clear.
01 14 41 45	CC	You sure do sound wide awake.
01 14 42 34	CDR	Hello, Houston, Apollo 8. How do you read?
01 14 42 36	CC	Apollo 8, Houston. Read you loud and clear. How me?
01 14 44 05	CC	Honeysuckle network, GOSS CONFERENCE. How do you read?
01 14 44 07	CDR	Houston, this is Apollo 8. How do you read?
01 14 44 11	CC	Loud and clear, Apollo 8.
01 14 44 53	CT	Go ahead Honeysuckle. How do you read?
01 14 45 03	CT	Well, I would like to say hello to all of you in Australia. How is everything down there?
01 14 45 18	CT	Pretty good so far. Thank you.
01 14 45 27	CT	Honeysuckle, Houston network, on GOSS CONFERENCE. How do you read?
01 14 45 33	CT	Houston network, this is Honeysuckle reading at 5, 5.
01 14 45 38	CT	Roger.
01 14 45 45	CC	Apollo 8, Houston.
01 14 45 53	CC	Apollo 8, Houston.
01 14 46 18	CC	Apollo 8, Houston.
01 14 47 16	CC	Apollo 8, Houston.

01 14 47 21	CDR	Roger, just checking with you. Hey, if you all start having ground switching problems, how about having some place that has COMM come in and tell us about it. Will you please?
01 14 47 35	CC	Roger. Apollo 8. That's what we have been trying to do. Some of our problem seems to be getting from here to that site.
01 14 47 42	CDR	Houston. Apollo 8. How do you read?
01 14 47 45	CC	Apollo 8, Houston. Loud and clear. How me?
01 14 47 59	CDR	Houston, Apollo 8.
01 14 48 03	CC	Apollo 8, Houston. Read you loud and clear.
01 14 48 36	CC	Apollo 8, Houston.
01 14 48 40	CDR	Roger. Go ahead Houston. Apollo 8.
01 14 48 43	CC	Roger. We read you loud and clear and copy your remarks about having our remote site talk to you. Some of our problem has been in going from MCC to the remote site. We will attempt to do that anytime we can.
01 14 49 01	CDR	That's right. Just tell them you are having problems.
01 14 49 04	CC	Roger.

END OF TAPE

01 15 38 02	CDR	Houston, Apollo 8. How do you read?
01 15 38 06	CC	Apollo 8, Houston. Reading you weak but clear.
01 15 38 11	CDR	Okay. Thank you, Jerry.
01 16 02 15	CC	Apollo 8, Houston. Over.
01 16 02 20	CDR	Go ahead, Houston, Apollo 8. Over.
01 16 02 22	CC	Roger, Frank. I've got a little news and some ball scores if you want them.
01 16 02 28	CDR	Go ahead.
01 16 02 29	CC	Okay. The big news right now, on the wires, is that all 82 crewmen of the Pueblo have been returned. They walked across the Bridge of Freedom Monday night.
01 16 02 42	CDR	Wonderful!
01 16 02 48	CC	Said it took about 30 minutes for all 82 men to come across the Bridge of No Return and that's the one separating North and South Korea. They started across about 11:30 a.m. and were over by about noon, and they brought the body of the crewman that was killed, also.
01 16 03 17	CC	Okay, Frank. On ball scores, did you get the word on the Baltimore and Minnesota game today?
01 16 03 24	CDR	Not the final one.
01 16 03 26	CC	Okay. Final score was the Colts 24, Vikings 14. That gives them the western conference, so it looks like for the NFL title it's gonna be the Browns versus the Colts on the 29th.

01 16 02 41	CDR	29th?
01 16 02 44	CC	Roger. Slow return - you'll get it.
01 16 03 49	CDR	Say again.
01 16 03 53	CC	Roger. Come back slow return and we'll get it.
01 16 03 58	CDR	I'd rather come back fast and watch it on television.
01 16 04 02	CC	Atta boy! Let's see, for the AFL: the big game today was Oakland and Kansas City and Oakland dumped them 41 to 6, so it's looks the AFL title game will be the Raiders and Jets.
01 16 04 17	CDR	Righto! That's hard to believe, that score.
01 16 04 20	CC	Amen! Okay. In yesterday's game, I don't know if you got the score on that. The Cleveland Browns and the Cowboys. The Browns dumped the Cowboys 31 to 20.
01 16 04 34	CDR	Yes, we heard that.
01 16 04 36	CC	Yes, they're crying in Dallas. Basketball scores: Houston didn't do so good this weekend. Illinois beat Houston 97 to 84. And North Carolina took the Owls. The score was 85 to 77. We had a couple of words in the paper, Frank on - the Oilers. The Oilers voted George Webster their most valuable player and - although Houston didn't make anybody on the All Offensive Team this year, they put Walt Suggs and Hoyle Granger on the second team.

01 16 05 40	CDR	Very good.
01 16 05 48	CC	But although the Oilers didn't do so well out on the field, they did great in the box office. Bud Adams, Don Klausterman and Wally Lemm were all - real pleased with it. By the way, they were at the Cape to watch the show. Houston in 11 games - the Oilers attracted 460 628 people.
01 16 06 12	CDR	That must be a record? For them? I don't believe they ever got that many in Rice Stadium.
01 16 06 23	CC	I think so. Let's see the regular season attendance was about half that. This includes all the exhibition games. The paper says they averaged about 40 480 for the league games.
01 16 06 38	CDR	Great!
01 16 06 45	CC	Well, that's about it for now, Frank. We got some more news that they promised they would bring over as soon as it comes off the wire. The only thing of real interests were - particularly the Pueblo release. I think you've already been told about the - Nixon-Eisenhower wedding. And about the only other thing is the weather which is pretty clear around here. We've got high overcasts. But it is cold, good visibility, and it's beginning to feel like winter again.
01 16 07 20	CDR	Good time for Christmas, good weather for Christmas.
01 16 07 37	CC	Who have you got up now, Frank?

01 16 07 41	CDR	The other two guys are pretty sleepy. They sacked out again. So I am holding the fort down for a while.
01 16 07 48	CC	Okay. Thanks.
01 16 07 52	CDR	Roger. Thank you.
01 16 08 00	CC	Frank, we had a little egg nog over Charlie Duke's tonight.
01 16 08 03	CDR	Say again.
01 16 08 04	CC	We had a little egg nog at Charlie Duke's tonight. Vale Anders dropped by. She's looking fine. Tell Bill she's doing real fine.
01 16 08 14	CDR	Fine.
01 16 08 43	CDR	How do you like shift work, Jerry?
01 16 08 51	CC	It's great Frank. You've got the black watch watching you tonight.
01 16 08 56	CDR	Yes, that's what I figured.
01 16 11 17	CDR	Boy, Jerry. That earth is sure looking small.
01 16 11 25	CC	Roger. I guess it'll get smaller, too.
01 16 11 33	CDR	Yes, we're getting along pretty good, though, now.
01 16 11 36	CC	Real good. It looks like you're approaching a 150 000 miles.
01 16 11 42	CDR	Roger.
01 16 11 48	CC	How does the moon look, Frank?
01 16 11 52	CDR	Say again.
01 16 11 53	CC	Have you looked at the moon lately?
01 16 11 57	CDR	No. I saw it yesterday, but we haven't seen it today.

01 16 12 51	CC	Frank, you've probably already been told this, but you looked great on TV today. One little homey item, though. In the El Lago area you were upstaged by Santa Claus. He came along on a fire engine just about the time you guys came along. So most of the little critters were all outside.
01 16 13 10	CDR	That's good. I wish we could have got that one lens working. I'd like to share the view here we have of the earth.
01 16 13 20	CC	Frank, we've got some guys looking at it. We might be able to find a way to make it work for you. Hopefully, by a couple of hours before TV time tomorrow, we'll have an answer.
01 16 13 31	CDR	Very good.
01 16 13 32	CC	Jack Schmitt is working with us, too.
01 16 13 39	CDR	Very good.
01 16 13 41	CC	Ah, Jack Schmitt's working with it, too.
01 16 13 43	CDR	Very good. That's Typhoid Jack.
01 16 13 44	CC	(Laughter)
01 16 14 06	CDR	This COMM is so good we don't figure we'll have much to debrief.
01 16 14 13	CC	Roger. Probably the biggest part of the debrief will be the medical part.
01 16 14 26	CDR	Roger. You're sure right. Oh, we're all in fine shape.

01 16 14 45	CC	Real fine, Frank.
01 16 48 42	CDR	Houston, Apollo 8. We have just completed the canister change.
01 16 48 47	CC	Apollo 8, Houston. Roger. Copy.

END OF TAPE

01 17 37 31	CC	Apollo 8, Houston.
01 17 37 36	CDR	Go ahead.
01 17 37 37	CC	Apollo 8, this is Houston. We have a handover coming up in 2-1/2 minutes to Guam. Over.
01 17 37 44	CDR	Okay, Jerry. Thank you. Hey, Jerry?
01 17 37 52	CC	Go ahead.
01 17 37 55	CDR	How about a long-range guess on what the weather is going to be like in the recovery area on Friday.
01 17 38 03	CC	Roger, Frank.
01 17 44 52	CC	Apollo 8, Houston, with a weather watch.
01 17 45 02	CDR	Go ahead, Houston. Apollo 8.
01 17 45 04	CC	Roger, Frank. For 7 degrees, 38 minutes north, 165 west landing area, we are showing 2000 scattered, 12 000 broken, high over and 10; the wind's from the east at 12, 4-foot swells, about an 82 degree temperature. There will be some rain showers in about 10 to 30 percent of the area with ceilings around 2000. If there is - turns out to be a thunderstorm in the area, it will probably have a ceiling around 500 feet.
01 17 47 02	CC	Apollo 8, Houston. Did you copy that weather okay?
01 17 47 05	CDR	Roger. I said thank you. Do you read me now?
01 17 47 07	CC	Roger. Reading you much better. We got the voice coming down through Honeysuckle now.
01 17 47 14	CDR	Okay.

01 17 58 23	CC	Apollo 8, Houston.
01 17 58 27	CDR	Go ahead, Houston. Apollo 8.
01 17 58 29	CC	Roger, Frank. Can you cycle the H_2 and O_2 cryo fans now for us?
01 17 58 38	CDR	Roger. Will turn her now, the H_2. Manual - 2 minutes.
01 17 58 44	CC	Roger.
01 17 58 55	CDR	You may need to call us now and then. Everybody is a little drowsy.
01 17 59 01	CC	Okay, Frank.
01 18 07 07	CDR	That completes it, Jerry. They're all cycled through.
01 18 07 11	CC	Roger, Frank.
01 18 07 21	CDR	Houston, Apollo 8.
01 18 07 23	CC	Apollo 8, Houston. Roger.
01 18 07 28	CDR	Did you get my message about the fans?
01 18 07 31	CC	Sure did, Frank. Thanks.
01 18 07 35	CDR	Okay.

END OF TAPE

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APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

01 18 44 47	CDR	Houston, Apollo 8.
01 18 44 52	CC	Apollo 8, houston. Go.
01 18 45 00	CC	Apollo 8, Houston. Go.
01 18 45 04	CDR	Roger. The cabin temperature is down to 60, and it's getting pretty chilly in here. Have you got any approved solutions on how to bring it up without stirring up this nice thermal balance we have?
01 18 45 15	CC	Roger. Stand by.
01 18 46 01	CC	Frank, do you have your cabin fans on?
01 18 46 05	CDR	Negative.
01 18 46 06	CC	Roger.
01 18 46 08	CDR	We haven't had them on since we separated.
01 18 46 14	CC	Okay.
01 18 46 22	CC	Apollo 8, Houston.
01 18 56 26	CDR	Go ahead.
01 18 56 28	CC	Roger, Frank. Midcourse number 3 looks like just a shade more than 1 foot per second, so we don't recommend that you do it. That leads us on into a midcourse 4 of only about 3 feet per second right now. Your trajectory is looking real good. Your height at pericynthian is 70 miles.
01 18 56 53	CDR	Roger. Understand. Thank you.
01 18 56 55	CC	Roger. Roger, Frank. Little few thoughts on what is coming up now. The star sightings when

Jim gets up; looks right now like we've had enough of the earth horizon, and everything looks real good; and we are ready to start on some lunar horizon sightings. So when Jim gets up, we will pass the flight plan update to him for a set of stars with the moon. Also, around 48, or after the star sightings is when we would like to see your next water dump come up. So, if you can, I recommend you get a little shuteye.

01 18 57 36	CDR	Roger. Have you got any answer about warming this place up a little bit?
01 18 57 40	CC	Roger. They are still cranking around. They are talking about cabin fans, but that sounds like sort of a noisy proposition.
01 19 05 17	CC	Apollo 8, Houston.
01 19 05 21	CMP	Go ahead.
01 19 05 23	CC	Apollo 8, this is Houston. I have got two methods for you to warm up the cabin there. The first one is a one-man job - about the best way would be to one or both cabin fans ON and go full hot on the cabin heat exchanger. It'll be a fairly slow process of warming up, and you won't get a whole lot of heating. Your second method would be to adjust with the mixing valve your radiator OP temperatures. This, again, is a two-man job, and you have to be pretty careful.

01 19 06 03	CMP	Roger. Well, Frank just went to bed, and Bill isn't up yet. I'll tell you what I'll do. I'll put on the fans and go HIGH on the cabin temperature and see what that does.
01 19 06 16	CC	Okay, Jim. Remember, if you use just one fan, cover the other.
01 19 06 26	CMP	Roger.
01 19 10 22	CMP	Houston, Apollo 8.
01 19 10 25	CC	Apollo 8, Houston. Go.
01 19 10 30	CMP	Roger. If I use just one fan - You mentioned about covering the other one - are you sure that's true in this spacecraft?
01 19 10 43	CC	Roger. That's affirmative.
01 19 10 49	CMP	I thought that was a BLOCK I problem.
01 19 11 01	CC	Stand by, Jim. We'll recheck on that one.
01 19 11 16	CC	Apollo 8, Houston. Did you get the word from Frank on the star-sighting plans?
01 19 11 25	CMP	Roger. I'll get out the flight plan if you have an update to it now, though, then we can update it right now.
01 19 11 32	CC	Okay.
01 19 28 42	CC	Apollo 8, Houston.
01 19 29 07	CC	Apollo 8, Houston.
01 19 29 11	CMP	Go ahead, Houston.
0o 19 29 14	CC	Roger. Are you ready for that flight plan update?

01 19 29 21	CMP	Roger. Go ahead.
01 19 29 23	CC	Okay. At 47:15, delete the P23 sightings you're showing there; and at 45 minutes - correction, 45 hours, add one additional set of sightings to each star.
01 19 29 52	CMP	Okay. You said at 45 hours we're going to add one set of sightings to each of the three stars. Is that correct?
01 19 29 58	CC	That's affirmative. Everybody's real pleased with the earth horizon work; and as far as we're concerned, you can knock that off, and just add one set to each one of your lunar horizon stars at about 45. This 45 our time also is not hard. You can shift it as your - as you desire.
01 19 30 25	CMP	Roger. I see things coming up now. Jerry, we're going to get the block data around 44, and we'll do alignment around 44:30 and then we'll go into cislunar navigation.
01 19 30 39	CC	Okay. Fine, Jim. Then remember after you do the sightings, we'll want you to go back to the PTC mode again. And a little curiosity, how's the water tasting, and how did you sleep?
01 19 30 57	CMP	Water's tasting okay; no problems. And the sleep is getting better. We find it better to sleep underneath the couch now. I was up here

		with Frank, and I was dozing off periodically over the last several hours. Frank's now below and Bill's below, too.
01 19 31 17	CC	Okay, Jim; thanks.
01 19 37 27	CC	Apollo 8, Houston.
01 19 37 31	CMP	Go ahead, Houston.
01 19 37 32	CC	Apollo 8, we've got a command handover from Guam to Honeysuckle coming up in about 2 and 1/2 minutes.
01 19 37 43	CMP	Roger.
01 19 39 22	CMP	Houston, Apollo 8.
01 19 39 27	CC	Go ahead, Apollo 8. This is Flight -
01 19 39 33	CMP	... at this distance --
01 19 39 38	CC	Say again, Apollo 8.
01 19 39 39	CMP	... at this distance, there is no problem - there is no problem in seeing stars in the daylight at this distance.
01 19 39 53	CC	Roger. Copy.
01 19 40 23	CC	Apollo 8, Flight.
01 19 40 27	CMP	This is 8; go ahead.
01 19 40 29	CC	Jim, are you talking about out the window or out any of the - or out the telescope?
01 19 40 36	CMP	I am looking out the window right now. I have the lights out in the spacecraft, the window covered where the sun is, and I can see the stars very well out the left rendezvous window.

01 19 40 49	CC	Okay. I guess that window is still pretty good for you then.
01 19 40 55	CMP	That's right. It is one of the few that is. The center window, unfortunately, is all fogged over; it looks like a coating of ice or coating of heavy fog. Bill claims it is something else, though.
01 19 41 12	CC	Roger. By the way, I am just getting OJT on this CAP COMM job while Jerry is out of the room.
01 19 41 25	CMP	Well, we all have to learn sometime.
01 19 41 31	CC	Yes sir.
01 19 41 47	CMP	You picked a midnight shift, I see.
01 19 41 50	CC	Yes, it is turning out to be kind of quiet, too.
01 19 41 57	CMP	We like it that way.
01 19 42 00	CC	Well, things will pick up here by tomorrow night, I think.
01 19 42 05	CMP	I believe you are right.
01 19 42 14	CC	We're starting to show cabin temperature at 70, so it may be warming up for you.
01 19 42 21	CMP	Well, we can feel it warm up. I have both fans on and the - our gages indicate about 70.
01 19 42 28	CC	Okay. And I have got a real CAP COMM back now.
01 19 53 47	CC	Apollo 8, Houston.
01 19 53 52	CMP	Go ahead, Houston. Apollo 8 here.

01 19 53 55	CC	Apollo 8. This is Houston, with a flyby, and a PC, pericynthian plus 2 hours maneuver PAD, when you are ready to copy.
01 19 54 16	CMP	Ready to copy.
01 19 54 18	CC	Roger. Your TLI plus 44 maneuver PAD is good, requires no update. Flyby maneuver PAD follows: SPS/G&N 62954, minus 162, plus 129. Copy?
01 19 54 55	CMP	I am copying.
01 19 54 57	CC	Roger. 060 59 4808, plus 00953, plus 00578, minus 02076 000 000 000. Copy?
01 19 55 46	CMP	I am copying. Stand by. I am going to switch to OMNI antenna.
01 19 55 50	CC	Roger. Standing by.
01 19 56 03	CMP	Okay. Go ahead.
01 19 56 05	CC	Roger. HA is not applicable, plus 00202, 02356 022 02280 03 0393 310 013, up 048, right 35 - I repeat, right 35. Copy?
01 19 57 08	CMP	Copy.
01 19 57 11	CC	Roger. Plus 1418, minus 16505, 12904 36160 146 29 11; GDC align with your Sirius, Rigel set stars, 137 311 339; no ullage. Copy?
01 19 58 14	CMP	We are copying.
01 19 58 16	CC	Roger. I have two comments. Number one; requires realignment to preferred REFSMMAT; two, raises perilune to 554 miles. Over.
01 19 58 42	CMP	Roger. I have it. Stand by for readback.

01 19 58 46	CC	Roger. Standing by.
01 19 58 51	CMP	Flyby maneuver SPS/G&N 62954, minus 162, plus 129 060 59 4808 953 578 - those are 00953 and plus 000578 - minus 02076 000 000 000, not applicable, plus 00202, 02356 022 02280 03 0393 310 013, up 048, right 35, plus 1418, minus 165 05 12904 36160 146 2911, Sirius, Rigel 137 311 339, no ullage, requires realignment to preferred REFSMMAT, raises perilune to 554 nautical miles.
01 20 00 25	CC	Roger. Jim, that is correct. Let me know when you are ready for your PC plus 2.
01 20 00 37	CMP	Okay. Let's go on PC plus 2.
01 20 00 40	CC	Roger. Pericynthian plus 2, data return, SPS/G&N 61503, minus 158, plus 131 071 36 1244, plus 59578, minus 00086, minus 05287. Copy?
01 20 01 39	CMP	I am copying.
01 20 01 41	CC	Roger. 012 080 018, not applicable, plus 00203 59813 650 59566 11 2160 332. Copy?
01 20 02 31	CMP	Copying.
01 20 02 33	CC	Roger. Earth up 005, right 27, plus 0398, plus 06500 13215 36961 106 1911, Sirius, Rigel, 137 311 339, no ullage. Copy?
01 20 03 37	CMP	Copy.
01 20 03 39	CC	Roger. I have five remarks. Number one, assumes execution of flyby maneuver; number two,

use same alignment as for flyby; number three, time of midcourse number 5 for GERU determination GET of 83:38. Copy?

01 20 03 29	CMP	Roger.
01 20 03 31	CC	Roger. Two remarks to go. Number four, - stand by - number four: use P37 NC dash 4, steps 1 through 10 and NC-8, steps 3 and 4. Remark number five: average V 400K for corridor control chart equals 36531. Over.
01 20 05 41	CMP	Roger, Houston. PC plus 2, maneuver plan as follows: SPS/G&N 61503, minus 158, plus 131, 07136 1244. Copy?
01 20 06 06	CC	Roger. Copy.
01 20 06 10	CMP	Plus 59578, minus 00086, minus 05287, 012 080 018, not applicable, plus 00203 59813 650 59566 11 2160, 332, earth up 005, right 27, plus 0398, plus 06500 13215 36961 106 19 11; Sirius Rigel 137 311 339, no ullage, assume execution of flyby maneuver, uses stable alignment as the flyby; time of MCC 5 for GERU determination is 83 plus 38; use P37 NC-4 steps 1 through 10, NC-8 steps 3 and 4. Average V 400K for corridor control chart 36531.
01 20 07 46	CC	Roger, Jim. That's all correct.
01 20 08 00	CC	Apollo 8, Houston. That PC plus 2 is a fast return.

01 20 08 08 CMP Roger. Understand. Fast return.

END OF TAPE

01 21 14 50	CMP	Houston, Apollo 8.
01 21 14 55	CC	Apollo 8, Houston. Go.
01 21 15 00	CMP	Roger. Just some interesting things on the - just done a NAV with the moon; the sun is currently right in the way. I managed to get one set on Antares and was working on the second set, and the rim of the moon just disappeared completely. The view through the sextant is a milky white, whether you're looking at black sky or the moon. The tint of the moon is slightly washed out by the brightness of the sun. I'll try the next star and see what I can do with it.
01 21 15 35	CC	Roger, Jim.
01 21 15 56	LMP	Good morning, Houston. How are the systems looking here lately?
01 21 16 02	CC	Mornin', sleepy head. Systems are looking GO.
01 21 16 11	LMP	Thank you.
01 21 16 34	CC	How'd you sleep, Bill?
01 21 16 41	LMP	Oh, off and on, Jerry. There was quite a bit of noise in here, and anytime somebody responds to a transmission, why, it tends to wake you up. But it was a reasonably good rest.
01 21 16 54	CC	Real fine. We got a little work scheduled for you here. We've got an ECS redundant

		component check to run and some fuel cell purging to do.
01 21 17 06	LMP	Okay. How about if we wait until this NAV exercise is over with?
01 21 17 11	CC	Roger.
01 21 18 23	CC	Bill, what we have planned for you right after Jim gets finished is a waste water dump, a cryo fan cycle, redundant component check, and a fuel cell purge.
01 21 18 37	LMP	Roger.
01 21 18 40	CC	We'll be wanting an O_2 and H_2 fuel cell purge; we'll give you a 20-minute hack on the heater.
01 21 18 51	LMP	Okay. Want me to turn them on now or when you give me a hack?
01 21 18 56	CC	You better wait about 20 minutes.
01 21 19 01	LMP	Okay.
01 21 25 13	CC	Apollo 8, Houston. Bill, are you still eating?
01 21 25 21	LMP	Doing what?
01 21 25 25	CC	Are you busy eating?
01 21 25 26	LMP	Negative. I'm watching the store while Jim does his NAV sighting and then recording the data for him.
01 21 25 33	CC	Okay. We have a correction to make to your TLI plus 44 hour PAD. If you've got a chance there, we'd like to fire it on up to you.

01 21 25 47	LMP	Stand by.
01 21 25 50	CC	Roger.
01 21 26 17	LMP	Okay. Ready to copy the correction to TLI plus 44.
01 21 26 24	CC	Roger. The correction is in the remarks at the end. Delete the reference to high speed procedure minus NA.
01 21 26 42	LMP	Roger. Delete minus NA slash NC-1, Charlie.
01 21 26 49	CC	That's affirmative, and copy the following. This comment should read use P37 NC-4, step 1 through 11. Over.
01 21 27 15	LMP	Roger. Use P37 NC-4, steps 1 through 11.
01 21 27 22	CC	Roger. Then proceed to longitude control for no COMM procedure, page NC-7.
01 21 27 46	LMP	You went a little fast. Say again the page.
01 21 27 49	CC	Roger. That page is NC-7. I'll read that again. Then proceed to longitude control for no COMM procedure, page NC-7. Average 400K, V 400K, for corridor control charts is 36253. I repeat, average V 400K for corridor control charts is 36253. Over.
01 21 28 42	LMP	Roger. Say again. That's average C as in George.
01 21 28 47	CC	Negative. Average Victor 400K for corridor control chart is 36253.

01 21 29 03	LMP	Roger. Average V 400K for corridor control chart is 36253.
01 21 29 11	CC	Roger. The minus NA procedure is okay after abort when the GERU is less than 07990.
01 21 30 08	LMP	Roger. Minus NA procedure okay for abort when GERU less than 07990.
01 21 30 20	CC	Roger. I'll read back the entire remarks now just to make sure we got it straight. Use P37 NC-4, steps 1 through 11; then proceed to longitude control for no COMM procedure on page NC-7; average Victor 400K for corridor control chart is 36253; Minus NA procedure is okay after abort when GERU is less than 07990.
01 21 31 14	LMP	Roger. Copy.
01 21 42 24	CC	Apollo 8, Houston.
01 21 42 29	LMP	Go ahead.
01 21 42 31	CC	Bill, you can turn on the H_2 purge line heater now.
01 21 42 36	LMP	Okay.
01 21 47 41	CC	Apollo 8, Houston.
01 21 47 47	CMP	Go ahead, Houston.
01 21 47 49	CC	Jim, when you get a chance, either you or Bill, would you give us a crew status report on you and Bill?
01 21 47 57	CMP	Roger. We're going to finish up this one set of stars for you, then we'll do that.

01 21 48 01	CC	Okay.
01 21 48 11	CMP	Have you been getting this data down there in Houston.
01 21 48 15	CC	That's affirmative, Apollo 8.
01 21 48 38	CC	Jim, so far we've only missed one point; we'll ask you to read it back a little bit later.
01 21 48 49	LMP	Which one do you need?
01 21 48 56	CC	Stand by.

END OF TAPE

01 21 -- --	CC	Apollo 8, Houston. What we need is the third mark on the first set, star 33, trunnion only. Over.
-- -- -- --	LMP	Roger. That's the only one we're in doubt of. We think it was 12020.
-- -- -- --	CC	Roger. Copy.
-- -- -- --	CMP	Okay. That completes two for this time, Houston. Are you satisfied?
-- -- -- --	CC	Roger, Jim.
-- -- -- --	CMP	Houston, for information, the last two stars, 34 and 40, were shot at the very tip of the lit rim. You practically have to imagine the rim continued on past where it goes into the darkness.
-- -- -- --	CC	Roger. I understand they were shot at the tip of the lit rim.
-- -- -- --	CMP	That's affirmative, and the area around the entire moon now, both the sky and the moon itself, are all a milky white because of the nearness of the sun.
-- -- -- --	CC	Roger. Copying.
01 21 53 42	CC	Apollo 8, Houston. You can reestablish PTC same attitude, 224 and 20.
01 21 53 53	LMP	Roger, Houston. I'm heading that way now.
01 21 53 56	CC	Okay.
01 22 01 33	CC	Apollo 8, Houston.
01 22 01 37	LMP	Go ahead, Houston.

01 22 01 39	CC	We'd like to have you start your waste water dump as soon as you can; dump to 20 percent. We're doing this in order to get 71 percent at LOI. Over.
01 22 01 55	LMP	Understand; 20 percent.
01 22 01 58	CC	Roger.
01 22 14 32	CC	Apollo 8, Houston.
01 22 14 36	LMP	Go ahead, Houston.
01 22 14 38	CC	Roger. We see waste water coming down now. While it's on its way down, how about a cryo fan cycle?
01 22 14 48	CMP	Okay. Cryo fan cycle; I'll cycle H_2 and O_2 fans, one at a time, 2 minutes each.
01 22 14 56	CC	Roger.
01 22 21 56	CC	Apollo 8, Houston. We're showing you at 20.0 percent now.
01 22 22 07	LMP	Roger. We're showing about 25. We'll shut it off now.
01 22 22 12	CC	Roger. Next on deck is the fuel cell H_2, O_2 purge.
01 22 22 21	LMP	Stand by.
01 22 30 34	LMP	Okay. Houston, we're ready to start the purge.
01 22 30 38	CC	Roger, Bill. While you're purging, can you give us a crew status report?
01 22 30 49	LMP	That's going to be O_2 and H_2. Is that correct?
01 22 30 52	CC	Affirmative.
01 22 31 00	LMP	Roger. H_2 first, okay?
01 22 31 07	CC	Roger. That's okay.

01 22 32 13	LMP	We're getting H_2 flow, Jerry, but we don't have any of the - any vapor particles anywhere. Some are starting now.
01 22 32 33	CC	Roger. We confirm your flow and understand you're seeing particles now.
01 22 32 42	LMP	Not much, though. Okay. Now going to number 2.
01 22 32 45	CC	Roger.
01 22 33 08	LMP	You know, it's really too bad the side windows are fogged up because we never see any sun in the rendezvous windows, and we can't get very good pictures through these foggy ones.
01 22 33 22	CC	Roger.
01 22 34 36	LMP	Start number 3, H_2.
01 22 36 21	LMP	Okay. Start number 3, O_2.
01 22 36 28	CC	Roger, Apollo 8. Apollo 8, this is Houston. Would you set for ACCEPT for a P27 update, state vector to your limb sides, and we'd like you to --
01 22 36 46	LMP	Say again.
01 22 36 48	CC	Roger, Bill. Would you set up to ACCEPT a state vector update? We'll be putting it in the limb slot, and do not unzap. Over.
01 22 37 02	LMP	Roger. NORMAL ACCEPT.
01 22 37 17	LMP	We're going to put the word "zap" back in the dictionary.
01 22 37 20	CC	Roger, Batman.
01 22 38 19	CMP	Houston, Apollo 8.

01 22 38 22	CC	Apollo 8, Houston. Go.
01 22 38 27	CMP	It might be interesting to note that after NAV sightings, we ran out P21, and we get a pericynthian now of 66.8 miles.
01 22 38 38	CC	Roger, 8. We copy.
01 22 38 45	LMP	I knew if he did it long enough, he'd finally get one that was close.
01 22 39 13	LMP	Okay. Start fuel cell 2.
01 22 39 18	CC	Roger.
01 22 39 54	CC	Apollo 8, Houston. Your state vector update is complete and verified. You can have the computer back in BLOCK. Over.
01 22 40 05	CMP	Roger.
01 22 41 20	LMP	Okay. Going to number 1, O_2.
01 22 41 25	CC	Roger, Bill.
01 22 41 28	LMP	Old Helmut Kuehnel's kitchen timer is pretty nice.
01 22 41 58	CC	Roger, Bill. You can turn off your H_2 heaters now.
01 22 42 06	CMP	Wilco.
01 22 43 01	CC	Bill, we show you 168 000 out, and we're getting - still getting pretty good high bit rate off the 30-foot dishes.
01 22 43 13	LMP	Okay. I'm in NARROW BEAM high gain now. Were you getting good high bit rate on the OMNI?
01 22 43 26	CC	That's affirmative. We're back on high gain now.

01 22 43 39	LMP	Okay. Number 1 O_2 is off, and will you clarify your previous statement. Were you getting good high bit rate while we were on the OMNI's about 10 minutes ago? Over.
01 22 43 50	CC	Apollo 8, Houston. That's affirmative. We were getting fairly good high bit rate with a little bit of noise.
01 22 43 59	LMP	Okay. Thank you.
01 22 44 02	CC	Roger. We only got two things left to do now. We need your crew status report and a redundant component check.
01 22 44 13	LMP	Okay. Jim will give you the latter - former, and I'll give you the latter.
01 22 44 20	CC	Okay.
01 22 44 42	CC	Bill, EECOM says thanks for the good job of keeping the OMNI's moving.
01 22 44 54	LMP	Roger. We'll make any sacrifice as long as they keep an eye on the systems.
01 22 45 03	CC	Wilco.
01 22 45 10	LMP	Who's on the watch with you?
01 22 45 15	CC	It's just me right now.
01 22 45 20	LMP	How about EECOM?
01 22 45 22	CC	Well, we have Clint. The Black Watch is watching.
01 22 45 32	LMP	Okay. Stay alert.
01 22 45 34	CC	Roger. The Black Watch is watching.
01 22 45 35	LMP	Roger. I'll stay alert.

01 22 46 35	CMP	Okay, Houston. Here comes the status report.
01 22 46 42	CC	Roger. We're ready to copy.
01 22 46 46	CMP	Roger. For sleep, each of us has had two sleep periods; Frank's in his third one right now. Bill had 6 hours the last time; I had 4 hours the last time. Good to fair, both of us. Frank had 5 hours the last time, of fair. And Frank, of course, is sleeping now.
01 22 47 18	CC	Roger, Jim. How are the three of you feeling?
01 22 47 24	CMP	We're all feeling pretty good now; no problems. We've all had about between 40 and 60 ounces of - or clicks of water so far today.
01 22 47 38	CC	Okay.
01 22 47 43	CMP	The food: we're up to - we've eaten day 2, meal 2 so far. And both of us have eaten the rehydratables and the juices and about half of the solids.
01 22 48 07	CC	Roger. Copy.
01 22 48 15	CMP	The cabin's running slightly cold. We do have one cabin fan ON, and we're in full heat, and it's running just slightly under 70. Might be a design note for future spacecraft.
01 22 48 31	CC	Roger, Jim. That fan pretty noisy?
01 22 48 37	CMP	It's not as noisy as both fans when they're running; we cut it down to one fan.
01 22 48 43	CC	Roger. We keep thinking we hear it when you're talking to us.

01 22 48 50	CMP	I wouldn't be a bit surprised.
01 22 48 56	LMP	Houston, we're showing a glycol EVAP OUT TEMP around 44, and a RAD OUT TEMP of about 28. I wonder if we might try some manual mixing here to raise the glycol EVAP TEMP OUT a little bit?
01 22 49 26	CC	Roger, Bill. Stand by.
01 22 54 15	LMP	Okay. Houston, secondary loop is coming up.
01 22 54 19	CC	Roger, Bill.
01 22 55 16	LMP	Okay. We're boiling the secondary EVAP, and the temperature's stabilized, and so we're gonna close up the EVAP pressure valve.
01 22 55 25	CC	Roger. Copy.
01 22 56 33	CC	Apollo 8, Houston.
01 22 56 37	LMP	Go ahead, Houston.
01 22 56 39	CC	Roger, Bill. Before you try the manual mixing, we'd like you to give it a whirl at the manual and increase on the cabin TEMP. Over.
01 22 56 52	LMP	We've done that. We're in full HOT, and what is your - what's the lowest RAD OUT - individual RAD OUT TEMP you seen here during our PTC?
01 22 57 10	CC	Roger. Stand by.
01 22 57 36	CC	Apollo 8, this is Houston. We saw 26 one time.
01 22 57 45	LMP	Roger. Understand; plus 26.
01 22 57 50	CC	Affirmative.
01 22 58 22	CC	Apollo 8, Houston. Go ahead with your manual mixing. Suggest you set your EVAP OUT at about 55. Over.

01 22 58 33	LMP	Okay. We'll give that a try, and let us know if the RAD OUT TEMP's get too low.
01 22 58 38	CC	Roger. We're monitoring.
01 23 10 18	LMP	Houston, Apollo 8.
01 23 10 21	CC	Apollo 8, Houston. Go.
01 23 10 26	LMP	Roger. We have it stabilized about 53 degrees, and we will leave it there, but we will go back AUTO if you start having any concern about the radiators.
01 23 10 39	CC	Roger, Bill. We are showing 51.4 here.
01 23 10 46	LMP	Okay.
01 23 23 00	CC	Apollo 8, this is Houston. We are going to have a command changeover to Honeysuckle in about 2 minutes. Over.
01 23 23 08	CMP	Roger, Houston. Standing by.
01 23 23 13	CC	Apollo 8, Houston. That was Honeysuckle to Madrid.
01 23 23 21	CMP	Si, senor.
01 23 23 27	LMP	Goodby, you chaps.
01 23 24 34	CMP	Houston, Apollo 8.
01 23 24 36	CC	Apollo 8, Houston. Go.
01 23 24 40	CMP	Roger. Did you delete the cislunar NAV exercise at 47:15?
01 23 24 46	CC	That's affirmative, and we added the extra star sightings to the one at 45.
01 23 27 43	LMP	Houston, Apollo 8. How do you read?
01 23 27 48	CC	Apollo 8, this is Houston. Buenas dias, muchachos.

01 23 27 53	LMP	Buenas dias. We're going to be answering your calls pretty quietly for a little while here to let the CDR get to sleep. If you can't hear us, why, just tell us so.
01 23 28 09	CC	Okay.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

01 23 33 07	LMP	Houston, Apollo 8.
01 23 33 10	CC	Apollo 8, Houston. Go.
01 23 33 19	CC	Apollo 8, Houston. Go.
01 23 33 24	LMP	Roger. My two cohorts are going to try and get some sleep here, so y'all might keep a good eye on the systems. I'm going to move over to the other side.
01 23 33 35	CC	Roger.
01 23 34 24	CC	Apollo 8, Houston. We're getting low bit rate now. We could do better with a high-gain antenna before you move over to the other side. Over.
01 23 34 36	LMP	Roger.
01 23 40 49	LMP	Houston, Apollo 8.
01 23 40 52	CC	Apollo 8, Houston. Go.
01 23 40 57	LMP	You might give me a call every now and then, Jerry, just to let me know you're still there, as we're switching antennas, or play some music or something.
01 23 41 10	CC	Say again, Bill. You're kind of garbled.
01 23 41 15	LMP	I say you might just give me a call every now and then as we switch antennas, just to let me know you're still there, or play some music or something, just to make sure we haven't lost COMM.
01 23 41 29	CC	Okay, Bill. Your antennas are looking good now.
01 23 42 03	CC	Hey, Bill. If you want music, I'll have Mike sing.

01 23 42 11	LMP	Ask him to sing "Anchors Aweigh", will you?
02 00 07 45	CC	Apollo 8, Houston.
02 00 07 51	LMP	Roger.
02 00 07 53	CC	On your secondary coolant loop, looks like your back-pressure valve might be slightly open. I suggest you go to secondary coolant loop EVAP switch to the RESET position for 58 seconds. Over.
02 00 08 12	LMP	Roger. I did that again; I'll try it a third time.
02 00 08 14	CC	Okay.
02 00 10 04	LMP	That didn't do it any good, Houston.
02 00 10 07	CC	Roger, Bill.
02 00 10 18	LMP	Keep an eye on it, in case it starts dropping. It stabilized there right after I shut the evaporator off.
02 00 10 24	CC	Roger. We will watch it.
02 00 11 06	LMP	What might have happened, Jim might have gotten the water control valve off before we completely had the back-pressure valve closed.
02 00 11 20	CC	Roger. Understand Jim turned the water control valve off.
02 00 11 28	LMP	Roger. We have the secondary water EVAP control valve off, but he might have gotten it off on that return pump chart check prior to the time the evaporator back-pressure valve had completely

		closed, which might explain its lower-than-nominal state pressure.
02 00 11 46	CC	Roger. Understand.
02 00 30 17	CC	Apollo 8, Houston. Over.
02 00 30 23	LMP	Go ahead.
02 00 30 24	CC	Roger, Bill. We see your secondary steam pressure coming back up slowly, and we would like to just sit and watch it for a while before doing anything else.
02 00 30 36	LMP	Okay.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

02 01 16 34	CC	Apollo 8, Houston.
02 01 17 07	CC	Apollo 8, this is Houston. Over.
02 01 17 13	LMP	Go ahead, Houston. Apollo 8.
02 01 17 15	CC	Roger. I just wanted to let you know we still have voice contact, and we have the morning news for you. We can give it to you now or some time later, your choice.
02 01 17 27	LMP	How about right now?
02 01 17 29	CC	Very good. This is the 23rd of December edition of the Interstellar Times a la Paul Haney. We would like to let you know that there are only 2 more shopping days until Christmas. He says your TV transmission was a real big hit yesterday. Mickey Herskowitz is doing double duty for the Post. He's written a couple of columns on your launch in addition to his other sports columns, and, Jim, your mom certainly appreciated that birthday greeting. Twenty-one convicts broke out of a prison in New Orleans yesterday, and President Johnson went home last night from Bethesda Naval Hospital after his bout with the flu. He sends you guys a special message - not what to do for the flu - but congratulations on the flight. Are you reading me so far okay?
02 01 18 25	LMP	You're very clear, Mike.
02 01 18 27	CC	Good. Well, we had a big blizzard down here in the midwest; I don't know if you can see that from

up there or not. And in Houston, as a matter of fact, it's getting pretty chilly, about 35 degrees. And we would like to know who you like next Sunday, Baltimore of Cleveland? Baltimore defense looked pretty tremendous yesterday. They put on a great pass rush, and it sounds to CAP COMM like Haney is trying to con you guys into a bet. Over.

02 01 17 57 LMP I like Baltimore.

02 01 19 01 CC Are you giving points?

02 01 19 05 LMP Negative. I don't bet.

02 01 19 09 CC I guess you don't if you don't give points.

02 01 19 14 LMP How with you anyway.

02 01 19 19 CC Okay. That's about the size of the news. Houston, standing by.

02 01 19 24 CDR How are the families doing, Mike?

02 01 19 29 CC They are doing just great, Bill; just talking to Valerie a few minutes ago.

02 01 19 37 CDR That was Frank.

02 01 19 40 CC Oh, well, likewise with Susan. I have not talked to her since last night.

02 01 19 48 CDR Roger.

02 01 21 16 CDR Mike, this is Frank again. Would you tell the doctors I got about 5 hours of good sleep yesterday?

02 01 21 21 CC Roger. Thank you, Frank; we were wondering about that, about 5 hours of good sleep.

02 01 21 29	CDR	Right.
02 01 21 37	CC	How is everything going up there, Frank; all three of you guys feeling okay this morning?
02 01 21 43	CDR	Feel fine. Jim went back to sleep. Bill and I are having breakfast and everything seems fine.
02 01 21 48	CC	Good; glad to hear it.
02 02 07 18	CC	Apollo 8, Houston. Over.
02 02 07 23	CDR	Go ahead, Houston.
02 02 07 24	CC	Just checking in with you after about a 45-minute quiet break. Say, we notice on your high-gain antenna, if you like, you can get a little bit more use out of it by switching to it from OMNI when you have a yaw angle of 90 degrees and a pitch angle of minus 45 degrees. We are noticing that you are staying an extra 10 minutes on the OMNI, which is fine; but you could get more use out of the high gain if you use that procedure. Over.
02 02 08 00	CDR	Okay, thank you. It's a lot simpler for us, as long as the OMNI isn't working. We've got it all wrapped up here on the eight ball with the roll ... pointing to an OMNI number. We just switch it; it makes it a lot easier, if it is not bothering you.
02 02 08 13	CC	Okay. That is fine. We are presently happy with the COMM, Frank. We are just trying to be helpful.

02 02 08 25	CDR	Thank you very much. It's unusual that Mike Collins tries to be helpful, but nevertheless, thank you very much.
02 02 08 30	CC	Good; aerospace first, Frank.
02 02 08 35	CDR	Say hello to Howard Tindall for us, will you? His procedure seemed to be working.
02 02 08 39	CC	Sure will.
02 02 08 59	CDR	I hope that you have got everybody looking this thing over very carefully. One thing we want is a perfect spacecraft before we consider the LOI burn.
02 02 09 07	CC	Apollo 8, Houston. We concur, and we are doing that.
02 02 09 13	CDR	Okay.
02 02 09 55	CDR	Houston, Apollo 8. The water is in the process of being chlorinated at this time.
02 02 09 59	CC	Roger. Understand you're chlorinating the water at this time.
02 02 10 06	CDR	Roger.
02 02 10 48	CC	Apollo 8, Houston. Over.
02 02 10 53	CDR	Go ahead.
02 02 10 54	CC	At your convenience, we would like the readout of your service module RCS propellant quantities. We haven't gotten one of those so far this flight.
02 02 11 04	CDR	Alright. Stand by. We are just about to - need to change the antenna. I'll give them to you.

02 02 12 14	CDR	Houston, Apollo 8. How do you read?
02 02 12 18	CC	Go ahead, Apollo 8.
02 02 12 25	CDR	Okay. A, service module A, you ready?
02 02 12 30	CC	Ready to copy.
02 02 12 34	CDR	The temperature is about 111, the helium pressure - Do you just want the quantity, or do you want the whole works?
02 02 12 41	CC	Well, if you are reading, give us the whole works.
02 02 12 46	CDR	Okay. The helium pressure is about 37, the manifold is 182, and the quantity is reading 80. B has got the temperature about 112, the helium pressure about 36.5, the fuel pressure 180, and the quantity about 77. C has got the temperature of 140 - incidentally, those other temperatures should have been 120 instead of 110; I was looking at the wrong calibration here. The pressure is 37, the manifold pressure is about 182, and the quantity is 80. Temperature on D is 115, pressure is 37, the manifold pressure is 181, and the quantity is about 83.
02 02 14 02	CC	Roger, Frank. I read you loud and clear. On the temperatures, quad A and B should both the 120. Roger.
02 02 14 11	CDR	Roger.
02 02 14 12	CC	Thank you.

02 02 14 36	CDR	I will trade all of that good information for a readout of the actual quantities. If you will give us a minute, we will go ahead and plot them up, Mike.
02 02 14 45	CC	Roger. We will stand by until we get them for you.
02 02 16 34	CC	Apollo 8, Houston. I have your service module RCS quantities available. Over.
02 02 16 43	CDR	Roger. We are ready to copy at 50 hours 16 minutes.
02 02 16 47	CC	Okay. I have them both in percent and pounds; I'll give you both numbers. The pounds are slightly more accurate for plotting on your chart. Quad A 72 percent, 219 pounds; quad B 76 percent, 233 pounds; quad C 70 - -
02 02 17 10	CDR	Take it a little slower, Mike; whoa, whoa, whoa whoa.
02 02 17 13	CC	Okay.
02 02 17 15	CDR	Slow up. We just got quad A plotted. They are on separate charts.
02 02 17 20	CC	Okay.
02 02 17 22	CDR	Okay for quad B.
02 02 17 24	CC	Quad B 76 percent, 233 pounds.
02 02 17 34	CDR	Okay. Quad C.
02 02 17 36	CC	Seventy-six percent, 231 pounds.
02 02 17 49	CDR	Quad D.
02 02 17 50	CC	Seventy-six percent, 229 pounds.

02 02 17 59	CDR	Okay.
02 02 18 15	CDR	Would you give us the O_2 and H_2 as long as we are plotting?
02 02 18 18	CC	Roger. Stand by for O_2 and H_2.
02 02 19 58	CC	Apollo 8, Houston. We have got those numbers in a percent. We are going to switch them over to pounds, and in the meantime, we are going to be changing our ground antenna in about another 2-1/2 minutes. You can expect a COMM glitch. Over.
02 02 20 14	CDR	Thank you.
02 02 23 44	CC	Apollo 8, Houston. Over.
02 02 23 52	CDR	Go ahead, Houston. Apollo 8.
02 02 23 55	CC	Roger. I have your oxygen and hydrogen quantities when you are ready to copy.
02 02 24 02	CDR	Ready.
02 02 24 06	CC	Oxygen tank number 1 270 pounds, 270; oxygen tank 2 267, 267 pounds. Over.
02 02 24 24	CDR	Roger. Thank you.
02 02 24 26	CC	Roger. On the hydrogen, hydrogen tank 1 19.7; hydrogen tank 2 20.1. Over.
02 02 24 41	CDR	Understand; 19.7 and 20.1.
02 02 24 44	CC	Roger. You are a little bit low on the line on your graph due to the fact that they started out low.
02 02 24 55	CDR	Roger.

END OF TAPE

02 02 54 46	CDR	Houston, how do you read? Apollo 8.
02 02 54 48	CC	Apollo 8, Houston. Loud and clear. How me? Over.
02 02 54 54	CDR	Loud and clear. I was just checking. Over.
02 02 54 57	CC	Roger.
02 02 56 09	CC	Apollo 8, Houston. Over.
02 02 56 13	CDR	Go ahead.
02 02 56 15	CC	Roger, Frank. Your 51-hour update of block data will be omitted. The block data you have on board is satisfactory. Over.
02 02 56 28	CDR	Understand. The block data we have aboard is satisfactory.
02 02 56 30	CC	Right. That's for the flyby and pericynthian plus 2 hour block update. We would like also to get a current up-to-date report on all your windows. We are trying to make some alternate plans for using the center hatch window when you are in lunar orbit, and we would like to make sure we understand exactly what the condition of all five windows is. Over.
02 02 56 54	CDR	Okay. Number - window number 1 and number 5 are clouded, but they may be partially useful. The hatch window is very badly clouded. Windows number 2 and 4 are good.
02 02 57 06	CC	Okay. Understand the hatch window is unusable, 1 and 5 are partially usable, and the rendezvous windows are both good.

02 02 57 17	CDR	Right.
02 02 57 18	CC	Okay.
02 03 13 13	CC	Apollo 8, Houston. Over.
02 03 13 18	CDR	Go ahead, Houston. Apollo 8.
02 03 13 20	CC	Roger, Frank. We would like to ask you about the next few hours in the flight plan. We are inclined to let Jim go ahead and sleep and to slip the P23 that occurs at 52:15. On the other hand, we would think it would probably be a good idea if he returned more to the normal sleep rest cycle; and if you got him up nominally to do the 52:15 work, then perhaps he would be ready to go back to sleep at about 61 hours, when he nominally is expected to do so.
02 03 13 55	CDR	Okay. He's up now, eating. We are planning to go to normal procedures on the flight plan.
02 03 14 02	CC	Okay. That - that's fine then. If - you know, there is no - it's not time critical that P23 be done at 52:15, but if you get up to do it then, that's just fine.
02 03 14 16	CDR	Well, we thought we might give it a try.
02 03 14 18	CC	Roger.
02 03 14 23	CDR	This sleep cycle here is - we're just going to have to real tire it, I guess. I'm supposed to be asleep right now but, obviously - or I'm supposed to go to sleep here shortly, but I just got up. We are going to have to play this by ear.

02 03 14 39	CC	Roger. Understand.
02 03 17 39	CDR	Houston, Apollo 8.
02 03 17 41	CC	Go ahead, Apollo 8.
02 03 17 46	CDR	Are the stars in the flight plan proper for this next exercise of P23?
02 03 17 52	CC	We would like to talk to Jim about it when he is ready to copy.
02 03 17 59	CDR	He's ready.
02 03 18 01	CC	Okay.
02 03 18 03	CMP	Good morning, Mike. How are you doing?
02 03 18 05	CC	Fine, fine, Jim. You are sounding good this morning. We would like to give you a little rundown on these stars. As you can see in the flight plan, we've got you scheduled for a number 33, Antares, number 34, Atria, and number 40, old Altair. Now, the first of those, Antares, is in plane; the second two are out of plane. As you know, we would like to get a mixture of the in and the out of plane. Antares, number 33, is close to the sun, and we expect that you are going to have difficulty getting those measurements on number 33. We would like very much for you to try, but if you are unable to do number 33, then we propose that you use number 42, which is Peacock, to the lunar far horizon. We realize Peacock isn't the greatest one available - greatest star in the sky - but it's about the only one available. Over.

02 03 19 06	CMP	Roger. Understand. I'll - we will go to Antares first and try it. You know, we tried it last time, but I got one set before I lost the moon completely in the white haze. I'll give it another try, and if it doesn't work out, we will go to Peacock and give it -
02 03 19 26	CC	That - that is affirmative, Jim, and if neither Antares nor Peacock work, well then, we just will be happy to go with Atria and with Altair. We would like them to increase the number of sets and do three on Atria, that is, number 34, and two on Altair, number 40; but that is only in the event that you can get neither Antares nor Peacock.
02 03 20 07	CC	Apollo 8, Houston. Did you copy?
02 03 20 12	CMP	Roger. This is 8. Copied. We'll increase the number 34 to three and the number set of 40 to two if we cannot get 33 or 42.
02 03 20 25	CC	Yes, that's exactly right.
02 03 47 55	CC	Apollo 8, this is Houston. Over.
02 03 47 59	CDR	Go ahead, Houston. Apollo 8.
02 03 48 02	CC	Roger. We're getting low bit rate from you, rather than high, and on this P23 work, for us to get our data, you're going to have to delay the DSKY display about 10 seconds when it comes up with NOUN 987. Over.
02 03 48 18	CDR	Roger.

02 03 48 44	CC	Apollo 8, Houston. We are past that 87 display now. Did you write down what your trunnion bias was?
02 03 48 57	CDR	Negative.
02 03 49 00	CMP	Houston, we haven't started 23 yet. Our CAL is zero.
02 03 49 12	CC	Roger. Understand. Thank you.
02 03 49 17	CMP	We are in the process now to - to go to P23 attitude.
02 03 49 27	CC	Roger. Thank you.
02 03 53 42	CC	Apollo 8, Houston.
02 03 53 47	CDR	Go ahead, Houston. Apollo 8.
02 03 53 49	CC	Roger. Downlink data shows that on star 33, Jim is using the lunar far horizon when he should be using the lunar near horizon. Over.
02 03 54 02	CDR	Okay. Thank you. 220?
02 03 54 07	CC	Roger. 220.
02 03 54 14	CDR	Let us check it.
02 03 54 16	CC	Roger.
02 03 54 58	CDR	You want the far horizon now, Houston?
02 03 55 01	CC	Roger. Far horizon.
02 03 55 06	CMP	We have far horizon in now, Mike, on 220. I will check again, though.
02 03 55 12	CC	Yes. That is right. We are requesting the lunar near horizon as per the flight plan, the lunar near horizon. We show that you are using the lunar far horizon.

02 03 55 27	CMP	Okay. Roger. I thought that you had copied up 220 to me. I will put it in the near horizon.
02 03 55 34	CC	Roger.
02 03 58 50	LMP	Houston, Apollo 8. Over.
02 03 58 52	CC	Apollo 8, Houston. Go ahead.
02 03 59 03	LMP	Mike, it's getting kind of damp - we're getting a playback, Mike. It is getting kind of damp in here. It might be a good idea to go back into AUTO on the temp in - the glycol temp in for awhile to try and get some of this moisture out of the cabin.
02 03 59 21	CC	Roger. Stand by, Bill.
02 03 59 28	LMP	Roger.
02 04 00 08	CC	Apollo 8, Houston.
02 04 00 13	LMP	Go ahead.
02 04 00 14	CC	We concur. We would like you to go back to AUTO on the glycol temp inlet valve. Over.
02 04 00 22	LMP	Okay. When was our lowest radiator OUT TEMP during the last couple of hours while we have been in MANUAL?
02 04 00 28	CC	I will get it for you.
02 04 00 33	LMP	And we are back in AUTO.
02 04 00 35	CC	Roger. Back in AUTO, and 29 degrees is as low as we've seen.
02 04 00 43	LMP	Okay. We are showing a CABIN TEMP of about 76. It is very comfortable, but we are getting a lot of condensation on the walls now.

02 04 00 54	CC	Roger. Understand.
02 04 05 00	CDR	Houston, Apollo 8.
02 04 05 04	CC	Apollo 8, this is Houston.
02 04 05 08	CDR	Roger, Mike. While we are waiting for the spacecraft to maneuver to the moon, I might note that as we get closer to the moon, the light from the sun comes right into the scanning telescope, and it is impossible to use. You have to rely on the sextant alone.
02 04 05 35	CC	Roger, Jim. Understand that light from the sun is coming into the scanning telescope making it impossible to use, and you have to rely on the sextant alone. Can you attach any angle to that?
02 04 05 55	CDR	Well, Mike, I am right now at the substellar point of 33. I don't know where the sun is exactly from there, but that is about the angle. We're - the optics are pointed right at the moon now.
02 04 06 10	CC	Roger. Understand.
02 04 08 47	CC	Apollo 8, Houston. We are going to be changing our antennas in a couple of minutes. You can expect a COMM switch-over.
02 04 08 57	CDR	Thank you.

END OF TAPE

02 04 19 22	LMP	Houston, Apollo 8. Over.
02 04 19 26	CC	Apollo 8, Houston. Go.
02 04 19 30	LMP	Roger. The LMP is going to take a little snooze here for a while. I am wondering, can you give me a quick - your view of the system status here before I depart, and, also, give me an idea of when the next cryo stir is due?
02 04 19 48	CC	Roger, Bill. Will do; stand by.
02 04 20 23	CC	Apollo 8, Houston.
02 04 20 27	LMP	Go ahead.
02 04 20 29	CC	Roger. Your systems remain unchanged. They are all looking good. You can go ahead and stir up the cryo starting right now.
02 04 20 38	LMP	Okay. Will do.
02 04 25 19	CC	Apollo 8, Houston.
02 04 25 23	CDR	Go ahead, Houston.
02 04 25 25	CC	Roger. Before Jim makes his next mark, could he call up VERB 1 NOUN 1? We missed the last trunnion. Over.
02 04 25 36	CDR	Roger. The last trunnion was 10660.
02 04 25 41	CC	10660. Thank you.
02 04 26 53	CC	Apollo 8, Houston.
02 04 26 59	CDR	Go ahead.
02 04 27 00	CC	Roger. Before Bill gets his snooze, we would like him to give us a PRD readout on all three crewmembers. Over.

02 04 27 12	LMP	Roger. CDR is 0.06, CMP is 0.64, and LMP is 0.64.
02 04 27 51	CC	Roger. Thank you, Bill.
02 04 28 00	CDR	Looks like I'm the only one that is radioactive.
02 04 28 02	CC	Understand.
02 04 28 18	CMP	Okay. Houston, we got three sets on 33; we are going now to 34 lunar far horizon for one set. Don't you agree?
02 04 28 26	CC	We agree. Star 34 lunar far horizon for one set.
02 04 29 48	LMP	Houston, the cryos have been stirred, and could you also give me a quick rundown on how the SPS line temps are doing?
02 04 29 58	CC	Roger, Bill. Understand you stirred the cryos. Last time we checked, the SPS line temps were excellent; they were nice and warm. We will give you another number right now.
02 04 30 10	LMP	And a PU valve.
02 04 31 05	CC	Apollo 8, Houston.
02 04 31 10	LMP	Go ahead.
02 04 31 12	CC	Roger. On your SPS system, your oxidizer is running 75 degrees, fuel 74 degrees, and PU valve between 78 and 82 depending on where we measured it. Over.
02 04 31 27	LMP	Real good. Everything really is working fine, isn't it?
02 04 31 30	CC	Yes, it's really humming along, Bill.
02 04 31 37	LMP	Okay. See you later.
02 04 31 39	CC	Adios.

02 04 37 57	CDR	Houston, Apollo 8.
02 04 38 01	CC	Apollo 8, this is Houston.
02 04 38 05	CDR	I understand you want two sets on number 40, lunar near horizon. Is that right?
02 04 38 08	CC	That's affirmative. Two sets on number 40, lunar near horizon.
02 04 42 25	CC	Apollo 8, Houston.
02 04 42 30	CDR	Go ahead, Houston.
02 04 42 32	CC	Roger. We missed your last trunnion angle, Frank.
02 04 42 37	CDR	21450.
02 04 42 41	CC	Roger. 21450, and Paul tells me Valerie is over here and wishes Bill a happy nap.
02 04 42 52	CDR	Okay. Thank you. Tell her that he makes us tired sometimes too, will you?
02 04 43 13	CC	Roger. I will deliver a modified version of the message.
02 04 43 20	CDR	Thank you.
02 04 43 58	CC	Apollo 8, Houston.
02 04 44 04	CDR	Go ahead, Houston.
02 04 44 07	CC	Roger. On star number 40 that you are doing now, the flight plan only calls for one set of marks. You called down two sets, and it's really your choice. Only one is required. We are glad to have the data if you do a second set. Over.
02 04 44 24	CDR	We will only do one then, if you want to. Our flight plan has been updated to include two sets. That is why I called it down.

02 04 44 32	CC	Roger. One set is - will suffice.
02 04 47 28	CC	Apollo 8, Houston. We missed the last trunnion.
02 04 47 34	CDR	Very well, I will read it to you; 21455.
02 04 47 39	CC	21455. Thank you. Just a matter of interest: it is taking your voice about 1.6 seconds to get down to us.
02 04 47 51	CDR	I'm a little hoarse, that's why.
02 04 48 19	CDR	Okay. Houston, do you want us to go back to the PTC attitude now and start the rotisserie again?
02 04 48 25	CC	That is affirmative, Frank. We will have the PTC attitude for you in just a second here.
02 04 48 48	CC	Apollo 8, Houston.
02 04 48 53	CDR	Go ahead.
02 04 48 55	CC	Roger. Those PTC attitudes remain pitch 224 degrees, yaw 020 degrees. On the next page, page 239 of your flight plan, those PTC numbers should be changed to reflect that.
02 04 49 12	CDR	Pitch 224 and yaw 20.
02 04 49 15	CC	That's affirmative.
02 04 52 23	CC	Apollo 8, Houston. Over.
02 04 52 29	CDR	Go ahead, Houston. Apollo 8.
02 04 42 31	CC	When you have a few minutes, we would like to hear the detailed crew status report from you.
02 04 42 40	CDR	Like what?
02 04 42 42	CC	Well, like we would like to know, in the last 24 hours, has anybody had any symptoms similar

to Frank's. We would also like to know - You know, we told you the other day to take Marezine as you like - we would like to know if anybody had taken any drugs, and then we would like to talk over there about sweet breads and water and such.

02 04 53 01 CDR Okay. Nobody has taken any other drugs; nobody took any Marezine; nobody is sick. Bill took one of those pills, a sleep Seconal pill, last night. Everybody had breakfast this morning and ate most of a meal - 1 day 3 - meal a day 3. What else do you want?

02 04 53 31 CC We would like to tell you to drink plenty of water. We think that your water intake may be down. We copied your dosimeter readings. The only other thing is we just were wondering how in general you feel. We show you to have about 15 hours sleep total - Frank or Bill about 10, and Jim about the same, and we were wondering just how you are feeling in general.

02 04 53 58 CDR We all feel fine; we are going to fix it now so that we all have one more rest period before the LOI.

02 04 54 04 CC Roger. Thank you.

02 04 54 11 CMP Happiness is bacon squares for breakfast.

02 04 54 18 CC If you don't eat them all, bring them back, and we'll polish them off here.

02 04 54 34	CDR	Okay, Houston. Apollo 8 here. I stand corrected, William had one Marezine. He didn't tell me about it; he snuck it.
02 04 54 40	CC	Roger. Understand Lovell took the Marezine. Understand.
02 04 54 43	CDR	That's Bill Anders, and he took one when he took the - with the Lomotil, when the doctors told him to.
02 04 54 54	CC	Roger. We copy that. Thank you.
02 04 56 06	CDR	Okay. We are back on the bar-b-que attitude, starting PTC.
02 04 56 10	CC	Roger, Apollo 8. Thank you.
02 04 56 21	CDR	Mike, we ran the latest state vector we have through the P21, and it showed the pericynthian at 69.7 miles.
02 04 56 30	CC	Yes, we were all having big talks about that down here. It looks like you are giving us a real good comparison on our system. Looking - looking extremely good.
02 04 56 45	CDR	We've got the navigator, par excellence.
02 04 56 50	CC	I believe.
02 04 57 28	CC	Apollo 8, Houston.
02 04 57 33	CDR	Go ahead.
02 04 57 36	CC	Roger. What was the time you used on that P21?
02 04 57 42	CDR	6910 there, Mr. Slide Rule.
02 04 57 46	CC	Thank you.
02 04 58 01	CDR	Mike, I wonder if Buz wants us to change the time?

02 04 58 04	CC	No, that is fine.
02 04 58 07	CDR	Oh, okay. Thank you.
02 05 03 07	CDR	Houston, Apollo 8.
02 05 03 11	CC	Apollo 8, Houston.
02 05 03 15	CDR	Roger. Are you going to give us an update for a maneuver PC plus 2 that does not assume a flyby maneuver?
02 05 03 26	CC	Roger. Stand by.
02 05 08 03	CC	Apollo 8, Houston.
02 05 08 12	CMP	Go ahead, Houston. Apollo 8 here.
02 05 08 14	CC	Roger. Here is a rather brief summary of the updates that you will be getting. The one that you have now for PC plus 2 following an LOI minus 8 flyby maneuver is still good. That will not be updated. The next update you will get will be MCC 4. After that, you will get two PC plus 2 maneuvers, that assume MCC 4 completed. One will be a minimum DELTA-V, and the other will be a fast return. Do you copy?
02 05 08 50	CMP	Roger. Understand, and also I take it for MCC 4 you are going to give us a new alignment. Is that correct?
02 05 08 57	CC	That is affirmative.
02 05 26 31	CC	Apollo 8, Houston.
02 05 26 36	CDR	Go ahead, Houston. Apollo 8.

02 05 26 38	CC	Roger, Frank. I've got a lot of talking to do regarding TV cameras and brackets and whatnot. I would like to start in on it whenever you are ready to talk about it.
02 05 26 52	CDR	Let me get a piece of paper out.
02 05 26 54	CC	Okay.
02 05 27 06	CDR	Go ahead.
02 05 27 08	CC	Okay. First a question. Are you planning to show us TV pictures of the earth today?
02 05 27 18	CDR	Well, that is what we wanted to do. It seems that would be the most interesting thing we can show you, but we - you know, we had trouble with the lens.
02 05 27 25	CC	Well, okay, that's good. All this procedure that I am going to give to you here is relative to what we hope are fixes to the lens and for looking out your rendezvous window at the earth, and all the gimbal angles and all that good stuff is based toward looking out the window at the earth rather than at the moon. Over.
02 05 27 49	CDR	Roger.
02 05 27 50	CC	Okay. First, unstow the red filter, the polarizing filter, the red and blue filter holder, and some tape. Over.
02 05 28 07	CDR	Okay. Let me write this down.
02 05 28 09	CC	Roger. I'd suggest that. I've got a whole page full.

02 05 28 33	CDR	Okay.
02 05 28 35	CC	Alright. Tape the red filter to the telephoto lens. That red filter is the 25A red filter, not the one that is in the red and blue filter slider.
02 05 28 48	CDR	Roger.
02 05 28 49	CC	Attach telephoto lens to the camera.
02 05 28 56	CDR	Okay. We can figure out how to do that. Roger.
02 05 29 00	CC	Insure that the automatic light control, the ALC switch on the camera, is in the IN position. Over.
02 05 29 11	CDR	ALC IN. Roger.
02 05 29 14	CC	Roger. Attach camera to the adjustable TV bracket and attach the bracket to the TV mounting point on the commander's side of the hatch to point out rendezvous window number 2.
02 05 29 41	CDR	Roger.
02 05 29 43	CC	Okay. There is a note here that says use dovetail on top of camera, rather than the side dovetail. Use the dovetail on the top of the camera for mounting to bracket and place the rocking nut on the bracket down, and down means toward your minus X direction.
02 05 30 16	CDR	Roger.
02 05 30 18	CC	Okay. They say this step I just got through giving you is somewhat complicated. You might want to get

		the cameras set up early using the instructions I just gave you. When it's properly - -
02 05 30 31	CDR	We are not reading you.
02 05 30 34	CC	Roger. I say again, the instructions that I just gave you should end up having the camera looking out the window and about 30 degrees yawed left from your plus X-axis, so I suggest you get the camera set up that way early; and if there are any problems, come back to us; we will talk them over. These mounting instructions are sort of complicated.
02 05 31 00	CDR	Roger.
02 05 31 03	CC	Okay. The next step: dim the interior lights. Over.
02 05 31 12	CDR	Dim interior lights.
02 05 31 14	CC	Roger. Next, stop passive thermal control at gimbal angles pitch 224, yaw 020, roll 270. Over.
02 05 31 36	CDR	Pitch 224, yaw 020, roll 270.
02 05 31 41	CC	Roger. Next, acquire on high-gain antenna, switch to AUTO tracks, now beam upon acquisition. Over.
02 05 32 02	CDR	Got it.
02 05 32 04	CC	Okay. Yaw spacecraft left to get good view of earth and your rendezvous window number 2. You may have to pitch slightly as well, but primarily a left yawing maneuver to get a good view of the earth.

02 05 32 20	CDR	Got it.
02 05 32 22	CC	Okay. This maneuver is going to put you very close to your scan limits for the high-gain antenna, so while you are making the maneuver, check your lights. If your scan limit light comes on, you still have got 15 degrees to play with. But the only message is, should you break lock, then you are going to have to go back and reacquire and do that maneuver over again, because you are going to be very close to the edge of your high-gain antenna capability.
02 05 32 52	CDR	Thank you.
02 05 32 54	CC	Okay. And then finally, now that you have got the spacecraft over there, aim the camera as required to include the earth and the field of view, and do not touch the body of the lens while televising. Apparently, if you put your hands on the lens itself, it causes electrical interfere e. Over.
02 05 33 26	CDR	Okay. Aim camera and do not touch lens . e televising.
02 05 33 30	CC	Right. And in all this stuff in all these pictures using the ALC, it is important that you let the camera stabilize for at least 10 or 20 seconds, to let the ALC do its thing.
02 05 33 58	CDR	Stabilize for 10 to 20 seconds. Thank you.
02 05 34 01	CC	Right. Now we have some additional instructions in case this does not work. They say a full 20, Frank,

on that ALC. It requires a full 20 seconds undisturbed for the ALC to properly do its thing. Now if these procedures that I've given you do not work, then we will be giving you some more, and they have to do with other filters and various combinations thereof. So I'd have the polarizing filter and the red and blue filter holder at hand because we will be attempting to use those in addition to the red filters if this procedure doesn't work.

02 05 34 43 CDR All very well, Mike.

02 05 34 46 CC That's all we have right now. We will have a few more remarks on the TV coming up to you later. I would suggest that you get set up for this early, and if you have any questions on it, shoot them down to us. We have a bunch of experts down here to help out.

02 05 35 03 CDR Thank you; will do.

END OF TAPE

02 06 06 18	CC	Apollo 8, this is Houston. Over.
02 06 06 23	CDR	Go ahead, Houston. Apollo 8.
02 06 06 25	CC	Roger. Just a voice check, Frank.
02 06 06 30	CDR	Roger. You're loud and clear.
02 06 06 32	CC	Thank you.
02 06 18 50	CC	Apollo 8, Houston.
02 06 18 55	CDR	Go ahead, Houston. Apollo 8.
02 06 18 57	CC	Roger. We would like some high bit rate data when you can get it locked up on the high gain. We haven't had any of that for a while.
02 06 19 06	CDR	Roger. We will do that.
02 06 19 09	CC	Thank you. How is that camera bracket thing working out?
02 06 19 13	CDR	We are doing it right now.
02 06 19 53	CDR	Houston, this is Apollo 8 transmitting to you on the high gain. How do you read?
02 06 19 57	CC	Read you loud and clear, Frank. Thank you.
02 06 20 08	CDR	Apollo 8 transmitting on the high-gain antenna.
02 06 20 11	CC	Apollo 8, Houston. You are loud and clear. Thank you for the high gain.
02 06 20 18	CDR	Roger.
02 06 32 59	CDR	Houston, this is Apollo 8. Are you getting high bit rate all right?
02 06 33 08	CC	That is affirmative, Apollo 8. We are getting a good high bit rate.
02 06 33 14	CDR	Thank you.

02 06 33 36	CC	Apollo 8, Houston.
02 06 33 40	CDR	Go ahead.
02 06 33 42	CC	Roger. I've got some more talking to do about the TV any time it's convenient for you.
02 06 33 48	CDR	Go ahead.
02 06 33 50	CC	Okay. First thing, we've made no provisions in these instructions for taking pictures of the moon. If you get some moon shots after it's all over by looking out a different window or by making some small maneuver, or course, we would be happy to have them, but the show as scheduled is just out the window at the earth only. Over.
02 06 34 15	CDR	Roger.
02 06 34 17	CC	The second point is, of course, when you stop your passive thermal control, you are about 90 degrees to the earth line, so when you make that yaw left, you are going to have to yaw left until your middle gimbal angle is in the vicinity of 60 degrees. You will get the additional 30 degrees by offset between where the camera is pointed and your plus X axis. But the two together are going to total up around 90. We just wanted to make sure that you understood you were going to be working with a large middle gimbal angle. Over.
02 06 34 52	CDR	Roger. We understand that. We also are looking at the earth right now, and there is a spectacular

long thin band of clouds. Looks like it may be a jet stream. It's absolutely spectacular - going almost all the way - or half way around the earth.

02 06 35 12 CC Roger. Well, you might want to repeat that during the TV narrative, and we would like you, if possible, to go into as much of a detailed description as you poets can on the various colors and sizes of those things and how the earth appears to you, in as much detail as you can possibly muster. Over.

02 06 35 36 CDR Roger. I figure we will have to do that because I bet you - I won't bet - but I bet the TV doesn't work.

02 06 35 44 CC Well, we won't take that bet, but anyway, we are standing by for a nice lurid description, and we would suggest that you talk a little bit slower than you did yesterday. Over.

02 06 35 56 CDR Okay.

02 06 35 58 CC And the only other thing on this TV is that the experts tell us that - do not point - with the wide angle lens on the camera, do not point at either the earth or the moon. It comes close to damaging interior of the instrument due to the fact that it's too bright. Over.

02 06 36 18 CDR Understand.

02 06 36 20 CC Thank you.

02 06 41 23	LMP	Houston, Apollo 8. We're going to have to switch to an OMNI.
02 06 41 28	CC	Roger, Apollo 8.
02 06 52 57	CC	Apollo 8, Houston. Over.
02 06 53 03	CDR	Go ahead, Houston. Apollo 8.
02 06 53 05	CC	Roger. Just checking the voice COMM, Frank.
02 06 53 09	CDR	Thank you.
02 06 57 39	CC	Apollo 8, Houston.
02 06 57 44	CDR	Go ahead, Houston.
02 06 57 46	CC	Roger. We'll be switching antennas from Madrid to Goldstone in another 3 minutes. You can expect a glitch on your COMM.
02 06 57 56	CDR	Thank you.
02 07 02 38	CDR	Houston, how do you read? Apollo 8.
02 07 02 41	CC	Apollo 8, Houston. We're reading you loud and clear through Goldstone. Over.
02 07 02 46	CDR	Okay. We have the television ON now, and we're trying to maneuver to the - to the earth.
02 07 02 55	CC	Roger. Understand.
02 07 04 11	CMP	Houston, Apollo 8.
02 07 04 15	CC	Apollo 8, Houston. Over.
02 07 04 20	CMP	Roger. We're maneuvering to position now for the TV. Bill's got it set up in Frank's left rendezvous window, and I'm over in Bill's spot looking out the right rendezvous window, and the earth is now passing through my window. It's about as big as the end of my thumb.

02 07 04 45	CC	About as big as the end of your thumb at arm's length, huh?
02 07 02 51	CMP	That's right. I think what we see now is South America down below us.
02 07 02 55	CC	Roger. Is the TV camera pointed about 30 degrees yaw left from the plus X axis?
02 07 05 05	CMP	Stand by a moment. We're checking it. We think we've got it in the right position. We're going into position now.
02 07 05 13	CC	Okay.
02 07 05 33	LMP	Houston, are you getting any sort of a picture?
02 07 05 52	CC	Apollo 8, Houston. Negative; not yet.
02 07 06 32	LMP	Okay. Houston, Apollo 8. We should have - -
02 07 07 36	CDR	Hello, Houston; this is Apollo 8. We have the television camera pointed directly at the earth now and have followed the instructions you gave us.
02 07 07 45	CC	Roger, Frank. We're picking something up on our TV. It's not very good so far, but let it sit for a second, and we'll have more instructions for you.
02 07 08 00	CC	Okay. It's coming into view now, Frank.
02 07 08 07	CDR	It is?
02 07 08 08	CC	Yes. We have it in the corner of our screen. You're slightly off on your pointing, but we're getting a darn good look at the corner of it.

02 07 08 21	CC	It's moving off, Frank. It's moving off our - 3 o'clock on our TV screen. I have no idea what to tell you about which way to point.
02 07 08 32	CC	It's moving further away. We've lost it now.
02 07 08 57	CC	Apollo 8, Houston. Receiving nothing now. Over.
02 07 09 03	CDR	Okay.
02 07 09 05	CC	We're receiving the picture; we're just not seeing the view of the earth.
02 07 09 11	CDR	Roger. I got you.
02 07 09 16	CC	Okay. We are just picking it up at 3 o'clock on our screen.
02 07 09 21	CDR	Okay.
02 07 09 23	CC	It is moving up toward 1 o'clock and in toward the center; keep it going in that direction.
02 07 09 29	CDR	Okay.
02 07 09 31	CC	It's looking better. You're holding it about 1 or 2 o'clock. Looking better. Give us a little more in that same direction. You're down at 3 o'clock now. We see about half of what you see. Too much. It is disappearing at our 5 o'clock. Now it is coming back. It is half off - screen at our 2 o'clock.
02 07 10 05	CC	And it's disappeared off at our 3 o'clock. There, it is coming back in now. It is headed toward the center of our screen.
02 07 10 14	CC	MARK.

02 07 10 15 CC It is right in the center of our screen. Just hold her - hold her steady. It is really looking good. Okay. We have - -

02 07 10 28 CMP What you're seeing, Mike, is a - Houston, what you are seeing is the Western Hemisphere. Looking - at the top is the North Pole; in the center - just lower to the center is South America - all the way down to Cape Horn. I can see Baja California and the southwestern part of the United States. There is a big long cloud bank going northeast, covers a lot of the Gulf of Mexico, going up to the eastern part of the United States, and it appears now that the east coast is cloudy. I can see clouds over parts of Mexico; the parts of Central America are clear. And we can also see the white, bright spots of the subsolar point on the light side of the earth.

02 07 11 28 CC Roger. Could you give me some ideas about the colors, and also, could you try a slight maneuver? It is disappearing. We're seeing about half of it. It is going off to our 12 o'clock. Now it is going off to our 3 o'clock. That is the wrong direction. Yes, that is a good direction.

02 07 11 50 CC We need another small correction to bring it to our center screen. If you could maneuver toward the terminator, that is the part of it we are missing.

We are getting the lighted portion. There you go; that's fine. Stop it right there.

02 07 12 17 CMP Okay. For colors, waters are all sort of a royal blue; clouds, of course, are bright white; the reflection off the earth is - appears much greater than the moon. The land areas are generally a brownish - sort of dark brownish to light brown in texture. Many of the vorteces of clouds can be seen of the various weather cells. A long band of - it appears cirrus clouds that extend from the entrance to the Gulf of Mexico going straight out across the Atlantic. The terminator, of course, cuts through the Atlantic Ocean right now, going from north to south. Southern Hemisphere is almost completely clouded over, and up near the North Pole there is quite a few clouds. Southwestern Texas and southwestern United States is clear. I'd say there are some clouds up in the northwest and over in the northeast portion.

02 07 13 25 CC Roger. Could you maneuver toward the terminator again, please?

02 07 13 34 CC A little bit more. Stop her right there and hold it. It keeps slipping up a little bit; could you maneuver slightly more toward the terminator?

02 07 14 02 CDR How is that, Houston?

02 07 14 05	CC	We are getting about half of the earth, Frank. The top half - our top half which includes the dark portion it - is obscured.
02 07 14 19	CDR	How is the definition on the picture?
02 07 14 23	CC	Looks pretty good.
02 07 14 28	CMP	Can you see cloud patterns at all?
02 07 14 31	CC	That's affirmative.
02 07 14 36	CMP	Good.
02 07 14 39	LMP	Are you still seeing it, Houston?
02 07 14 42	CC	Yes, we are seeing it. We are missing the portion of the earth that is over toward the terminator. The dark portion of the earth is what we are not picking up. We are getting about three-quarters or four-fifths of the rest of it.
02 07 14 56	LMP	Roger. I will move it, and tell me when I am getting better or worse please.
02 07 15 01	CC	Good.
02 07 15 08	CC	Stop right there. That is worse, Bill. Go back where you were. You make it disappear to our 3 o'clock. Now it's coming back. Okay. Stop right there. Now you are back where you were, and we need a motion that is about 90 degrees to that last one you gave us.
02 07 15 38	CC	That is the wrong 90 degrees. 180 degrees away from that one.

02 07 15 47	CC	Stop right there. Okay. Now we have lost a different half of it. I need a motion 90 degrees to that last one.
02 07 16 24	CC	That is good right there, Bill. That is good right there.
02 07 16 42	CC	Apollo 8, Houston. If you can stick your polarizing filter in front of the camera without disturbing anything else, it might improve the quality slightly.
02 07 17 02	LMP	Stand by.
02 07 17 04	CC	Roger, Bill.
02 07 17 12	LMP	Okay. The polarizing filter is in front.
02 07 17 24	LMP	How is it now, Mike?
02 07 17 28	CC	Still looking good. That didn't make much of a change one way or another, but in general, considering how far away, it's looking excellent.
02 07 17 51	LMP	Well, I hope that everyone enjoys the picture that we are taking of themselves. How far away from earth now, Jim, about?
02 07 18 03	CC	We have you about 180 000.
02 07 18 11	LMP	You are looking at yourselves at 180 000 miles out in space.
02 07 18 22	CMP	Frank, what I keep imagining is if I am some lonely traveler from another planet what I would think about the earth at this altitude, whether I think it would be inhabited or not.

02 07 18 31	CC	Don't see anybody waving; is that what you are saying?
02 07 18 36	CMP	I was just kind of curious if I would land on the blue or the brown part of the earth.
02 07 18 44	LMP	You better hope that we land on the blue part.
02 07 18 48	CC	So do we, babe.
02 07 18 49	LMP	Jim is always for land landings.
02 07 18 55	CC	Roger. This picture is drifting off center again. If you could make another correction to bring it back. I couldn't tell you which direction, but you're going the right way, you're going the right way. A little bit more; a little bit more. Whoa, stop right there. That's the best centering we have had, Apollo 8. If you could just hold that, that's perfect.
02 07 19 25	CMP	To give you some idea, Mike, of what we can see: I can pick out the southwest coastline of the Gulf and where Houston should be, and also the mouth of the Mississippi; I can see Baja California and that particular area. I am using a monocular that we have aboard.
02 07 19 50	CC	Roger. Understand.
02 07 19 55	CMP	This is an 8-power instrument I have.
02 07 19 58	CC	Right. Well, we are seeing the entire earth now including the terminator. Course we can't see anything past the terminator at all. Are

you able with your binoculars to see the dark horizon? Anything past the terminator?

02 07 20 13 CMP Negative, Mike. We can't see anything past the terminator with the binoculars or without them. This earth is just too bright, and it cuts down the night adaptation to see anything on the dark side.

02 07 20 31 CC Roger. Understand.

02 07 20 33 LMP Since this is winter - since this is winter time in the northern hemisphere, we can see all of the South Pole and the southern ice cap, and not too much of the North Pole.

02 07 20 48 CDR Hey, you and Jim better get together. Jim just said he saw the North Pole.

02 07 20 54 CC He is looking out a different window.

02 07 20 57 LMP That is what makes it different.

02 07 20 59 CC Do you still have the - -

02 07 21 01 LMP He has the monocular upside down.

02 07 21 03 CC Do you still have the polarizing filter in front of the camera?

END OF TAPE

— — — —	LMP	Negative?
— — — —	CC	Okay.
— — — —	CC	Try putting it back in front of the camera one more time.
— — — —	LMP	... Okay?
— — — —	CC	And once again, we need a small attitude correction. Our earth is disappearing up and to the right. Our earth and your earth. The wrong way, wrong way. A little bit more. Okay. That is fine if you can hold it right there. Oops! Now it's slipping back off again. Okay. Keep coming a little bit more, a little bit more. Okay. Ninety degrees to that direction; that is the wrong 90, the other way. There we go. A little bit more. Nope, wrong way, wrong way; I am sorry. Keep coming in that direction. No, it is gone up at our 12 o'clock. There we go, it is coming back down. There we go, it's coming back down, it's coming back down. Bring it down a little bit more. Okay. Stop. Now we need 90 degrees to that direction again.
02 07 22 54	LMP	I hope that the next camera has a sight on it.
02 07 22 58	CC	Roger.
02 07 23 11	LMP	How is that?
02 07 23 13	CC	Well, that has disappeared, just practically. We were wondering if there was any change of your

looking out one of the other windows and seeing the moon? Hey, it is coming back in, Bill. Okay. Hold it right there. That is just fine for the earth right where you are. That is extremely good on the earth if you can just hold that.

02 07 23 35 CDR I don't think we have - It has the polarizing filter in front of it now, Mike.

02 07 23 43 CC Roger. Thank you, and it is centered very well. We get a very slight improvement with this, but in general, it is very good considering the distance. How about the moon, Frank? Is it visible through one of your other windows? Could you get it visible with a small maneuver?

02 07 24 05 CDR Negative. I think we will have to save the moon for another time.

02 07 24 08 CC Roger. I understand. You are still very well centered with your picture. We noticed a couple of jumps in the apparent intensity. Did you make some filter changes?

02 07 24 37 CDR Roger. We tried to put that other red filter in front of it, but it didn't seem to fit.

02 07 24 43 CC Roger.

02 07 24 49 CC We would - On a final test when you get down to the end of your allotted time here, we would like you to remove all filters and let us see how it looks with all filters removed, and then we would

like to get several spotmeter readings at the very end after the test.

02 07 25 13 CDR Okay. We will be removing the red filter now.

02 07 25 15 CC Roger.

02 07 25 50 CDR Do you still have us, Mike? The lens is off now.

02 07 25 53 CC Roger. We have it, and if you could maneuver it toward the terminator slightly, you would again center our picture.

02 07 26 11 CDR Okay. Stand by. How's that? Is that the right direction?

02 07 26 21 CC That is the right direction. Keep coming. Now that is the wrong direction, Frank. Did you - -

02 07 26 44 CDR How is it now, Houston?

02 07 26 46 CC Well, negative. I need another maneuver toward the terminator. It is drifting off the screen to our 11 o'clock. We appear to need a maneuver toward the terminator, Frank.

02 07 27 08 CDR Thank you.

02 07 27 17 CC No, that is apparently the wrong way, Frank. We are starting to lose the picture. There you go. That is the correct way.

02 07 27 35 CDR Okay, Houston. How's that for today?

02 07 27 39 CC That is just fine, Frank. That's great. We would like to, at the conclusion here, take three spotmeter readings. You can do that at any time at your convenience. We would just

		like to get some after-the-fact readings on the earth intensity.
02 07 27 55	CDR	Roger. Jim has got the spotmeter on now.
02 07 27 57	CC	Thank you.
02 07 27 58	CDR	Is it centered now, Houston?
02 07 28 00	CC	Not quite, Frank.
02 07 28 08	CC	That's good right there. Hold that right there. That's perfect.
02 07 28 24	CDR	Okay, earth. This is Apollo 8 signing off for today.
02 07 28 29	CC	Good show, Apollo 8. We appreciate it. See you mañana.
02 07 28 34	CDR	Roger.
02 07 28 55	CC	We have Haney down here following your trajectory, so all is well. He says you're 10 minutes from the moon's sphere of influence.
02 07 29 04	CDR	Okay. Good.
02 07 33 28	CDR	Houston, Apollo 8. Returning to the PTC mode.
02 07 33 34	CC	Apollo 8, Houston. Understand; returning to PTC. Thank you.
02 07 33 41	CDR	Roger.
02 07 33 54	CC	You can tell Jim he is getting pretty ham-handed with that P21; he got a perilune altitude three-tenths of a mile off what we are predicting down here.
02 07 34 08	CDR	Is that right?

02 07 34 09	CC	Roger. Apparently, he got 69.7, and the RTC says 70.
02 07 34 18	CDR	Are we going to leave it at that, or are we going to correct it to make it lower?
02 07 34 24	CC	We are talking about it, Frank.
02 07 34 50	CDR	We have got a lumen reading of about between 1 and 1.25 thousand - 1.25 K.
02 07 35 01	CC	Roger. Understand; between 1 and 1.25 K. Thank you.
02 07 35 31	CMP	Houston, Apollo 8.
02 07 35 35	CC	Apollo 8, Houston.
02 07 35 40	CMP	Roger. If you put your CMTLM to ACCEPT, we will send you our state vector.
02 07 35 47	CC	Touché.
02 07 45 03	CDR	Houston, Apollo 8.
02 07 45 06	CC	Apollo 8, Houston.
02 07 45 10	CDR	How does everything look, Mike, all our systems and everything? See any switches out of place?
02 07 45 16	CC	Negative. I'll take a check around here, but it is looking good. Just a second.
02 07 45 23	CDR	We are over in the cabin, Mike, like monkeys, and I wanted to make sure we didn't hit anything.
02 07 45 51	CC	Apollo 8, Houston. Everything is looking good down here. All switches and systems are GO.
02 07 46 00	CDR	Thank you.
02 07 50 25	CDR	Houston, Apollo 8. How are you reading on OMNI D?

02 07 50 28	CC	We are reading you loud and clear, Frank.
02 07 50 32	CDR	Okay. We are reading you like that, also. Thank you.
02 07 50 38	CC	We are having a playback of your TV shows and are all enjoying it down here. It was better than yesterday because it didn't preempt the football game.
02 07 50 57	CDR	Thank you. Don't tell me they cut off a football game; didn't they learn from Heidi?
02 07 51 10	CC	Well, you and Heidi are running neck and neck in the telephone call department.
02 08 10 06	CDR	Houston, Apollo 8.
02 08 10 09	CC	Go ahead, Apollo 8.
02 08 10 12	CDR	Hey, Jerry, how much water does this - the water dispenser in the lower equipment bay, the one that puts out hot and cold water - how much comes out of that with each shot?
02 08 10 23	CC	Stand by. I'll take a check on that. And, by the way, welcome to the moon's sphere.
02 08 10 32	CDR	The moon's fair?
02 08 10 34	CC	The moon's sphere - you're in the influence.
02 08 10 39	CDR	That's better than being under the influence.
02 08 11 00	CDR	Hey, Jerry?
02 08 11 03	CC	Go ahead, 8.
02 08 11 07	CDR	My handy LMP had his schematics out of the drop of a hat and informs me that it's 1 ounce per cycle.

02 08 11 29	CC	Apollo 8, looks like the flying EECOM and the ground EECOM came to a dead heat on that one.
02 08 11 39	CDR	They did?
02 08 11 40	CC	Roger. We got the same answer at the same time.
02 08 11 53	CDR	I'll have Bill put it on the tape recorder and send it down to you.
02 08 37 05	CC	Apollo 8, Houston.
02 08 37 11	LMP	Go ahead, Houston. Apollo 8.
02 08 37 13	CC	Okay, 8. We want to run a little exercise on the ground here to make sure that we're able to dump the tape and bring the voice portion back to Houston in a timely manner. So we plan to dump your tape, and we're going to exercise the procedures on the ground to get it back here and take a listen to it. We believe that we have something on the tape already unless you have recorded over it after the last dump. Just to make sure, we'd like to have you just say a few words, give us a short count or something on the tape and anything else that you might want to put on there. And we're going to do this in the next 5 minutes before we get away from Madrid. That's the site we want to exercise, so we'll go ahead and do that, and we'll tell you before we make the dump.
02 08 38 05	LMP	Roger.

02 08 44 20	LMP	Houston, Houston, this is Apollo 8. Over.
02 08 44 24	CC	Go ahead, Apollo 8.
02 08 44 29	LMP	Okay. Ken, we put a few comments on the last of the tape after we heard from you, and it's being rewound now, and you can have it as soon as we get it back to the beginning.
02 08 44 38	CC	Okay. We'll have to wait. It looks like you are going out of the attitude to use high gain. We'll catch it next time around and then dump it.
02 08 44 51	LMP	Okay. I know this would be better in high bit rate, so it will probably take quite awhile.
02 08 44 55	CC	Alright.

END OF TAPE

02 09 16 44	CC	Apollo 8, Houston.
02 09 16 49	LMP	Go ahead, Houston.
02 09 16 51	CC	Roger. Do you think you're in a position where you could use the high gain?
02 09 16 57	LMP	I'll give it a try.
02 09 16 59	CC	Okay.
02 09 19 05	CC	Apollo 8, Houston. We're dumping at this time.
02 09 19 12	LMP	Roger. Tape voice is probable.
02 09 19 21	LMP	We ought to also get a check on it at low bit rate for DSE voice, Ken.
02 09 19 31	CC	Apollo 8, are you saying that everything that's on there now is in high bit?
02 09 19 38	LMP	That's where my switch was.
02 09 19 40	CC	Okay. We'll take a look at it then. If there wasn't anything that was previously recorded in low bit, then we'll come back and maybe take a look at that, too.
02 09 19 52	LMP	Okay. We might get ... if maybe we can get in a little closer to the moon to put as big a strain on it as we can.
02 09 28 24	CC	Apollo 8, Houston.
02 09 28 30	LMP	Go ahead, Houston.
02 09 28 31	CC	Okay. We've completed the dump, and the tape recorder's back to you. You can use it any way you want. We may want to dump that thing again, and if we do we'll go ahead and use the same

information unless you have something else that you specifically wanted to put on there later. Listening to the voice quality - it sounds real good. We're coming up on a midcourse 4 and right now it's - talking about doing it on time, and you can anticipate the burn in the neighborhood of 3 foot per second. We're considering and would like for you to think about the possibility of doing this burn using the onboard vector and just have us update the vector in the LM slot, so that you will have the MSFN vector on board. But it looks like it won't have any big effect on the burn results, and it might prove interesting. So if you think about that one for a bit and let us know if you have any suggestions or thoughts on the subject.

02 09 28 39	LMP	Roger. You say it uses the onboard vectors and leaves the MSFN vectors on the LM slot.
02 09 29 45	CC	That's affirmed, if that's what you would like to do, right. We considered it, and it looks like that would be a reasonable thing.
02 09 29 55	LMP	Roger. Frank and Jim are asleep now, and I'll bring this up to them when they wake up.
02 09 30 03	CC	Okay. Real fine.
02 09 30 48	CC	Apollo 8, Houston. How about stirring up the oxygen?

02 09 30 56	LMP	Okay. Stand by.
02 10 06 38	CC	Apollo 8, Houston.
02 10 06 43	LMP	Go ahead, Houston.
02 10 06 45	CC	Okay, Bill. I guess I want to belay my last about using the onboard state vector for MCC 4. After looking at it some more on the ground, they've got to get going on making the PAD's and doing all their computations, and rather than put it off or do it twice, we're going to go ahead and go with the procedures we've been using all along. On the lunar orbit stuff, we've been looking it over and we got several guys - Jack Schmitt and company in the back room - looking at what effect your windows have. And, basically, it looks like there's two options that will make an impact on that REV 2. One of the options, of course, will be just to have you and Jim change seats and let Jim look out and get his SAM that way, and another option will be to roll the bird over and let Jim point the optics as far forward as he can get them and take his SAM through the telescope. And I guess we'd like to have any thoughts that you folks have on what you think you can do with the windows; if you have anything, we'd like to factor it into our thinking and go ahead and firm up

our plans as early as we can. We'd like not to put it off so that we have none of these things to do after midcourse. You folks can probably tell us more about what you can do with those windows. So if you have any thoughts, go ahead and sing out with them, and we'll see what we can do about factoring that in.

02 10 08 25 LMP Okay. With reference to the midcourse, I think that's generally agreed upon, that we do it like we've always been doing it. Now, with respect to the windows, center windows, essentially, are usable. The two side windows are - may be all right for observation, and the problem with the rendezvous windows is that they're pretty small. And I just thought we'd have to play the window game by ear almost. Not really sure what capability we're going to have. And we'll give you some more thoughts on this later.

02 10 09 02 CC Okay. How about exercising the idea of rolling over and having Jim do his polarization through the telescope because if we have to change attitudes we'd like to go ahead and start thinking about what effects that'll have on such things as antenna orientation and all that.

02 10 09 24 LMP Okay. We'll, I'll mention it to them when they wake up.

END OF TAPE

02 10 30 34	CC	Apollo 8, Houston.
02 10 30 40	LMP	Go ahead, Houston.
02 10 30 42	CC	Okay. Apollo 8, we'd like to update your CMC clock. This is not the correct errors which we have now but just to make up for some effects that we're going to have in lunar orbit. And what we'd like to have you do is go to POO and ACCEPT and let us update the clock time.
02 10 31 04	LMP	Stand by.
02 10 31 23	LMP	Okay. You got POO and ACCEPT.
02 10 31 25	CC	Roger. Thank you.
02 10 38 07	CC	Apollo 8, Houston.
02 10 38 13	LMP	Go ahead, Houston.
02 10 38 14	CC	Okay. We're completed with the clock update, and the computer is yours.
02 10 38 21	LMP	Roger. Going to BLOCK.
02 10 38 28	CC	Roger.
02 10 49 50	CC	Apollo 8, Houston.
02 10 49 56	LMP	Go ahead, Houston.
02 10 49 58	CC	How about an O_2 purge?
02 10 50 04	LMP	Okay.
02 10 50 07	CC	Thank you.
02 10 51 26	LMP	There's number 1.
02 10 51 30	CC	Roger.
02 11 42 19	CC	Apollo 8, Houston.
02 11 42 24	LMP	Houston, Apollo 8. Go ahead.

02 11 42 26 CC . Okay. We'd like to update CMC. The order that we'll update will be the LM state vector, the CSM state vector, and then the external DELTA-V and the REFSMMAT. So any time you're free with it, we can have POO in ACCEPT; we'll go ahead with it.

02 11 42 53 LMP I understand you're going to update LM state vector, CSM state vector, and external DELTA-V and the REFSMMAT.

02 11 43 00 CC Affirmative. And I'll have one, two, three PAD's to read to you.

02 11 43 12 LMP Stand by. Okay. You've got POO in ACCEPT.

02 11 43 18 CC Okay, thank you. And just a minute, I'll be with you on the PAD's. They'll be three minute maneuver PAD's, one of them MCC 4.

02 11 45 19 LMP Houston, this is Apollo 8. We're ready to copy if you read.

02 11 45 22 CC Okay. Stand by.

02 11 45 27 LMP Okay. I thought maybe we had lost COMM here for a second.

02 11 45 31 CC No, I'm just behind.

02 11 46 26 CC Okay. Apollo 8, let me just read you midcourse correction number 4.

02 11 46 38 LMP Okay.

02 11 46 42 CC Alright. Midcourse correction number 4: the RCS/G&N 628 88 November Alfa November Alfa 06059 5430 minus 00012, minus 00011, plus 00012 031

		008 323 November Alfa, plus 00618 00020 011 00020 1729 65308 Alpha-Centauri, up 073, left 34. For the stars, it will be the primary Sirius, secondary Rigel, 129 155 010. Over.
02 11 49 25	LMP	Roger. MCC 4, RCS/G&N 6288 NA, NA 06059 5430, minus 00012, minus 00011, plus 00012 031 008 323, NA. Are you with me so far?
02 11 50 02	CC	Keep going.
02 11 50 06	LMP	Plus 00618 00020 011 00020 1729 65308 Alpha-Centauri, up 073, left 34, primary Sirius, secondary Rigel 129 155 010. Over.
02 11 50 48	CC	That's correct, Apollo 8.
02 11 51 05	LMP	And what else have you got?
02 11 51 07	CC	Okay. I've got one for pericynthian plus 2, and it's a minimum DELTA-V solution.
02 11 51 24	LMP	Roger. Ready to copy.
02 11 51 29	CC	Okay. That's pericynthian plus 2, RCS/G&N 628 71 November Alfa, and stand by one. Okay. We'll pick up with a pitch trim and yaw trim of not applicable; time 07107 2216, minus 00468, plus 00254, plus 00181 173 101 027 November Alfa plus 00187 00563 515 00563 013169 198 044, down 044, left 45, plus 1100, minus 02500 12967 36193 1370153, primary Sirius, secondary Rigel 129 155 010, four jets plus X. This assumes execution of midcourse correction number 4 and

		uses the same alignment as midcourse correction 4. Over.
02 11 54 33	LMP	Roger. Pericynthian plus 2, minimum DELTA-V RCS/G&N 62871, NA, NA, 07107 2216, minus 00468, plus 00254, plus 00181 173 101 027, NA, plus 00187 00563 515 00563 013169 198 044, down 044, left 45, plus 1100, minus 02500 12967 36198 1370153, primary Sirius, secondary Rigel, 129 155 010, four jets plus X, assumes MCC 4 with same alignment. Over.
02 11 56 10	CC	That is correct, Apollo 8.
02 11 56 28	LMP	Houston, Apollo 8. Confirm that boresight star and SPA are exactly the same number and not typographical error.
02 11 56 47	CC	Roger, Apollo 8. They are checking that. Apollo 8, the computer is yours. You can take it back.
02 11 57 00	LMP	Roger. Going to BLOCK.
02 11 57 02	CC	Thank you.
02 11 59 06	CC	Apollo 8, Houston.
02 11 59 26	CC	Apollo 8, Houston.
02 11 59 35	LMP	Houston, this is Apollo 8. Do you copy?
02 11 59 37	CC	I do now loud and clear. I've got one more PAD for you, and the confirmation that those boresight star number and the pitch angle are correct at 44.
02 11 59 54	CC	Roger. And we are ready to do our P52 preferred alignment at this time. Are you ready?

02 12 00 02	CC	Affirmative.
02 12 00 14	LMP	Okay. We are ready to copy.
02 12 00 17	CC	Okay. This is a pericynthian plus 2 for a fast return. This will be SPS/G&N 62871, minus 161, plus 129 071 064207, plus 45224, minus 06216, minus 18712 001 287351, November Alfa plus 00187 49336 60349 118 112038 296, earth up 010, right 37, plus 1475, plus 06500 13239 369 131060 923, primary star Sirius, secondary Rigel 129 155010, no ullage, assumes execution of midcourse correction 4 and uses the same alignment. The time for MCC 5 for GERU determination - that's Golf Echo Romeo Uniform - this will be a GET of 83:02; use P37 NC-4, steps 1 through 10 and NC-8 steps 3 and 4. I say again, use P37 November Charlie 4 steps 1 through 10 and November Charlie steps 3 and 4; velocity 400K for corridor control chart 36507. Over.
02 12 04 26	LMP	Houston, Roger. This is Apollo 8. You copy?
02 12 04 32	CC	This is Houston. No joy.
02 12 04 40	LMP	Roger, Houston. This is Apollo. How you read?
02 12 04 42	CC	Okay. Loud and clear, Bill.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

02 12 04 47	LMP	Okay, Ken. Pericynthian plus 2, fast return SPS/G&N 62871, minus 161, plus 129 071 064207, plus 45224, minus 06216, minus 18712 001 28 603 49 118 11 2038 296 earth up 010, right 37, plus 1475, plus 06400 1323 936 913 1060 923, primary Sirius, secondary Rigel 129 155 010, no ullage, assume MCC 4 same alignment, MCC 5 GERU determination GET 83:02 P37 NC-4 0 through 10 and copy NC-8, 3, and 4. Velocity at 400K 36507. Over.
02 12 07 10	CC	Okay, Apollo 8. That's correct with one exception: in the PAD format under longitude NOUN 61, that is plus 06500. Over.
02 12 07 31	LMP	Roger. That's what I have, plus 06500.
02 12 07 38	CC	Okay. That's correct, Apollo 8
02 12 07 52	LMP	And we're ready to copy whatever else you have.
02 12 08 03	CC	Apollo 8, let's go back and confirm on your minimum DELTA-V pericynthian plus 2 that the pitch column is 101; that's the fifth block down.
02 12 08 19	LMP	Roger. Pitch. Roger, pitch 101.
02 12 08 25	CC	Okay. Thank you very much. And the item we have left to go is that we'd like to get with you on how you want to handle the problem with windows on REV 2.
02 12 09 59	LMP	Okay, Houston. Stand by on that, please.
02 12 09 01	CC	Roger.

02 12 09 02	LMP	Houston, this is Apollo 8. We want you to come up with a suggested redline for RCS usage during lunar orbit, also, please.
02 12 09 12	CC	Roger. That's in work.
02 12 09 21	LMP	And for your information, Houston, when the sun is shining on window 5, it's pretty hazy; window number 1 is a little bit better.
02 12 09 34	CC	Okay. Thank you.
02 12 10 10	LMP	Houston, this is Apollo 8.
02 12 10 20	LMP	Houston, Apollo 8.
02 12 10 23	CC	Apollo 8, go ahead.
02 12 10 26	LMP	Roger. We tried to get this realignment. We need - Do you have a maneuver to get us some gimbal angles so we don't get gimbal lock when we get the preferred alignment?
02 12 10 41	CC	Stand by on that.
02 12 10 45	LMP	Thank you.
02 12 10 49	CMP	Houston, on our present position, we'll go into gimbal lock. I figure to try and get the preferred angle.
02 12 10 57	CC	Say again, Apollo 8.
02 12 11 01	CMP	In running through PROGRAM 52, we got a PROGRAM ALARM 401 which would indicate that if we continued, we'd drive it into gimbal lock.
02 12 11 12	CC	Roger. I understand.
02 12 12 11	CC	Apollo 8, Houston. This should be an OPTION 1 like OPTION 3.

02 12 12 23	CMP	Houston, we're doing an OPTION 1 like OPTION 3. We keep getting a 401 ALARM, which says desired RCTU yields gimbal lock.
02 12 12 34	CC	Roger. Stand by.
02 12 19 14	CC	Apollo 8, Houston. It appears that you have maneuvered around the gimbal locks system.
02 12 19 22	CDR	Roger. Roger.
02 12 19 25	CC	Okay. Sorry we were late on that answer.
02 12 19 30	CDR	Thank you.
02 12 21 20	CMP	Houston, Apollo 8.
02 12 21 22	CC	Go ahead.
02 12 21 26	CMP	Well, we stopped and went through coarse align of P52 and then we got fine align, and pick-a-pair, pick Capella, but she drove and didn't get to any place. I didn't pick Capella, and I can't recognize any out there right now. Can I re-cycle here and go back and pick a pair?
02 12 21 54	CC	That's affirmative, Apollo 8.
02 12 25 27	CMP	Houston, Apollo 8.
02 12 25 30	CC	Go ahead, Apollo 8.
02 12 25 33	CMP	My plan is to go back into re-enter PROGRAM 52 - well, it did not drive to Capella, and I can't recognize it in the scanning telescope. My plan is to go back into recall P52.
02 12 25 50	CC	Okay. Stand by one.
02 12 25 54	CC	Apollo 8, can you confirm that you zeroed the optics prior to starting?

02 12 26 02	CMP	Roger. That's affirmative. We zeroed the objects.
02 12 26 32	CC	Apollo 8, Houston. You have a GO for a second try in P52 with an OPTION 3.
02 12 26 43	CMP	Okay. I now have Aldebaran in the scanning telescope; I might want to call that one instead of Capella.
02 12 26 50	CC	Okay.
02 12 26 51	CMP	I'll see what it comes up with first, though.
02 12 32 23	CDR	Houston, Apollo 8. We came up with an unacceptable difference in our stars; we're going to have to recycle.
02 12 32 29	CC	Roger.
02 12 32 33	CDR	If we don't get this midcourse in, what will that do to our pericynthian?
02 12 32 40	CC	Stand by. We'll -
02 12 32 57	CC	Apollo 8, Houston. In the event that we don't get this midcourse in, we'll still go for an LOI, and it's been suggested you might try Mirfak which is OCTO 10.
02 12 33 12	CDR	That's the one we're trying now.
02 12 33 13	CC	Roger.
02 12 51 50	CDR	Houston, Apollo 8.
02 12 51 52	CC	Go ahead.
02 12 51 56	CDR	We are all set up and counting down at 8 minutes.
02 12 52 00	CC	Roger.

02 12 52 08	CC	Apollo 8, our data is down right now; eppreciate making sure you have the tape recorder on.
02 12 52 19	CDR	Roger. I am going to go - I'll have to go COMMAND RESET. You've got control.
02 12 53 52	CDR	Houston, Apollo 8.
02 12 53 57	CC	Go ahead.
02 12 54 00	CDR	Roger. You have some pitch and yaw angles for our PTC extra burn.
02 12 54 14	CC	Okay, Apollo 8. That's pitch 348, yaw 315.
02 12 54 25	CDR	Pitch 348, yaw 315.
02 12 54 30	CC	That's affirmative. And would you give us another hack on your countdown time?
02 12 54 39	CDR	It's 518 17 16 15 14.
02 12 54 45	CC	Thank you.
02 12 55 51	CDR	Houston, I will give you a mark in 4 minutes.
02 12 55 53	CC	Alright. Thank you.
02 12 55 54	CDR	3, 2, 1 -
02 12 55 57	CDR	MARK.
02 12 55 58	CDR	Four minutes.
02 12 57 05	CC	Apollo 8, Houston. How about switching the BIOMED switch over to the left.
02 12 57 12	CDR	Roger. 3, 2, 1 -
02 12 57 16	CDR	MARK.
02 12 57 18	CDR	Switched.
02 13 01 02	CMP	Houston, Apollo 8.
02 13 01 05	CC	Go ahead.

02 13 01 08	CMP	Roger. Burn on time, angles nominal, burn time about 12 seconds, 0.2 feet per second after the DELTA-V_C, 0 in VG_X. We have transferred the results of the burn over to the left slot VERB 66.
02 13 01 30	CC	Roger. And got a couple of items that I would like to clean up. We will get you an RCS budget. We've got one redline now; we are trying to get some firmer numbers for you, and we will have those in a little bit. Right now your PTC usage is right on the flight plan line, so everything looks pretty good there. We want to get a crew status report from you. We would like to firm up the REV 2 flight plan idea; and sometime at your convenience, we would like to take a reading of the PRD for the commander and CMP and then have you swap them. We are trying to isolate the -- what the possible reason is for the discrepancies or the disparity in the two readings.
02 13 02 29	CMP	Roger.
02 13 02 58	CMP	And we are maneuvering to the PTC attitude, Houston.
02 13 03 01	CC	Roger.
02 13 05 17	CC	Apollo 8, Houston. Could you give us the sign of that Z residual?
02 13 05 40	CMP	Stand by, Houston. Alright, Houston. Looks like we didn't record just the Z. We recorded DELTA V_C, which is minus 0.2.

02 13 06 16	CC	Okay. Understand.
02 13 06 17	CMP	DELTA-V was 0.1, but we didn't get the sign.
02 13 06 24	CC	Roger. Understand that was DELTA-V_C was minus 0.2. I copied DELTA-V_Z; ZULU is 0.2. Is that incorrect?
02 13 06 39	CMP	Roger. It was 0.1, but we didn't get the sign.
02 13 06 44	CC	Okay. Thank you.
02 13 06 46	LMP	We can get it. We have it on the tape, Houston, whenever you want to dump it.
02 13 06 54	CC	Roger. Thank you.
02 13 06 57	LMP	It'll be about the last 5 minutes worth.
02 13 07 00	CC	Roger.
02 13 07 59	LMP	Okay, Houston, for the PRD's: CDR is 0.07, CMP is 0.64, LMP is 0.80. Note that the CMP's hasn't changed since we started and the commander's hasn't changed much. We have swapped PRD's; commander has LMP, CMP has commander's, and LMP has CMP's PRD. Over.
02 13 08 27	CC	Okay. Thank you.
02 13 09 53	CMP	Houston, Apollo 8.
02 13 09 57	CC	Go ahead.
02 13 10 01	CMP	Roger. Crew status report as follows: water, the commander has about 50 clicks so far today; CMP 43; and the LMP is 44. We've eaten two meals so far today. Day 3 meal A and B; consumed most of it except for the hard hard bite, which no one

cares for. Pudding was outstanding. We're at a gain of pericynthian now of plus 63 miles. Commander and CMP have had a rest period just before the midcourse 4 of about 2 hours.

Start GDS DUMP 61:12

02 13 11 07	CC	Roger.
02 13 16 11	CMP	Houston, Apollo 8.
02 13 16 13	CC	Go ahead.
02 13 16 18	CMP	We're at a gain of about 20 500 miles from the moon at 61:14. How does that agree with what you figure?
02 13 19 18	CC	Apollo 8, Houston. Looks like you're on the secondary loop. We would like to run that for about 5 minutes.
02 13 19 28	CDR	Roger. We're doing the ECS redundant component check.
02 13 19 31	CC	Roger. We'll follow.
02 13 19 32	CDR	Getting any data now Houston? Guess you are. Okay. See you stopped my tape then. I've been running for about 3 extra minutes here to record the check.
02 13 19 45	CC	Roger. We have data now. That was a temporary loss.
02 13 19 55	CDR	What's the matter? Was it chow time down there?
02 13 19 58	CC	Roger. Didn't know you could smell it that far away.

61:19 dump stop over GDS

02 13 20 13	CDR	Give me a call when you're satisfied with the secondary loop; it's stabilized out here pretty well.
02 13 20 18	CC	Wilco, and you might tell Jim that our RTCC is about 4 miles off; we had 20 496.
02 13 20 34	LMP	Fine.
02 13 21 07	CDR	We just put compressor 2 on ac 2.
02 13 22 23	CDR	Houston, Apollo 8. Do you show battery B as voltage dropped some from the postcharge value? Over.
02 13 23 51	CC	Apollo 8, Houston. Confirm that battery B is a little bit lower, and this is attributed to the parasitic loads that are on there.
02 13 24 06	LMP	Okay. I just didn't see the same kind of drop for A. So if you think it's okay, it's fine.
02 13 24 11	CC	That's affirm. You don't have the same parasitic loads on that; B is actually drawing some.
02 13 24 20	LMP	Okay. I guess that's the radiators, huh?
02 13 24 39	CC	Apollo 8, Houston. We've seen enough of the secondary evaporator. We would like for you to wait about 2 minutes between the time you go to RESET and the time you turn the pump off.
02 13 24 53	CDR	I agree; good idea. And we plan to leave the water control in AUTO.
02 13 25 09	CC	Roger.
02 13 31 30	CC	Apollo 8, Houston.

02 13 31 34	CDR	Go ahead, Houston. Apollo 8.
02 13 31 37	CC	Okay. Looking over the - our redundant component check, it appears we have not yet checked the integrity of the secondary loop radiators; and if you haven't done that, some time we would like to open up the secondary radiators but not flow through them and just measure the accumulator pressure.
02 13 32 03	CDR	Stand by.
02 13 32 42	CDR	Houston, we don't show that in our pre-LOI check, but we're willing to go ahead and do it if you want to.
02 13 32 50	CC	Roger. We just noticed that it isn't there, and, yes, we would like to. You understand that we are not proposing that you flow, but merely we check for any pressure decay.
02 13 33 10	CDR	Roger. Wait till I get my trusty assistant here to help me.
02 13 34 20	CDR	Okay, Houston. We're going to blow the secondary, I mean, open the secondary RAD for 30 seconds now.
02 13 34 27	CC	Roger.
02 13 34 38	CDR	Looks pretty good.
02 13 34 40	CC	Sure does.
02 13 35 05	CDR	Okay. They're closed now.
02 13 35 07	CC	Okay. Thank you. Looks good.
02 13 35 11	CDR	Roger. No meteoroids yet.

02 13 38 48	CC	Apollo 8, Houston. You take your tape recorder to stop, and we'll reset it then and give it back to you.
02 13 39 00	CDR	Roger. It's stopped.
02 13 39 02	CC	Thank you.

END OF TAPE

02 13 53 18 CC Apollo 8, Houston.

02 13 53 23 LMP Go ahead.

02 13 53 25 CC Okay. We still need to talk about the REV 2 attitudes we're going to use here to work around the fact that you have a fogged center window. Whenever that's convenient, we'd like to go over what your thoughts are on the subject so we can make sure we can get our flight plan squared away.

02 13 53 47 LMP My thoughts are to make to do with the best with what we have. We are not interested in changing a lot of things right now.

02 13 53 55 CC Okay. The one proposal that sounds like it has some advantage to it: if we let Jim do his evaluation through the telescope, you do everything exactly the same except you turn and roll over 180 degrees so that your head's up, and let Jim do his tracking through the telescope and you'll still be a yaw right when you go to pick up your TV and that type of thing. It looks like that probably will cover everything. We can do that or we can just go as is and just have to let some of that tracking evaluation go by. Another alternate would be to have Jim look out the right-hand rendezvous window, and you may have to change your

attitude in order to get the same picture there also.

02 13 55 08 CDR I think we'll try to do that, but I don't - this is one of the things that we'll work out when we get there.

02 13 55 16 CC Okay. The reason we were looking into it in the flight plan is, if you do want to try rolling over and flying heads up or something of that nature, we can help Bill get a little more out of his photography by giving him some new film settings and that type of thing. We'll have something like that available; in case you do fly heads up, why, we'll have some numbers we can call up for film settings.

02 13 55 45 CDR Thank you.

02 13 57 15 CDR Houston, Apollo 8.

02 13 57 17 CC Go ahead.

02 13 57 22 CDR Roger. We are going to have to dump some urine here shortly. Will this bother your tracking?

02 13 57 42 CC Apollo 8, we're checking on that with the tracking people now.

02 13 58 01 CDR Houston, just give us the time when we can start on it, and we'll hold off until you say so.

02 13 58 06	CC	Okay. And you can anticipate a handover between stations here on the hour, and you might get a slight glitch as we go through. I'll give you a call when we get back.
02 13 58 21	CDR	Thank you, Ken. What station are we going to be going to, Ken?
02 13 58 32	CC	Okay. We'll be going to Honeysuckle.
02 13 58 37	CDR	Thank you.
02 13 59 31	CC	Apollo 8, Houston. You're cleared for a dump at this time, and I understand this is the last gas station for a long time.
02 13 59 42	CDR	You mean you don't want us to dump after this for a while?
02 13 59 45	CC	That's affirm. Due to the tracking as you approach the LOI, they would like to minimize any of these type of perturbations.
02 14 04 06	CC	Apollo 8, Houston through Honeysuckle.
02 14 04 11	LMP	Roger. Houston through Honeysuckle. We read you loud and clear.
02 14 04 15	CC	Okay. Good morning.
02 14 04 20	LMP	Good morning.
02 14 04 23	CC	Thought you went to sleep.
02 14 04 25	LMP	You got over to Australia pretty fast.
02 14 04 30	CC	Roger. Did that gas station call wake you up?
02 14 04 41	LMP	Man, I've been all eyeballs and elbows here for the last several hours.

02 14 04 57	CC	I'll bet. If you've got nothing else to do, I do have two charts in your LOI table that I need to give you some update numbers on.
02 14 05 04	LMP	Stand by.
02 14 05 21	LMP	We'll get our LOI tables man on the line here. Houston. Stand by.
02 14 05 25	CC	Roger.
02 14 06 07	CMP	Okay, Houston, CMP here. I understand you have some updates for me.
02 14 06 12	CC	Yes, sir; I've got a couple of charts in your chart book under LOI, and I have some numbers to fill in, one of them being the chart of LOI DELTA-V magnitude versus abort DELTA-V.
02 14 06 35	CMP	Okay. Stand by, and I'll get it out.
02 14 06 37	CC	Roger.
02 14 07 04	CMP	Okay, I have the chart out. Go ahead.
02 14 07 06	CC	Alright. Mode 1, 5 hours, roll 1.38, pitch 7.89, yaw 357.37; Mode 1, 15 minutes, roll 180.73, pitch 29.46, yaw 1.65. Over.
02 14 08 11	CMP	Roger. The new attitudes for the Mode 1, 5 hour Mode 15 minute are as follows: roll 1.38, pitch 7.89, yaw 357.37; Mode 1, 15 minute, roll 180.73, pitch 29.46, yaw 1.65.
02 14 08 43	CC	Okay. That is correct. Now I also have to give you a couple of points to plot on that curve. The present curve you have drawn is based on a 60-mile perigee or perilune, and you right

now have a 62-mile pericynthian; and the reason that your target is for 62 miles is to pass over the landing site, so I have five sets of coordinates for you to copy.

02 14 09 16	CMP	Is this to go on the same chart to redraw the curve?
02 14 09 19	CC	That is affirmative.
02 14 09 24	CMP	Okay. Go ahead.
02 14 09 27	CC	Okay. We'll go in on the LOI DELTA-V magnitude 1600, abort DELTA-V 2450, two-four-five-zero.
02 14 09 59	CMP	Okay. LOI DELTA-V magnitude 1600, abort DELTA-V 2450. Stand by just one. I have it; continue.
02 14 10 20	CC	Okay. The next one is the LOI DELTA-V 2000, abort DELTA-V 3130.
02 14 10 47	CMP	Roger. I've got that plotted.
02 14 10 51	CC	2400 LOI DELTA-V, abort DELTA-V 3880, three-eight-eight-zero.
02 14 11 18	CMP	I've got it plotted.
02 14 11 20	CC	2800 LOI, abort DELTA-V 4700. Over.
02 14 11 46	CMP	Roger. I have that one plotted, too.
02 14 11 50	CC	Alright. The last one is LOI DELTA-V 2990, abort DELTA-V 5114. That is almost directly into the end of the present curve, 5114.
02 14 12 20	CMP	Say again the LOI DELTA-V magnitude, please.
02 14 12 24	CC	Okay. LOI DELTA-V 2990.

02 14 12 31	CMP	Roger. 2990. Okay. I have it plotted.
02 14 12 49	CC	Alright. And on the next one, you should have a chart (number 10), and we have three numbers to go in there for a Mode 3 gimbal angle.
02 14 13 06	CMP	Roger. Go ahead with the Mode 3 gimbal angles.
02 14 13 12	CC	Roll 180.87, pitch 42.31, yaw 1.65.
02 14 13 36	CMP	Mode 3 gimbal angles are as follows: roll 180.87, pitch 42.31, yaw 1.65.
02 14 13 48	CC	Roger. That is correct.
02 14 13 56	CMP	Could you please send up a French curve for me?
02 14 14 00	CC	Roger.
02 14 14 03	CDR	Send up a couple.
02 14 14 07	CC	The only one I have is about 6 foot.
02 14 14 18	CDR	Houston, could you give us some gimbal angles to point at the moon? I never have seen it the whole trip, and I'm wondering which way it is from us now.
02 14 14 26	CC	Roger. 180.
02 14 16 35	CMP	Houston, Apollo 8. Radio check.
02 14 16 38	CC	Roger. Loud and clear.
02 14 16 42	CMP	Roger.
02 14 16 47	CC	We are getting ready to give you a rundown on your systems. We're going over all the final steps, and we will tell you what we see in

the way of trajectory and systems information. And once again, Dr. Joe Kerwin has brought over all the latest news, and we can read that up to you a little bit at a time if you don't go to sleep.

02 14 17 12 CDR What's he going to do, read out of the AMA Journal?

02 14 17 20 CC Roger.

02 14 17 23 CMP Go ahead. We are all ears.

02 14 17 25 CC Okay. Here is one: the previously scheduled 72-hour cease fire by the Viet Cong went into effect today, 17 hours before the allied truce was to begin.

02 14 17 57 CDR You lost us on the numbers there. What was that again?

02 14 18 04 CC The gist of it was that the VC went into a cease fire earlier than the truce that we had planned on, as a Christmas holiday type.

02 14 18 25 CDR Roger. Good.

02 14 21 36 CDR Houston, how do you read? Apollo 8.

02 14 21 38 CC Loud and clear. Sorry to have stopped on you there. We are going over the summary of the systems data.

02 14 21 49 CDR Okay.

02 14 31 19 CC Apollo 8, Houston.

02 14 31 24 CDR Go ahead, Houston. Apollo 8.

02 14 31 26	CC	Okay. I have a rundown on your systems here, GNC status. Everything looks real --
02 14 31 38	CDR	Just a minute.
02 14 31 42	CC	Go ahead.
02 14 31 52	CDR	I want to wait until the LMP gets on the head set, Houston.
02 14 31 55	CC	Roger.
02 14 33 11	CMP	Okay, Houston, go ahead. EECOM's on the line.
02 14 33 19	CC	Okay. We'll just start with ECCOM business, then I'll give you a summary of your batteries; battery A, we calculate 38.3 amp-hours, battery B --
02 14 33 36	CMP	Stand by a second, Ken.
02 14 33 46	CDR	Let me get my chart out.
02 14 33 49	CC	Roger.
02 14 33 53	CDR	Go ahead now.
02 14 33 55	CC	Okay. Battery A 38.3, battery B 36.9, battery C, 38.5. That's looking pretty good. It looks like we got all the things back in that we took out, and we're running right along prediction. We would like to get a battery C voltage from you if you can just reach over there and switch it.
02 14 34 28	CDR	Roger. Thirty-seven volts, on battery C.
02 14 34 34	CC	Roger. Thirty-seven volts, Okay. The predicted cryo quantities at SEP: on oxygen

tank 1 170, oxygen tank 2 170, hydrogen 1 9.5, and hydrogen 2 10.0. You essentially have single cryo tank capabilities all the way at full power now.

02 14 35 14 CDR Fine.

02 14 35 17 CC The secondary coolant loop really looked good. Looks like you had a nice tight radiator and everything else on there was working right along the performance curves. Your main oxygen regulators both filled at 104 psi during our check. Looking at the lunar orbit, expect to be doing a water boil of about 1 pound per hour, and this is just an approximation; there's quite a variety of estimates as to what the water boiling requirements may be, might go anywhere from boiling lots to not boiling at all. The next water dump will be coming up after TEI, so you don't have to worry about any of that until you get through. Communications predictions are looking good, possibly a little bit better than what we had hoped for, and looks like we're going to get high bit rate on OMNI's with our 210-foot dish at Goldstone. This will be working for us on the first couple of rev's, and then we'll be switching sights, so we'll go back

to using OMNI's for high bit. The voice quality on DSE is good. Your fuel cells have been running above nominal for the entire flight, and they really look nice and stable. There's been some destratification --

02 14 37 04 LMP ... on normal voice, doesn't it?

02 14 37 11 CC Okay. Looks like may not be able to hack the normal voice. On the cryo tanks, we've had quite a bit of destratification, particularly in the oxygen, and you notice this during the fan cycles and DELTA-V's, so we're going to be sure and we'll remind you again to stir up the oxygen prior to LOI. CMC is running along like clockwork. G&C tells us that the RCS quantities are looking good. You're using the same amount as predicted for your PTC and for your alignment. What we have in the way of 9 redline: we're going to tell you that you can use 30 percent per quad in lunar orbit. Now this is quite a bit of fuel to play with, and you can take 30 percent and substract that from what you have to completion of LOI, and that will be a good number.

02 14 38 27 CC On the SPS, the oxidizer and fuel feed line temperatures are 75 and holding steady. The

service module RCS quad package temps are cycling and holding between 120 and 140, and looks like we're getting good normal heater operations. We plan to have you in a 60-mile circular orbit after LOI 2. And we should have some PAD's for you on the LOI burn at about 67 hours.

02 14 39 30 CDR Roger. We got all that.

02 14 39 32 CC Okay. We're still going through the tracking, and as you know, we're going to hold down on the water dumps and so forth during the last couple of hours in and out, sort of aid the tracking procedures. Everything's running along the line normally now. Do you have any other specific questions? We are looking for an angle on the moon. I guess that about summarizes the system. Everything looks GO right now.

02 14 40 06 CDR Okay, Ken. Thank you. We just completed day 3 meal C, and now are going to break up and each take a rest period before LOI.

02 14 40 18 CC Okay, real fine. Everybody wanted to ask if you wouldn't try and get some sack time here before we go in. It's going to be a big day.

02 14 40 31	CDR	Roger.
02 14 58 21	CC	Apollo 8, Houston.
02 14 58 26	CDR	Go ahead.
02 14 58 28	CC	Finally found out where the moon is, and your present PTC attitude - if you happen to look out the right window as you go by - roll attitude of 320, it should be there.
02 14 58 46	CDR	Thank you.
02 15 06 13	CDR	Houston, Apollo 8.
02 15 06 15	CC	Go ahead.
02 15 06 20	CDR	Roger. Bill would like to ask the doctor for permission to take a Seconal.
02 15 06 25	CC	Okay. Stand by.
02 15 08 06	LMP	Houston, this is Apollo 8. Did you call? We lost track for a minute.
02 15 08 10	CC	Okay, Apollo 8. You're cleared to go ahead with that pill. Take - Surgeon recommends a small one.
02 15 08 21	LMP	Small one. Roger.
02 15 10 12	CC	Apollo 8, Houston. If you can, we'd like to have you stir up the oxygen cryo.
02 15 10 19	CDR	Okay, I'll do that right now. Just a moment, just the oxygen?
02 15 10 26	CC	Okay. We want to get both the oxygen and hydrogen.

02 15 10 29	CDR	Just the oxygen, then?
02 15 10 30	CC	No, sir; both the oxygen and the hydrogen.
02 15 10 33	CDR	Okay. Start, starting wiht the hydrogen.
02 15 10 36	CC	Thank you.

END OF TAPE

02 15 20 01	CDR	Okay. Houston, Apollo 8. We've cycled through all of the cryo fans.
02 15 20 04	CC	Okay. Thank you.
02 15 54 56	CDR	Houston, Apollo 8. How do you read?
02 15 54 58	CC	Loud and clear, Apollo 8.
02 15 55 03	CDR	Okay. Thank you.
02 15 55 05	CC	Roger. We had a momentary loss there.
02 15 55 07	CDR	How is the tracking?
02 15 55 09	CC	Looking great.
02 15 55 10	CDR	How's the tracking data look, Ken?
02 15 55 13	CC	Looking great.
02 15 55 16	CDR	Roger.
02 16 38 09	LMP	Houston, Apollo 8 with a radio check.
02 16 38 13	CC	Apollo 8, Houston. Loud and clear.
02 16 38 19	LMP	Good evening, Jerry.
02 16 38 21	CC	Howdy. The Black Watch is watching.
02 16 38 30	LMP	How do you read on this - how do you read on this antenna?
02 16 38 34	CC	Loud and clear on that one, Bill.
02 16 38 39	LMP	That's great. Roger.

END OF TAPE

02 16 51 43	CDR	Houston, Apollo 8. Do you read on OMNI 3?
02 16 51 48	CC	Apollo 8, Houston. Reading you loud with some background noise.
02 16 51 57	CDR	Roger. You are loud and clear.
02 17 24 01	CC	Apollo 8, Houston. COMM check.
02 17 24 07	CMP	Roger, Houston. This is Apollo 8. Loud and clear. How me?
02 17 24 11	CC	Roger. Loud and clear, Jim.
02 17 54 24	CC	Apollo 8, Houston with a preliminary LOI 1 PAD. Over.
02 17 54 49	CC	Apollo 8, Houston. Over.
02 17 55 57	CMP	This is 8. Go ahead, Houston.
02 17 55 59	CC	Apollo 8, Houston. This is a preliminary LOI 1 PAD. Over.
02 17 56 08	CMP	Roger. Standby one.
02 17 56 10	CC	Roger. Standing by.
02 17 57 06	CMP	Houston, Apollo 8. Ready to copy.
02 17 57 10	CC	Apollo 8, this is Houston. Roger. LOI 1 SPS/G&N: 62844, minus 161, plus 129 06908 1841. Copy?
02 17 57 52	CMP	8 is copying.
02 17 57 55	CC	Roger, 8. Minus 29837, plus 02390, plus 00994 000 200 0501693, plus 00600 29949 402 29782. Copy?
02 17 58 02	CMP	8 is copying.

02 17 58 15	CC	Roger, 8. 010689260 Persei zeta, down 048, left 05. The remainder is not applicable. Sirius, Rigel, set of stars for GDC align, 129 155 010, negative ullage. We'll pass the horizon window data later. Over.
02 17 59 15	CMP	Roger. Preliminary LOI 1 PAD as follows: SPS/G&N; 62844, minus 161, plus 129. Are you copying?
02 17 59 30	CC	Roger. Copying.
02 17 59 35	CMP	069 08 1841, minus 29837, plus 02390, plus 00994 000 200 005 01693, plus 00600 29949 402 29782 01 0689 260, Persei zeta, down 048, left 05. The remainder not applicable. Sirius, Rigel, 129 155 010. No ullage. We'll pass up the remainder up later.
02 18 00 31	CC	Roger, Jim. One question - we talked about a P40 gimbal check. Would you like to do that during this maneuver to LOI 1 attitude, or would you rather hold that off until a little closer to LOI? Over.
02 18 00 57	CMP	Let me check on that. Wait one, Houston.
02 18 01 01	CC	Roger. Standing by.
02 18 02 39	CMP	Houston, Apollo 8.
02 18 02 40	CC	Apollo 8, Houston. Go.
02 18 02 47	CMP	Roger. We could make this gimbal check as a maneuver to the LOI attitude.

02 18 02 53	CC	Roger.
02 18 03 00	CMP	I understand that you'll load us up with the LOI 1 PAD and we'll run through P40 as far as the gimbal check.
02 18 03 08	CC	Roger. That's what we heard you were going to do on it. Are you going to run both the manual gimbals as well as the automatic? Over.
02 18 03 25	CMP	Roger.
02 18 18 42	CC	Apollo 8, Houston. Standing by to monitor P52. Over.
02 18 18 51	CMP	Roger.

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

02 18 42 01	CDR	Houston, how do you read? Apollo 8.
02 18 42 03	CC	Apollo 8, this is Houston. Loud and clear.
02 18 42 11	CDR	Okay, Jerry. At 67, we are going over to the LOI 1 attitude, do a sextant star check, and then we will have to go back to PTC. I want to know if you want us to go back to the same attitudes we are at now?
02 18 42 24	CC	Apollo 8, Houston. That is affirmative, Frank. We are getting ready to ask you to do an erasable dump, VERB 47. We are ginning up to get ready for it now, and we will call you as soon as we are ready to copy.
02 18 42 41	CDR	Understand. VERB 47 when you call.
02 18 42 45	CC	Negative; VERB 74.
02 18 42 50	CDR	Okay. VERB 74.
02 18 43 43	CC	Apollo 8, this is Houston. We are setting up for the dump now. It will take about 3 minutes and 20 seconds once we start the dump. Over.
02 18 43 54	CDR	Understand.
02 18 47 09	CDR	Houston, Apollo 8.
02 18 47 12	CC	Apollo 8, Houston. Go.
02 18 47 17	CDR	Roger. Can you point out the position of this Zeta Persei to us a little better? We don't have it marked on our charts. We have got Mirfak, and we know Algol, but which one is Zeta Persei?

66:43

48
18
11

02 18 47 30	CC	Roger, Frank. Persei Zeta is just about exactly between Aldebaran and Mirfak.
02 18 48 40	CC	Apollo 8, this is Houston. We are ready for your CMC erasable dump. Key VERB 74 ENTER. Over.
02 18 48 51	CDR	Roger.
02 18 49 02	CMP	VERB 74 ENTER.
02 18 49 06	CDR	Did you get it?
02 18 49 26	CDR	Houston, Apollo 8. Are you getting the dump?
02 18 49 29	CC	Apollo 8, this is Houston. Indications are that we are getting it; we are checking. You will have to leave the computer alone for 3 minutes and 20 seconds. Over.
02 18 49 39	CDR	Roger. We are.
02 18 49 49	CC	Apollo 8, Houston. We are getting your dump low bit rate through Honeysuckle.
02 18 49 56	CDR	Roger.
02 18 50 05	CC	Apollo 8, Houston. Persei Zeta is a third magnitude star same as Enif. Over.
02 18 50 15	CDR	Same magnitude as Enif.
02 18 26 59	CMP	Roger. Houston, Apollo 8. P52 complete.
02 18 27 05	CC	Apollo 8, Houston. Roger. Copy.
02 18 50 17	CC	Affirmative.
02 18 51 14	CDR	Jerry, when are you going to send us the TEI 1 and the rest of that block data?

02 18 51 31	CC	Apollo 8, Houston. PC plus 2 does not need an update. We'll have your TEI 1 and 2 in about 10 minutes. Over.
02 18 51 41	CDR	Roger.
02 18 53 53	CC	Apollo 8, Houston.
02 18 53 58	CDR	Go ahead, Houston. Apollo 8.
02 18 54 00	CC	Apollo 8, Houston. The dump is complete; you can have your computer back. The reason for the dump was to investigate further the P52 anomaly you had about 4 hours ago. We will try to have some words for you in about 20 or 30 minutes. Over.
02 18 54 18	CDR	You mean when it wouldn't come up with the proper star?
02 18 54 22	CC	Affirmative.
02 18 54 26	CMP	Okay.
02 18 54 30	CDR	We are going to go ahead and start our maneuver to LOI 1 attitude.
02 18 54 34	CC	Roger. Standing by to monitor.
02 18 54 42	CMP	Houston, Apollo 8.
02 18 54 45	CC	Houston. Go ahead.
02 18 54 50	CMP	During the flight, I noticed that the AUTO optics wouldn't drive to the star pick-a-pair selected. Example, it picked Alpheratz at one time, wouldn't drive there, drove to a spot that had no star; and I went back and reselected the program and came back, and it worked okay.

02 18 55 11	CC	Roger, Jim. Copy.
02 18 55 26	CC	Jim, is this anomaly you are talking about - was that 4 hours ago when we did the REFSMMAT align?
02 18 55 37	CMP	This happened, I think, yesterday. When we - we were doing a regular REFSMMAT alignment. Alpheratz was the first star selected, and it didr't drive to Alpheratz; and I ran and reselected the program again, and it worked okay.
02 18 55 54	CC	Okay, Jim. Thank you.
02 18 55 56	CDR	Jerry, this is Apollo 8.
02 18 55 57	CC	Go ahead.
02 18 55 59	CDR	Apollo 8 here, Jerry.
02 18 56 01	CC	Go ahead, Frank.
02 18 56 06	CDR	Our PAD here is - Roger. Our PAD here hasn't been correct. I understand the gimbal angles for LOI 1 are roll 0, pitch 200, and yaw 5. Is that correct?
02 18 56 17	CC	Affirmative, Frank. That is correct.
02 18 56 22	CDR	Thank you.
02 18 57 39	CC	Apollo 8, Houston with a map update. Over.
02 18 57 45	CDR	Okay. Stand by a minute.
02 18 57 48	CC	Roger.
02 18 58 04	CDR	Go ahead.
02 18 58 07	CC	Apollo 8, this is Houston. Map update REV 1, slash 2: 685804 690505 693141 701448. Copy?
02 18 58 41	CDR	Copy.

02 18 58 43	CC	705636 710059 711042 713940 722317. Copy?
02 18 59 21	CDR	Copy.
02 18 59 23	CC	Roger. Remarks: Charlie Poppa 1, 711457, Charlie Poppa 2, 712832, Charlie Poppa 3, 714726, Bravo 1, 720942. Over.
02 19 00 06	CMP	Roger. Stand by. I'll get the antenna.
02 19 00 25	CMP	Map update as follows, Houston: 685804 690505 693141 701448 705636 710059 711042 713940 722317; Charlie Poppa 1, 711457, Charlie Poppa 2, 712832, Charlie Poppa 3, 714726, Bravo 1, 720942.
02 19 01 25	CC	Apollo 8, this is Houston. Readback is correct.
02 19 04 26	CC	Apollo 8, Houston. Try to lock up an OMNI for us. Over.
02 19 04 33	CMP	Roger.
02 19 04 59	CDR	How do you read now, Houston?
02 19 05 03	CC	Apollo 8, Houston. Reading you loud and clear. No TM.
02 19 05 11	CDR	Understand. No TM.
02 19 06 33	CC	Apollo 8, Houston.
02 19 06 39	CDR	Go ahead, Houston. Apollo 8.
02 19 06 41	CC	Roger, Frank. How far are you from your gimbal drive check? Over.
02 19 06 50	CDR	We're just maneuvering to the attitude now.
02 19 06 55	CC	Roger, Frank. Can you lock up the high gain at that attitude? We have a telemetry problem. Over.
02 19 07 04	CDR	We'll try to. I don't know if we can or not; have to wait until we get there.

02 19 07 09	CC	Roger. Standing by.
02 19 11 25	CDR	Houston, this is Apollo 8. We cannot get the high gain at the burn attitude.
02 19 11 31	CC	Roger, Frank. Thanks anyway.
02 19 12 07	CC	Apollo 8, this is Houston. We have a handover from Honeysuckle to Guam in about two minutes.
02 19 12 16	CDR	Thank you.
02 19 13 29	CC	Apollo 8, Houston.
02 19 13 47	CC	Apollo 8, Houston.
02 19 14 22	CC	Apollo 8, Houston. Over.
02 19 15 17	CC	Apollo 8, Houston. Over.
02 19 16 08	CC	Apollo 8, Houston.
02 19 16 58	CDR	Houston, Apollo 8.
02 19 17 00	CC	Apollo 8, Houston. Loud and clear. How me?
02 19 17 10	CDR	Houston, Apollo 8.
02 19 17 13	CC	Apollo 8, this is Houston. Loud and clear. How me? Over.
02 19 17 41	CC	Apollo 8, Houston. Over.
02 19 17 54	CC	Apollo 8, Houston. Over.
02 19 18 00	CDR	Go ahead, Houston. Apollo 8 here.
02 19 18 02	CC	Apollo 8, this is Houston. I have TEI 1 and TEI 2 PAD's. We still have no telemetry; expect to get it soon. Over.
02 19 18 14	CDR	Roger. You think it's a ground problem?
02 19 18 19	CC	Roger. It's a ground problem; we just got it back.

02 19 18 57	CDR	Houston, Apollo 8. Go ahead with your data.
02 19 19 05	CC	Apollo 8, this is Houston with an LOI 1 PAD. Over.
02 19 19 14	CDR	Roger. Understand. LOI 1.
02 19 19 17	CC	That is affirmative, LOI 1, SPS/G&N: 62844 1, correction, minus 161, plus 129 069 08 1952, minus 29840, plus 02390, plus 01053. Copy?
02 19 20 58	CC	Apollo 8, Houston. Over.
02 19 21 02	CDR	Roger. We broke lock; did not get the DELTA-V_X.
02 19 21 08	CC	Apollo 8, Houston. Roger. Beginning with DELTA-V_X: minus 29840, plus 02390, plus 01053 000 200 005 01693, plus 00600 29954 402 29788. Copy?
02 19 22 19	CDR	Roger.
02 19 22 21	CC	Roger. 01 0688 259, Persei Zeta, down 048, left 05. The remainder not applicable. Sirius, Rigel, 129 155 010; negative ullage. Horizon window, ignition minus 2 minutes, 40 degrees unlit, ignition 27 degrees unlit. Over.
02 19 23 35	CDR	Roger. LOI 1, SPS/G&N: 62844 minus 161, plus 129 069 08 1952, minus 29840, plus 02390, plus 01053 000 200 005 01693, plus 00600 29954 402 29788 01 0688 259, Persei Zeta, down 048, left 05; Sirius, Rigel, 129 155 010: no ullage, horizon 2 minutes 40 degrees unlit, ignition 27 degrees unlit.

02 19 24 58	CC	Apollo 8, Houston. Readback is correct. Ready to copy TEI 1. Over.
02 19 25 05	CDR	Roger, Houston.
02 19 25 14	CC	Apollo 8, this is Houston. Are you waiting for us before you start your gimbal check? Over.
02 19 25 23	CDR	We can start the gimbals check right here.
02 19 25 27	CC	Roger. You want to copy while you're doing it or stand by on TEI 1?
02 19 25 35	CDR	Stand by for a minute.
02 19 25 37	CC	Roger. Standing by.
02 19 26 48	CC	Apollo 8, this is Houston. Shifting command back to Honeysuckle. Over.
02 19 26 55	CDR	Roger.
02 19 34 46	CC	Apollo 8, Houston. How did that gimbal drive check go?
02 19 34 52	CDR	It went fine.
02 19 34 53	CC	Roger, Frank. We're ready with the TEI 1 and 2 maneuver PAD's. We've also got two state vectors and a target load to uplink and load if you'll configure for it. Over.
02 19 35 07	CDR	Roger. We're trying to get the high gain now. We're maneuvering to PTC attitude.
02 19 35 15	CC	Roger.
02 19 35 24	CMP	Go ahead with your TEI PAD's.
02 19 35 29	CC	Apollo 8, this is Houston. TEI 1, SPS/G&N: 462, correction, 46728, minus 053, plus 121 071 25 0473, plus 37746, minus 03299, plus 00844. Copy?

02 19 36 33	CMP	We're copying.
02 19 36 35	CC	Roger. 179 346 357, not applicable, plus 00176 37900 336 37705 42 1279 309. Copy?
02 19 37 26	CMP	Copying.
02 19 37 28	CC	Roger. NA, NA, NA, plus 1350, minus 16500 13050 36389 1221 045; Sirius, Rigel, 129 155 010, ullage two-jet, 20 seconds jet Bravo Delta, horizon window X-axis on horizon at ignition minus 3 minutes; assumes LOI 1. Over.
02 19 38 59	CMP	Houston, Apollo 8. TEI 1 as follows: SPS/G&N: 46728, minus 053, plus 121 071 25 0473. Copy?
02 19 39 22	CC	Roger. Copy.
02 19 39 26	CMP	Plus 37746, minus 03299, plus 00844 179 346 357, not applicable, plus 00176 37900 336 37705 42 1279 309, not applicable three times, plus 1350, minus 16500 13050 36389 1221045; Sirius, Rigel, 129 155 010, ullage two jets, 20 seconds, quads B and D, horizon window X-axis on horizon at TIG minus 3, assumes IOI 1.
02 19 40 36	CC	Apollo 8, Houston. Roger. Correct.
02 19 41 05	CMP	Standing by for TEI 2, if you have it.
02 19 41 15	CMP	Apollo 8, Houston. Will be ready with the TEI 2 in about 1 minute.
02 19 41 19	CMP	Roger.
02 19 42 10	CC	Apollo 8, Houston with a TEI 2 maneuver PAD.
02 19 42 18	CMP	Roger. Ready to copy.

02 19 42 21	CC	Roger. TEI 2 SPS/G&N: 46728, minus 053, plus 121. Copy?
02 19 42 47	CMP	Roger. Copy.
02 19 42 49	CC	Roger. 073 21 3024, plus 28466, minus 00350, plus 02406 180 022 002, not applicable, plus 00188. Copy?
02 19 43 46	CMP	Roger. Copy.
02 19 43 48	CC	Roger. 28570 250 28401 42 0641 296, not applicable three times, plus 0920, minus 16500 12953 36175 146 32 16. Copy?
02 19 45 01	CMP	Copy. Looks like you left out a digit ...
02 19 45 09	CC	Apollo 8, Houston. Request you switch your OMNI. It's getting pretty garbled now.
02 19 45 18	CMP	Roger. Stand by.
02 19 45 30	CMP	Houston, this is Apollo 8. I copied. I question the latitude and the range to go. It appears that you gave me one too few digits in both cases.
02 19 45 43	CC	Roger. I repeat, latitude plus 0920, minus 16590 12953 36175 146 32 16. Copy?
02 19 46 20	CMP	I copied.
02 19 46 21	CC	Roger. Your GDC align is no change, ullage no change, horizon on the minus 2-degree line at ignition minus 3 minutes, assumes LOI 1. Over.
02 19 46 58	CMP	Roger. TEI 2 maneuver PAD, SPS/G&N: 46728, minus 053, plus 121 073 21 3024 plus 28466 minus 00350. I did not get the 502406 for a DELTA-V_Z. 180 022 002,

not applicable, plus 00188 28570 250 28401 42 0641 296, not applicable three times, plus 0920 minus 16500 12953 36175 1463216. No change in the GDC align stars, no change in ullage, a rise on the minus 2-degree line at TIG minus 3, assumes LOI 1.

02 19 48 28	CC	Apollo 8, this is Houston. Roger. Correct. I repeat DELTA-V_Z plus 02406. Over.
02 19 48 42	CMP	Roger. Plus 02406.
02 19 48 46	CC	Roger.
02 19 48 57	CC	Apollo 8, Houston. If you can go OO and ACCEPT, we'll start the NAV loads.
02 19 49 05	CMP	Roger.
02 19 49 12	LMP	Go ahead.
02 19 51 20	CC	Apollo 8, Houston. The CM vector is in; working on the LM now. Over.
02 19 51 28	CDR	Roger.
02 19 52 17	CC	Apollo 8, Houston. We'd like a cryo fan cycle when you can. Over.
02 19 52 24	CDR	Roger. We're starting that now.
02 19 52 26	CC	Roger.
02 19 53 17	CC	Apollo 8, Houston. The LM vector is loaded. Target load going in now.
02 19 53 23	CDR	Roger.
02 19 55 20	CC	Apollo 8, Houston.
02 19 55 25	CMP	Go ahead, Houston.

02 19 55 27	CC	Apollo 8, Houston. The update is complete. You can have the computer, TLM to BLOCK. Be advised the erasable dump checks out okay.
02 19 55 41	CMP	Roger. Thank you. We have the computer; we're in BLOCK.
02 19 55 45	CC	Roger.
02 19 55 50	CC	Apollo 8, this is Houston. We'd like to make at this time a down-voice backup COMM check. Set the S-band AUX tape to DOWN-VOICE BACKUP, TLM inputs PCM, LOW. Over.
02 19 56 10	LMP	Roger, Houston. And we'd like to have a check of our DSE on low bit rate for voicing.
02 19 56 19	CC	Roger. Understand you want the DSE check on low bit rate for voice.
02 19 56 30	CDR	That's affirmative, and we'll give it about 10 minutes now or about 5 minutes, then you can check it out.
02 19 56 37	CC	Roger.
02 19 57 55	CMP	Houston, Apollo 8.
02 19 57 57	CC	Apollo 8, Houston. Go.
02 19 58 01	CMP	As a matter of interest, we have as yet to see the moon.
02 19 58 07	CC	Roger.
02 19 58 21	CC	Apollo 8, Houston. What else are you seeing?
02 19 58 31	LMP	Nothing. It's like being on the inside of a submarine.

02 19 58 36	CC	Roger.
02 19 59 17	CDR	Houston, we just did a PROGRAM 21, and we show a pericynthian of plus 74.9 miles on the state vector you just uploaded.
02 19 59 24	CC	Roger. Plus 74.9.
02 19 59 32	CDR	Roger.
02 19 59 50	CC	Apollo 8, this is Houston. Reading your down-voice backup loud and clear. Request you keep those switches where they are for the remainder of the pass. Over.
02 20 00 02	CDR	Roger. And we're rewinding the tape recorder for a dump for a DSE voice check.
02 20 00 10	CC	Roger, 8.
02 20 00 15	CDR	It's rewound; are you ready to dump?
02 20 00 23	CDR	We'd like to go to S-band AUX tape briefly so you can dump the tape while we're on the high gain. We've only got about 30 seconds worth.
02 20 00 44	CC	Apollo 8, Houston. Roger. We'll do that from the ground. Over.
02 20 00 48	CDR	Roger. I'll switch configuration - -

END OF TAPE

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02 20 00 44	CC	Apollo 8, Houston. Roger. We'll do that from the ground. Over.
02 20 00 54	CDR	Roger. Switch configuration is down-voice backup and stop. You got it.
02 20 00 59	CC	Roger. We will dump it.
02 20 01 15	CDR	You won't need to dump more than a minute's worth.
02 20 01 19	CC	Roger.
02 20 01 49	CC	Apollo 8, Houston. Over.
02 20 02 03	CC	Apollo 8, Houston.
02 20 02 04	CDR	Roger. This is Apollo 8.
02 20 02 06	CC	Roger. That pericynthian you read out is for ignition. We read that as 75 miles; your true pericynthian is 64 miles at 69:10:35. Over.
02 20 02 25	CDR	Roger.
02 20 03 03	CC	Apollo 8, this is Houston with an addition to your TEI 1 maneuver PAD. Over.
02 20 03 12	CDR	Stand by a minute.
02 20 03 25	CDR	Go ahead.
02 20 03 27	CC	Roger. Under remarks, add the following: "requires minus MA procedure". Over.
02 20 03 43	CDR	Requires minus MA procedure.
02 20 03 47	CC	Affirmative, 8.
02 20 04 07	CC	Apollo 8, this is Houston. At 68:04, you are GO for LOI.
02 20 04 17	CDR	Okay. Apollo 8 is GO.

02 20 04 22	CC	Apollo 8, Houston. You are riding the best one we can find around.
02 20 04 30	CDR	Say again.
02 20 04 32	CC	You are riding the best bird we can find. Over.
02 20 04 33	CDR	Thank you.
02 20 04 38	CDR	Roger. It's a good one.
02 20 11 45	LMP	The cryo's have been stirred, Houston.
02 20 11 49	CC	Roger, Bill.
02 20 12 08	CC	Apollo 8, Houston. We just saw an MC&W light.
02 20 12 16	LMP	We just tested the caution and warning.
02 20 12 18	CC	Roger.
02 20 12 22	LMP	That's keeping alert.
02 20 12 24	CC	Roger. Clint there is getting white.
02 20 15 59	CC	Apollo 8, Houston. We're 42 minutes from LOS, and we caught another caution and warning light.
02 20 16 09	CDR	It was the high-gain antenna going out of limits.
02 20 16 12	CC	Roger.
02 20 21 04	CC	Apollo 8, Houston. Voice quality on the DSE dump is very good. The DSE is yours. Over.
02 20 21 14	CDR	Mighty fine.
02 20 26 25	CC	Apollo 8, Houston. COMM check.
02 20 26 30	CMP	Read you loud and clear, Houston.
02 20 26 32	CC	Roger.
02 20 30 37	CDR	Houston, Apollo 8. Over.
02 20 30 40	CC	Apollo 8, Houston. Go.
02 20 30 45	CDR	Roger. We are ready to activate the primary water boiler.

02 20 30 49	CC	Roger. Copy.
02 20 30 53	CDR	We got a GO?
02 20 30 57	CC	Roger. GO.
02 20 31 01	CDR	Okay. Steam pressure going to AUTO; H_2 flow going to AUTO.
02 20 31 49	CC	Apollo 8, Houston. We are on low bit rate. We won't see your steam pressure; your RAD OUT is 33. Over.
02 20 32 01	CDR	Roger. We're below the boiling limit, and steam pressure is steady at 0.15.
02 20 32 09	CC	Roger.
02 20 33 21	CC	Apollo 8, this is Houston. We have got our lunar map up and ready to go.
02 20 33 29	CDR	Roger.
02 20 37 38	LMP	Houston, Apollo 8. Over.
02 20 37 40	CC	Apollo 8, Houston. Go.
02 20 37 45	LMP	Roger. We're showing a fuel pressure of 167, in AUX of 163. Wondering, do you think there's a possibility of us having a transient caution warning trip on fuel AUX pressure at the beginning of the burn that would correct itself nominally as we had a chance to pressurize? Over.
02 20 38 12	CC	Roger. Understand; will check. Stand by.
02 20 38 20	LMP	Roger.
02 20 38 43	CC	Apollo 8, Houston.
02 20 38 49	LMP	Go ahead.

02 20 38 51	CC	Apollo 8, this is Houston. We've been reading fuel 173, AUX 167, holding steady for a long period of time. We expect no caution and warning trip. Over.
02 20 39 12	LMP	Roger. Understand.
02 20 48 30	CC	Apollo 8, Houston. Nine minutes 30 seconds from LOS.
02 20 48 38	CMP	Roger. Understand.
02 20 49 00	CC	Apollo 8, Houston.
02 20 49 05	CMP	Go ahead.
02 20 49 08	CC	Roger. In about 10 seconds, we'll have you 19 minutes from ignition. Five, four, three, two, one -
02 20 49 18	CC	MARK.
02 20 53 06	CC	Apollo 8, Houston. Five minutes LOS, all systems GO. Over.
02 20 53 13	CDR	Thank you. Houston, Apollo 8.
02 20 53 17	CC	Roger, Frank. The custard is in the oven at 350. Over.
02 20 53 30	CDR	No comprendo.
02 20 53 38	LMP	Roger.
02 20 56 06	CC	Apollo 8, Houston. Two minutes until LOS.
02 20 56 12	CDR	Roger.
02 20 57 06	CC	Apollo 8, Houston. One minute to LOS. All systems GO.
02 20 57 12	CDR	Roger. Going to COMMAND RESET, tape recorder FORWARD low bit rate.

02 20 57 19	CC	Roger. Safe journey, guys.
02 20 57 24	LMP	Thanks a lot, troops.
02 20 57 26	CMP	We'll see you on the other side.
02 20 57 54	CC	Apollo 8, 10 seconds to go. You're GO all the way.
02 20 58 00	CDR	Roger.
02 21 10 XX		BEGIN LUNAR REV 1
02 21 32 02	CC	Apollo 8, Houston. Over.
02 21 32 35	CC	Apollo 8, Houston. Over.
02 21 32 50	CC	Apollo 8, Houston. Over.
02 21 33 08	CC	Apollo 8, Houston. Over.
02 21 33 21	CC	Apollo 8, Houston. Over.
02 21 33 44	CC	Apollo 8, Houston. Over.
02 21 33 52	CMP	Go ahead, Houston. This is Apollo 8. Burn complete. Our orbit 160.9 by 60.5; 169.1 by 60.5.
02 21 34 07	CC	Apollo 8, this is Houston. Roger. 169.1 by 60.5. Good to hear your voice.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

02 21 35 23	CC	Apollo 8, this is Houston. Verify your evaporator water control in AUTOMATIC. Over.
02 21 35 56	CC	Apollo 8, Houston. Over.
02 21 36 09	CC	Apollo 8, Houston. Over.
02 21 36 24	CC	Apollo 8, Apollo 8, this is Houston, Houston. Over.
02 21 36 32	CDR	Roger, Houston. We read you loud and clear. How do you read us?
02 21 36 35	CC	Apollo 8, this is Houston. Reading you loud and clear now. And verify your evaporator water control panel switch to the AUTO position. Over.
02 21 36 51	CDR	Roger. I am sure it is in AUTO.
02 21 36 54	CC	Roger.
02 21 37 00	CMP	Burn status report as follows: burn on time, burn time 4 minutes 6-1/2 seconds, VG_X minus 1.4, attitude is nominal, no trim, VG_Y was zero, VG_Z was plus 0.2, DELTA-V_C was minus 20.2, orbit 169.1 by 60.5.
02 21 37 45	CC	Apollo 8, Houston. Roger. The burn on time, burn time of 4 06.5, VG_X is minus 1.4.
02 21 38 19	CC	Apollo 8, Houston. Verify your EVAP water control on panel 382 is AUTO. Your EVAP OUT temperature is high. Over.
02 21 38 33	LMP	Roger. Standing by.
02 21 38 40	LMP	Houston, Apollo 8. Roger. Primary EVAP is AUTO, H_2 flow AUTO. Do you recommend activating the secondary water boiler?

02 21 38 51	CC	Roger. Copy. Stand by.
02 21 39 10	CC	Apollo 8, this is Houston. Reverify manual valve on panel 382, evaporator water control AUTOMATIC. Over.
02 21 39 22	LMP	Roger. Verified.
02 21 39 36	CC	Apollo 8, this is Houston. Recommend you activate your secondary water evaporator.
02 21 39 54	LMP	Secondary EVAP coming on line.
02 21 39 56	CC	Roger.
02 21 40 40	CC	Apollo 8, Houston. Turn off your DSE, and we will go to high bit rate. Over.
02 21 40 49	LMP	Roger.
02 21 40 52	CC	Apollo 8, this is Houston. And I will continue my readback of the burn status report. Copied VG_X zero, VG_Y zero, VG_Z 1.2, DELTA-V Charlie minus 20.2. Over.
02 21 41 15	LMP	Stand by; he's getting the chart out again.
02 21 41 21	CMP	DELTA-VG_Z was 0.2.
02 21 41 26	CC	Roger. Understand; 0.2 on VG_Z.
02 21 41 53	LMP	Houston, this is Apollo 8. We are on malfunction 1 of 6, going through step 1 to step 2. Over.
02 21 42 02	CC	Apollo 8, Houston. Roger. Copy.
02 21 42 08	LMP	Correction. That is to step 4.
02 21 42 10	CC	Roger. Copy; to step 4.
02 21 42 41	LMP	Now to step 13.

02 21 42 44	CC	Roger. Step 13.
02 21 43 14	LMP	Now to step 14.
02 21 43 18	CC	Houston. Roger.
02 21 43 25	LMP	Looks like the boiler dried out somewhere along the line.
02 21 43 28	CC	Roger, Bill.
02 21 44 01	CDR	Houston, this is Apollo 8. I would like to confirm that burn status report. VG_X was minus 1.4, VG_Y 0. VG_Z 0.2, minus 0.2 that is. DELTA-V_C was minus 20.2 --
02 21 44 26	CC	Apollo 8, --
02 21 44 27	CDR	-- apogee 169.1, perigee 60.5.
02 21 44 36	CC	Apollo 8, this is Houston. Roger. I will read back again. The burn was on time, 4 minutes and 6-1/2 seconds, VG_X minus 1.4, trim nominal, VG_Y zero, VG_Z minus 0.2, DELTA-V Charlie minus 20.2. Over.
02 21 45 05	CDR	That's Roger.
02 21 45 06	CC	Roger. And we copy your apogee and perigee.
02 21 45 24	LMP	Steam pressure is coming up.
02 21 45 27	CC	Roger, Bill.
02 21 46 37	LMP	Step 15.
02 21 46 39	CC	Roger. Concur.
02 21 46 41	LMP	Very good.
02 21 46 58	LMP	EVAP TEMP's coming down.
02 21 47 04	CC	Apollo 8, Houston. Roger. We concur.

02 21 47 20	LMP	Okay. Houston, keep a good eye on it.
02 21 47 23	CC	Roger. We're watching.
02 21 47 28	LMP	Okay. Nice job on the malfunction procedures.
02 21 47 32	CC	Roger, Bill. Thanks.
02 21 47 39	LMP	You, too.
02 21 49 02	LMP	Give us a call when you think we ought to stop the secondary boiler, Houston.
02 21 49 06	CC	Apollo 8, Houston. Wilco.
02 21 49 40	CMP	Houston, Apollo 8.
02 21 49 41	CC	Apollo 8, Houston. Go.
02 21 49 47	CMP	Roger. For information, we're passing over just to the side of the crater Langrenus at this time going into the Sea of Fertility.
02 21 49 57	CC	Apollo 8, Houston. Roger.
02 21 51 04	CC	Apollo 8, Houston. What does the ole moon look like from 60 miles? Over.
02 21 51 16	CMP	Okay, Houston. The moon is essentially gray, no color; looks like plaster of Paris or sort of a grayish deep sand. We can see quite a bit of detail. The Sea of Fertility doesn't stand out as well here as it does back on earth. There's not as much contrast between that and the surrounding craters. The craters are all rounded off. There's quite a few of them; some of them are newer. Many of them look like - especially the round ones - look like hits by

meteorites or projectiles of some sort. Langrenus is quite a huge crater; it's got a central cone to it. The walls of the crater are terraced, about six or seven different terraces on the way down.

02 21 52 35 CC Roger. Understand.

02 21 52 40 CMP And coming up now, the Sea of Fertility are the old friends Messier and Pickering that I looked about so much on earth.

02 21 52 49 CC Roger.

02 21 52 50 CMP And I can see the rays coming out of blaze Pickering. We're coming up now near our P-1 initial site which I'm going to try and see. Be advised the round window, the hatch window, is completely iced over; we can't use it; Bill and I are sharing the rendezvous window.

02 21 53 15 CC Apollo 8, Houston. Roger. Got any more information on those rays? Over.

02 21 53 24 CMP Roger. The rays out of Pickering are quite faint from here; there are two different groups going to the left. They don't appear to have any depth to them at all, just rays coming out.

02 21 53 42 CC Roger.

02 21 53 45 CMP They look like just changes in the color of the mare.

02 21 54 08 CC Bill, if you can tear yourself away from that window, we'd like you to turn off the secondary evaporator. Over.

02 21 54 16	LMP	Roger. Going OFF.
02 21 54 45	CC	Apollo 8, this is Houston. You can leave that secondary pump on for just a few minutes. Over.
02 21 54 53	CMP	Stand by.
02 21 54 54	LMP	Roger.
02 21 55 28	CMP	Okay. Over to my right are the Pyrenees Mountains coming up, and we're just about over Messier and Pickering right now. Our first initial point is easily seen from our altitude. We're getting quite a bit of contrast as we appear - as we approach the terminator. The view appears to be good, no reflection of the sun back to our eyes; it appears that visibility at this particular spot is excellent. It's very easy to pick out our first initial point; and over this mountain chain, we can see the second initial point, the Triangular Mountain.
02 21 56 33	LMP	And we're coming upon the craters Columbo and Gutenberg. Very good detail visible. We can see the long parallel faults or Grabens, and they run through the Mare material right into the highland material.
02 21 57 41	CMP	We're directly over our first initial point now for P-1. It's almost impossible to miss, very easy to pick out, and we look right over into the second initial point.
02 21 57 56	CC	Roger, Jim.

02 21 58 04	CMP	I can see very clearly the five crater star formation which we had on our lunar chart --
02 21 58 14	CC	Roger.
02 21 58 18	CMP	-- And right now, I'm trying to pick out visually P-1.
02 21 58 28	CC	Roger, Jim. Bill, you can turn off the secondary EVAP pump now.
02 21 58 40	CDR	Houston, this is Apollo 8.
02 21 58 43	CC	Apollo 8, Houston. Go.
02 21 58 47	CDR	Roger. How about giving us a system status, please?
02 21 58 51	CC	Roger.
02 21 59 19	CMP	Okay. I've got P-1 in sight now, Houston.
02 21 59 30	CC	Roger, Jim.
02 21 59 32	CMP	It's very easy to spot. You can see the entire rims of the craters from here with, of course, the white crescent on the far side where the sun is shining on it. The shadows are quite lengthy now. Maskelyne B (Marsh of Sleep) has quite a few shadows off of it, but it can be recognized. Just west of the Maskelyne B, we start going to the terminator. The terminator is actually quite sharp over the Pyrenees, and it's - I can't see anything in earthshine at this present time. Bill says that he can see things out the side window when he's not looking down on the sunshine on the moon.

02 22 00 50	CC	Apollo 8, this is Houston. All systems are GO. We're evaluating the strip charts on your SPS burn, and we'll give you a readout on that shortly. Over.
02 22 01 03	CDR	Roger. Thank you. It seemed smooth. Do you need high bit rate any more?
02 22 01 15	CC	Roger. We'd like high bit rate. We have dumped your DSE, and we'd like to stick with high bit rate for a while.
02 22 01 26	CDR	Roger.
02 22 01 45	CMP	Well, we're just about over Maskelyne B (Marsh of Sleep) now, and our target is just directly below us.
02 22 02 32	CC	Apollo 8, this is Houston. If you want the recorder now, it's yours.
02 22 02 41	LMP	Roger. Thank you.
02 22 03 17	CC	Apollo 8, Houston. MSFN tracking is comparing very well with your onboard NAV.
02 22 03 26	CDR	Roger.
02 22 03 31	CDR	Houston, for your information, we lost radio contact at the exact second you predicted.
02 22 03 40	CC	Roger. We concur.
02 22 03 47	CDR	Are you sure you didn't turn off the transmitters at that time? (Laughter in viewing room)
02 22 03 52	CC	Honest Injun, we didn't.

02 22 04 00	CDR	While these other guys are looking at the moon, I want to make sure we have a good SPS. How about giving me that report when you can?
02 22 04 06	CC	Sure will, Frank.
02 22 04 14	CDR	We want a GO for every REV please; otherwise, we'll burn in TEI 1 at your direction.
02 22 04 21	CC	Roger. I understand.
02 22 07 22	CC	Apollo 8, this is Houston. Are you eating?
02 22 07 28	CDR	Say again.
02 22 07 39	CC	Apollo 8, this is Houston. Are you eating dinner?
02 22 07 45	CDR	Negative. We'll have breakfast in a little while here.
02 22 07 49	CC	Roger.
02 22 08 00	CC	Apollo 8, this is Houston. When you go into the dark in about 7 or 8 minutes, I have some words for you on the filters for the wide-angle lens, for your TV camera. Over.
02 22 08 19	CDR	We are in the dark now.
02 22 08 23	CC	Roger. Let me know when you are ready to copy.
02 22 08 36	CC	Apollo 8, Houston. Any words on earthshine? Over.
02 22 09 13	LMP	Earthshine is about as expected, Houston. Not as much detail, of course, as in the sunlight, but you can see the large craters quite distinctly, and you can see the albedo contacts quite distinctly. And, also, the - there's a good three-dimensional view of the rims of the larger craters.

02 22 09 43	CC	Roger, Bill.
02 22 09 54	LMP	I think our high-speed film will be able to pick some of this stuff up quite well.
02 22 09 58	CC	Roger.
02 22 12 44	LMP	Go ahead with your information on the filter, Houston.
02 22 12 47	CC	Apollo 8, Houston. Roger. We recommend you use a wide-angle lens on this particular TV run. You can use a telephoto lens with the same setup as yesterday's TV show. However, we recommend a wide-angle lens. Step number 1, tape the single red filter to the red filter on the red/blue filter holder; do it so that the filter slide still functions. Over.
02 22 13 38	LMP	Go ahead.
02 22 13 40	CC	Roger. Step number 2, attach the filter holder to the lens with the tape on the top and bottom; do this with the slide forward. Over.
02 22 14 04	CDR	Go ahead.
02 22 14 05	CC	Roger. Then at the end of your second REV TV pass, or on request from here, we would like you to remove that red filter from the holder and transmit briefly with it that way, then slide it over the blue side for your final transmission. Over.
02 22 14 27	CDR	We got you.
02 22 14 28	CC	Okay, Frank.

02 22 15 35	CDR	Houston, Apollo 8. Standing by to record TEI 1 and TEI 2.
02 22 15 40	CC	Apollo 8, this is Houston. Your TEI 1 and TEI 2 PAD's you received last pass are still good. Using these PAD's, your next midcourse will be less than 20 feet per second. Over.
02 22 15 56	CDR	Roger. Understand.
02 22 16 14	CC	Apollo 8, Houston. We have all the SPS experts looking at your data now. The preliminary look is very good, and we will give you some final words later.
02 22 16 28	CDR	Roger. We could feel the chug when we threw in BANK B, not a chug, but we could feel additional thrust.
02 22 16 37	CC	Roger. Copy.
02 22 16 44	LMP	Houston, be advised on this red/blue filter technique on the TV. You cannot slide the two filters out of the way with them taped onto the TV camera; so I suggest we do red, blue, and then take them off.
02 22 17 06	CC	Roger. We concur, but make sure the little red filter is taped over the big one. Over.
02 22 17 20	LMP	Alright, you don't want the red fil - you want the blue by itself. Is that correct?
02 22 17 25	CC	That's affirmative, Bill.
02 22 17 33	CC	Bill, we'd like you to use the double red filter for the first transmission. Over.

02 22 17 43	LMP	Roger. It worked.
02 22 18 38	CC	Apollo 8, Houston.
02 22 18 43	LMP	Go ahead, Houston. Apollo 8.
02 22 18 45	CC	Apollo 8, this is Houston. If you should decide that you want to roll heads up on REV 2, one thing to remember, be sure you yaw 45 degrees right in order to maintain your high-gain antenna COMM. Over.
02 22 19 01	CDR	We will not do that; we're going to stick with the flight plan, and make the best we can here.
02 22 19 06	CC	Roger, Frank.
02 22 19 12	CDR	As usual, in the real world, the flight plan looks a lot fuller than it did in Florida.
02 22 19 18	CC	Roger. Understand.
02 22 27 19	CC	Apollo 8, Houston. We need an O_2 purge now.
02 22 27 27	LMP	Roger. And we're standing by for a map update.
02 22 27 31	CC	Roger.
02 22 27 43	CMP	Houston, Apollo 8. Just for your information, after we completed P52, I acquired the earth in the sextant. Quite a sight from here.
02 22 27 57	CC	Roger. Bet it is.
02 22 28 11	CDR	How are the systems experts on the SPS coming, Jerry?
02 22 28 16	CC	They are still working, Frank; another 5 or 10 minutes.
02 22 28 24	CDR	Roger.

02 22 28 38	CC	Apollo 8, Houston. Your SPS data looks real good. It is just a matter of getting it all in from the site and getting it looked at.
02 22 28 48	CDR	Thank you.
02 22 28 49	CC	So far, everything looks copacetic.
02 22 30 42	CC	Apollo 8, Houston. We would like to take about 5 minutes of high bit rate. Over.
02 22 30 50	CDR	Roger. Five minutes of high bit rate coming on.
02 22 30 52	CC	Roger.
02 22 30 56	CDR	You've got it.
02 22 32 14	CC	Apollo 8, Houston with a map update.
02 22 32 15	CDR	Stand by one.
02 22 32 52	CDR	Go ahead with the map update.
02 22 32 55	CC	Roger, Frank. Map update: REV 1/2, no change; the REV 2/3 follows: 73 04 57, 73 09 37, 73 19 01, 73 48 53, 74 24 23; remarks: Bravo 1 74 16 24. Over.
02 22 33 49	CDR	Roger. Copy.
02 22 33 52	CC	Roger. We show you 23 minutes to LOS.
02 22 33 59	LMP	Roger. Are you going to dump the tape?
02 22 34 41	CC	Apollo 8, this is Houston. You are GO for REV 2; all systems are GO. SPS evaluation is still underway and looking good. Over.
02 22 34 56	CDR	Understand; GO for REV 2. Thank you.
02 22 35 00	CC	Roger, Apollo 8. We're still using the tape recorder. We will dump it in a little bit.
02 22 35 35	CC	Apollo 8, this is Houston. The recorder is yours. You can go to low bit rate.

02 22 35 43	CDR	Thank you.
02 22 37 55	CC	Apollo 8, Houston. Request BIOMED switch center.
02 22 38 04	CDR	Three, two, one -
02 22 38 08	CDR	MARK.
02 22 38 11	CC	Roger. Mark.
02 22 43 50	CC	Apollo 8, Houston. Put your TELEMETRY INPUT switch to LOW. Over.
02 22 43 57	CDR	Roger. GO in LOW.
02 22 44 38	CDR	Houston, Apollo 8. We're in the process of preparing meal 4, day - correction: day 4, meal A.
02 22 44 47	CC	Roger, Frank.
02 22 48 13	LMP	Houston, Apollo 8. Over.
02 22 48 15	CC	Apollo 8, Houston. Go.
02 22 48 20	LMP	Are you going to be able to dump that tape prior to LOS?
02 22 48 30	CC	Roger. Bill, they say they have already dumped the tape, and it's almost totally clean.
02 22 48 42	LMP	What does that mean?
02 22 48 52	CC	That means you have got about 2 minutes of low bit rate on there, but the rest is clean. Over.
02 22 48 59	LMP	The high bit rate of the burn wasn't on there?
02 22 49 03	CC	Negative. We've already dumped and got that.
02 22 49 18	LMP	Okay. Let me know when you're going to dump it next time, Jerry. I understand we are GO now on the DSE. Have you got any voice off of it?
02 22 49 26	CC	That's affirmative. We did.
02 22 49 31	LMP	Okay. Thank you.

02 22 50 10	CC	Apollo 8, Houston. The voice quality on your tape was just fair-to-middling; we were able to monitor your burn and hear most of that pretty well.
02 22 50 27	LMP	Roger. Did you get a report of the photography accomplished, or is that on the tape at present?
02 22 50 36	CC	Negative. We haven't heard that.
02 22 50 42	LMP	Okay. We will put it on the tape now.
02 22 50 46	CC	Roger.
02 22 51 53	CC	Apollo 8, Houston. You are 4 minutes and 40 seconds away from LOS. I would like a reconfirmation on your S-band AUX switch in the DOWN-VOICE BACKUP position. Over.
02 22 52 09	CDR	Negative; it is in the NORMAL voice. We will go DOWN-VOICE BACKUP.
02 22 52 17	CC	Roger. Request you leave it there forever. Over.
02 22 52 22	CDR	Roger. In DOWN-VOICE BACKUP now.
02 22 52 44	CC	Apollo 8, this is Houston. All systems are GO. You're still GO for REV 2. Over.
02 22 52 53	CDR	Thank you.
02 22 55 32	CC	Apollo 8, Houston.
02 22 55 37	CDR	Go ahead, Houston. Apollo 8.
02 22 55 39	CC	Roger. One minute to LOS.
02 22 55 44	CDR	Thank you.
02 22 56 25	CC	Apollo 8, Houston. Ten seconds to LOS. All systems are GO.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

02 23 21 XX		BEGIN LUNAR REV 2
02 23 39 46	CC	Apollo 8, Houston. Over.
02 23 40 42	CC	Apollo 8, Houston. Over.
02 23 40 52	LMP	Houston, this is Apollo 8 with the TV going. Over.
02 23 41 00	CC	Apollo 8, this is Houston. Reading you loud and clear. We see your TV. It is a little bit - little bit clearer.
02 23 41 15	LMP	Roger. The moon is very bright and not too distinct in this area. I will give you a shot of the horizon.
02 23 41 21	CC	Roger.
02 23 41 25	LMP	How's that look? Is it on the top or your picture?
02 23 41 30	CC	Apollo 8, this is Houston. It's a good picture - the horizon - we can't see many terrain features as yet.
02 23 41 41	LMP	Roger.
02 23 41 48	CC	Apollo 8, Houston. We are beginning to pick up a few craters very dimly; the whole thing is pretty bright.
02 23 41 58	LMP	Roger. There is not much definition up here either out out on the horizon. We are now approaching the craters See and Bassett.
02 23 42 06	CC	Roger.
02 23 42 15	LMP	I'll shift to the rendezvous window.

02 23 42 18	CC	Roger, Bill.
02 23 42 22	CC	Apollo 8, Houston. We want to take the DSE.
02 23 42 28	LMP	Roger. You've got it.
02 23 42 29	CC	Roger. Looks like we've got a real good picture now.
02 23 42 35	LMP	Okay. That's the crater Brand.
02 23 42 37	CC	Roger.
02 23 42 42	LMP	Sorry we missed Carr.
02 23 42 43	CC	Me, too.
02 23 42 54	CC	Apollo 8, this is Houston. We are going to need a cryo fan cycle sometime during this pass.
02 23 43 02	LMP	Roger. Can we wait till sunset?
02 23 43 06	CC	Roger. We can wait.
02 23 43 10	LMP	Okay. I think we are coming up on Miller right now.
02 23 43 53	LMP	There's a very new bright impact crater; should be in the field of view now.
02 23 44 01	CC	Roger, Bill.
02 23 44 05	LMP	You see it in the upper part of your screen.
02 23 44 10	CMP	Say, Bill, how would you describe the color of the moon from here?
02 23 44 14	LMP	The color of the moon looks like a very whitish gray, like dirty beach sand with lots of footprints in it.
02 23 44 23	CMP	Some of these craters look like pickaxes striking concrete leaving a lot of fine haze dust.

02 23 44 38	LMP	There's some interesting features out on the other window. Let me switch windows on you now.
02 23 44 41	CC	Roger, Bill.
02 23 44 48	LMP	You should see the horizon now in the top of your picture.
02 23 44 51	CC	Roger. We have the horizon, Bill.
02 23 45 01	CC	Apollo 8, Houston.
02 23 45 02	LMP	I believe these are the craters now Bassett and See.
02 23 45 07	CC	Roger, Bill. If you have the polarizing filter handy, try flipping it in front, would you?
02 23 45 15	LMP	Roger.
02 23 45 18	CMP	Jerry, as a matter of interest, there's a lot of what appears to be very small new craters that have these little white rays radiating from them.
02 23 45 29	CC	Roger, Jim.
02 23 45 50	CC	Roger. We see the filter going over it. Apollo 8, this is Houston. Looks like we have to much light. The polarizing filter doesn't help much. Go ahead and remove it again.
02 23 46 16	LMP	Roger. It's removed.
02 23 46 25	CC	Looks like we just got --
02 23 46 26	LMP	Roger. We're just passing over the crater Borman, and there's Anders out there; Lovell is right south of it.

02 23 46 33	CC	Roger. The TV is breaking up now. Okay. We are back with a good picture. Looks like we just have too much light. Our definition is rather weak.
02 23 46 49	LMP	Roger.
02 23 47 01	LMP	Also, we're fogging up the window here, Houston, among other problems.
02 23 47 06	CC	Roger, Bill. The other window is better than that one.
02 23 47 12	LMP	Okay.
02 23 47 21	CC	Much better picture, Bill; much better.
02 23 47 25	LMP	Alright. The right side of the camera is pointing retrograde. We are now passing abeam of the crater Houston; I will show the camera over there once for the folks in Texas.
02 23 47 47	CC	Roger.
02 23 47 53	LMP	It's a big and sprawly one; it's got those two impact craters, one to the rignt and one to the left.
02 23 48 03	CC	Roger, Bill.
02 23 48 13	LMP	How's your picture?
02 23 48 15	CC	Still about the same, Bill. It's - the terrain's pretty bright. We are not getting much definition at all; definition on this side is much much better.
02 23 48 26	LMP	Okay. I think - Okay. We are leaving the

		window; that gives you an idea how bad our window is.
02 23 48 34	CC	Roger. This picture now is much better; I guess the light levels are decreasing now.
02 23 48 42	LMP	Okay. We are coming up on the crater Collins.
02 23 48 45	CC	Roger. What crater is that just going off.
02 23 48 52	LMP	That's some small impact crater.
02 23 48 56	CC	Roger.
02 23 48 57	LMP	We will call it John Aaron's.
02 23 48 59	CC	Okay.
02 23 49 04	LMP	If he'll keep looking at the systems anyway.
02 23 49 06	CC	He just quit looking.
02 23 49 19	CMP	Jerry, another ID feature: these small impact craters have dark spots in the center where it appears that they buried in it and hit some new material down below and scattered a lot of fine white dust around them.
02 23 49 32	CC	Roger. Understand, Jim.
02 23 49 39	CC	Apollo 8. This is Houston. Looks like we could see Collins now.
02 23 49 48	LMP	Roger. There is Collins for you.
02 23 49 52	CMP	And Collins is right on the edge of Smythe's Sea which we are about to pass over.
02 23 49 57	CC	Roger.
02 23 50 24	CC	Apollo 8. This is --
02 23 50 26	LMP	We are now going across the Smythe Sea. Go ahead.

02 23 50 31	CC	Roger. We just saw a Stellenword go by.
02 23 50 39	LMP	Roger. He was really in a hurry.
02 23 50 45	CC	Roger. Picture is much improved now; getting better all the time.
02 23 50 51	LMP	Roger. The terrain here is, as you can see, not well defined. We are going to start a roll to the left, in order to come across the target area, with the television --
02 23 51 15	CC	Roger.
02 23 51 16	LMP	-- landing site area.
02 23 51 18	CC	Roger, Bill.
02 23 51 38	LMP	How is that crater in - right in the middle look now?
02 23 51 41	CC	Roger. That's a very good one; that must be O'Neal.
02 23 51 49	LMP	Roger.
02 23 52 09	CC	Roger, Bill. We see O'Neal real well, also the smaller crater off to the side of it.
02 23 52 19	LMP	That's Dennis.
02 23 52 21	CC	Roger.
02 23 52 38	CDR	Houston, this is Apollo 8. We are going to terminate our program for this pass and get on with the preparations for LOI 2, if you say we are GO.
02 23 52 49	CC	Apollo 8, this is Houston. Roger.
02 23 52 55	CDR	Okay. Signing off until ninth rev. Apollo 8.

Who's O'Neal?

02 23 53 00	CC	Apollo 8, Houston. Roger.
02 23 53 07	CC	Apollo 8, Houston. Thank you for the look.
02 23 53 12	CDR	Roger.
02 23 55 02	CC	Apollo 8, this is Houston. You have the DSE.
02 23 55 08	CDR	Thank you, Houston.
02 23 55 10	CC	Roger. Apollo 8, on your backside data, it's pretty much unintelligible. We suggest, Bill, that you recheck the position of your mike for your backside pass and try to speak a little bit louder and more distinctly. The last one we listened to was pretty much unintelligible. Over.
02 23 55 34	LMP	Roger. As soon as we get squared away, we will give you a real quick real time summary.
02 23 55 39	CC	Roger.
02 23 55 56	LMP	And, Houston, you might let us know, can we do the red/blue filter exercise with both these filters - red filters on? Over.
02 23 56 06	CC	Stand by.
02 23 56 10	CC	Apollo 8, this is Houston. Apollo 8, Houston. Negative.
02 23 56 33	CC	Apollo 8, this is Houston with an LOI 2 maneuver PAD. Ready to copy?
02 23 56 41	CDR	Stand by.
02 23 56 42	CC	Houston. Standing by.
02 23 57 06	CDR	Okay, Houston. Go ahead.

02 23 57 09	CC	Apollo 8, this is Houston. LOI 2, SPS/G&N: 46427, minus 053, plus 141 07335 0570 minus 01350, plus all zeros, plus all zeros. Copy?
02 23 58 03	LMP	Roger.
02 23 58 06	CC	Roger. 000 175 358 00607, plus 00606, 01350 009 01265 02 3112 197. Copy?
02 23 59 00	LMP	Roger.
02 23 59 05	CC	Roger. Taurus, Aida; I repeat, Taurus Aida. Up 162, left 01, the remainder not applicable. GDC align Sirius, Rigel 129, 155, 010, negative ullage, horizon window ignition minus 3 27 degrees, horizon left. At ignition, 18 degrees, horizon left; before readback, configure for receiving any update. Over.
03 00 00 16	CDR	Roger. Understand. Configure for receiving an update.
03 00 00 26	CDR	Okay. We're in POO and ACCEPT. Go ahead.
03 00 00 30	CC	Roger. I'm ready for your readback.
03 00 00 35	CDR	LOI 2, SPS/G&N: 46427, minus 053, plus 141 073 35 0570, minus 01350, plus 0000, plus 0000 000 175 358 00607, plus 00606 01350 009 01265 02 3112 197; Taurus, Aida, up 16.2, left 0.1, fixed read not applicable; Sirius, Rigel 129 155 010, no ullage, ignition minus 3 27 degrees, ignition 18 degrees.
03 00 01 51	CC	Apollo 8, Houston. Roger. Readback is correct.

03 00 02 12	CC	Apollo 8, this is Houston. Your map update for REV 2/3, no change. Over.
03 00 02 22	CDR	Understand. No change, REV 2/3.
03 00 02 25	CC	Roger, Frank. You can expect GO/NO-GO for the next rev at 20 minutes before LOS. Over.
03 00 02 37	CDR	Roger.
03 00 02 45	CC	Apollo 8, this is Houston. We'll try to make that call 20 minutes before every LOS. Over.
03 00 02 54	CDR	Fine.
03 00 03 20	CC	Apollo 8, Houston. We have the CSM vector in starting on the LV. Over.
03 00 03 27	CDR	Thank you.
03 00 03 36	CMP	Houston, this is Apollo 8.
03 00 03 40	CC	Apollo 8, Houston. Go.
03 00 03 44	CMP	Roger. Just an interesting feature: on my center window which has ice on it, it is now beginning to melt. I'm beginning to see through it.
03 00 03 53	CC	Roger. That's good news.
03 00 03 59	CMP	And again we're directly over our favorites, Messier and Pickering.
03 00 04 23	CMP	The view at this altitude, Houston, is tremendous. There is no trouble picking out features that we learned on the map.
03 00 04 33	CC	Roger. Jim, that's good news. What do you think of the lighting situation as far as the range of lighting for good visibility?

03 00 04 46	CMP	The range from here is outstanding. I wish we had the TV still going because the brown area now is darker. We have just passed over the Sea of Fertility, and the mare is darker. The mountain range has got more contrast, has more contrast because of the sun angle. Bill's got the 16 mm going for us.
03 00 05 10	CC	Roger.
03 00 05 13	CMP	There is a crater Taruntius, I believe, over there.
03 00 05 27	CMP	We will try to get TV on this at a later time, when we are not getting ready for a burn.
03 00 05 32	CC	Roger, Jim.
03 00 05 40	CMP	I can see the old second bishop right now, Mount Marilyn.
03 00 05 47	CC	Roger.
03 00 06 18	CMP	Houston, at these sun angles, everything is quite distinct; shadows are good; the ground doesn't have any sunlight returned. It appears very good visibility at these sun angles.
03 00 06 30	CC	Roger.
03 00 07 02	CMP	As a matter of fact, Bill just mentioned that the visibility seems to be excellent just about up to the terminator. It's something which I didn't expect. I thought there would be a little bit more gradual shift to darkness, but it's very sharp and distinct.

03 00 07 15	CC	Roger, Jim.
03 00 07 19	LMP	Of course, we are in a very high phase angle now.
03 00 07 24	CC	Apollo 8, Houston. All of your updates are in; the computer is yours. Over.
03 00 07 32	CDR	Thank you.
03 00 07 41	CC	The update block.
03 00 07 44	CC	Roger. Break. Apollo 8, Houston. Your TEI 2 PAD is good; stand by to copy your TEI 3. Over.
03 00 08 05	CDR	Ready for TEI 3.
03 00 08 08	CC	Roger. TEI 3. SPS/G&N 46427, minus 053, plus 141 07531 2995, plus 28960, minus 00456, plus 00720. Copy?
03 00 09 06	CDR	Roger.
03 00 09 08	CC	Roger. 180 021 002, not applicable, plus 00188 28972 251 28793 40 2769 396. Copy?
03 00 09 58	CDR	Roger.
03 00 10 00	CC	Roger. 033 0000, left 17, plus 0883, minus 16500 12955 36185 146 3507; Sirius, Rigel 129, 155 010, ullage two jets, 20 seconds, quads Bravo and Delta. Horizon on the 2-degree line at ignition minus 3 minutes, assumes no LOI 2. Over.
03 00 11 29	CDR	Roger. SPS/G&N - this is for TEI 3 - 46427, minus 053, plus 141 07531 2995, plus 28960, minus 00456, plus 00720 180 021 002, NA, plus

00188 28972 251 28793 40 2769 396 033 0000, left 17, plus 00883, minus 16500 12955 36185 146 3507; Sirius, Rigel 129, 155, 01, two jet, 20 seconds, B and D, horizon 2 degrees at ignition minus 3 minutes, assumes no LOI 2.

03 00 12 51	CC	Apollo 8, Houston. Readback is correct.
03 00 13 13	CC	Apollo 8, this is Houston with a TEI 3 - with an LOI 2. Over.
03 00 13 31	CDR	Go ahead.
03 00 13 33	CC	Roger. TEI 3: SPS/G&N 45810, minus 053, plus 141 07521 2846, plus 30128, minus 00540, plus 01911 180 019 001. Copy?
03 00 14 46	CDR	Roger. Go ahead.
03 00 14 48	CC	Roger. Not applicable, plus 00188 30193 255 30008 40 2742 396 033, down 021, left 18. Copy?
03 00 15 42	CDR	Roger.
03 00 15 44	CC	Roger. Plus 0888, minus 16500 12955 36185 146 34 50 GDC, align no change, ullage no change, horizon 1 degree at ignition minus three. Assumes LOI 2. Over.
03 00 16 45	CDR	Go ahead - or Houston, this is Apollo 8. TEI 3 with LOI 2. SPS/G&N 45810, minus 053, plus 141 07521 2846, plus 30128, minus 00540, plus 01911 180 019 001, NA plus 00188 30193 255 30008 40 2742 396 033, down 021, left 18, plus 0888, minus 16500 12955 36185 146 3450;

no change, no change 1 degree in the rise of ignition minus three, assumes LOI 2.

03 00 18 04	CC	Apollo 8, Houston. Roger. I made one mistake; horizon window is minus 1 degree. Over.
03 00 18 16	CDR	Minus 1 degree.
03 00 18 18	CC	Roger. Readback is correct.
03 00 18 36	CC	Apollo 8, this is Houston. You are GO across the board for LOI 2. Would like to take the DSE for a dump. Over.
03 00 18 47	CDR	Roger. You got it. I understand we are GO for LOI 2.
03 00 18 51	CC	That's affirmative.
03 00 18 52	LMP	Before you take the DSE for a dump, let me give you a quick - let me give you a quick rundown on the DSE before you dump it, if you will.
03 00 19 01	CC	Roger. Standing by.
03 00 19 06	LMP	Roger.
03 00 21 02	LMP	Okay, Houston. You've got the tape.
03 00 21 06	CC	Apollo 8, Houston. Roger.
03 00 21 52	CC	Apollo 8, Houston. Would you believe that Taurus, Aida is Pleaides? Over.
03 00 22 01	CMP	Thank you.
03 00 27 15	LMP	Have you got that tape dumped, Houston? We're about to lose the high gainer.
03 00 27 32	CC	Apollo 8, Houston. We're dumping now - looks like we'll be 5 or 10 more minutes.

03 00 27 42	LMP	Okay. Try to get it dumped, and I'll play it, rewind it if necessary -
03 00 27 47	CC	Roger. Copy.
03 00 28 55	LMP	We are about to lose it, Houston. How far are you on the tape dump?
03 00 29 01	CC	Apollo 8, this is Houston. It looks like we have lost it. They weren't quite done. We are standing by for a countdown to BIOMED switch left. Over.
03 00 29 12	CDR	Roger.
03 00 29 14	CMP	Look, we would like to get it dumped if we could. Standby a second.
03 00 29 18	CC	Okay.
03 00 29 19	CDR	Did you get it stopped?
03 00 29 30	CC	Bill, you can go ahead and turn it off.
03 00 29 54	LMP	Okay. We are not going to have a high gain now until the next time around. Can you give me some idea of how much of that pass you got.
03 00 30 04	CC	Apollo 8, this is Houston. We - negative. We can't tell. You can go ahead and turn it off.
03 00 30 12	LMP	Well, how long did you - did you dump it?
03 00 30 15	CC	Roger. Stand by; they are checking.
03 00 31 09	CC	Apollo 8, Houston.
03 00 31 21	LMP	Go ahead Houston.
03 00 31 23	CC	Apollo 8, this is Houston reading you with a great deal of noise in the background. Go

		ahead and rewind your tape and start it in low bit rate, and we will try to catch that dump at the end of the next rev.
03 00 31 46	LMP	Roger. I would like to have an idea on how much you dumped. So I know whether ... all these things or whether we have better setting in.
03 00 31 56	CC	Roger. Stand by.
03 00 32 29	CC	Apollo 8, Houston. We are working on that time. We should be able to tell you before LOS. Over.
03 00 32 47	CC	Apollo 8, Houston. Over.
03 00 32 53	LMP	Go ahead.
03 00 32 54	CC	Roger. Did you read my last?
03 00 32 59	LMP	That is affirmative. You will give us a rundown when you figure out how much tape you dumped.
03 00 33 03	CC	Roger. They feel reasonably sure, however, that if you rewind and start low bit rate, we'll be able to get all of the burn and still not run into what needs to be down linked yet.
03 00 35 32	CDR	Houston, Apollo 8.
03 00 35 33	CC	Apollo 8, Houston. Go.
03 00 35 34	CDR	Roger. What REFSMMAT are we using for this LOI 2 burn?
03 00 36 11	CC	Stand by, Frank. We're talking.

03 00 36 17	CDR	Okay. I notice an LOI 2 REFSMMAT. If it is, I don't understand why the pitch is 175.
03 00 38 12	CC	Apollo 8, Houston.
03 00 38 17	CDR	Go ahead.
03 00 38 18	CC	Apollo 8, this is Houston. You are right; the REFSMMAT is LOI 2. The REFSMMAT was determined out there before the last midcourse correction, and since that time, there has been a slight change of trajectory, and the point at which you are burning LOI 2 now is just a shade different than where it was originally planned. Over.
03 00 38 42	CDR	Okay. Thank you.
03 00 41 43	CC	Apollo 8, Houston.
03 00 41 51	CC	Apollo 8, Houston. Over.
03 00 42 12	CC	Apollo 8, Houston. Over.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

03 00 43 27	CC	Apollo 8, Houston. Over.
03 00 43 45	CC	Apollo 8, Houston. Over.
03 00 44 10	CC	Apollo 8, Houston. Over.
03 00 44 35	CC	Apollo 8, Houston. Over.
03 00 45 12	CC	Apollo 8, Houston. Over.
03 00 45 26	CC	Apollo 8, Houston. Over.
03 00 45 33	CDR	Roger. Go ahead, Houston. Apollo 8.
03 00 45 35	CC	Apollo 8, this is Houston. DSE is rewound, and it's yours - available for use is about 1 hour of low bit rate and 2 minutes of high bit rate for your burn, without running over your good data. Over.
03 00 45 52	CDR	Roger. Do you read us now, Houstor?
03 00 45 55	CC	Roger. Reading you loud and clear now.
03 00 46 00	CDR	Okay.
03 00 46 16	CC	Apollo 8, this is Houston. You are GO for LOI 2 on the next rev. Over.
03 00 46 23	CDR	I can understand GO for LOI 2 on the next rev.
03 00 46 31	CDR	How do you read, Houston?
03 00 46 33	CC	Apollo 8, this is Houston. Reading you loud and clear. How me?
03 00 46 40	CDR	Loud and clear.
03 00 46 41	CC	Roger. Frank, did you get my message on the DSE?
03 00 46 47	CDR	Roger. Roger.
03 00 46 49	CC	Okay.
03 00 50 15	CC	Apollo 8, Houston. Verify the TELEMETRY INPUT switch LOW. Over.

03 00 50 23	CDR	Roger. Understand; TELEMETRY INPUT LOW.
03 00 50 26	CC	Affirmative.
02 00 50 27	CDR	Going to LOW; it was in HIGH.
02 00 50 28	CC	Roger.
03 00 59 37	CC	Apollo 8, Houston. Five minutes to LOS. Over.
03 00 59 44	CDR	Thank you, Houston.
03 01 03 30	CC	Apollo 8, this is Houston. One minute to LOS; all systems GO. Over.
03 01 03 40	CDR	Apollo 8. Roger.
03 01 04 25	CC	So long.
03 01 04 30	CDR	Adios. See you.
03 01 31 XX		BEGIN LUNAR REV 3
03 01 49 25	CC	Apollo 8, Houston. Over.
03 01 49 40	CC	Apollo 8, Houston. Over.
03 01 50 17	CC	Apollo 8, Houston. Over.
03 01 50 27	LMP	Houston, Apollo 8. Over.
03 01 50 28	CC	Apollo 8, Houston. Loud and clear. How me?
03 01 50 40	LMP	Houston, Apollo 8. Over.
03 01 50 42	CC	Apollo 8, Houston. Loud and clear. How me?
03 01 50 49	LMP	Roger. Reading you loud and clear and ready for the burn status report.
03 01 50 53	CC	Roger. Ready to copy.
03 01 50 56	CDR	Roger. The burn was on time, 11 seconds, 0.2 with a VG_X, 1.8 VG_Y; that's minus 1 ^{p}, minus 0.2 VG_Z. DELTA-V_C was minus 9.4; VERB 82 gives us an apogee 62 and a perigee of 60.8.

03 01 51 42	CC	Apollo 8, this is Houston. Roger. Your burn was on time, 11 seconds; VG_X was plus 0.2, VG_Y was minus 1.8, VG_Z minus 0.2, DELTA-V_C minus 9.4, apogee 62, perigee 60.8. Over.
03 01 52 16	CDR	Roger.
03 01 59 06	LMP	Houston, how do you read? This is Apollo 8.
03 01 59 09	CC	Apollo 8, Houston. Weak but clear.
03 01 59 15	LMP	You are loud and clear.
03 02 00 49	CDR	Houston, Apollo 8. We're on high gain now if you want to get the high-speed data to look at that burn.
03 02 00 56	CC	Apollo 8, this is Houston. Roger.
03 02 01 04	CC	Apollo 8, this is Houston. We are taking the DSE.
03 02 01 11	CDR	Thank you. Can you hold it for about 5 seconds - or about 1 minute?
03 02 01 17	CC	Roger. Holding.
03 02 01 30	CDR	Okay. Okay. You can dump the data now.
03 02 01 42	CC	Apollo 8, Houston. Roger. We are taking the DSE for dump.
03 02 01 55	CDR	Thank you. We have - updated the LM state vector with the VERB 66, Houston.
03 02 02 01	CC	Houston. Roger.
03 02 11 38	CC	Apollo 8, this is Houston. Over.
03 02 11 42	CDR	Hello, Michael.
03 02 11 44	CC	Hey, good morning, Frank. We've been tracking you for about 18 minutes now, and we show your orbit 61 by 61-1/2. Over.

03 02 11 54	CDR	Thank you.
03 02 12 02	CC	Apollo 8, Houston. Your SPS engine looked good on LOI number 2 burn.
03 02 12 11	CDR	Thank you.
03 02 16 24	CC	Apollo 8, Houston.
03 02 16 29	CDR	Go ahead.
03 02 16 30	CC	Bill has got the tape recorder now; we are evaluating the dump. The data is good, and we are evaluating the voice quality here shortly.
03 02 16 41	CDR	Thank you.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

— — — —	CC	Apollo 8, this is Houston. Over.
— — — —	CDR	Go ahead, Houston. Apollo 8.
— — — —	CC	I've got a few jolly updates for you when you are ready to copy.
— — — —	CDR	Stand by.
03 02 21 33	CDR	Go ahead, Houston, with your updates.
03 02 21 36	CC	Roger. Apollo 8, Houston. I have a TEI 3, TEI 4, and map update for REV 3 and 4 to read to you. Actually the TEI 3 update which you have on board is still valid, but we will not update that one. Which do you want first, the TEI 4 or the map update?
03 02 22 03	CDR	TEI 4.
03 02 22 05	CC	Alright. This is the TEI 4 update: SPS/G&N 45695, minus 053, plus 141. Are you with me so far? Over.
03 02 22 34	CDR	So far.
03 02 22 36	CC	Very good. 07721 2758, plus 30627, minus 00625, plus 00577 180 018 001, not applicable, plus 00188 30639 256 30452. Are you with me so far? Over.
03 02 23 50	CDR	So far seems ... hold it a minute though, will you?
03 02 24 11	CDR	Okay. Go ahead.
03 02 24 13	CC	Okay. The last number I gave was DELTA-V_C. Picking up at the sextant star: 40 2730 396 033, down 030, left 19. Are you with me? Over.

03 02 24 52	CDR	Roger.
03 02 24 53	CC	Okay. Plus 0858, minus 16500 12960 36195 146 3721; comments: north set of stars Sirius and Rigel, roll 129, pitch 155, yaw 010, ullage two quad, 20 seconds, two-zero seconds from quads Bravo and Delta; horizon on 2-degree line at time of ignition minus 3 minutes. Over.
03 02 26 15	CDR	Roger, Houston. We got a TEI 4 SPS/G&N 45695, minus 053 plus 141 07721 2758, plus 30627, minus 00625, plus 00577 180 018 001, NA, plus 00188 30639 256 30452 40 2730 396 033, down 030, left 19, plus 0858, minus 16500, plus 12960, plus 36195 146 3721; Sirius, Rigel, 129 155 010, two quads, 20 seconds B and D, horizon 2 degrees at TIG minus 3.
03 02 27 26	CC	That's about the size of it, Frank, and a map update for REV's 3/4 when you are ready.
03 02 27 38	CDR	Ready.
03 02 27 40	CC	REV's 3/4: LOS 75:01:23, sunrise 75:10:16, prime meridian 75:17:16, AOS 75:47:18, sunset 76:23:11; remarks: subsolar point 75:46:55, IP-1 acquisition 76:11:17, IP-2 acquisition 76:12:30. For IP-1 and 2, those ACQ times are for shaft and trunnion angles equals zero. Over.
03 02 28 53	CDR	Roger. Thank you. 750123 751016 751716 754718 762311, subsolar 754655, IP-1 761117, IP-2 761230, and at shaft and trunnion at 0.

03 02 29 16	CC	That's affirmative, Frank.
03 02 32 53	CC	Apollo 8, Houston.
03 02 32 57	CDR	Go ahead, Houston.
03 02 32 58	CC	Roger. When Bill gets a minute, we'd like to get battery B started charging. Over.
03 02 33 07	CDR	Roger. Thank you. He'll take a minute right now.
03 02 36 01	CC	Apollo 8, Houston.
03 02 36 07	CDR	Go.
03 02 36 08	CC	Roger. For Bill - the voice quality on the backside DSE is extremely poor. We consider it unusable, and we recommend that all pertinent comments be hand recorded so we don't lose them. We should not count on using the tape at low bit rate for voice.
03 02 36 32	LMP	Okay, Houston. We're getting so busy that we are having a hard time trying to do a neat job of logging. I'll try to do it on the flight plan; and if I make any visual observations, we'll put them on the DSE, and I'll try to scribble some notes here and there.
03 02 36 49	CC	Roger. Understand. Now high bit rate is working great.
03 02 36 59	LMP	Roger.
03 02 38 27	CDR	Hey, Houston, Apollo 8.
03 02 38 30	CC	Apollo 8, Houston. Over.
03 02 38 35	CDR	How about giving us the TV times for the ninth REV, will you please?

03 02 38 38	CC	Yes, we sure will, Frank. Stand by.
03 02 40 36	CC	Apollo 8, Houston.
03 02 40 40	CDR	Go ahead.
03 02 40 42	CC	Roger. We were checking into precise start and stop times for TV, and you are GO for the next REV. Over.
03 02 40 51	CDR	I understand; go for the next REV. Mike, we'd like to, if we could, time the TV to a passing over the terminator. We would like to track the terminator with the TV; think that's the most impressive thing we've seen, and that might be the best thing rather than trying to acquire the earth.
03 02 41 07	CC	Okay, Frank. That's one of the things we are looking at right now. We have you ending at about 86 hours, and we're looking at extending that few minutes to include that terminator view. Over.
03 02 41 23	CDR	Okay. I don't want us to run into REV 10 very much at all, though.
03 02 41 28	CC	Roger. Understand.
03 02 41 30	LMP	Houston, Apollo 8.
03 02 41 31	CC	Go ahead, Apollo 8.
03 02 41 36	CC	Apollo 8, Houston.
03 02 41 37	LMP	... since the DSE qual is not so good. How do you read, Mike?
03 02 41 43	CC	I read you loud and clear. You were cut out about the DSE. Say again.

03 02 41 50	LMP	Roger. Since the qual isn't so good, let me give you a quick rundown of the status of photo targets. You ready to copy?
03 02 41 59	CC	Ready to copy.
03 02 42 05	LMP	Okay. At REV 1, we got photo target 90 and terminator photography south for near-side terminator. Starting on REV 2, we've got target 12 and targets 10, 14, 16, 19, 20, 21, and 23. Unfortunately, we got into a high - I got into the high-speed film there somewhere, and I think those 250mm targets were on high speed. We did change film, and starting out in Tex - Crater, Texas, with target 28, 31, 40, 36, plus several targets of opportunity that were recorded on the DSE, but apparently lost. Have you been able to copy?
03 02 43 13	CC	Yes, I'm with you, Bill. Keep going.
03 02 43 18	LMP	Okay. I might be calling up too fast. Okay. On the third REV, we got target 58 and 63 and 65. The training photography was accomplished, and it was done on magazine D, which now has - correction, that's magazine E - which now shows 95 exposures. Magazine D is fresh. Magazine K was also used for training photography, and it's showing 0.51.
03 02 44 22	CC	Roger. We copy all that, Bill.
03 02 44 36	CC	Apollo 8, Houston.
03 02 44 37	CDR	... Mike, this is Frank again.

03 02 44 38	CC	Go ahead, Frank.
03 02 44 40	CDR	Go ahead.
03 02 44 41	CC	Roger for Bill.
03 02 44 42	CDR	... around.
03 02 44 46	CC	Apollo 8, Houston standing by.
03 02 44 51	CDR	I said is Rod Rose around?
03 02 44 54	CC	Stand by one, Frank; we'll look for him, and while we're doing that, for Bill the DSE voice quality on high bit rate is very good, so if he wants to use the DSE in high bit rate for a limited amount of time to record important things, we suggest that he do that. We would like him to wait 20 seconds after turning it on prior to talking. Over.
03 02 45 28	LMP	Roger. Copy.
03 02 45 30	CC	Thank you, Bill.
03 02 45 38	CC	Apollo 8, Houston.
03 02 45 43	CDR	Go ahead.
03 02 45 44	CC	Rod Rose is sitting up in the viewing room; he can hear what you say.
03 02 45 50	CDR	I wonder if he is ready for experiment P1?
03 02 45 56	CC	He says thumbs up on P1.
03 02 46 04	LMP	Houston, with reference to the DSE on high bit rate, what I would like to do this is - if you got the last pass - I'd like to play it - run it back and start at AOS on low bit rate and then go to high when we need it. How would that be?

03 02 46 27	CC	John Aaron buys it.
03 02 46 32	CDR	Okay, Mike. This is Frank again.
03 02 46 36	CC	Go.
03 02 46 40	CDR	Roger. Rod and I got together, and I was going to record a little - say a little prayer for our church service tonight. And I wonder - I guess that's what we are ready on?
03 02 46 56	CC	Stand by one, Frank.
03 02 47 00	CDR	Alright.
03 02 49 41	CDR	Houston, Apollo 8. Are you still there?
03 02 49 43	CC	You're still loud and clear, Frank.
03 02 50 01	CC	Apollo 8, Houston. Go ahead, Frank, with your message.
03 02 50 07	CDR	Okay. This is to Rod Rose and the people at St. Christopher's, actually to people everywhere. Give us, O God, the vision which can see thy love in the world, in spite of human failure. Give us the faith to trust the goodness in spite of our ignorance and weakness. Give us the knowledge that we may continue to pray with understanding hearts, and show us what each one of us can do to set forth the coming of the day of universal PEACE. Amen.
03 02 50 35	CC	Amen.
03 02 50 36	CDR	I was supposed to lay-read tonight, and I couldn't quite make it.

03 02 50 42	CC	Roger. I think they understand.
03 02 51 57	CDR	Houston, how do you read? Apollo 8.
03 02 52 02	CC	Apollo 8, Houston. Over.
03 02 52 07	CDR	Roger. Go ahead.
03 02 52 09	CC	Roger. Frank, we'd like to know about the water chlorination. Have you - when was the last time you chlorinated the water? Over.
03 02 52 16	CDR	About an hour and a half ago; we've already done it.
03 02 52 22	CC	Roger. We copy you an hour and a half ago. Affirmative?
03 02 52 28	CDR	Roger. You know we wouldn't forget that.
03 02 52 36	CC	Roger.
03 02 52 40	CDR	Jim spilled a little, and it smelled like a bucket of Clorox about an hour ago.
03 02 52 51	CC	Apollo 8, Houston. Say again.
03 02 52 57	CDR	I said Jim indavertently spilled some of that chlorine, and it smelled like a bucket of Clorox in here for a little while.
03 02 53 06	CC	Roger. Understand.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

03 02 58 40	CC	Apollo 8, Houston. Over.
03 02 58 50	CDR	Go ahead, Houston. Apollo 8.
03 02 58 52	CC	Roger. We have two and a half minutes to LOS, and all systems are looking good. Everything is looking just fine down here, Frank.
03 02 59 02	CDR	Thank you.
03 02 59 06	CC	We'll have some more information on the TV on the next rev. We're not planning any big change in the time, just to extend them a little bit, I think, closer to the terminator.
03 02 59 21	CDR	Just give us the time, will you, because we just want to know when it is. I'd like to get the terminator if we could, and we've got a little message, and that's it.
03 02 59 29	CC	Roger. We'll do that the next time you come around.
03 02 59 32	CDR	Thank you. Okay. And have the EECOM guys keep a sharp watch on our systems. Old Anders is so busy fooling around with these pictures that - not much else is getting done.
03 02 59 47	CC	Roger. The EECOM is doing that.
03 03 30 XX		BEGIN LUNAR REV 4
03 03 49 30	CC	Apollo 8, this is Houston. Over.
03 03 50 08	CC	Apollo 8, this is Houston. Over.
03 03 50 26	CC	Apollo 8, this is Houston. Over.
03 03 50 33	CDR	Go ahead, Houston. Apollo 8 here.

03 03 50 36	CC	Roger. We have been having a little antenna problem on the ground here. We are reading you now with a lot of noise in the background. How me?
03 03 50 46	CDR	Loud and clear, Michael.
03 03 50 59	CC	Roger. Frank, we are still trying to get a little bit better COMM here. Stand by; you're unreadable.
03 03 52 26	CC	Apollo 8, this is Houston. Over.
03 03 52 30	CDR	Loud and clear, Houston. Apollo 8.
03 03 52 32	CC	I understand you are reading us loud and clear; we are barely reading you. Would you go to P00 in ACCEPT, please? We are going to send you a P27 update.
03 03 52 45	CDR	Roger. Going to P00 and to ACCEPT, Houston.
03 03 53 47	CDR	We are in P00 and ACCEPT.
03 03 53 51	CC	Apollo 8, Houston. You are not readable. We are going to delay the P27 until we get a little bit better lock on you.
03 03 54 11	CC	As long as you're reading me okay, Frank, I'll bring you up to date on a couple of things. The P27 which we will be sending you is a state vector update going to the LM slot, and we'd like to - as per plan - to transfer that to the CSM slot by a VERB 47 ENTER, and we would like to just remind you that prior to doing your VERB 47 ENTER manually select P00 and wait for the computer activity light to go out. Did you copy? Over.

03 03 54 49	CDR	Roger. Roger. We copy.
03 03 54 57	CC	Okay, Frank. Are you still reading me loud and clear? Over.
03 03 55 03	CDR	Roger. Loud and clear.
03 03 55 05	CC	Alright. I'll go ahead with a map update when you're ready to copy.
03 03 55 17	CDR	Okay. Can you hold off a minute?
03 03 56 17	CC	Apollo 8, this is Houston. How are you reading now?
03 03 56 34	CDR	Go ahead, Houston. This is Apollo 8.
03 03 57 04	CC	Apollo 8, this is Houston with a map update. Are you ready to copy?
03 03 57 12	CDR	Just a minute, Mike.
03 03 57 20	CC	Roger. Apollo 8, Houston. Your map update for REV 455: LOS 76:59:59, sunrise 77:09:06, prime meridian 77:15:47, AOS 77:45:50, sunset 78:22:03; IP-1 position time for control point 2, 77:29:42; IP-1 time closest approach for target B1, 78:10:25. Over.
03 03 58 23	CDR	We'll have to get that data later on.
03 03 58 31	CC	We'll try it again later, Frank.
03 03 58 38	CDR	Thank you.
03 04 03 14	CC	Apollo 8, this is Houston. Over.
03 04 03 23	LMP	Do you want to take this NAV sighting?
03 04 06 12	CC	Apollo 8, this is Houston. Over.
03 04 06 17	LMP	Roger, Houston. How do you read?

03 04 06 19	CC	Reading you a lot better, Bill. How are you reading me?
03 04 06 25	LMP	I'm reading you five - loud and clear, and you copying our low bit data to record these tracking passes? Over.
03 04 06 35	CC	That is affirmative. We are getting low bit data now.
03 04 06 41	LMP	Okay. I've played - run the tape recorder back to the beginning. We have quite a bit of high bit, so all you'll have to do is start recording when you are ready.
03 04 06 55	CC	Roger. Stand by one, Bill.
03 04 07 27	CC	Apollo 8, Houston. Stand by one on the tape recorder dump. We would like you to look at your steam pressure. We think that the primary evaporator may have dried out, and if the steam pressure shows off-scale low, would you please close the back pressure valve and reservice the evaporator? Over.
03 04 07 50	CDR	Roger.
03 04 08 49	CC	Apollo 8, Houston. We are ready to send you the P27 LM state vector update when you are ready. Over.
03 04 08 58	CDR	You will have to wait until this tracking exercise is over with, Mike.
03 04 09 02	CC	Roger. Thank you.

03 04 18 09	LMP	Apollo 8.
03 04 18 14	CC	Apollo 8, this is Houston. Were you calling? Over.
03 04 18 19	LMP	Roger. You can go ahead now and give you computer and get the updates, and let's get going on the PAD messages.
03 04 18 26	CC	Roger.
03 04 18 36	LMP	It is in POO and ACCEPT.
03 04 18 44	LMP	Okay, Houston. Are you ready to talk about the water boiler problem?
03 04 18 49	CC	Roger. We copy you in POO and ACCEPT, and we are sending you a P27 lens state vector. On the water boiler, it looks to us like the evaporator has been reserviced. How does it look to you? Over.
03 04 19 06	LMP	Roger. I reserviced it, put it to AUTO - H_2O flow to AUTO; and the steam pressure went to zero again. So I tried reservicing it the second time for 1 minute, and again no results. I'm in the present process of closing the back pressure valve manually. Over.
03 04 19 25	CC	Roger. Understand you tried to reservice it twice, both times steam pressure has gone to zero, and now you are closing the back pressure valve manually.
03 04 19 36	LMP	Roger. Each time I have reserviced it, the steam pressure came up to about 0.07 to 0.1; but as soon

		as the steam and water were put to AUTO, the steam pressure went right back down again.
03 04 20 01	CC	Roger. We copy, and we are reading you loud and clear now, Bill. On your map update, did you copy that that I gave you previously?
03 04 20 13	CMP	Negative. We have not copied it yet.
03 04 20 14	LMP	Negative.
03 04 20 17	CC	Okay. I have it for you again when you are ready to copy.
03 04 20 24	CMP	Ready to copy.
03 04 20 26	CC	This is a map update for REV's 4/5: LOS 76:59:59, sunrise 77:09:06, prime meridian 77:15:47, AOS 77:45:50, sunset 78:22:03; remarks: IP-1, acquisition time for CP2 is 77:29:42, IP-1 time closest approach for target B1 78:10:25. Over.
03 04 21 27	CDR	Roger. LOS 76:59:59, sunrise 77:09:06, 77:45:47, 77:45:50, 78:22:03; IP-1, CP2 77:29:42, IP-1 TCA for B1 78:10:25.
03 04 21 52	CC	That's right, and the prime meridian time is 77:15:47, and you got your computer back. We've got a good P27 update.
03 04 22 04	CDR	Okay. We will go to POO and TRANSFER.
03 04 22 07	CC	Roger.
03 04 22 45	CDR	Houston, do you have a TEI 5 for us?
03 04 22 48	CC	We are working on it now, Frank. Have it for you momentarily.

03 04 22 56	CDR	Roger.
03 04 23 27	CC	Apollo 8, Houston.
03 04 23 32	LMP	G6.
03 04 23 33	CC	Roger. On your back pressure valve, we would like to know how long after you closed the back pressure valve the firt time - how long it was from the time you closed it until the time you started the reservicing? We would like for you to wait about 15 minutes to prevent any ice from forming due to flash freezing. Over.
03 04 23 59	LMP	Okay. I started immediately to reservice it.
03 04 24 17	CC	Apollo 8, Houston. We show that you closed it this last time about 4 minutes ago, so we would like you to wait another 15 minutes and then try to reservice it again at that time and then go to AUTO. Over.
03 04 24 41	LMP	Roger.
03 04 24 43	CC	Roger. Thank you. The TEI 4 PAD which you have is still valid. We will have a TEI 5 PAD for you shortly.
03 04 24 55	LMP	Roger. Be advised we are presently in steam pressure MANUAL, and we're in H_2O flow AUTO, and are now in H_2O flow OFF, as of about 5 seconds ago.
03 04 25 15	CC	Roger. We copy that, Bill. And we confirm that's a good configuration.
03 04 25 28	LMP	Right now, I've got the H_2O flow OFF. Do we stay that way?

03 04 25 32	CC	Affirmative.
03 04 25 45	CC	Apollo 8, Houston. On your television update, we propose that you start the TV at the flight plan time of 85 hours 37 minutes and simply extend the stop time a few minutes. You're currently scheduled to stop at 86 hours, and we would like to keep it going until the terminator, which should be approximately 86:14. Over.
03 04 26 13	CDR	Roger.
03 04 26 27	CC	Frank, I know you are busy up there. We've got the daily news for you whenever and if ever you'd like to hear it.
03 04 26 38	CDR	I'll give you a call.
03 04 27 46	CC	Apollo 8, this is Houston.
03 04 27 51	CDR	Go ahead.
03 04 27 53	CC	I have the TEI 5 PAD for you whenever you are ready to copy.
03 04 28 05	CDR	Okay. Go ahead.
03 04 28 07	CC	Okay. TEI 5, SPS/G&N: 47 correction - 45701, minus 043, plus 116 07921 2603. Are you with me so far?
03 04 28 41	CDR	Roger.
03 04 28 43	CC	Plus 31171, minus 00767, minus 00214 180 017 001, not applicable, plus 00188 31181 259 31003. Are you with me? Over.
03 04 29 44	CDR	Roger.

END OF TAPE

03 04 29 47	CC	Roger. 40 2711 398 033, down 043, left 23, plus 0832 minus 16500 12956 36208 146 3944; north set of stars remain Sirius and Rigel; roll, pitch, and yaw remain same angles: 129 155 010, ullage remains two quads for 20 seconds, quads B and D; horizon on 4-degree line at TIG minus 3 minutes. Over.
03 04 31 14	CDR	Roger. Here we go: TEI 5, SPS/G&N 45701, minus 043, plus 116 07921 2603, plus 31171, minus 00767, minus 00214 180 017 001, NA, plus 00188 31181 259 31003 40 2711 398 033, down 043, left 23, plus 0832, minus 16500, plus 12956 36208 146 3944. Set stars are the same; ullage - we'd like - do you have any objection to using four quads for 15 seconds?
03 04 32 23	CC	No objection to four-quad ullage, Apollo 8.
03 04 32 28	CDR	Okay. We'd like to just go ahead and use four quads all times, unless we get a lot shorter on fuel than we are now.
03 04 32 34	CC	Understand.
03 04 32 39	CDR	And is that 15 seconds?
03 04 32 42	CC	Affirmative: 15 seconds, four quads.
03 04 32 49	CC	Apollo 8 - -
03 04 32 50	CDR	Thank you, and horizon is 4 degrees at minus - -
03 04 32 54	CC	That readback is correct, Frank, and we'd like to advise that the voice quality on that high bit rate is excellent. Over.

03 04 33 04	CDR	Thank you. Mike, it's four quads for 15 seconds. Is that right?
03 04 33 12	CC	That is affirmative, Apollo 8: four quads for 15 seconds.
03 04 33 18	CDR	Thank you.
03 04 33 45	CC	Apollo 8, Houston.
03 04 33 50	CDR	Go ahead, Houston. Apollo 8.
03 04 33 53	CC	Roger for Bill. He can go ahead and do his standard reservice on the water now. It's looking good.
03 04 36 05	CDR	Okay. You want us to reservice it now?
03 04 36 07	CC	That's affirmative, and upon completion, go back to AUTO.
03 04 36 19	LMP	Roger.
03 04 40 21	CC	Apollo 8, Houston.
03 04 40 27	CDR	Go ahead, Houston.
03 04 40 28	CC	Roger. We are still dumping your tapes. The voice quality on high bit is coming through superb, and you are GO for the next rev. And we would like to get a brief status report on your rest between 60 hours and LOI 1, just to fill in some information for us.
03 04 40 56	CDR	We only got a couple hours rest.
03 04 40 58	CC	Okay.
03 04 41 06	CDR	We're tired right now, but we will have to wait until TEI before we get back to the regular cycle.

03 04 41 12	CC	Alright. I suspect you're right.
03 04 41 17	LMP	Okay, Houston. The water boiler has been re-serviced, back pressure valve CLOSED for 1 minute, water ON for 2, and it's now steam pressure AUTO, H_2O flow AUTO.
03 04 41 30	CC	Roger. We copy, Bill.
03 04 41 56	LMP	If we have a problem, a similar problem, again on the back side in the sunlight, might be a good idea to crank the secondary loop until we have AOS. What do you think about that?
03 04 42 11	CC	Stand by one, Bill.
03 04 43 17	CC	Apollo 8, Houston.
03 04 43 23	CMP	Go ahead, Houston. Apollo 8.
03 04 43 25	CC	Roger, Jim. In regard to your evaporator, we feel that if you do have a similar problem next time on the back side in sunlight, check the evaporator outlet temperature, and if it gets above 60, we concur that it would be a good idea to bring up the secondary loop. Over.
03 04 43 47	CMP	Roger.
03 04 44 17	CC	Apollo 8, Houston. When we say bring up the secondary loop, we mean bring up the evaporator only on the secondary loop. Copy?
03 04 44 28	CDR	Roger.
03 04 44 29	CMP	Roger.

03 04 49 51	LMP	Houston, Apollo 8. We got time for a little news?
03 04 49 56	CC	Apollo 8, this is Houston. Over.
03 04 50 02	LMP	I say how about a little bit of that news you promised?
03 04 50 05	CC	Roger. We got the Interstellar Times here, the December 24 edition. Your TV program was a big success. It was viewed this morning by most of the nations of your neighboring planet, the earth. It was carried live all over Europe, including even Moscow and East Berlin, ~~also in Japan and~~ all of North and Central America and parts of South America. We don't know yet how extensive the coverage was in Africa. Are you copying me all right? Over.
03 04 50 38	CDR	You are loud and clear.
03 04 50 38	CC	Good. San Diego welcomed home today the Pueblo crew in a big ceremony. They had a pretty rough time of it in the Korean prison. Christmas cease-fire is in effect in Viet Nam, with only sporadic outbreaks of fighting. And if you haven't done your Christmas shopping by now, you better forget it.
03 04 51 02	LMP	Thank you.
03 04 51 04	CC	A couple of Oilers made the All-Star team, Webster and Farr.

03 04 51 14	LMP	Roger.
03 04 51 22	CC	And that's about all our news. How about your news?
03 04 51 28	CDR	Well, we'll be looking forward to a big burn here shortly.
03 04 51 34	CC	Roger.
03 04 51 39	CMP	Mike, I think I can say it without contradiction, it's been a mighty long dry spell up here.
03 04 51 48	CC	I guess you can say anything you like without contradiction.
03 04 51 56	CDR	When can we dump water, Houston?
03 04 52 00	CC	Say again, Frank.
03 04 52 04	CDR	When can we dump water?
03 04 52 06	CC	Stand by.
03 04 53 32	CC	Apollo 8, Houston.
03 04 53 38	CDR	Go, Houston.
03 04 53 39	CC	We will get you the number after a while on your water dump. It looks like the quantity isn't increasing very slightly, and we're considering not only the quantity in regard to the dump, but also its effects on the trajectory relative to TEI and so forth, but we will have a good answer for you shortly.
03 04 54 00	CDR	We are not just thinking about the waste water tank: we're thinking about some other kind of

water that has to get dumped out of the space- urine
craft, slightly used water. ?

03 04 54 11	CC	Roger. We understand.
03 04 56 30	CC	Apollo 8, Houston.
03 04 56 35	CDR	Go ahead.
03 04 56 36	CC	Roger. We have about three and a half minutes to LOS. We give you back the DSE under your control, and in regard to your water dump, we are tentatively predicting a waste water tank dump at about 80 hours GET and any other dumps are at your discretion, any time you would like to make them.
03 04 57 00	CDR	Thank you.
03 04 57 08	CC	People listening to the high bit rate down here say it's like sitting in your living room listening to good hi-fi.
03 04 57 21	CDR	Sounds like a good idea.
03 04 58 03	CC	Apollo 8, Houston. Coming up on 2 minutes to LOS. We got a good reservice on the primary evaporator, and everything is still looking very good down here.
03 04 58 16	CDR	Okay. Thank you.
03 04 59 12	CC	Apollo 8, Houston. One minute to LOS. Are you still reading us loud and clear?
03 04 59 18	CDR	Loud and clear. Loud and clear.

03 04 59 20	CC	Okay, fine. We've been noticing a little bit of increase in our background noise as you approach backside.
03 04 59 30	CDR	Roger. We had to go off the high gain. That's why.
03 04 59 35	CC	Roger.
03 04 59 44	CC	Have a good backside; we'll see you next time around.
03 04 59 49	CDR	Okay, Mike.
03 05 29 XX		BEGIN LUNAR REV 5
03 05 46 48	CC	Apollo 8, this is Houston. Over.
03 05 47 05	LMP	Houston, Apollo 8. Go ahead.
03 05 47 07	CC	Roger. Read you loud and clear. Welcome back.
03 05 47 13	LMP	Roger. Looks like the evaporator - looks like the evaporator is holding okay, or at least it is trying to. It dropped the temperature down to about 32, and now it's come back up again and stabilized at about 42 degrees.
03 05 47 31	CC	Roger. Copy you, Bill.
03 05 48 41	CMP	Houston, Apollo 8.
03 05 48 44	CC	Apollo 8, Houston.
03 05 48 50	CMP	Roger. Houston, this is Apollo 8. What we are doing on the control point tracking - I managed to look for a CP-1 at the same time we were trying to do a CP-2 on this rev. I picked up two

marks which are just as small, but more easily recognizable, than the ones that were given to me. I know that I can repeat the process and pick the same small point on the next rev. Now I can try to look for the control points that are written down, but I think that I have better control over the ones that we have.

03 05 49 29	CC	Roger, Jim. Understand. We'll check that for you.
03 05 49 34	CMP	Roger. One more point: the control point times which you have given me are a little bit off, and I can notice by comparing these maps that these maps are not too well aligned either.
03 05 49 47	CC	Roger. These two small points that you can repeat your marks on: will you be able to identify those precisely on a map? Over.
03 05 50 00	CMP	That's affirmative; that is why I picked them. They are both - they're both very prominent features, and they are both very small craters about the same size as the ones we are looking for, but I can pinpoint them on a map.
03 05 50 13	CC	Roger.
03 05 50 48	CMP	Houston, Apollo 8.
03 05 50 49	CC	Apollo 8, Houston. Over.
03 05 50 54	CMP	Roger. One more comment: as if it offered a lot of controversy at data priority meanings,

it looks like 10 degrees pitch up is the best attitude to obtain the horizon so that you can follow the landmark down through the scanning telescope. If you pitch down any more, full up trunnion will not get the horizon, and the horizon is a great help in leading yourself into the control point.

03 05 51 28	CC	Roger. Understand.
03 05 52 40	CC	Apollo 8, Houston.
03 05 52 45	CMP	Go ahead.
03 05 52 47	CC	Jim, we concur with your use of the two small craters which you can repeatedly mark on and find on the map; and also if you will give us your new latitudes and longitudes we can compute for you a time of closest approach to those points with the spacecraft 10 degrees pitched-up. Over.
03 05 53 12	CMP	Roger, Houston. CP-1 latitude minus 606269, longitude over 2, minus 78954, altitude plus 00152; for CP-2 latitude minus 09638, longitude over 2, plus 81691, altitude minus 00007. I tried to get CP3 at the same pass, but I let it go by to get set up for this first track at the landing site.

03 05 54 05	CC	Roger, Houston. CP-1: would you say again the latitude, and on CP-2, say again the longitude CP2, please?
03 05 54 15	CMP	Roger. CP-1 latitude minus 06269; that is the latitude; and for longitude over 2 for CP-2, plus 81691.
03 05 54 34	CC	Okay. We copied them. Thank you.
03 05 54 43	CMP	And it appears that resolve medium is a very good combination to track.
03 05 54 53	CC	Roger. I understand. Resolve medium.
03 05 54 59	CMP	And it appears so far, Houston, that no spacecraft pitch motion is required to get five marks on the target in plenty of time.
03 05 55 10	CC	Roger. I understand you require no spacecraft motion to get five marks.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

03 06 04 15	CC	Apollo 8, Houston.
03 06 04 20	CMP	Go ahead.
03 06 04 21	CDR	Go ahead, Houston.
03 06 04 23	CC	Roger. I am about 15 minutes early with the TEI fix update and the map update. I will have them here whenever it's convenient for you to copy.
03 06 04 36	LMP	Okay. Just a little bit, Mike.
03 06 13 28	CC	Apollo 8, Houston.
03 06 13 35	CMP	Go ahead.
03 06 13 37	CC	Roger. We would like to ask you to stop using AUTO OPTICS on the pseudo landing site. It's necessary that we send you up a P27 to update the RLS values stored in the computer. Over.
03 06 13 54	CMP	Roger. I found ... I went to MANUAL OPTICS on B1.
03 06 14 01	CC	Roger. Understand.
03 06 16 44	CC	Apollo 8, Houston. Over.
03 06 16 49	CDR	Go ahead, Houston.
03 06 16 51	CC	Roger. If you would go to P00 and ACCEPT, please, we are going to send you a P27 load which will update an RLS value which will be followed by a procedural change, Jim, we will give you later; and AUTO OPTICS should be working shortly.
03 06 17 12	CMP	Roger. Or I could use no landmark AUTO OPTICS instead of the code.
03 06 17 31	CC	Apollo 8, Houston. We are also sending you up a state vector update at the same time.

03 06 17 39	CMP	Okay. We will be expecting that.
03 06 18 14	CC	Apollo 8, Houston. We're taking the DSE for a dump. Over.
03 06 18 31	CC	Apollo 8, Houston. Over.
03 06 18 36	CMP	Go ahead, Houston.
03 06 18 38	CC	Roger. We would like to take Bill's DSE for a dump. Over.
03 06 18 44	CMP	Roger. Go ahead.
03 06 18 46	CC	Thank you.
03 06 24 33	LMP	Houston, Apollo 8. We're ready for the - your updates, your PAD's.
03 06 24 38	CC	Apollo 8, Houston. Roger. I have updates, a map update for REV 5/6, and TEI 6 update. Which would you like first?
03 06 24 51	LMP	Okay. I've got the map update page now. Why don't you give me that one?
03 06 24 55	CC	Okay. Map update for REV 5/6. LOS 78:58:49, sunrise 79:08:07, prime meridian 79:14:30, AOS 79:44:36, sunset 80:21:05; IP-1, time of closest approach to target B1 80:09:08. Now your two new control points that Jim gave us: control point number 1, acquisition 79:10:32, control point number 2, acquisition 79:23:14. Over.
03 06 26 16	LMP	Roger. Copy. Ready for the TEI.
03 06 26 26	CC	Okay, Bill. Before we read the big TEI update here, I'd like to give Jim briefly a procedure

for P22. When he comes to NOUN 89, we request that he do a VERB 34 ENTER. Do not proceed, and by so doing then, he will not incorporate the lat and longitude from his mark, and he will not change the reference value of the landing site, and we will solve this AUTO OPTICS problem. Over.

03 06 27 08 CMP Let me see if I have this correct, Mike. When flashing 0689 comes up with the latitude and longitude information, I will not proceed but will go to VERB 34 and terminate. Is that correct?

03 06 27 24 CC Yes, that is affirmative. Do a VERB 34 ENTER instead of a PROCEED. And that will -

03 06 27 34 CMP Alright. Is this technique true?

03 06 27 45 CMP Houston, is this technique true for both the node control point AUTO OPTICS on P25?

03 06 27 52 CC Stand by one, Jim.

03 06 27 54 CMP And the len ...

03 06 28 09 CC That is affirmative, Apollo 8. That is always true.

03 06 28 16 CMP Okay. Roger. True for the code AUTO OPTICS and no landmark. I'll proceed instead of going on - or I'll use 34 instead proceding on 89.

03 06 28 25 CC Roger. Thank you, Jim, and I have the TEI 6 hour when you are ready - or TEI number 6.

03 06 28 45 CDR Go ahead.

03 06 28 52	LMP	Ready to copy.
03 06 28 54	CC	Roger. I'm glad you are ready to copy TEI number 6. I've got one last comment for Jim before you do so. The VERB 89 - or correction - the NOUN 89 we are talking about is the one that he gets after marking. There are two NOUN 89's, one prior to marking and one after, and our procedure references NOUN 89 after marking. Over.
03 06 29 21	CMP	Roger. Understand.
03 06 29 24	CC	Thank you, and, Bill, you still ready to copy?
03 06 29 29	LMP	Ready to copy, Mike.
03 06 29 31	CC	TEI 6, SPS/G&N: 45701, minus 040, plus 157. Are you with me so far?
03 06 29 56	LMP	Roger.
03 06 29 57	CC	081 21 24 43, plus 31776, minus 00823, minus 01365 180 016 001, not applicable, plus 00188. Are you still with me? Over.
03 06 31 56	LMP	That's Roger.
03 06 31 57	CC	Good. 31816 302 31624 40 2699 396 033, down 054, left 21, plus 0810 control minus 16500 12968 36222 146 42 04; GDC align remains the same; Sirius and Rigel, roll 129, pitch 155, yaw 010, ullage four quads for 15 seconds; horizon on 6-degree line at TIG minus 3 minutes. Over.
03 06 32 46	LMP	Roger, Houston. TEI 6, SPS/G&N: 45701, minus 040, plus 157 018 21 2443, plus 31776, minus 00823,

minus 01365 180 016 001, NA, plus 00188 31816 302 31624 40 2699. · Are you with me?

03 06 33 39 CC Yes, I'm with you, Bill.

03 06 33 44 LMP 396 033, down 054, left 21, plus 08 10 minus 16500 129 68 36222 146 42 04; same GDC align; Sirius and Rigel, 129 155 010, four jet, 15 seconds, horizon 6 degrees, TIG minus 3. Over.

03 06 34 27 CC Roger, Bill. On your ignition time, GETI is 81 hours, 081. Over.

03 06 34 39 LMP Roger. Got it, 081.

03 06 34 42 CC Thank you, sir.

03 06 34 46 LMP Thank you, Michael. As a matter of interest, these side windows are so hazy that when the sun shines on them, they just about - they are real poor for any visual observation or photography- heads-up.

03 06 35 04 CC Roger. Understand.

03 06 36 30 CC Apollo 8, Houston. Over.

03 06 36 36 CMP Go ahead, Houston.

03 06 36 37 CC Roger. The last state vector updates we sent you, Jim, was to the LM slots, and you will have to transfer that over to the CSM slots using VERB 47 ENTER. Over.

03 06 36 52 CMP Roger. Will do.

03 06 36 54 CC Thank you.

03 06 38 16 CC Apollo 8, Houston.

03 06 38 21	CMP	Go ahead, Houston.
03 06 38 23	CC	Roger. Bill has got his tape recorder back, and we noticed during that last dump, it was all in low bit rate. We wonder whether that was intentional or not? Over.
03 06 38 42	LMP	Roger. We didn't have much to say; we couldn't see out of the windows very well, Mike.
03 06 38 47	CC	Roger. Understand. Thank you, Bill.
03 06 38 53	LMP	It was really too bad.
03 06 40 31	CC	Apollo 8, Houston. - -
03 06 40 38	LMP	Go ahead - -
03 06 40 39	CC	Roger, Bill. This next time around into the sunlight, we do not expect any problem with the primary evaporator. If it does start drying out, we think it is best just to close the back pressure valve, and there is no need to activate the secondary boiler. Over.
03 06 41 02	LMP	Okay. I guess the 60-degree limit will still hold then.
03 06 41 12	CC	Stand by.
03 06 41 40	CC	Apollo 8, Houston. We are suggesting you disregard the 60 degree limit, and let it go ahead and rise up above 60. There is no need to activate the secondary. Over.
03 06 41 54	LMP	Okay. We just don't want to boil our IMU.
03 06 41 57	CC	Roger. Understand then. Apollo 8, you are GO for the next lunar orbit REV.

03 06 42 06	LMP	Roger, Houston.
03 06 42 11	CMP	Roger, Houston. I'll read the book this time.
03 06 42 14	CC	Roger.
03 06 54 08	CC	Apollo 8, Houston. Over.
03 06 54 13	CMP	Go ahead, Houston. Apollo 8 - -
03 06 54 16	CC	Roger. We have about 4-1/2 minutes left before we have LOS; we'd like your last PRD readout. Over.
03 06 54 29	CMP	Stand by. The commander is asleep; we'll get his when he wakes up. The LMP is still 6 ... 0.64, C is 9, CMP is 0.09.
03 06 55 07	CC	Roger. Copy 0.64, 0.09. Thank you.
03 06 58 04	CC	Apollo 8, Houston. About 40 seconds to LOS, and everything's looking good down here.
03 06 58 14	CMP	Roger. Houston. We will give it another try here.
03 06 58 19	CC	Roger.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

03 07 28 XX		BEGIN LUNAR REV 6
03 07 45 36	CC	Apollo 8, this is Houston. Over.
03 07 46 32	CC	Apollo 8, this is Houston. Over.
03 07 47 16	CC	Apollo 8, this is Houston. Over.
03 07 48 43	CC	Apollo 8, this is Houston. Over.
03 07 51 56	CC	Apollo 8, this is Houston. Over.
03 07 52 05	LMP	Houston, Apollo 8. Over.
03 07 52 07	CC	Reading you very weak but - a lot of background noise. Welcome back around. How are you reading us?
03 07 52 18	LMP	Reading you fine.
03 07 52 20	CC	Okay.
03 07 55 43	CMP	Houston, Apollo 8.
03 07 55 45	CC	Apollo 8, Houston. Go ahead.
03 07 55 51	CMP	Roger, Houston. A few words on our optics tracking system. I used AUTO OPTICS for control points 1 and 2 on the backside, and they worked beautifully, tracked both the targets for me. And I went to the control point 3 as designated in our orbital control book to see the latitude and longitude that was given to me and used AUTO OPTICS to track that particular coordinate system, and it was very close to the actual tracking plot. I picked the mark there where I did a final marking and recorded latitude and longitude. I'm now about to come up on the landing site and using AUTO OPTICS in the coded input to see how that works.

03 07 56 57	CC	Roger, Apollo 8.
03 07 59 28	CC	Apollo 8, Houston.
03 07 59 34	LMP	Go ahead.
03 07 59 35	CC	Roger. We know you're busy so we are not going to bother you. We are watching your progress on the DSKY. You are looking good; all your systems are looking good, and we have maneuver PAD's for you any time at your convenience.
03 07 59 52	LMP	Roger. We will take them when we are doing the P52, if that's okay.
03 07 59 56	CC	That is just fine.
03 08 07 56	LMP	Mike, Apollo 8.
03 08 07 58	CC	Apollo 8, go ahead.
03 08 08 03	CMP	Mike, there are an awful lot of objects down on the landing site. It would just warm up Jack Schmidt's heart. The AUTO OPTICS are tracking perfectly on the target, and the two high peaks stand out beautifully. I have a beautiful view of it. The first I've seen just barely beneath the vertical now, and the second one coming up - It's just a grand view!
03 08 08 28	CC	Roger, Jim. Glad to hear it. Jack's listening.
03 08 09 45	CMP	Jack, the information - The triangles that we see now are from the first IB, second IB, and the B1 are just right, I think, for landing conditions. The shadows aren't too deep for you to get confused,

but the land has texture to it, and there are enough shadows there to make everything stand out.

03 08 10 01 LMP If Jack's listening, tell him that the optical may be doing all right, but the eyeball is having a little trouble looking through all this smear on the windows.

03 08 10 25 CC Roger. Understand the optics are doing better than the eyeballs. How about the cameras?

03 08 10 33 LMP We always have the same smear to look through. The rendezvous windows are okay, but they're so small and looking in the wrong directions here so far.

03 08 10 42 CC Roger.

03 08 10 43 LMP I think the vertical stereo will be okay.

03 08 11 10 LMP It certainly looks like we're picking the more interesting places on the moon to land in. The backside looks like a sand pile my kids have been playing in for a long time. It's all beat up, no definition. Just a lot of bumps and holes.

03 08 11 27 CMP I'm looking at 2P-2 right now, Houston, and it's a great spot.

03 08 11 33 LMP The area we're over right now gives some hint of possible volcanic, though I really can't eyeball it at the moment to pin that down. There are some craters and buildups that just definitely suggest volcanic activity.

03 08 11 52 CC Roger. Understand, Bill, and understand Jim thinks the old 2P-2 is a winner.

03 08 12 06	LMP	Yes, that backside doesn't look good at all.
03 08 12 10	CC	Roger.
03 08 12 15	LMP	That's relatively speaking, of course.
03 08 12 18	CC	Of course.
03 08 18 52	CC	Apollo 8, Houston.
03 08 18 53	CMP	This is Apollo 8.
03 08 18 56	CC	Roger, Jim. We have you on the high-gain antenna. We'd like you to take the DSE and dump it over.
03 08 19 05	CMP	Roger, Houston. Are you going to use our computer to update our state vector?
03 08 19 34	CC	That's affirmative, Jim. We'd like to - stand by one, and I'll tell you when to go to POO and ACCEPT.
03 08 19 45	CMP	Roger. Then I'll work my 52 around your ...
03 08 20 05	CC	Jim, would you please go to POO in ACCEPT, and we'll send you a P27 and run a state vector update.
03 08 20 12	CMP	Roger. You have POO in ACCEPT.
03 08 20 16	CC	Thank you.
03 08 20 36	CMP	Houston, this is Apollo 8. We have a little piece of useful information if you're interested in deliberating over it.
03 08 20 46	CC	Go ahead. Say again.
03 08 20 51	CMP	Roger. Our first control point is very near the terminator, and as the optics were tracking it, I had occasion to watch the sun come up. And at about 2 minutes before sunrise, you get - the limb begins to brighten up into sort of a fine white

haze, a fine glow completely over the space just behind the limb.

03 08 21 23 CC Roger. I understand. About 2 minutes before the sun comes up, you get a fine white haze radiating out from behind the limb. How far out does it extend?

03 08 21 34 CMP It goes up quite a ways. It takes a fan shape, unlike the sunrise on earth where the atmosphere affects it. This just sort of is a complete haze all over the local area. It's concentrated at the exact spot where the sun comes up at ignition and then goes away from the sun spots. Very interesting.

03 08 21 54 CC Thank you, Jim. Thank you.

03 08 22 36 CC Apollo 8, Houston. We're standing by with your map and TEI 7 updates.

03 08 22 48 CMP Stand by.

03 08 22 54 CC Apollo 8, Houston. You can go back to BLOCK with your computer.

03 08 23 02 CMP Roger.

03 08 23 31 LMP Okay, Mike. We're ready for the map update and then the TEI.

03 08 23 38 CC Okay. When you get your - before you get your map book out, the Houston COMM TECHS have got a little word for an old ex-CAP COMM. They say they consider you in NONREMOTE. Over.

03 08 23 54 LMP Not permanently, I hope.

03 08 23 59	CC	Okay. Your map update for REV 6/7: LOS 80:57:24, sunrise 81:06:57, prime meridian 81:13:02. Are you with me?
03 08 24 29	LMP	You cut out after the prime meridian. I got it, but not AOS.
03 08 24 33	CC	AOS 81:43:05, sunset 82:19:54. Remarks: IP-1 PCA for B-1 82:07:39, and now I've got four more times for you which - acquisition times for when various things come over the horizon. Over.
03 08 25 09	LMP	Roger. Go ahead.
03 08 25 12	CC	Okay. Control point 1, acquisition time 81:09:05; control point 2, acquisition time 81:21:48; control point 3, acquisition time 81:43:17; B-1 acquisition time 82:03:54. And I say again all those ACQ times are when they first come over the horizon. Over.
03 08 25 54	LMP	Roger. Copy, Houston. In about 2 seconds, I'll be ready for the TEI.
03 08 26 01	CC	Alright.
03 08 26 13	LMP	I'm ready.
03 08 26 16	CC	TEI 7, SPS/G&N - stand by one, Bill.
03 08 26 55	LMP	Just a matter of general interest, Houston: everybody is feeling good, and the CDR is taking a snooze.
03 08 27 01	CC	Roger. Glad to hear it. We were just talking about a water dump down here. We've got one coming up, and it looks like on this REV prior to the time

around LOS or just prior to LOS, would be a convenient time to do it. Do you concur?

03 08 27 20 LMP Okay. We will. Down to 25 percent again?

03 08 27 24 CC That's affirmative, and we'd also be interested in any comments about what these various dumps have done to your optics, if anything, and how long the effects last after a dump.

03 08 27 38 LMP Don't seem to have done anything to the optics, but they've definitely got in some of the windows. There are a few little chunks of ice on window number 1, which is nearest the vent, and also on window number 5 a little bit; windows 2 and 4 remain amazingly clear.

03 08 28 11 CC Roger. Thank you, Bill, and I'm ready to resume the PAD when you are.

03 08 28 19 LMP Okay. Press on with the weight.

03 08 28 22 CC Alright. Weight 45701, minus 040, plus 157 083 18 2080, plus 32346, minus 01168, plus 05730. Are you with me so far? Over.

03 08 29 28 CC Apollo 8, Houston. Over.

03 08 29 33 LMP Go ahead, Mike.

03 08 29 35 CC Roger. I got down through DELTA-V, minus X, minus Y, and minus Z. Did you copy those? Over.

03 08 29 44 LMP No, I didn't read a word. I'm still waiting for the weight.

03 08 29 49 CC Roger. Let's go back to the weight: 45701, minus 040, plus 157. Are you with me? Over.

03 08 30 09	LMP	Sounds good.
03 08 30 11	CC	Okay. GETI 083 18 2080, plus 32346, minus 01168, plus 4 - correction, plus 05730. Are you with me? Over.
03 08 30 52	LMP	Roger.
03 08 30 53	CC	Thank you. 179 009 001, not applicable, plus 00187 32870 307 32676 42 0880 253 033, down 121, left 27, plus 0790 minus 16500 129 73 36238 146 4414; same north set Sirius and Rigel, roll 129, pitch 155, yaw 010, four quads for 15 seconds, horizon on the 2-degree mark at P ignition. Over.
03 08 32 53	LMP	Roger. GETI 7 SPS/G&N: 45701, minus 040, plus 157 08318 2080, plus 32346, minus 01168, plus 05730 179 9 - correction, 009 001, NA. Are you with me?
03 08 33 28	CC	Yes, I'm with you, Bill.
03 08 33 32	LMP	Plus 00187 32870 307 32676 32 - correction, 420880 253033, down 121, left 27, plus 0790, minus 16500 12973 36238 146 44 14; same north set Sirius and Rigel, 129 155 010; four-jet, 15 seconds, 2 degrees, now horizon and peak.
03 08 34 26	CC	That's all correct.
03 08 39 12	CC	Apollo 8, Houston. Over.
03 08 39 18	LMP	Go ahead, Houston.
03 08 39 20	CC	Roger. You got your DSE back, and you are GO for the next lunar orbit. Over.

03 08 39 27	LMP	Roger. How far did you want us to dump that water?
03 08 39 34	CC	Twenty-five percent, please, Bill.
03 08 39 44	LMP	Roger. Twenty-five percent.
03 08 40 52	CMP	Houston, Apollo 8.
03 08 41 07	CC	Apollo 8, this is Houston. Over.
03 08 41 13	CMP	Are you receiving our tracking data?
03 08 41 24	CC	That's affirmative, Jim. We are receiving.
03 08 41 29	CMP	Okay. Thank you.
03 08 41 33	CC	And also, Jim, we are - That last P27 we sent was for the LM state vector only, and it will require a VERB 47 ENTER to transfer to the CSM slot. Over.
03 08 41 48	CMP	Roger. Will do.
03 08 41 49	CC	Thank you.
03 08 45 39	LMP	Okay. We're dumping the waste tank now, Houston.
03 08 45 44	CC	Roger, Bill.
03 08 52 57	CC	Apollo 8, Houston. Over.
03 08 53 02	CMP	Go ahead, Houston.
03 08 53 04	CC	Roger. We've got 4 minutes til LOS, and everything is looking good down here.
03 08 53 13	LMP	Roger. How much longer do you think we have to go into battery charge there, Mike?
03 08 53 19	CC	I'll find out for you.
03 08 53 26	LMP	If you can wake up the ECOMM, why don't you have him ask the back room?

03 08 53 33	CC	Oh, you really know how to hurt a guy.
03 08 53 41	CC	Apollo 8, Houston. We estimate the charge will be complete in another 45 minutes. Over.
03 08 53 51	LMP	Okay. Thank you very much.
03 08 55 59	CC	Apollo 8, Houston. One minute til LOS, and standing by.
03 08 56 06	LMP	Okay. See you on the other side, Mike.
03 08 56 09	CC	Looking forward to it.
03 08 56 21	LMP	Me, too.

END OF TAPE

03 09 27 XX		BEGIN LUNAR REV 7
03 09 43 58	CC	Apollo 8, this is Houston. Over.
03 09 44 34	CC	Apollo 8, this is Houston. Over.
03 09 44 47	CDR	Houston, Apollo 8.
03 09 44 49	CC	Roger, Frank. Good morning. You're loud and clear, how me?
03 09 44 54	CDR	Loud and clear.
03 09 44 58	CC	Welcome back.
03 09 45 04	CDR	Thank you.
03 09 46 51	CC	Apollo 8, Houston. Over.
03 09 46 58	CDR	Go ahead, Houston.
03 09 46 59	CC	Roger. We have a request that Jim space his marks, his five marks out a bit more slowly. If possible, we would like to get a couple of them past the zenith. We're getting five of them with rather rapid spacing, and from the geometry viewpoint, it would be better if you'd slow them down a little bit and lengthened them out so as to include a couple of them past the zenith. Over.
03 09 47 29	CDR	Roger. We understand.
03 09 47 39	CDR	Houston, Apollo 8. That last set of marks are invalid. Disregard what Jim drew the last time.
03 09 47 48	CC	Roger. Understand the last set of marks are invalid. Over.

03 09 47 54	CMP	Roger. If you would correlate ... the last set.
03 09 48 03	CC	We have an awful lot of background noise, Jim. Could you say again, please?
03 09 48 12	CMP	Roger. I'm coming up on control voice 3. I tried to stick another control voice in between 2 and 3. It didn't do it, so I just took out our program, marked it down on the program.
03 09 48 25	CC	Roger. Understand you are coming up on 3.
03 09 52 03	CC	Apollo 8, Houston.
03 09 52 07	CDR	Go ahead, Houston. Apollo 8.
03 09 52 09	CC	Roger. On Jim's marks, we'd like to get spacing of approximately 30, 30 seconds between each mark. The last ones we are copying roughly 15 seconds between marks, and we would like to stretch it out even further if that is okay with you.
03 09 52 31	CDR	Alright.
03 10 02 18	CMP	Houston, Apollo 8.
03 10 02 22	CC	Apollo 8, Houston. Over.
03 10 02 27	CMP	Roger, Mike. I find that tracking is much easier using the sextant than the scanning telescope. You have finer control, and at these orbital speeds, resolved to medium seem to be the best combination.

03 10 02 46	CC	Roger, Jim. I copy that it's easier for you to use the sextant than the scanning telescope. It gives you finer control, and say again after that.
03 10 03 05	CC	Apollo 8, Houston. Do you read?
03 10 03 09	CMP	Roger. Did you copy?
03 10 03 12	CC	Roger. I copy that it's - tracking is easier using the sextant than the scanning telescope; it gives you finer control, and say again after that. Over.
03 10 03 26	CMP	And the combination of resolved and medium is perhaps the best combination of - combination of - speed low is too low; we can't catch up with the target.
03 10 03 39	CC	Roger. Understand that the best combination is resolved and medium. Low is just too low.
03 10 03 49	CMP	Roger.
03 10 13 33	CMP	Houston, Apollo 8.
03 10 13 36	CC	Apollo 8, Houston. Over.
03 10 13 41	CMP	Roger. I'm not too sure what happened that time, Mike. I was marking on the landing sites, using the code, and I kept getting a large trunnion for AUTO OPTICS. And I could see the target, or landing site was coming up, so I just went manually and marked and got the - the latitude and longitude were quite different from the nominal.
03 10 14 14	CC	Roger. We copy that, Jim.

03 10 17 20	CC	Apollo 8, Houston.
03 10 17 24	CDR	Go ahead, Houston. Apollo 8.
03 10 17 26	CC	Roger. We're checking into Jim's remarks on his P22; and in the meantime, I have your maneuver PAD's and map updates, at your convenience. Over.
03 10 17 41	CDR	Roger.
03 10 18 12	CMP	Go ahead with your data, Mike.
03 10 18 14	CC	Okay. And before that, we'd like to take the DSE away from you, please, for a while.
03 10 18 28	CMP	All yours.
03 10 18 30	CC	Thank you, and we'd like you to go to POO and ACCEPT. We have a P27 state vector update for you.
03 10 18 42	CMP	There's POO, and I'm going to ACCEPT.
03 10 18 46	CC	Thank you.
03 10 18 48	CMP	All yours.
03 10 18 55	CC	Which would you like first, the map update or the TEI 8?
03 10 19 02	CMP	The map would be fine.
03 10 19 07	CC	Okay. Map update: LOS 82:55:54, sunrise 83:05:49, prime meridian 83:11:38, AOS 83:41:43, sunset 84:18:45; remarks: control point 1 acquisition 83:07:39, control point 2 acquisition 83:20:21, control point 3 ACQ 83:41:51, B-1 acquisition 84:02:28. Over.

03 10 20 05	CMP	Roger. 82:55:54, 83:05:49, 83:11:38, 83:41:43, 84:18:45. CP-1 83:07:39, CP-2 83:20:21, CP-3 83:41:51, B-1 84:02:28.
03 10 20 29	CC	That's affirmative.
03 10 20 52	CC	Understand - -
03 10 20 53	CMP	- - for the TEI PAD.
03 10 20 56	CC	Roger. The TEI 8 PAD, SPS/G&N: 45701, minus 040, plus 157 085 18 1904. Are you with me so far? Over.
03 10 21 31	CMP	Roger.
03 10 21 33	CC	Okay. Plus 3195, minus 01267, plus 04716 179 008 001, not applicable, plus 00187 33552 311 33355 42 0909 252. Are you still with me? Over.
02 10 22 40	CMP	Roger.
02 10 22 43	CC	Okay. Picking up with the boresight star, it's old Dzuba who is the center star in the head of Scorpion; he's down 060, left 42, plus 0773, minus 16500 12982 36256 146 46 18. North set stars remain Sirius, Rigel, roll 129, pitch 155, yaw 010; four-quad ullage of 15 seconds, horizon on a 4-degree line at TIG, and requesting you zero the optics. Over.
03 10 24 03	CDR	Roger. Going to ZERO OPTICS.
03 10 24 14	CDR	Are you through with the computer now, Mike?
03 10 24 17	CC	It's your computer; P27 LM state vector in and verified.

03 10 24 26	CMP	Roger. We're going to put it in the CSM slot.
03 10 24 30	CC	Roger. That's affirmative.
03 10 24 38	CDR	Okay. TEI 8, SPS/G&N: 45701, minus 040, plus 157 085 18 1904, plus 33195, minus 01267, plus 04716 179 008 001, NA, plus 00187 33552 311 33355 42 09090 252, Dzuba down 060, left 4.2, plus 0773, minus 16500 12982 36256 1464618; Sirius, Rigel, 129 155 010, four-quad, 15 seconds, horizon 4 degrees at TIG.
03 10 25 36	CC	You keep good books; that's all correct.
03 10 25 42	CDR	Thank you.
03 10 26 44	CC	Apollo 8, Houston.
03 10 26 50	CDR	Go ahead, Houston.
03 10 26 52	CC	Roger. Some time back, we noted evidence of a restart in the computer and wondered if you had any remarks about it. Over.
03 10 27 00	CDR	I know it. Jim got screwed up on one of those programs. He's getting kind of tired here, and we got a RESTART and a couple of PROGRAM ALARMS. I don't know what he did.
03 10 27 12	CC	Roger, Frank. The main point is the computer is looking fine to us, now.
03 10 27 20	CDR	That's good.
03 10 27 23	CMP	Houston, don't believe all you hear up here.
03 10 27 28	CC	No, we have a filter, Jim, for that.
03 10 27 34	CDR	Thank you.

03 10 28 32	CC	Apollo 8, Houston.
03 10 28 37	CDR	Go.
03 10 28 39	CC	Roger. In some of Jim's previous comments about the limb brightness as the sun was about to come up has sparked a lot of interest down here. And we'd like to ask him if he gets a chance to notice again or perhaps he can recall, whether there were any changes in the appearance of the stars. Such as, did he notice any twinkling while this was taking place, and did he notice any narrow limb brightening within 10 to 20 seconds prior to the sun's rising? Over.
03 10 29 14	LMP	He'll be with you - he's doing a P52 now.
03 10 29 17	CC	Okay.
03 10 30 08	CMP	Houston, my comments concerning the sunrise was the comments above the terrain. There appeared what might be called diagonal light or light due to the haze or something like that. As the sun came above or before the sun came above the limb, definite rays could be seen coming from the other side. It was a uniform haze emanating from the center spot where the sun was going to rise, and this was something which I didn't expect.
03 10 30 42	CC	Roger, Jim. Understand. We copied that and just curious, and if you see it again whether you notice any stars twinkling or any additional information.

03 10 30 55	CMP	Will do. Won't have a chance until control point 1.
03 10 31 06	LMP	Actually, he doesn't want to pass out too much of that information. He wants to save it and write a paper when he gets back, Mike.
03 10 31 12	CC	Right. In German, probably, huh?
03 10 35 57	CDR	Houston, Apollo 8.
03 10 35 59	CC	Apollo 8, Houston.
03 10 36 04	CDR	Okay. What time is that TV, Mike, 85:37?
03 10 36 08	CC	85:37 to terminator, which is probably like 86:14.
03 10 36 20	CDR	Okay. Well, I don't know if we can go that long with it, and I'm going to scrub all the other experiments, the converging stereo or other photography, and we are a little bit tired; I want to use that last bit to really make sure we're right for TEI.
03 10 36 38	CC	Roger. I understand, Frank.
03 10 36 42	CC	A couple of miscellaneous items for you: we'd like for you to discontinue charging battery B at this time; we'd also like to get a cryo stir, 2 minutes on all four; and your UP TELEMETRY IU switch, put to BLOCK, please, and you are GO for the next lunar orbit.
03 10 37 08	CDR	Thank you.
03 10 37 10	CC	Roger.
03 10 40 10	CDR	Houston, Apollo 8.
02 10 40 14	CC	Apollo 8, Houston. Go ahead, Frank.

02 10 40 18	CDR	Roger. I want to scrub these control point sightings on this next REV, too, and let Jim take a rest.
02 10 40 25	CC	Roger. I understand.
02 10 40 30	CC	I understand you want to scrub control points 1, 2, and 3 on the next REV and the converging stereo on the following REV.
02 10 40 42	CDR	That's right. We're getting too tired.
02 10 40 44	CC	Okay, Frank.
02 10 41 39	CC	Apollo 8, Houston.
02 10 41 41	CDR	Go ahead.
02 10 41 44	CC	This REV coming up we would like to clarify whether you intend to scrub control points 1, 2, and 3, only, and do the psuedo landing site; or whether you also intend to scrub the psuedo landing site marks. Over.
02 10 42 01	CDR	We're scrubbing everything. I'll stay up and try and keep the spacecraft vertical and take some automatic pictures, but I want Jim and Bill to get some rest.
02 10 42 10	CC	Roger. Understand.

END OF TAPE

03 10 51 42	CC	Apollo 8, Houston. Four minutes to LOS. You have control of the DSE now, and all your systems are looking good.
03 10 51 53	CDR	Thank you very much, Mike.
03 10 51 55	CC	You bet.
03 10 52 03	CDR	Lovell is snoring already.
03 10 52 06	CC	Yes, we can hear him down here.
03 10 54 35	CC	Apollo 8, Houston.
03 10 54 39	CDR	Go ahead.
03 10 54 41	CC	We have 1 minute to LOS, Frank. You can terminate stirring up your cryos any time, and we agree with all your flight plan changes. Have a beautiful backside, and we will see you next time out.
03 10 54 57	CDR	Thank you.
03 10 54 59	CC	Roger.
03 11 26 XX		BEGIN LUNAR REV 8
03 11 42 18	CDR	Houston, Apollo 8.
03 11 42 21	CC	Apollo 8, loud and clear.
03 11 42 24	CDR	Roger.
03 11 53 44	CC	Apollo 8, Houston.
03 11 53 49	CDR	Go ahead, Houston. Apollo 8.
03 11 53 51	CC	Roger, Apollo 8. Couple of notes for you: on the P52 you are coming up to on this REV, we've looked at your state vectors and all your information. The platform looks good, and it appears

that it is your option if you would like to bypass this P52, your platform will still be good at the following TEI pass. And we would like to have your PRD reading, and I guess we are behind the sleep summary. Over.

03 11 54 28	CDR	Okay. Jim and Bill are both resting now. I had about 3 or 4 hours earlier today.
03 11 54 41	CC	Roger. Copy.
03 11 54 47	CDR	This PRD now reads 144.
03 11 54 50	CC	Copy, 144. And we have an update ready to go into your computer for the state vector if you want to go to POO and ACCEPT.
03 11 55 07	CDR	POO and ACCEPT.
03 11 55 09	CC	Thank you.
03 11 59 52	CDR	Jerry, I'm standing by to copy the TEI 9 PAD.
03 12 00 14	CC	Okay, Apollo 8. We have completed with the computer. You can use the VERB 47 to transfer, and I have the TEI 9 PAD.
03 11 00 26	CDR	That's Ken, isn't it? Just a minute, and I'll take care of it.
03 11 00 30	CC	Roger.
03 11 01 08	CDR	Okay. I went to POO and then VERB 47, and I'm ready to copy.
03 11 01 12	CC	Okay. Do you have it in BLOCK?
03 11 01 17	CDR	Say again.
03 12 01 18	CC	I say, do you have the UP TELEMETRY in BLOCK?
03 12 01 24	CDR	Roger.

03 12 01 26 CDR Okay. This PAD is a TEI 9, SPS/G&N: 45597, minus 040, plus 157 08719 1820, plus 34188, minus 01353, plus 00780 180 008 001, November Alfa, plus 00187 34223 313 34021 42 0898 253 033, down 131, left 28, plus 0758, minus 16500 12987 36277 14648 16; primary star Sirius, secondary Rigel, 129 155 010; four quads, 15 second, ullage, horizons on 1.2-degree window line at T minus 3; use high speed procedure with minus Mike Alfa. After looking at the burn information from your previous SPS burns, it appears that the engine performance should give us a 3-second burn time, longer than what you have on the PAD. The PAD number should correspond with what you get out of the computer. So we have not factored this into the past data; however, you can anticipate the engine for a normal DELTA-V to give you a 3-second - 3.7-second burn in excess of the computed times. Over.

03 12 05 52 CDR Roger. Thank you.

03 12 06 02 CDR TEI 9, SPS/G&N: 45597, minus 040, plus 157 08719 1820, plus 34188, minus 01353, plus 00780 180 008 001, NA, plus 00187 34223 313 34021 42 0898 253 033, down 131, left 28, plus 0758, minus 16500 12987, plus - or 36277 146 4816;

and that's Sirius and Rigel 129 155 010, four jet, 15 seconds, 1.2 degrees on the window at T minus 3, high speed minus MA, engine 3.7 seconds longer than given.

03 12 07 11 CC That's affirmative, Apollo 8. And when you get around to it, if you would like for us to dump your tape, we can do that when you get on the high gain.

03 12 07 25 CDR Roger.

03 12 08 06 CDR Okay. Should have it on the high gain now, Houston.

03 12 08 10 CC Roger. And we're going to go ahead and dump the tape.

03 12 08 20 CDR Roger.

03 12 08 42 CDR Ken, will we get the real TEI PAD the next time around now?

03 12 09 04 CC Apollo 8, we'll have one for you the next time around, and we'll update it if necessary on the following REV.

03 12 09 14 CDR Okay.

03 12 11 34 CDR Houston, Apollo 8.

03 12 11 36 CC Go ahead.

03 12 11 40 CDR Do you have any idea why quad B seems so much lower in quantity than the other three quads?

03 12 11 47 CC Stand by.

(GOSS NET 1)

03 12 15 48	CC	Apollo 8, Houston.
03 12 15 52	CDR	Go ahead.
03 12 15 54	CC	Okay. It looks to us like, although we're reading out the same thing you are on the quad quantity, using the computer program and all of the correction factors that are in there, it looks like all four of your quads are very close. In pounds, it looks like you have, for example, 193 pounds in quad A and 189 in B, 200 in C, and 190 in Delta. And the difference that you read on the gage is attributed to the fact that you don't have all of the correction factors in there. This ground calculation has an accuracy of about plus or minus 6 percent, and the best you can do on board, even using your chart, is plus or minus 10 percent. Over.
03 12 16 44	CDR	Thank you.

END OF TAPE

03 12 24 35	CC	Apollo 8, Houston. The tape recorder is back to you.
03 12 24 42	CDR	Thank you.
03 12 26 54	CC	Apollo 8, Houston.
03 12 27 00	CDR	Go ahead.
03 12 27 02	CC	Okay. We've just finished looking at all your systems and all the trajectory information, and you have a GO for another REV.
03 12 27 13	CDR	Thank you.
03 12 27 41	CDR	I understand we're GO for REV 9.
03 12 27 47	CC	That's affirmative, 8.
03 12 29 01	CDR	How's the weather down there, Ken?
03 12 29 03	CC	It's really beautiful; loud and clear and just right in temperature.
03 12 29 12	CDR	How about the recovery area?
03 12 29 14	CC	That's looking real good.
03 12 29 19	CDR	Very good.
03 12 29 24	CC	Yes. They told us that there is a beautiful moon out there.
03 12 29 32	CDR	Now I was just saying that there's a beautiful earth out there.
03 12 29 36	CC	It depends on your point of view.
03 12 29 40	CDR	Yes.
03 12 29 54	CC	If you're looking for things to do up there, Frank, you might hit that BIOMED switch over to the left position.

03 12 30 02	CDR	Okay.
03 12 30 42	CDR	Are you ready?
03 12 30 44	CC	All set.
03 12 30 46	CDR	Five, four, three - say again.
03 12 30 53	CC	We've got the computers waiting.
03 12 30 55	CDR	Ken, are you ready? Five, four, three, two, one.
03 12 31 00	CDR	MARK.
03 12 34 07	CDR	Houston, Apollo 8. How do you read?
03 12 34 09	CC	I'm reading you weak but clear, Frank.
03 12 34 16	CC	How about this antenna? Is that any better?
03 12 34 18	CC	It's a little louder.
03 12 34 26	CDR	Okay.
03 12 39 45	CDR	Hey, Ken, how did you pull duty on Christmas Eve? It happens to bachelors every time, doesn't it?
03 12 39 52	CC	I wouldn't be anywhere else tonight.
03 12 42 08	CDR	Ken, how's the ... tracking on this lunar orbit coming out?
03 12 42 27	CC	Okay. Frank, it's looking like it's coming right down the pike. It's doing just what it is supposed to, and apparently, all our computer programs have got the right numbers in them because they're predicting where you're going.
03 12 42 42	CDR	Have they covered any of these anomalies due to high spots?
03 12 42 48	CC	Roger. They're detectable, but they're not changing things encugh to be anything more than - of interest.

03 12 42 58	CDR	Fine. Hope they are as good with the corridor as they were with the LOI. That was beautiful.
03 12 43 03	CC	It sure was. That's - that is textbook all the way.
03 12 44 24	CC	Apollo 8, Houston.
03 12 44 29	CDR	Go ahead.
03 12 44 31	CC	Okay. We're about - inside 10 minutes till LOS. We'll be picking you up again at 85:40, and we'll have all of the TV types' information standing by. In the event that the situation develops again, for pointing accuracies, if I see anything that looks like a terminator or anything of that nature, I'm going to call the dark side of it 12 o'clock, and use that as a reference system, and we'll try that. If that doesn't dope out any problems with camera pointing, why I may try - call for a plus pitch, and then I'll just correct what I see to account for it.
03 12 45 16	CDR	Roger. We're not going to use the telephoto lens. I don't believe we'll be able to get a picture of the earth. It's going to have to be the terminator, the lunar surface. I'm looking at the earth right now; and we won't see it again during that period.
03 12 45 31	CC	Okay. Real fine then. And next time around, why, we'll take an extra special look at all of the parameters; we'll have our TEI PAD for you. And

we'll use the last REV for a real good hack on all systems. I'll give you a rundown by system of all things we see and where they stand.

03 12 45 55	CDR	Okay. Fine.
03 12 50 15	CC	Apollo 8, Houston. We're approaching 4 minutes to LOS. All systems are GO.
03 12 50 25	CDR	Roger. Thank you.
03 13 25 XX		BEGIN LUNAR REV 9
03 13 42 56	LMP	Houston.
03 13 42 58	CC	Loud and clear and an initial look at your systems are good.
03 13 42 59	LMP	Houston, Apollo 8. Over.
03 13 43 03	CC	We've got a picture, Apollo 8.
03 13 43 07	LMP	Roger. We've got the T - Roger. We've got the TV ...
03 13 43 13	LMP	How does the picture look, Houston?
03 13 43 16	CC	Loud and clear.
03 13 43 21	LMP	The TV look okay?
03 13 43 23	CC	That's very good.
03 13 43 28	CMP	Welcome from the moon, Houston.
03 13 43 33	CC	Thank you.
03 13 44 00	LMP	Houston, you're seeing a view of the earth taken below the lunar horizon. We're going to follow a track until the terminator, where we will turn the spacecraft and give you a view of the long shadowed

terrain at the terminator, which should come in quite well in the TV.

03 13 44 26 CC Roger.

03 13 44 28 CMP We don't know whether you can see it from the TV screen, but the moon is nothing but a milky white - completely void. We're changing the cameras to the other window now.

03 13 44 58 CDR This is Apollo 8, coming to you live from the moon. We've had to switch the TV cameras now. We showed you first a view of earth as we've been watching it for the past 16 hours. Now we're switching so that we can show you the moon that we've been flying over at 60 miles altitude for the last 16 hours. Bill Anders, Jim Lovell, and myself have spent the day before Christmas up here doing experiments, taking pictures, and firing our spacecraft engines to maneuver around. What we will do now is follow the trail that we've been following all day and take you on through to a lunar sunset. The moon is a different thing to each one of us. I think that each one of us - each one carries his own impression of what he's seen today. I know my own impression is that it's a vast, lonely, forbidding-type existence, or expanse of nothing, that looks rather like clouds and clouds of pumice stone, and it certainly would not appear to be a very inviting

place to live or work. Jim, what have you thought most about?

03 13 46 23 CMP Well, Frank, my thoughts are very similar. The vast loneliness up here of the moon is awe inspiring, and it makes you realize just what you have back there on earth. The earth from here is a grand oasis in the big vastness of space.

03 13 46 41 CDR Bill, what do you think?

03 13 46 44 LMP I think the thing that impressed me the most was the lunar sunrises and sunsets. These in particular bring out the stark nature of the terrain, and the long shadows really bring out the relief that is here and hard to see at this very bright surface that we're going over right now.

03 13 47 05 CDR You're describe - that's not color, Bill. Describe some of the physical features of what you're showing the people.

03 13 47 17 CC Apollo 8, Houston. We're not receiving a picture now. Over.

03 13 47 24 LMP We're now coming on to Smyth's Sea, a small mare region covered with a dark, level material. There is a fresh, bright, impact crater on the edge towards us and a mountain range on the other side. These mountains are the Pyrenees.

03 13 47 48 CC Apollo 8, we're not receiving modulation on the signal; we do have SYNC.

03 13 47 58 CDR Are you reading us? Apollo, Houston.

03 13 48 02	CC	Apollo 8, we're reading you loud and clear, but no picture. We have no modulation.
03 13 48 07	CMP	Roger. We understand. Take a look now.
03 13 48 09	CMP	How about now? Apollo.
03 13 48 12	CC	Loud and clear. Good picture.
03 13 48 28	CMP	What you're seeing has been cross - Smyth's Sea are the craters Castner and Gilbert, and what we've noticed especially, that you cannot see from the earth, are the small bright impact craters that dominate the lunar surface.
03 13 49 03	LMP	The horizon here is very, very stark. The sky is pitch black, and the earth - or the moon, rather, excuse me - is quite light; and the contrast between the sky and the moon is a vivid, dark line. Coming into the view of the camera now are some interesting old double ring craters, some interesting features that are quite common in the mare region and have been filled by some material the same consistency of the maria and the same color. Here are three or four of these interesting features. Further on the horizon you see the ... The mountains coming up now are heavily impacted with numerous craters whose central peaks you can see in many of the larger ones.
03 13 50 08	CMP	Actually, I think the best way to describe this area is a vastness of black and white, absolutely no color.

03 13 50 22	LMP	The sky up here is also rather forbidding, foreboding expanse of blackness, with no stars visible when we're flying over the moon in daylight.
03 13 50 52	LMP	You can see by the numerous craters that this planet has been bombarded through the eons with numerous small asteroids and meteoroids pock-marking the surface every square inch.
03 13 51 11	CMP	And one of the amazing features of the surface is the roundness that most of the craters - seems that most of them have a round mound type of appearance instead of sharp, jagged rocks.
03 13 51 23	LMP	Only the newest feature is of any sharp definition to them, and eventually they get eroded down by the constant bombardment of small meteorites.
03 13 51 45	LMP	How is the picture now, Houston? Houston, are you reading us?
03 13 51 54	CC	Loud and clear, and the picture looks real fine.
03 13 52 00	LMP	Thank you.
03 13 52 04	LMP	Can you see the two large craters just to the right of our track, Houston?
03 13 52 15	CC	That's affirmative.
03 13 52 51	LMP	The very bright features you see are the new impact craters, and the longer a crater has been on the surface of the moon, why, the more mottled and subdued it becomes. Some of the - -
03 13 53 25	CC	Apollo 8, we've apparently lost your voice; the picture is still good.

03 13 53 32	LMP	Roger.
03 13 53 37	CMP	Houston, we're passing over an area that's just east of the Smyth's Sea now, in checking our charts. Smyth's Sea is coming up in a few minutes.
03 13 53 51	CC	Roger.
03 13 54 12	CC	Apollo 8, if you go to POO and ACCEPT, we'll uplink some information.
03 13 54 43	LMP	We are now coming up towards the terminator, and I hope soon that we'll be able to show you the varying contrast of white as we go into the darkness. Houston, we're in POO, and you have the computer.
03 13 54 58	CC	Thank you.
03 13 55 16	LMP	We're now approaching a series of small impact craters. There is a dark area between us and them which could possibly be an old lava flow.
03 13 55 58	LMP	You can see the large mountains on the horizon now ahead of the spacecraft to the north of our track.
03 13 56 25	LMP	The intensity of the sun's reflection in this area makes it difficult for us to distinguish the features we see on the surface, and I suppose it's even harder on the television, but as we approach the terminator and the shadows become longer, you'll see a marked change.

03 13 57 00	LMP	There is a very dark crater in the filling material in this valley in front of us now. It is rather unusual in that it is sharply defined, yet it's dark all over its interior walls, whereas most new-looking craters are of very bright interior.
03 13 57 38	LMP	Small impact crater in front of us now in the little mare well defined, quite new, and another one approaching. The spacecraft is facing North. From our track, we are going sideways to our left.
03 13 58 11	LMP	You are now seeing the Sea of Crises coming over the horizon.

END OF TAPE

03 13 58 37	LMP	We believe the crater, the large dark crater between the spacecraft and the Sea of Crises is Condorcet Crater. The Sea of Crises is amazingly smooth as far as the horizon and past this rather rough mountainous region in front of the spacecraft.
03 13 59 10	CC	Apollo 8, we are through with the computer. You can go back to BLOCK, and it looks like we are getting a lot of reflection off your window now.
03 13 59 25	LMP	Roger. We'll switch windows. How does that look now, Ken?
03 13 59 41	CC	That's real fine.
03 14 00 26	CC	Apollo 8, can you tell us which window you are looking out? And there is a large crater, looks like it is sticking up in the upper right hand corner of our picture. Can you identify that one?
03 14 00 43	LMP	Roger. We are just about to lose our lock; that is why we are slowing up a little bit. We see the Sea of Crises in front of us now. We are looking out the left hand rendezvous window.
03 14 01 28	LMP	Houston, how are you reading us now?
03 14 01 30	CC	Loud and clear.
03 14 01 34	LMP	The crater you see on the horizon is the Sea of Crises. How are you reading us, Houston?

03 14 01 47	CC	Loud and clear, Apollo 8, and we have a picture that is good.
03 14 01 51	LMP	Right.
03 14 01 53	LMP	Roger. We are getting a lot of static. The Sea of Crises is in front of us on the horizon, and the dark crater Picard can be seen in the middle. We ar now breaking the moon's sunrise or the spacecraft's sunset. Tnis is an area that the sun has just recently come up on the moon. The mare we are over now has a mottled look aoout it, but not very heavily cratered, so it must be relatively new. This is the Sea of Fertility, and we're coming upon a large crater, the delta rim variety; has a strange circular cracked pattern around the middle of it. The crater that you see now is about 30 or 40 miles across.
03 14 03 51	LMP	How is your picture quality, Houston?
03 14 03 55	CC	This is phenomenal.
03 14 04 00	LMP	There is an interesting rill directly in front of the spacecraft now, running along the edge of a small mountain; rather sinuous shape with right-angle turns.
03 14 04 30	CMP	This area just to the west of the Sea of Crises is called the Marsh of Sleep and to the west of that the Sea of Tranquility.
03 14 04 40	LMP	Can you see the fracture patterns going across the mare in front of us now, Houston?

03 14 04 47 CC That doesn't quite stand out.

03 14 04 53 LMP Roger. The series of cracks or faults across the middle of the mare: they drop down in about three steps to the south. The parallel fault pattern to the north has a drop down in the center. I hope all of you back down on earth can see what we mean when we say that it is a rather foreboding horizon, a very rather dark and unappetizing looking place. We are now going over - approaching one of our future landing sites selected in this smooth region to - called the Sea of Tranquility - smooth in order to make it easy for the initial landing attempts in order to preclude the having to dodge mountains. Now you can see the long shadows of the lunar sunrise. We are now approaching the lunar sunrise, and for all the people back on earth, the crew of Apollo 8 has a message that we would like to send to you.

03 14 06 56 LMP In the beginning, God created the Heaven and the Earth. And the Earth was without form and void, and darkness was upon the face of the deep. And the spirit of God moved upon the face of the waters. And God said, "let there be light." And there was light. And God saw the light and that it was good, and God divided the light from the darkness.

03 14 07 29 CMP And God called the light Day, and the darkness he called Night. And the evening and the morning

were the first day. And God said, "let there be a firmament in the midst of the waters. And let it divide the waters from the waters." And God made the firmament and divided the waters which were under the firmament from the waters which were above the firmament. And it was so. And God called the firmament Heaven. And the evening and the morning were the second day.

03 14 08 07	CDR	And God said, "let the waters under the Heavens be gathered together into one place. And let the dry land appear." And it was so. And God called the dry land Earth. And the gathering together of the waters called the seas. And God saw that it was good. And from the crew of Apollo 8, we close with good night, good luck, a Merry Christmas and God bless all of you - all of you on the good Earth.
03 14 09 46	CDR	Houston, how do you read? Apollo 8.
03 14 09 48	CC	Loud and clear, Apollo 8. And thank you for a very good show. We have a maneuver PAD for you when you are ready to copy.
03 14 10 00	CDR	Houston, Apollo 8.
03 14 10 02	CC	Apollo 8, read you loud and clear.
03 14 10 07	CDR	Roger. Are we off the air now?
03 14 10 21	CC	That's affirmative, Apollo 8. You are.
03 14 10 26	CDR	Did you read everything that we had to say there?

03 14 10 29	CC	Loud and clear. Thank you for a real good show.
03 14 10 34	CDR	Okay. Now, Ken, we'd like to get all squared away for TEI here. Can you give us some good words like you promised?
03 14 10 41	CC	Yes, sir. I have a maneuver PAD. I think we would like to start by dumping the tape. If we can have that, I have your TEI 10 maneuver PAD, and then we will run through a systems brief.
03 14 10 59	CDR	I understand this is a maneuver PAD that we will use for TEI. Is that correct?
03 14 11 11	LMP	And you got the tape, Houston.
03 14 11 13	CC	Thank you.
03 14 11 18	CMP	Ready to copy, Ken.
03 14 11 20	CC	Roger. TEI 10, SPS/G&N: 45597, minus 040, plus 157 08919 1564, plus 35189, minus 01513, minus 00346 180 007 000, November Alfa plus 00186 35223 318 35019 42 0928 253, boresight star Scorpii Delta (another name for it is Dzuba) down 071, left 45, plus 0748 minus 16500 12995 363 00146 5005; primary star Sirius, secondary, Rigel, 129 155 010; four quads, 15 second, ullage; horizon on the 2.9 window line at T minus 3; use high-speed procedure with minus Mike Alfa. Over.

03 14 14 40	CMP	Okay. TEI PAD as follows: SPS/G&N: 45597, minus 040, plus 157 08919 1564, plus 35189, minus 01513, minus 00346 180 007 000, not applicable, plus 00186 35223 318 35019 42 0928 253, Scorpii Delta (Dzuba), down 071, left 45, plus 0748 minus 16500 12995 36300 146 5005; Sirius, Rigel, 129 155 010; four quads, 15 seconds, 2.9-degree window line at TIG minus 3, high-speed procedure minus MA.
03 14 16 09	CC	That's correct, Apollo 8.
03 14 16 17	CDR	Ken, this is Frank. I want to - - I want to make one thing certain. This the load that we are to use to burn with, right? This is not just a PAD data for 10 abort?
03 14 16 32	CC	Okay, Apollo 8. We will update this PAD prior to the burn.
03 14 16 40	CDR	Oh, you will? Okay.
03 14 16 42	CC	Yes, sir.
03 14 16 46	CDR	Say again.
03 14 19 39	CC	Apollo 8, Houston.
03 14 19 44	CDR	Go ahead, Houston. Apollo 8.
03 14 19 46	CC	Roger. I am reading you with a lot of background noise. Can you read me clearly?
03 14 19 54	CDR	Roger.
03 14 19 55	CC	Okay. I am going to give you a quick summary of systems. Basically, all systems are good. In

respect to your return trajectory, we can still get to the mid-Pacific line at 146 hours by waiting as late as the thirteenth REV. After 138 seconds of the burn, you are on your way home. The weather in the recovery area looks good. Apollo 8, did you call?

03 14 20 43	CDR	Continue, Houston.
03 14 21 05	CC	Apollo 8, Houston. Could we have the high gain for a little bit longer?
03 14 21 12	CDR	We broke scan on it, Ken.
03 14 21 15	CC	Okay. You are coming in loud and clear now. Did you copy my trajectory information?
03 14 21 20	CDR	We are on OMNI B now.
03 14 21 23	CC	Roger. That is fine.
03 14 21 24	CDR	Say again, please. Go ahead. We are 130 - Will you say again, please?
03 14 21 29	CC	Wilco, Apollo 8. First, if you can spare, we would like to have the high gain to complete the dump.
03 14 21 54	CDR	Stand by. We will try to get it for you.
03 14 21 56	CC	Roger.
03 14 22 17	CDR	In a couple of minutes there, Houston.
03 14 22 19	CC	Roger. Thank you.
03 14 22 47	CC	Okay, Apollo 8. While we are - -
03 14 22 57	CC	Apollo 8, while we are waiting for the high gain, I will continue the trajectory summary. We can

still get back to the mid-Pacific line in 146 hours from the thirteenth REV, and you are on your way after 138 seconds of the burn. That's 138 seconds, gets you clear of the butterfly region. We recommend not trying preignitions or restarts after 20 seconds. If you go beyond 20 seconds, this may get the trajectory beyond the correction - RCS correction capability to a free return. The weather in recovery area is good. We have an AOS following TEI of 89 plus 28 plus 39 and an AOS without TEI of 89 plus 37 plus 24. During the burn, you may notice a slight change in chamber pressure and tank pressures due to the fuel exhaustion in the storage tank and going to the sump tank. This may occur somewhere around 2 to 5 seconds into the burn. It'll be a small change in pressures in both systems. Going down the systems, all systems are GO. In ECS, we want to stop water boiling after TEI for trajectory purposes. Your water dump situation looks good; you should be good to greater than 105 hours. We'll try to hold off the water dump until after MCC 5. In the EPS, we'd like to stir the cryos prior to TLI - correction TEI. The next purge on the fuel cells will occur at approximately 92 hours, and that will be both hydrogen and oxygen. Your battery status: battery A 34.9, battery B 39.1, and Charlie 38.5. We have the

single tank cryo capability. SPS: looking at the performance on the previous burns, you can anticipate a normal burn taking approximately 3.7 seconds in excess of the computed values. Engine performance looks nominal, and all parameters have been steady. RCS looks good; all four quads according to the computer programs have approximately the same capacity. You have a good REFSMMAT to take you through TEI. We'll have a post TEI PTC attitude for you in a few minutes, and that just about wraps up what we have on systems. Over.

03 14 26 43	CDR	Roger. Thank you, Houston. We appreciate the summary. We're trying to get high gain.
03 14 26 49	CC	Roger.
03 14 26 53	CMP	I think we have it.
03 14 26 54	CDR	You do have the high gain. Now, Ken, as I understand it, if it shuts down after 20 seconds of burn, you don't want us to try to relight it. Is that what you said?
03 14 27 04	CC	Stand by.
03 14 27 12	CC	Apollo 8, the intent was do not delay ignitions beyond 20 seconds. Over.
03 14 27 21	CDR	Oh, do not delay ignition beyond 20 seconds. Roger.
03 14 27 24	CC	That's affirm.

03 14 27 27	CDR	Okay. You want me to start it on tank A and then switch to B again like we did on our LOI, right?
03 14 27 39	CC	That's affirmative.
03 14 27 43	CDR	Okay.
03 14 27 47	CDR	Did you put in this PAD for us? Should P30 and 40 be in our computer now?
03 14 28 19	CC	Apollo 8, that's negative. We had not uplinked this PAD. We'll put this one in on the next pass.
03 14 28 26	CDR	Okay. Roger.
03 14 33 28	CC	Apollo 8, Houston. You have a GO for this REV.
03 14 33 34	CMP	Roger, Houston.
03 14 38 29	CC	Apollo 8, Houston. We have completed the tape dump, and the recorder is yours.
03 14 38 35	CDR	Thank you.
03 14 43 03	LMP	Houston, how do you read? Apollo 8 on OMNI C.
03 14 43 06	CC	Loud and clear.
03 14 43 10	LMP	Thank you.
03 14 44 27	CC	Apollo 8, Houston. We're 5 minutes to LOS; we'll have AOS Honeysuckle at 87:38:42.
03 14 44 42	CMP	Roger.

3 minute interval

03 14 52 14	CC	Apollo 8, everything looks good going over the hill.
03 14 52 21	CDR	Roger, Ken. Thanks a lot. We'll see you around the next pass. Just have our TEI update for us when you're ready. Okay?
03 14 52 28	CC	Roger.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

03 15 24 XX		BEGIN LUNAR REV 10
03 15 39 47	CDR	Houston, Apollo 8.
03 15 39 49	CC	Loud and clear, Apollo 8.
03 15 39 53	CDR	Okay. You want the computer?
03 15 40 36	CC	Apollo 8, we would like to have the high gain, and when we get that, well, we will start a dump, and we will start your updates.
03 15 40 44	CDR	Okay. How about reading us the PAD, and we will try to get you the high gain.
03 15 40 57	CDR	Ken, read us off the PAD in case you can't get the dump in; we can still do it.
03 15 41 01	CC	Roger. I have got them right here.
03 15 41 19	CC	Okay, Apollo 8. The first PAD I have is TEI 10.
03 15 41 26	CDR	Go ahead.
03 15 41 28	CC	Alright. TEI 10, SPS/G&N: 45597, minus 040, plus 157 08919 1567, plus 35186, minus 01512, minus 00520 180 007 000, November Alfa, plus 00186 35223 318 35018 42 0924 253; Scorpii Delta, down 069, left 45, plus 0748, minus 16500 12994 36300 146 5005; primary star Sirius, secondary Rigel, 129 155 010; four quads, 15 seconds, ullage; horizon on 3.2-degree window line at T minus 3; use high-speed procedure with minus Mike Alfa. Over.
03 15 44 23	CDR	Stand by 1 second.
03 15 44 33	CDR	You got the high gain now, Ken.

03 15 44 36	CC	Roger.
03 15 44 38	CMP	Houston, Apollo 8. How do you read?
03 15 44 40	CC	Loud and clear.
03 15 44 44	CC	Apollo 8, we would like to - -
03 15 44 45	CMP	- - TEI 10.
03 15 44 50	CC	Apollo 8, we would like to have you go to POO and ACCEPT, and we would like to take the recorder at this time; then I will copy your PAD.
03 15 45 00	CMP	You have got POO and ACCEPT, and you have the recorder.
03 15 45 06	CC	Thank you, Jim.
03 15 45 13	CMP	All set for the maneuver.
03 15 45 14	CC	Go ahead.
03 15 45 18	CMP	TEI 10, SPS/G&N: 45597, minus 040, plus 157 08919 1567, plus 35186, minus 01512, minus 00520 180 007 000, not applicable, plus 00186 35223 318 35018 42 0924 253; Scorpii Delta, down 069, left 45, plus 0748, minus 16500 12994 36300 146 5005; Sirius, Rigel, 129 155 010; four-quad, ullage, 15 seconds; horizon on the 3.2-degree mark is T minus 3; high-speed procedure minus MA.
03 15 46 46	CC	That is correct, Apollo 8. Would like to confirm the hours on GETI, 089.
03 15 46 57	CMP	Roger. 089.
03 15 47 03	CC	Alright, Apollo 8. I have TEI 11 PAD.
03 15 47 15	CDR	We are ready; go ahead.

03 15 47 17	CC	Roger. TEI 11, SPS/G&N: 45597, 0 - correction - that's minus 040, plus 157 09118 1224, plus 36325, minus 01727, plus 01428 180 003 000, November Alfa, plus 00186 36394 323 36186 42 0995 254; Scorpii Delta, down 103, left 48, plus 0742, minus 16500 130 05 363 27 146 5144; Sirius and Rigel, 129 155 010, four quads, 15 seconds; horizon on 2.9-degree line at T minus 2; high-speed procedure with minus Mike Alfa. Over.
03 15 49 47	CMP	Roger, Houston. TEI minus 11, SPS/G&N: 45597, minus 040, plus 157 09118 1224, plus 36325, minus 01727, plus 01428 180 003 000, not applicable, plus 00186 36394 323 36186 42 0995 254; Scorpii Delta, down 103, left 48, plus 0742, minus 16500 13005 36327 14651 44; Sirius, Rigel, 129 155 010; four guads, 15 seconds, 2.9-degree window mark at T minus 2; high-speed procedure minus MA.
03 15 51 15	CC	That's correct, Apollo 8.
03 15 51 25	LMP	Houston, could you give me the SPS helium tank temperature at about 87:20, please?
03 15 51 42	CC	Okay. Stand by one.
03 15 51 47	LMP	Roger.
03 15 54 10	CC	Apollo 8, Houston. Our loads are in and verified; the computer is yours.
03 15 54 18	CMP	Roger.
03 15 54 35	CMP	Houston, Apollo 8.

03 15 54 46	CC	Apollo 8, Houston. At 87:48, we're reading 84 degrees, and at LOS we had 80. We'll take a look at the tape and see if we can find out what we had on the backside.
03 15 55 03	LMP	Okay. I would kind of like to know what I might expect at ignition here at TEI.
03 15 55 11	CC	Roger. We'll take that off the tape.
03 15 55 19	CMP	Houston, this is 8. I take it you have loaded both state vectors; is that correct?
03 15 55 24	CC	That's affirmative.
03 15 55 28	CMP	Roger.
03 15 55 33	CC	We loaded your CSM and LM NAV and external DELTA-V, in that order.
03 15 55 43	CMP	Roger.
03 16 03 28	CC	Apollo 8, Houston.
03 16 03 33	CDR	Go ahead, Houston. Apollo 8.
03 16 03 36	CC	Okay, Apollo 8. We've reviewed all your systems. You have a GO for TEI. One of the things we would like to do as soon as you come out on the other side is a P23. We are checking into your helium pressures now. We're going to correlate not only the last REV but the previous REV for the same location, and we will have that number for you in a little bit.
03 16 04 03	CDR	Okay.
03 16 09 47	CC	Apollo 8, Houston. The tape recorder is yours. I have your PTC attitude.

03 16 09 55	CDR	Roger. Go ahead.
03 16 09 58	CC	Okay. PTC attitude will be pitch 10, yaw 45. This begins at 92 hours. Over.
03 16 10 11	CDR	Is that pitch 10 and yaw 45?
03 16 10 14	CC	Affirmative. And looks like that will go with the entry REFSMMAT; begins at 92 hours.
03 16 10 24	CDR	Thank you.
03 16 10 31	CC	Apollo 8, would you put your UP TELEMETRY to BLOCK, please?
03 16 10 40	CMP	In BLOCK.
03 16 14 49	CC	Apollo 8, Houston.
03 16 14 54	CDR	Go ahead.
03 16 14 56	CC	Okay. On the helium tank TEMP's: that's not recorded on low bit rate, and looking over our tape dumps, most of this stuff we have on the backside there is low bit rate. So we won't be able to give you an exact number, but looking at what we have every time we go out of sight and come back over the hill, it looks like you can expect about 82 to 84 degrees as a nominel temperature.
03 16 15 22	CDR	Thank you.
03 16 28 28	CC	Apollo 8, Houston. We'd like to have the tape recorder for about 5 minutes for one last look.
03 16 28 35	CMP	Roger, Houston. You're getting it.

03 16 28 38	CC	Thank you. And I guess we still have a cryo stir ahead of us, and we've checked your triple bias, and there's no change.
03 16 28 52	LMP	Roger. And we're stirring cryos right now.
03 16 28 56	CC	Thank you.
03 16 31 20	CDR	Ken, are you through with the tape recorder?
03 16 31 23	CC	Stand by one.
03 16 31 28	CDR	We're on a maneuver to burn attitude, and it's going to make us lose the high gain.
03 16 31 57	CC	Apollo 8, the tape recorder is yours. We have your Double Umber update, 89:07:15.87.
03 16 32 11	CDR	Roger. Copy.
03 16 32 13	CC	Roger. And no change on your AOS time.
03 16 32 20	CMP	Say that again, will you, Ken?
03 16 32 22	CC	There's no change on your AOS time.
03 16 32 28	CDR	Now what was it?
03 16 32 31	CC	Okay. With TEI, 89:28:39.
03 16 32 40	CDR	Thank you.
03 16 32 42	CC	Roger.
03 16 47 37	CC	Apollo 8, Houston. We have 3 minutes to LOS; all systems are GO.
03 16 48 06	CC	Apollo 8, Apollo 8, this is Houston. Three minutes LOS; all systems are GC. Over.
03 16 49 16	CDR	Roger. Thank you, Houston. Apollo 8.
03 16 50 55	CC	All systems are GO. Apollo 8.
03 16 51 01	CDR	Thank you.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

03 17 15 XX — TEI MANEUVER

03 17 31 12	CC	Apollo 8, Houston.
03 17 31 30	CC	Apollo 8, Houston.
03 17 31 58	CC	Apollo 8, Houston.
03 17 32 50	CC	Apollo 8, Houston.
03 17 33 38	CC	Apollo 8, Houston.
03 17 34 16	CMP	Houston, Apollo 8. Over.
03 17 34 19	CC	Hello, Apollo 8. Loud and clear.
03 17 34 25	CMP	Roger. Please be informed there is a Santa Claus.
03 17 34 31	CC	That's affirmative. You are the best ones to know.
03 17 34 37	CMP	That burn status report: it burned on time; burn time 2 minutes 23 seconds, seven-tenths VG_X. Attitude nominal, residuals minus five-tenths VG_X plus four-tenths VG_X - of minus 0 VG_Z. DELTA-V_C minus 26.4.
03 17 35 14	CC	Roger.
03 17 35 19	CC	Apollo FLIGHT has -
03 17 35 23	CC	Apollo 8, reconfirm your burn time, please.
03 17 35 30	CMP	Roger. We had 2 minutes 23 seconds. Our - wait one. Change that to read 3 minutes 23 seconds.
03 17 35 43	CC	Thank you.
03 17 36 33	CDR	This gives the sensation that you are climbing, Ken.

03 17 36 35	CC	Say again, Apollo 8.
03 17 36 41	CDR	I say that this gives the sensation that you are climbing.
03 17 36 47	CC	Roger.
03 17 36 53	CDR	What's next on the docket?
03 17 36 56	CC	High-gain antenna.
03 17 37 10	CC	Apollo 8, at the first convenient moment, we'd like to have the high-gain antenna.
03 17 37 19	CDR	You've got it; you're on the high gain.
03 17 37 25	CC	Roger.
03 17 39 50	CC	Apollo 8, Houston. We do not have any data on the ground yet; the voice is very good.
03 17 40 01	CDR	Roger.
03 17 41 44	CC	Apollo 8, Houston. We'd like to try to have you manually acquire on the high gain.
03 17 41 55	CDR	Okay.
03 17 51 57	CC	This will take a wide beam width.
03 17 42 01	CDR	Wide beam width. Roger.
03 17 43 06	CDR	Houston, Apollo 8. We've manually acquired in wide beam.
03 17 43 10	CC	Roger. Reading you loud and clear. Initial tracking indicates a 4 foot per second at 8 hours will put you on target.
03 17 43 22	CDR	Four foot per second at 8 hours.
03 17 43 25	CC	Correction, that's 15 hours.
03 17 43 27	CDR	Roger. Roger.

03 17 43 43	CC	Apollo 8, we have data; we'd like to have the tape recorder.
03 17 43 50	CDR	You can have it.
03 17 43 52	CC	Thank you.
03 17 45 11	CDR	Houston, Apollo 8.
03 17 45 12	CC	Go ahead, Apollo 8.
03 17 45 17	CMP	Roger. Do you wish me to reinitialize the W-matrix at this time?
03 17 45 26	CC	Affirmative, Apollo 8.
03 17 45 31	CDR	Roger. And that - -
03 17 45 43	LMP	Houston, Apollo 8. Which battery do you want us to start charging?
03 17 45 52	CC	Okay. We'd like to start on battery Alfa.
03 17 45 57	LMP	Battery Alfa. Okay.
03 17 46 08	CC	Apollo 8, would you go to NARROW BEAM on the high gain?
03 17 46 17	CDR	Just a minute.
03 17 46 27	CDR	We're on NARROW BEAM.
03 17 46 29	CC	Roger. Sounds real good now.
03 17 51 33	CC	Apollo 8, Houston.
03 17 51 38	LMP	Go ahead, Houston. Apollo 8.
03 17 51 40	CC	Okay. If you'll go to POO and ACCEPT, we'll update the REFSMMAT, and I have some backup GDC angles for the new entry REFSMMAT.
03 17 51 51	LMP	Roger. Understand; POO and ACCEPT, and you'll give us the new REFSMMAT.

03 17 51 57	CC	Affirm.
03 17 52 52	LMP	Okay. Houston, you have the ACCEPT.
03 17 52 57	CC	Roger. Your backup GDC alignment: roll 308, pitch 209, yaw 357. Over.
03 17 53 17	LMP	Roger. Alright. What set of stars?
03 17 53 19	CC	That's on Sirius and Rigel.
03 17 53 27	LMP	Understand; roll 308, pitch 209, yaw 357.
03 17 53 31	CC	That's affirmative, Apollo 8.
03 17 54 06	CC	Good morning, Apollo 8; Deke here. I just would like to wish you all a very Merry Christmas on behalf of everyone in the Control Center, and I'm sure everyone around the world. None of us ever expected to have a better Christmas present than this one. Hope you get a good night's sleep from here on and enjoy your Christmas dinner tomorrow; and look forward to seeing you in Hawaii on the twenty-eighth.
03 17 54 30	CDR	Okay, leader. We'll see you there. That was a very, very nice ride, that last one; this engine is the smoothest one.
03 17 54 38	CC	Yes, we gathered that; an outstanding job all the way around.
03 17 54 46	CDR	Thank everybody on the ground for us. It's pretty clear we wouldn't be anywhere if we didn't have them doing it or helping us out here.
03 17 54 52	CC	We concur that.
03 17 54 53	CMP	I concur, too.

03 17 55 01	LMP	Even Mr. Kraft does something right once in a while.
03 17 55 07	CC	He got tired of waiting for you to talk and went home.
03 17 55 12	LMP	Okay.
03 17 57 01	CC	Apollo 8, Houston.
03 17 57 06	CDR	Go ahead, Houston.
03 17 57 07	CC	Okay. The computer is yours, and I guess we have an IMU alignment and a P23 on the schedule.
03 17 57 17	CDR	Okay. Thank you. Do an IMU alignment coming up. See them in black.
03 17 57 25	CC	Roger.
03 17 59 01	CC	Apollo 8, Houston. We would like to have you cycle your ZERO OPTICS switch prior to beginning P52.
03 17 59 11	CDR	Roger. We are going to see if we can find some stars here before we do this P52.
03 17 59 18	CC	Roger. And got a couple of words for you. Jack's been watching you since LOI, and he has a few words he wants to give you.
03 17 59 30	CDR	Go ahead.
03 17 59 31	CC	Typhoid Jack here, and we have got some good words here that originated at the Cape with a bunch of friends of yours. And it's sort of in a paraphrase of a poem that you probably are familiar with. Do you read me, Apollo 8?
03 17 59 50	CDR	You are loud and clear, Jack.

03 17 59 53 CC Okay. "'Twas the night before Christmas and way out in space, the Apollo 8 crew had just won the moon race. The headsets were hung by the consoles with care in hopes that Chris Kraft soon would be there. Frank Borman was nestled all snug in his bed, while visions of REFSMMAT's danced in his head; and Jim Lovell, in his couch, and Anders, in the bay, were racking their brains over a computer display. When out of the DSKY, there arose such a clatter, Frank sprang from his bed to see what was the matter. Away to the sextant he flew like a flash to make sure they weren't going to crash. The light on the breast of the moon's jagged crust gave a luster of green cheese to the gray lunar dust. When what to his wondering eyes should appear, but a Burma Shave sign saying 'Kilroy was here.' (Laughter) But Frank was no fool; he knew pretty quick that they had been first; this must be a trick. More rapid than rockets, his curses they came. He turned to his crewmen and called them a name. Now Lovell, now Anders, now don't think I'd fall for an old joke you've written up on the wall. They spoke not a word, but grinning like elves, and laughed at their joke in spite of themselves. Frank sprang to his couch, to the

ship gave a thrust, and away they all flew past the gray lunar dust. But we heard them explain ere they flew around the moon: Merry Christmas to earth; we will be back there real soon."

Great job, gang.

03 18 01 30	CDR	Thank you very much. That was a very good poem; but in order to win the race, you have got to end up on the carriers.
03 18 01 38	CC	We will see you there.
03 18 01 40	CMP	Hey, Jack. You really got Bill trained. (Laughter)
03 18 01 44	LMP	Okay.
03 18 01 45	CC	I certainly hope so.
03 18 01 47	CC	You did pretty well, Jim.
03 18 01 52	CC	You must have talked on the way out there. (Laughter)
03 18 07 21	CDR	Houston, this is Apollo 8.
03 18 07 24	CC	Go ahead.
03 18 07 28	CDR	Roger. We got an alignment with your new REFSMMAT now. What's on the program here? You want us in P23 and then what?
03 18 07 40	CC	Looks like some sleep is coming up.
03 18 07 46	CDR	That's what I wanted you to say. We used up the gimbal angles of 10 and 45 with the - this REFSMMAT, right?
03 18 07 54	CC	Affirmative.
03 18 07 58	CDR	Okay.

03 18 13 56	CC	Apollo 8, Houston.
03 18 14 00	CDR	Go ahead, Houston. Apollo 8.
03 18 14 03	CC	Roger. Notice that you are starting on your P23 which is the last scheduled activity. Initial tracking looks like the initial midcourse may be less than the 4 foot per second on the first guess. And we have looked at your burn data, and it's all just as smooth as you said; everything on there looked real nominal. Systems now look good; looks like in PTC attitude, we should be able to switch OMNI's for you, if you would like to do that. We were having good success with predicting on the way out where to switch the antennas, and if it will help you any, we can do that on the way back in.
03 18 14 48	CDR	That would be nice if you could do it, but we will keep one man in the shop to watch the gimbal angles; but if you could switch the OMNI's, it would sure save us a lot of problems.
03 18 14 58	CC	Okay. We will do that. When you get in the PTC attitude, we will let you know when we take the command on the antenna switching.
03 18 15 10	CDR	Okay. Just be careful what you do with the tape recorder. Bill's a little sensitive about that.
03 18 15 25	CC	Roger. We were listening to the tape dumps, and it looks like Bill gets a happy new year after all.

03 18 15 35	CDR	A happy new year? How come, Jack - an, in a joke?
03 18 15 40	CC	No, we got that off of his tape dump; he and Jim were discussing that one.
03 18 15 48	CDR	Oh, yes. That's right.
03 18 35 16	CDR	Houston, are you getting all this data from P23?
03 18 35 39	CDR	Houston, Apollo 8.
03 18 35 40	CC	Go ahead, Apollo 8.
03 18 35 44	CDR	I wanted to know if you're getting the data from P23?
03 18 35 47	CC	That's affirmative.
03 18 35 51	CDR	Okay.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

03 18 50 18	CC	Eureka!
03 19 09 55	CDR	Houston, Apollo 8.
03 19 09 56	CC	Go ahead, Apollo 8.
03 19 10 14	CDR	Houston, Apollo 8.
03 19 10 16	CC	Go ahead, Apollo 8.
03 19 10 22	CDR	Ken, we've about run out of gas here on this next set of stars. Would you ask your people to be especially alert there watching the systems tonight?
03 19 10 31	CC	Sure will, Frank.
03 19 10 36	CDR	Okay. It's maneuver to pitch 10 and yaw 45.
03 19 10 41	CC	Roger. I have - let's see, we've got a hydrogen purge line here that ought to come on about 91:40 and an oxygen-hydrogen fuel cell purge for 92 hours.
03 19 10 59	CDR	Okay. Will you call us about those, please?
03 19 11 02	CC	I sure will. And, let's see, we just wanted to let you know we've got a real good battery charge going here this time. Looks like - it looks just like the ones in the book, and I'd like to get a battery C voltage before you shut down, and a sleep report on what you did in - -
03 19 11 22	CDR	Okay.
03 19 11 23	CC	- - lunar orbit and your plans for the next couple of hours.
03 19 11 29	CDR	Okay.
03 19 11 47	CDR	Thirty-seven volts on battery C.

03 19 11 50	CC	Roger. Thirty-seven volts.
03 19 11 52	CDR	That looks good.
03 19 11 59	CDR	We all only got about 2 hours sleep today MAX, Ken. We're going now - Bill's going to stay up awhile, and Jim and I are going to sack out, and we're going to try to rotate short sleep cycles till we can get back to the normal one.
03 19 12 12	CC	Roger, sounds like a good idea. And EECOM on the ground tells us that the flying EECOM to go ahead and put his hydrogen purge line heater on, and we'll get ready for a fuel cell.
03 19 12 27	CDR	Thank you. He can't turn on his radio. There he goes.
03 19 12 44	CDR	I hope it won't disappoint anybody too much if we knock off those last two stars, but Jim is just in a daze, and so am I.
03 19 12 50	CC	Roger. No sweat.
03 19 12 55	CDR	Thank you.
03 19 13 19	CC	Apollo 8. One of the things we'd like to have before you shut down also is VERB 64 so we can watch the pointing angles.
03 19 13 30	CDR	Roger.
03 19 13 35	CC	Hey, Frank, you might be interested; they are having some trouble with the medics' P-2.
03 19 13 45	CDR	What?
03 19 13 48	LMP	The medics can't clean out their P-2.

03 19 14 01	CDR	Oh, is that right? It's been so busy.
03 19 14 02	CC	Oh, yeah. It's worn the thing out at the bearings. (Laughter)
03 19 14 33	CDR	Hey, Ken, tell the people if you see anything getting close to the gimbal lock to be sure and whistle, too, will you?
03 19 14 40	CC	We sure will, Frank. You will want to make sure one of you keeps your COMM carrier on.
03 19 14 43	CDR	We'll keep one man with a headset on.
03 19 14 50	CDR	That's right. We'll keep one man with a COMM carrier on.
03 19 19 39	CC	Apollo 8. You have got some big yaw angle there.
03 19 19 55	CC	Apollo 8, Houston.
03 19 20 04	CC	Apollo 8, Houston.
03 19 20 11	CC	Apollo 8, Apollo 8, Houston.
03 19 20 23	CC	Apollo 8, Houston.
03 19 20 41	CC	Apollo 8, Houston.
03 19 21 46	CC	Apollo 8, Houston.
03 19 22 17	CC	Apollo 8, Houston.
03 19 24 56	CC	Apollo 8, Houston.
03 19 28 16	CC	Apollo 8, Houston. Copy that you are now in PTC attitude, and we're watching your gimbal angle. We apparently do not have a downlink voice, but the data is good.
03 19 28 53	LMP	Houston, Apollo 8. Over.
03 19 28 55	CC	Loud and clear, 8.

03 19 29 07	LMP	Okay. We're establishing PTC. We took one last look at the moon and on our way back.
03 19 29 13	CC	Roger.
03 19 32 17	CC	Apollo 8, Houston.
03 19 32 23	LMP	Go ahead, Houston.
03 19 32 25	CC	Okay. In order for us to handle the antenna switching, I guess we'd like to have the AUX tape switched to OFF, and the tape FORWARD switch OFF; and we'll be switching between OMNI's Bravo and Delta.
03 19 33 01	LMP	Between what and what?
03 19 33 05	CC	Okay. We are going to be switching between OMNI's Bravo and Delta.
03 19 33 14	LMP	Okay.
03 19 33 17	CC	Alright. And I'm gonna - you bug me when you get over 50 degress of yaw, so I'll probably be watching that number pretty closely. We'd like to have the BIOMED switched to the right position. Okay. And for your own information: the fuel we show in the different quads I have here if you would like to copy it.
03 19 34 07	LMP	Stand by.
03 19 35 50	LMP	Okay. Ready to copy.
03 19 35 54	CC	Okay. I'll give you the percentage on Alfa 60, Bravo 57, Charlie ...

03 19 36 11	LMP	Wait a minute. It asks for present time, and I can't plot that fast, Ken.
03 19 36 15	CC	Okay. I'm sorry. Alfa is 60.
03 19 36 22	LMP	For what time?
03 19 36 26	CC	91:36.
03 19 36 35	LMP	Okay. Stand by.
03 19 36 44	LMP	Okay. What's Bravo?
03 19 36 46	CC	Okay. That's 57.
03 19 36 59	LMP	Okay.
03 19 37 00	CC	Charlie 62.
03 19 37 19	LMP	Okay.
03 19 37 20	CC	And Delta 57.33842.
03 19 37 33	LMP	That's a coincidence. That's just what I worked out on Lovell's slide rule.
03 19 37 46	LMP	How are we doing on the cryos?
03 19 37 52	CC	Oh, you've got some pretty good numbers on that that I sent up yesterday, and you had about 160 hours. Well, I'll check that out, but you were fat on cryo. I've got some SPS DELTA-V. You've got 33:20. You fly the service module RCS through the DAP. You have 142; and through SCS, it's 121.
03 19 38 43	LMP	Roger.
03 19 39 55	CC	Apollo 8, Houston. We can't monitor on low bit rate whether you started your fuel cell purge. If you haven't, we can still go ahead

		and start now; and if you can, keep us posted as you go through it.
03 19 40 08	LMP	Roger. You want an O_2 and an H_2 purge, Ken?
03 19 40 12	CC	That's affirmative.
03 19 40 18	LMP	You shall have it.
03 19 40 19	CC	Thank you.
03 19 51 59	CC	Apollo 8, Houston - -
03 19 52 05	LMP	Go ahead.
03 19 52 07	CC	It looks like you may be in OMNI Alfa. Can you confirm that we're set up to switch between Bravo and Delta?
03 19 52 29	LMP	You are now.
03 19 52 31	CC	Okay. Thank you very much. And you are in the fuel cell purge?
03 19 52 39	LMP	It's complete.
03 19 52 41	CC	Okay. Understand the purge is complete. Thank you. And in reference to your cryo, it looks like we'll have 180 pounds in each oxygen tank at SEP and 11 pounds in each hydrogen tank. And you're well above the single tank capability.
03 19 53 16	LMP	Okay. Thank you.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

03 20 22 22	CC	Apollo 8, Houston in the blind. Select OMNI Charlie. Over.
03 20 24 29	CC	Apollo 8, Houston. Apollo 8, Houston in the blind. We've lost all data on you and request you select us a good OMNI antenna; try Charlie. Over.
03 20 28 09	CC	Apollo 8, Houston in the blind. Your yaw is 42 degrees. Recommend you set pitch and yaw to ATTITUDE HOLD for PTC. Over.
03 20 29 58	CC	Apollo 8, Apollo 8, this is Houston in the blind. Switch to antenna Alfa. Over. Antenna Alfa.
03 20 32 56	CC	Apollo 8, Apollo 8, Houston in the blind. Select antenna Alfa, antenna Alfa. Over.
03 20 35 13	CC	Apollo 8, Houston. Over.
03 20 35 34	CC	Apollo 8, Houston. Over.
03 20 37 37	CC	Apollo 8, Houston. Over.
03 20 37 56	CC	Apollo 8, Houston. Over.
03 20 39 04	CC	Apollo 8, Houston. Over.
03 20 39 22	CC	Apollo 8, Houston. Over.
03 20 41 24	CC	Apollo 8, Apollo 8, this is Houston, Houston. Over.
03 20 41 45	CC	Apollo 8, Apollo 8, this is Houston, Houston. Over.
03 20 42 24	CC	Apollo 8, Apollo 8, Houston, Houston. Over.
03 20 43 20	CC	Apollo 8, Houston. Over.
03 20 52 46	CC	Apollo 8, Houston. Over.
03 20 53 22	CC	Apollo 8, Apollo 8, this is Houston, Houston. Over.
03 20 53 38	CC	Apollo 8, Apollo 8, this is Houston, Houston. Over.
03 20 54 01	CC	Apollo 8, Apollo 8, this is Houston, Houston. Over.

03 20 55 27	CC	Apollo 8, Apollo 8, this is Houston, Houston. Over.
03 20 57 28	LMP	Houston, Apollo 8.
03 20 57 30	CC	Apollo 8, this is Houston. How do you read?
03 20 57 36	LMP	I read you loud and clear; my COMM here must have come unconnected.
03 20 57 42	CC	Roger, Bill. We lost data on you for 15 minutes and voice COMM for about 45 and were beginning to get a little itchy. Is your PTC set up for rate command attitude hold?
03 20 58 05	LMP	Roger. Pitch and roll is in PTC.
03 20 58 09	CC	Roger.
03 20 58 18	CC	Apollo 8, Houston. Set up OMNI Charlie. Over.
03 20 59 01	LMP	Roger. OMNI Charlie.
03 20 59 04	CC	Roger.
03 20 59 26	CC	Apollo 8, Houston. We're showing yaw 54.5. Over.
03 20 59 41	LMP	Roger. It's been deadband right around there the whole time.
03 21 00 38	LMP	You can take command POO, also, if you want to. You might have to use it again.
03 21 00 44	CC	Apollo 8, Houston. Say again.
03 21 00 59	CC	Apollo 8, Apollo 8, Houston. Say again.
03 21 01 08	LMP	You can take over command POO; you might have to use it again.
03 21 01 14	CC	Roger, Bill.
03 21 01 23	LMP	I'm trying to be quiet so the other guys can sleep, Jerry.

03 21 01 28	CC	Roger, Bill.
03 21 06 24	CC	Apollo 8, Apollo 8, Houston. Over.
03 21 06 33	LMP	Roger.
03 21 06 36	CC	Apollo 8, this is Houston.
03 21 06 39	LMP	Go ahead.
03 21 06 40	CC	Switch to OMNI Bravo, and we'll try the Bravo-Delta switching again. Over.
03 21 06 53	LMP	You got it.
03 21 20 58	LMP	You blew it.
03 21 22 00	LMP	We're on OMNI E now, Houston.
03 21 22 03	CC	Roger, Bill.
03 21 22 09	LMP	Looks like B couldn't quite hack it; I'll put it back there in a minute.
03 21 22 12	CC	Roger.
03 21 22 18	LMP	Houston, if your EECOM's need any more help, just tell them to give me a call.
03 21 22 23	CC	Roger.
03 21 30 57	LMP	We're going on OMNI Bravo now, Houston.
03 21 31 05	CC	Apollo 8, Houston. Say again.
03 21 31 11	LMP	OMNI Bravo.
03 21 31 12	CC	Roger. OMNI Bravo.
03 21 32 58	CC	Apollo 8, Houston. Looks like we're getting pretty far off in both pitch and yaw. Showing about 50 degrees in pitch and about 25 in yaw.
03 21 33 13	LMP	Roger. I get that.

END OF TAPE

03 22 13 08	CC	Apollo 8, this is Houston. All systems looking good. Over.
03 22 13 15	LMP	Apollo 8. Roger.
03 22 53 20	CC	Apollo 8, Houston.
03 22 54 10	CC	Apollo 8, Houston. Over.
03 22 54 16	LMP	Go ahead, Houston.
03 22 54 18	CC	Apollo 8, this is Houston. Your systems are all looking good. Got a flight plan update for you: at time 96, you can delete P52. Your drift rates are real small.
03 22 54 36	LMP	Roger. And I'd like to do the chlorination at about 95:30 if I could.
03 22 54 43	CC	Roger. Understand; chlorination: 95:30. Okay?
03 22 55 41	LMP	Houston, we're on OMNI C and going to Bravo now - correction, Dog.
03 22 55 50	CC	Roger. Understand; going Delta.
03 22 55 59	LMP	We're on Charlie now.
03 22 56 03	CC	Roger. Understand you're on Charlie. Break. Verify your UP TLM switch at COMMAND RESET is at NORMAL. Over.
03 22 56 16	LMP	Roger. It's in NORMAL. I've had the COMMAND RESET since we broke lock there, and I have to get back and control the OMNI's, so why don't you go command it over to Dog. Then give it back, and I'll set the other one on Bravo.
03 22 56 30	CC	Roger.

03 22 56 56	CC	Apollo 8, Houston. We have you on Delta; you can go to Bravo. Break. Give us a call when you've finished your chlorination. Over.
03 22 57 06	LMP	Okay. Everybody seems to be stirring around now, so we'll probably do it on time.
03 22 57 11	CC	Okay.
03 22 59 26	LMP	Houston, and the other two space aces are up now, and LMP's going to hit the pad and like to take a Seconal prior.
03 22 59 36	CC	Apollo 8, Houston. Roger. Permission granted, Bill. Have a good sleep.
03 22 59 44	LMP	Thank you.
03 22 59 51	CC	Apollo 8, Houston. Looks like you need about 3 more hours on that battery A charging. Over.
03 23 00 00	LMP	Okay. Well, my cohorts can handle it.
03 23 00 04	CC	Roger.
03 23 00 34	CC	Apollo 8, Houston. Can we get a crew status report on Bill before he goes to sleep?
03 23 00 44	LMP	He's feeling fine; a little sleepy.
03 23 00 55	CC	Roger.
03 23 00 56	LMP	And had a meal about - had a meal about 2 hours ago; drinking lots of water.
03 23 01 05	CC	Roger, Bill. Thanks.
03 23 01 10	LMP	Okay.
03 23 01 12	CC	Good night.

03 23 01 18	LMP	Good night. Wish everybody a Merry Christmas for me.
03 23 01 21	CC	Sure will, Bill. Same to you.
03 23 01 38	LMP	Thanks.
03 23 01 48	CC	Make sure Bill hangs up his stocking before he goes to bed.
03 23 01 58	LMP	I've got it right next to my teddy bear.
03 23 05 34	CDR	Houston, Apollo 8.
03 23 05 36	CC	Apollo 8, Houston. Go.
03 23 05 41	CDR	Roger. We're up on all the jobs; Bill's going to sleep; he's already down.
03 23 05 46	CC	Roger, Frank. Good morning.
03 23 05 51	CDR	Good morning.
03 23 09 56	CC	Apollo 8, this is Houston. I have a little feature news and sports news for you if you'd like to hear it.
03 23 10 40	CC	Apollo 8, Houston.
03 23 10 44	CDR	Go ahead, Houston. Apollo 8.
03 23 10 47	CC	Roger, Frank. I have some feature page and sports page news if you'd like it.
03 23 10 54	CDR	Roger.
03 23 10 56	CC	Roger. First of all, Frank, the guys down here on the consoles want to spread their appreciation for a beautiful television job done.
03 23 11 10	CDR	Thank you.

03 23 11 12	CC	Roger. We'll start out with the sports news. Los Angeles Dodger pitcher, Sandy Koufax, and Ann Widmark, 23-year-old daughter of actor Richard Widmark, plan to marry some time in the near future. Koufax said Tuesday that no date for the wedding was set, but he and Miss Wicmark have been dating for some time. At Springfield, - -
03 23 11 40	CMP	...
03 23 11 44	CC	Say again.
03 23 11 49	CMP	Morning. How do you read?
03 23 11 51	CC	Good morning, Jim.
03 23 11 55	CC	Let's see. In Springfield, Missouri, Mickey Owen, the old-time catcher for the Brooklyn Dodgers who made the record books by dropping a third strike that led the New York Yankees to a victory over the Dodgers in the '41 World Series, decided that he would be remembered by more than just his sports record. Forty-five boys and girls have been the recipients of ponies that he offered. These youngsters were requested to send letters in telling him how they would care for a pony. When the letters poured in, he added five ponies to the 20 he already offered; and other donors pitched in 20 more. And said Mickey Owen, "I thought I'd have about 45 letters, but I ended

up with about 900." Now on the feature page: Wellington, New Zealand, about fifty men sat down to the traditional turkey and cranberry sauce at the South Pole today, but the Christmas had an Oriental flavor, as well. It included Sukiyaki cooked by members of a Japanese party who are crossing the Antarctic continent and stopped for the day with the U.S. Navy Polar base. In San Diego, California, the crewmen of the captured intelligence ship Pueblo donated their first paychecks to the workers at San Diego's Balboa Naval Hospital. They had all been given twenty dollars each, and - when they landed in San Diego - and they felt that this was a good demonstration of their feelings for those who had done so much to make their welcome here.

03 23 14 11	CC	Apollo 8, Houston. We read your antenna change. Are you still reading us?
03 23 14 18	CDR	Roger. This is Apollo 8, Houston.
03 23 14 20	CC	Roger.
03 23 14 21	CDR	We just now changed antennas, or you must have.
03 23 14 24	CC	Okay.
03 23 14 26	CDR	You lost ...
03 23 14 30	CC	In Reno, Nevada. Oh, that's affirmative, Frank. We changed the antennas from here.

03 23 14 41 CDR Thank you.

03 23 14 43 CC In Reno, Nevada, because there is no fireplace in his home, ... a little boy wrote Santa Claus in care of the local newspaper and suggested, "Would you please use the front door. You will have to kick the bottom a little bit because it sticks." In Little Rock, Arkansas, babies born at St. Vincent Infirmary during the week before Christmas and through Christmas Day are being released to their mothers at discharge time in huge red Christmas stockings. Here is one in ecumenical cooperation. In Indio, California, the Chief of Police was armed Christmas Day with a prayer book. Rabbi Phillip H. Wienburg has taken over as Chief for a day so the real Police Chief, Homer Hunt, a Methodist could spend the holiday with his family. This is the third straight Christmas the Rabbi has filled in for Hunt. The previous 6 years, Rabbi Weinburg did the same for the Roman Catholic Police Chief of Reno, Nevada.

03 23 16 00 CC From the Associated Press, Americans watch Pope Paul celebrate Christmas Mass in Italy, and Europeans viewed a Christmas greeting from Apollo 8 via the most powerful communications satellite yet sent aloft. The news of Pope Paul

and the Apollo 8 crew Tuesday night were the first to be relayed across the Atlantic commerically by Intelsat III, which was launched from Cape Kennedy last Wednesday. That's the one we saw go.

03 23 16 37 CDR Roger. I remember that.

03 23 16 40 CC Intelsat is a 63-nation international communication consortium; provides a chart on the first global communications network. The new satellite is scheduled to begin full commercial service on January 2, initially serving North and South America and Europe. Further coverage of the Apollo 8 mission is to be relayed to Europe this week.

03 23 17 15 CC From Washington: "This Christmas, the world is brightened with the hope of peace. When it comes, when hope turns to substance and the guns are quiet once again, it will come because you have pursued it with courage and skill." This was a message from President Johnson to the Armed Forces on Christmas.

03 23 17 46 CC Here is a feature by Harry Rosenthal of Associated Press. It says: from Houston. Two Santas brighten the Christmas Eve for 2-year-old Jeffrey Lovell. The first one knocked on his front door and brought presents. The second started his

daddy home from the moon. The first wore a red suit and a white beard and ho, ho'd loud enough to be heard down the block. The second was a huge engine spitting flame behind the moon, and thousands of people were awaiting word that it had fired. "Please be informed that there is a Santa Claus" were the first words from Apollo 8 as it emerged from radio silence to inform an anxious world 15 minutes after the fact that the engine had performed its critical burn. "None of us ever expect to have a better Christmas present than this one," said Ken Mattingly of Mission Control. "Thank everyone on the ground for us. You know we couldn't have done it without you," came the reply from Col. Frank Borman, the spacecraft commander. At this point, a Christmas tree came aglow in front of the consoles in Mission Control, and Astronaut Harrison Schmidt read a space version of "A visit from Saint Nicholas" to the crew. "Twas the night before Christmas, and way out in space, the Apollo 8 crew had just won the moon race," it began. The Mission Control crew had delayed the celebration until Jeffrey's daddy, Navy Captain

James Lovell, along with Air Force Major William A. Anders and Col. Borman were safely on their way home. Any other Christmas Eve, the families of the astronauts would have been in church for Christmas services, but this year they were all glued to their television sets. The homes all near the Manned Spacecraft Center were decorated. The lawns around the Lovell home and throughout his community of Timber Cove were lined with Mexican style luminarios, and the four Lovell children came out to light them about 7:30. They were just in time. At 8:00, a car drve up carrying a tall Santa Claus with a large sack on his back. He ho ho'd up to the door and knocked loudly. It opened, and there stood Jeffrey Lovell who will be 3 on January 14. Jeffrey recoiled at the sight. His mother held him up, and Jeffrey clung to her, still shying away. "Last year he ran away crying," saying his 15-year old sister Barbara. Earlier, she had to run after him to prevent his blowing out all the luminarios. The other Lovell children, 13-year-old James and 10-year-old Susan watched with great amusement. Finally, the Santa and the children disappeared inside; the presents

were put under the tree; presents not to be opened until today. Mrs. Lovell prepared egg nog and cookies for the guests, and they watched a 25-minute televised tour of the moon conducted by the three astronauts. Later, friends took Mrs. Lovell, Barbara, and Jeffrey on a tour of the neighborhood brightly lighted for Christmas. Above them in a clear sky, the quarter moon shone brightly, and the three astronauts, who more than any other men have seen the fruits of creation, pause in their scientific exploration there to beam to the earth the majestic words from Genesis. "And God created the firmament heavens, and God called the dry land Earth, and God saw that it was good."

03 23 21 22	CDR	Thank you, Jerry.
03 23 21 25	CC	Roger. We have a newspaper coming in after while; we will give you a little more news later.
03 23 21 33	CMP	Thank you, Jerry; that's nice.
03 23 22 02	CDR	Jerry, we have chlorinated the water, and we're changing the canister now.
03 23 22 06	CC	Roger, Frank. Copy.
03 23 23 13	CC	Apollo 8, Houston. Would you put the BIOMED switch to the left, and - -
02 23 23 21	CDR	Roger.
03 23 23 22	CC	We would like to get a crew status report on

Jim and Frank when you get a chance.

03 23 23 49 CMP Both Frank and myself had a meal before bed last night, and I believe that we had about 20 clicks of water, and a good night's rest. Just getting up.

02 23 24 04 CC Roger, Jim. Thank you.

END OF TAPE

03 23 29 01	CDR	Jerry, this is Frank. Do you have any later word on our trajectory and how the charging looks?
03 23 29 08	CC	Roger. Stand by, Frank, and we'll give you an update.
03 23 30 07	CC	Apollo 8, Houston. We are looking at a midcourse correction at 104 hours of about 5 feet per second. The tracking is real good. We got you in the center of the corridor and on target.
03 23 30 24	CDR	Understand; 5 feet per second at 104 hours.
03 23 30 27	CC	That's affirm.
03 23 30 50	CC	Frank, did you get the word that we deleted the P52 at 96?
03 23 30 57	CDR	Roger. Do you mind if we go ahead and do it now?
03 23 31 02	CC	Negative; we've deleted it. Your drift rates are small that you don't even need to unless you want to do it.
03 23 31 13	CDR	Okay. We won't.
03 23 31 14	CC	Roger.
03 23 37 19	CC	Apollo 8, Houston.
03 23 37 24	CDR	Go ahead, Houston.
03 23 37 26	CC	Roger, Frank. In 3 minutes, we are handing the control from Honeysuckle over to Madrid. Over.
03 23 37 34	CDR	Thank you.
03 23 37 36	CC	Roger.
03 23 41 46	CC	Apollo 8, Houston. Buenos dias from Madrid.
03 23 41 53	CDR	... reading ... now.

03 23 42 00	CC	Apollo 8, Houston. Reading you loud and very noisy.
03 23 43 47	CDR	Houston, Apollo 8. How do you read?
03 23 43 49	CC	Apollo 8, Houston. You're loud and clear. How me?
03 23 43 54	CDR	You are loud and clear now.
03 23 45 05	CDR	Hey, Jerry, this is Frank. Do you read me?
03 23 45 07	CC	Roger, Frank.
03 23 45 11	CDR	Okay. I wasn't sure we were lined up. Thank you. Enough ...
03 23 51 37	CC	Apollo 8, Houston. If you don't need the computer, we would like to have you call up VERB 64 ENTER so that we can do the B-D antenna switching from the ground. Over.
03 23 52 17	CC	Apollo 8, Houston.
03 23 52 22	CMP	Go ahead.
03 23 52 24	CC	Jim, if you don't need the computer, would you call up VERB 64 ENTER, and we will take care of the antenna B-D switching down here. Over.
03 23 52 36	CMP	Roger.
03 23 52 37	CDR	We just did an automatic maneuver and then get on back to PTC attitude.
03 23 52 42	CC	Roger.
04 00 26 15	CC	Apollo 8, this is Houston. All your systems looking good. Over.
04 00 26 22	CDR	Thank you, Houston. Apollo 8.

04 00 26 24 CC Roger, Frank. I got some more newspaper if you would like to hear it.

04 00 26 31 CDR We would enjoy it.

04 00 26 32 CC Roger. We will start out with the world news. On page 1 of the Houston Post: praise for America's Apollo 8 astronauts and hopes for international cooperation in space exploration with the world-wide Christmas Eve messages as the tiny spaceship orbited the moon. Even in the Communist world, there was enthusiasm for man's first voyage to the moon. In Moscow, Soviet scientist Anatoly Besaranov recalled his country and the United States had shared space knowledge before and predicted the Apollo 8 flight would lead to more cooperation. In Cuba, Radio Havana rebroadcast the Voice of America program to tell its listeners of the Apollo 8 speech. Voice officials said it was the first time that any of the U.S. agencies' programs had been carried by Havana radio. Czechoslovakia saw the moon flight through extensive television coverage; and in Budapest, Hungary, people talk of little else on the trains and buses. In the non-Communist world, office workers and Christmas shoppers held their breath as the spacecraft was readied for the blast toward earth. Frenchmen in the street praised American knowhow and the space feat, and some viewers watch television lunar

photos cheer "Magnifique!". In London, swarms of Christmas shoppers crowded into shops and pubs to watch television photographs of the moon's craters. Britain's foremost space astronomer, Bernard Lovell, who until a few weeks ago criticized the Apollo 8 project on the grounds that instruments could do the job without risking the astronauts' lives, made it clear that he was deeply impressed by the moon flight. Pope Paul VI said honor to those pioneers of the extension of man's intellect and activity. There were only a few scrooges that "pooh pooh-ed" the Christmas voyage, however. The most notable was Samual Shenton, secretary of London's Flat Earth Society, who said the public are being balihooed, taken for a ride. How does that grab you, Frank?

04 00 29 00 CDR It doesn't look toc flat from here, but I don't know; maybe something is wrong with our vision.

04 00 29 07 CC Roger. Elsewhere in the world news, the Pueblo crew landed at NAS Miramar yesterday afternoon at 14:00, and they will spend a few days there in Balboa Hospital with their families celebrating Christmas. On the local scene here, the Retail Merchants' Association has announced that its Christmas gift exchange policy is going to be the same this year as it was last year; that is, very liberal. Fellows, we will be glad

to replace any broken items that you might bring back, too; but, sorry, there won't be any cash refunds.

04 00 30 54 CDR Okay.

04 00 30 57 CC Another little bit of local news: the County Court House at Huntsville burned down before dawn yesterday, so it looks like they will go in the construction business there again. On the feature page: got a little bit about the waiting families. This one is by Ann James, Post reporter. "We rest on the backside of the moon," said Valerie Anders on Christmas Eve, as she and her family waited for Apollo 8 to get out of the moon orbit and head back toward home. Mrs. Anders had been up since 2:00 a.m. Tuesday, and neighbors had just collected all the youngsters so the family could get some rest while the spacecraft was behind the moon and out of communication. Colonel Frank Borman's home was decorated with four big evergreen wreaths outdoors and sprinkled with powdery snow and decorated with red bows. A tree in the den awaits his safe return, and his pretty blond wife Sue and husky sons, Frederick and Edwin, plan to stay home for the midnight blast out of moon orbit. Ordinarily, they would attend midnight services at St. Christopher's Episcopal Church. The plans were for the family

to go to Christmas Day service at 7:00 a.m. Since there are no young children in the Borman home, family Christmas gift giving will simply wait until Colonel Borman comes back with his fantastic holiday gift of the flight to the moon and back. Marilyn Lovell's four youngsters will have an absolutely normal Christmas as far as the kids are concerned, the busy wife of Captain Lovell reported; but talking about presents was out because two of them were sitting right there next to her. "I haven't even had time to change my clothes that I wore last night," Mrs. Lovell said. Adult-to-adult gifts, however, and the Christmas tree will still be right there when Lovell comes home. Here is a good one on the Action Line. There is a little letter to the Action editor. It says, "We intended to pay you Earthlings a surprise visit by a flying saucer last night. We got scared off by some crazy antics of a fat man and a sleigh and three guys in a rocket-powered bucket drag racing around the moon. Is that anyway to run a planet?" Signed the boys from Mars. Frank, it looks like the only people around here who aren't impressed by the Apollo 8 is the stock market. Its 30 industrials are down 1.43.

04 00 32 43 CDR Neil will be crying.

Armstrong

04 00 32 45 CC (Laughter) You bet. On the sports page, not too much activity. UCLA is tops in both basketball polls. If you got any particular one you want to ask about, let me know, and I'll tell you if they are in the top ten on either poll. As far as the North - the college All Star game that is going to be played tomorrow is concerned, the North is a slight favorite over the South. Ara Parsegian is the coach of the North team, and he's got six of the Notre Dame troops working for him, so they ought to be pretty tough. The coach of the South team is Frank Howard of Clemson. He says it ain't easy, he quips, to build a team in 4 days to play Notre Dame. Another little item of interest in the sports page is Woody Hayes from Ohio State was named Coach of the Year by the Football Writers' Association. Well, that's about it. Any questions?

04 00 33 49 CDR No. Thank you very much, Jerry.

04 00 33 51 CC Okay, Frank.

04 00 33 52 CMP Jerry, you can do this every Sunday.

04 00 33 56 CC Do you want me to read you the funnies?

04 00 34 02 CMP No, thanks.

04 00 34 17 CC Hey, Frank, did you get the word that Fred made all-district football team?

04 00 34 26 CDR Yes, thank you. I heard about that before - before the lift-off.

04 00 34 30	CC	Yes. I thought you heard about that. Now, back to the workday; we need a cryo fan cycle from you.
04 00 34 43	CDR	We're starting right now.
04 00 34 44	CC	Roger.
04 00 35 17	CMP	Houston, Apollo 8.
04 00 35 21	CC	Apollo 8, Houston. Go.
04 00 35 25	CMP	Jerry, in a little while, I would like to try out a little P37 exercise based on minus MA. I'll just run one through, and maybe we can get a solution from the ground and see how they compare.
04 00 35 38	CC	Okay, Jim.
04 00 35 55	CC	Retro says they are ready to copy.
04 00 36 02	CMP	Roger.
04 00 36 11	CDR	That performance at LOI was absolutely fantastic. You all really hit it on the money; I just couldn't believe it.
04 00 36 26	CC	Roger. That kinda surprised us, too.
04 00 36 32	CDR	Uh-uh. I hope you're not getting close to the earth. We got another corridor to hit, you know.
04 00 36 39	CC	We haven't quit yet.
04 00 36 45	CDR	Okay.
04 00 42 25	CMP	Houston, Apollo 8.
04 00 42 30	CC	Apollo 8, Houston. Go.
04 00 42 35	CMP	We'd like to use the computer now if you don't need it now. ...
04 00 42 40	CC	Roger, Jim. It's yours.
04 00 42 45	CMP	Thank you.

04 00 42 46	CDR	If you can switch it down there without VERB 64, well, go ahead and do it.
04 00 42 56	CC	We'll give it a whirl, Frank.
04 00 43 01	CDR	Okay.
04 00 43 58	CDR	... are all ... of the earth.
04 00 44 03	CC	Roger. Thank you, Frank.
04 00 46 42	CDR	Houston. ... pitch and yaw of 10 and 45, aren't you?
04 00 46 57	CC	That's affirmative, Frank. Pitch 10, yaw 45.
04 00 53 29	CC	Apollo 8, this is Houston with a battery status report.
04 00 53 36	CDR	Go ahead. We were just talking about the batteries.
04 00 53 39	CC	Roger. At 96 hours EEP, battery A has 38.95 amp-hours; battery B has 36.35 amp-hours; battery C has 38.46 amp-hours. Your total, 113.76 amp-hours. At 97 plus 50, battery A will be fully charged and will have 40 amp-hours, and you can terminate charge at that time. Over.
04 00 54 15	CDR	At 97:50.
04 00 54 17	CC	Roger.
04 01 02 12	CMP	We'll give you back VERB 64, Houston.
04 01 02 39	CC	Apollo 8, Houston. Say again.

END OF TAPE

04 01 02 45	CMP	We gave you back VERB 64. I wonder if you could have Guidance figure out a corridor correction at 114 hours for us with a minus 648 cabin.
04 01 03 03	CC	Okay, Jim. We copy, and now we see we've got VERB 64 back. We'll be back with you in a minute.
04 01 03 12	CMP	Roger.
04 01 29 08	CC	Apollo 8, Houston. Over.
04 01 29 13	CMP	Go ahead, Houston.
04 01 29 15	CC	Roger. We have a comparison now on your P37.
04 01 29 24	CMP	Roger.
04 01 29 26	CC	Okay. Based on your vector, the CMC vector, the ground computes 15.3 feet per second on the midcourse, VEI of 36221, a gamma EI of minus 6.51 so it looks like your P37 program is pretty good. Applying your P37 solution to our MSFN vector, however, we get a gamma EI of minus 10.32. We expect these two solutions to converge with a little more tracking and after you get some earth horizon sightings. Over.
04 01 30 11	CMP	Roger. How valuable do you think that the lunar we did just after TPIR as compared to your MSFN tracking? Go ahead, Houston.
04 01 30 46	CC	Apollo 8, Houston. Repeat your question, please.

04 01 30 52	CMP	Roger. I was getting curious of the value of onboard tracking in the P23 course close to the moon, in regards to the MSFN tracking that close to the moon. I think there might be a trail-off for onboard navigation, and I think it might be a little bit better than MSFN tracking.
04 01 31 20	CC	Roger. Stand by.
04 01 33 00	CC	Apollo 8, Houston.
04 01 33 04	CMP	Go ahead.
04 01 33 06	CC	Roger. I guess the experts would say that the MSFN data was probably best based on the number of sightings that you have taken. However, that's going to be the subject of quite a bit of evaluation, I think, after the mission. Over.
04 01 33 24	CMP	...
04 01 33 27	CC	Roger, Jim. Be advised that we are beginning to read you very weak, and with a rather loud background noise.
04 01 33 38	CMP	Understand. ...
04 01 33 59	CC	Apollo 8, Houston. How do you read now?
04 01 54 04	CMP	I'm reading - I'm reading you loud and clear.
04 01 54 06	CC	Roger. Still reading you weak but clearer.
04 01 54 55	CC	Apollo 8, Houston. You can turn off the battery charger. Over.
04 01 55 02	CMP	Roger. Will do.

04 02 04 22	CC	Apollo 8, Houston.
04 02 04 27	CMP	Go ahead, Houston.
04 02 04 29	CC	Roger. Is this Jim?
04 02 04 34	CMP	Roger.
04 02 04 36	CC	Roger, Jim. Christmas morning around your house was kinda quiet, says Marilyn. She said that they are all thankful the mission has gone so great. They missed having you around the tree this morning, but they wanted to reassure you that your presents are waiting, and the roast beef and Yorkshire pudding will be on the table when you get home.
04 02 04 58	CMP	Hey, that sounds good, Jerry - good old roast beef and Yorkshire pudding.
04 02 05 02	CC	Yeah, man. Is Frank listening?
04 02 05 04	CMP	Say hello to them for me, will you?
04 02 05 05	CC	Sure will. Is Frank listening?
04 02 05 06	CMP	Frank's not on the line yet; he will be shortly.
04 02 05 12	CC	Okay. How about Bill? Is he still asleep?
04 02 05 18	CMP	Bill is still asleep.
04 02 05 20	CC	Okay. Have Frank give me a holler when he is ready. I've got a message for him, too.
04 02 05 28	CMP	Okay. Sounds good. How is your Christmas, Jerry?
04 02 05 31	CC	Real good, Jim. Santa Claus struck last night before I came in here on the shift, and I guess

		we will finish off the unwrapping this morning when I get back.
04 02 05 45	CMP	Right. He was looking for a chimney on 103 here, but he didn't see any.
04 02 05 50	CC	(Laughter) You could have left the hatch unlocked for him.
04 02 06 08	CMP	I'll think about that one.
04 02 06 10	CC	Think real hard, Jim. EECOM says he could have slid down the steam duct.
04 02 06 37	CMP	Sounds good. About that time, Bill would have been boiling water.
04 02 06 53	CDR	Hey, Jerry, this is Frank. What's up?
04 02 06 55	CC	Hi, Frank. Christmas morning has come at the Borman house. And the boys and Susan and your Mom and Dad all send their love. They say for you to stay in there and pitch. Over.
04 02 07 11	CDR	Okay. Thank you. Please reciprocate for me.
04 02 07 16	CC	Sure will, Frank.
04 02 07 27	CC	Frank, when Bill wakes up, give me a holler. I've got a message for him, too.
04 02 07 35	CDR	Okay.
04 02 15 23	CMP	Houston, Apollo 8.
04 02 15 26	CC	Apollo 8, Houston. Go.
04 02 15 31	CMP	Roger. Are the Guidance boys busy this morning?

04 02 15 41	CC	They say they are.
04 02 15 49	CMP	I just worked out an answer to move my landing longitude 6 degrees east. I just want to compare with what they've got based on the same burn time of 114 hours, based on the bias impact longitude determined from the P37 which is wrong. I've indicated that I need 600 foot per second DELTA-V_C burn plus, and my DELTA-V_X changes from a minus 11.6 feet per second. I'd like to have them verify that if I could.
04 02 16 29	CC	Roger Jim. Stand by, and I'll see if they copied all that.
04 02 17 30	CC	Apollo 8, Houston.
04 02 17 34	CMP	Go ahead.
04 02 17 35	CC	The voice isn't too great right now, and the Guidance troops didn't get all of that. How about waiting about 2 or 3 minutes? We'll swap OMNI antennas, and then we should get good voice transmission from you and then repeat it. Would you, please?
04 02 17 54	CMP	Roger.
04 02 17 55	CC	Okay.
04 02 22 55	CC	Apollo 8, Houston. How do you read? Over.
04 02 23 00	CDR	Loud and clear.
04 02 23 01	CC	Roger. We're reading you much better now. Jim can go ahead with his transmission to the

guidance troops. They have one question before he starts. They would like to know what his GERU was at TIG, 114 hours. Over.

04 02 23 21 CDR Roger. Wait one. The GERU at TIG was plus 07972.

04 02 23 35 CC Roger. Plus 07972.

04 02 25 07 CC Apollo 8, this is Houston. We are ready to copy your data. Over.

04 02 25 14 CMP Okay, Houston. Based on the P37 with minus MA solution, I got an impact longitude of minus 160.95. I biased it to get an impact latitude - longitude of 163.75. I wanted to change my impact point 30 degrees to the east, and I tried to determine what my P30 burn parameters would be to do this, and I got a DELTA-V_X burn of minus 11.6 and a DELTA-V_C of plus 600, DELTA-V_Y of zero. Now that changed my previous DELTA-V_X burn from minus 50.2. I just want to know whether that meets with their approval.

04 02 26 15 CC Roger, Jim. We copy and will run it through the mill and give you an answer.

04 02 26 23 CMP Roger.

END OF TAPE

04 02 49 35	CC	Apollo 8, Houston.
04 02 49 40	CDR	Go ahead, Houston. Apollo 8.
04 02 49 42	CC	Apollo 8, this is Houston with a flight plan update.
04 02 49 48	CDR	Go ahead.
04 02 49 50	CC	Roger. At 100 hours 30 minutes, change star number 02 from one set to two set. Over.
04 02 50 05	CDR	Roger. Star 02 from one set to two set.
04 02 50 08	CC	Roger. Also, set number 2, set number 2, change star number 11 to star number 7. Over.
04 02 50 21	CDR	Roger. Eleven to 7.
04 02 50 23	CC	Roger. Then after star set number 3, initiate PTC again; pitch 10, yaw 45. Over.
04 02 50 36	CDR	Pitch 10, yaw 45.
04 02 50 38	CC	Roger. Then at 101 hours 30 minutes, delete the earth horizon settings. Over.
04 02 50 53	CDR	101:30, delete the earth horizons sightings.
04 02 50 57	CC	That's affirmative. The folks here are evaluating the thermal situation. Looks like you will be out of PTC rather at an extended period of time. That's the reason we have you initiating PTC again there around 101 as soon as you finish those three star sightings. We are still working on the - about the next 10 hours after 100 hours. We are looking at the thermal situation, and the star sighting situation, and we will be giving you more updates later on. Over.

04 02 51 32	CDR	Roger. We don't have a thermal problem at all now, do we? All our indications here are normal in here.
04 02 51 40	CC	Roger. Everything looks okay. I think they're just kinda trying to look down the track aways.
04 02 51 47	CDR	I'm all for keeping it that way.
04 02 51 50	CC	Roger.
04 02 51 53	CDR	We deleted them.
04 02 51 55	CC	Okay.
04 02 56 53	CC	Apollo 8, Houston.
04 02 56 59	CDR	Go ahead, Houston.
04 02 57 00	CC	Roger. Frank, I would like to talk to you for a minute or two about the AUTO OPTICS funnies that you have been seeing throughout the mission. Over.
04 02 57 11	CMP	Go ahead.
04 02 57 13	CC	Roger. The problems you have run into so far are due to some unknown source, probably EMI or the like loading your CMC trunnion cell which is now 91, so it doesn't really represent your true trunnion angle. Now this loading problem we don't feel implies any decrease in the reliability in your CMC at all. We think that the best way to circumvent the problem is to cycle the OPTICS ZERO switch first to OFF and then ON prior to using the optics for any purpose. And with that procedure, I think you probably won't have any more problems. Over.

04 02 58 01	CMP	Roger, Jerry. Understand. I do notice one difference. We did preferred REFSMMAT's. The first we had trouble with; the last one worked out as expected. I noticed for the first one that when the option came up, it was for nominal option, whereas for the very same procedure for this last REFSMMAT change, we got ... preferred REFSMMAT option. ...
04 02 58 27	CC	Roger, Jim. Copy.
04 03 00 56	CC	Apollo 8, this is Houston with a comeback on your entry navigation calculations. Over.
04 03 01 05	CDR	Go ahead.
04 03 01 07	CC	Roger. We went through the charts and got exactly the same answer as you got. Looks like your procedure is very good; looks like it was real good head. You remembered to average out the velocity. We also went ahead and computed the problem to verify the chart and got a good solution. Over.
04 03 01 30	CMP	Roger.
04 03 01 33	CDR	Thank you very much.
04 03 01 35	CC	You're welcome.
04 03 01 40	CMP	Now if we can get our state vectors to agree, we'll be in business.
04 03 01 45	CC	No sweat.
04 03 19 38	CC	Apollo 8, Houston.
04 03 19 55	CC	Apollo 8, Houston.

04 03 19 59	CDR	Go ahead.
04 03 20 01	CC	Roger, Frank. Is Jim listening?
04 03 20 06	CMP	Listening.
04 03 20 08	CC	Roger. On your question about the option: PROGRAM 40 fits the preferred flag such that the next P52 will come up option 1, subsequent alignments after that come up option 2. Over.
04 03 20 27	CMP	Roger. Understand. So 40 will have to come up with a TIG burn with an option 1 for us.
04 03 20 34	CC	Roger. Now concerning your restart that happened in lunar orbit, for the peace of mind of the computer people and the MIT folks, we have a question. Did VERB 34 ENTER to a flashing VERB 51 in P22 cause your restart? Over.
04 03 20 56	CMP	Yes. That sounds like it was it.
04 03 20 59	CC	Roger. Thank you, Jim.
04 03 21 03	CMP	That must be a "no, no".
04 03 21 08	CC	Yes, Yes. That's a "no, no".
04 03 21 14	CMP	That almost caused an unscheduled EVA, too.
04 03 22 29	CC	Apollo 8, Houston. BIOMED switch center. Over.
04 03 22 49	CMP	Three, two, one -
04 03 22 51	CMP	MARK.
04 03 22 52	CC	Roger. Your mark.
04 03 50 59	CC	Apollo 8, Houston.
04 03 51 03	CDR	Go ahead.

04 03 51 06	CC	Apollo 8, this is Houston. It is about time for us to start keeping track of some command module RCS temperatures; so when you get a chance, we'd like the reading now, and we'll try to repeat it about every 8 hours or so.
04 03 51 22	CDR	Okay. We'll get them for you right now.
04 03 51 24	CC	Roger.
04 03 51 32	CDR	You want the motor off the test meter, right?
04 03 51 37	CC	That's affirmative.
04 03 51 48	CDR	The 5C is pegged high.
04 03 51 55	CC	Roger. 5C pegged high.
04 03 51 56	CDR	5D is pegged high.
04 03 51 58	CC	Roger. D, high.
04 03 52 00	CDR	So's 5D. 6A is high; 6B is high; 6C is 5 volts; 6D is pegged high.
04 03 52 27	CC	Apollo 8, Houston. Roger. Understand. 5C and 5D are pegged high; 6A and 6D are pegged high; 6 Charlie is 5 volts; and 6 Delta pegged high. Over.
04 03 52 42	CDR	That's Roger.
04 03 54 56	CC	Apollo 8, Houston.
04 03 55 01	CDR	Roger. Go ahead.
04 03 55 03	CC	Apollo 8, Houston. We're showing quad A running a little bit warmer than the other quads. If you remember, I mentioned before that we were coming into a period of time here where we were going to

spend a lot of time with no PTC going. We'd like for you to try to favor quad A if you can in the shade, and do whatever you can to keep that temperature from getting out of hand. Over.

04 03 55 31 CDR Roger. I'm only reading 121 on quad A.

04 03 55 35 CC Roger.

04 03 55 44 CDR Quad C is the highest temperature we have; it's 142.

04 03 56 01 CC Roger, Frank. We are more interested in the tank temperatures than the quad temperatures. Over.

04 03 56 10 CDR Roger. I understand. Now listen, if you think it is that important, we'll just keep PTC-ing it and not even do anything.

04 03 56 17 CC Negative. There's no sweat right now. We're watching it, and we just wanted to let you know that this thing is being looked at. If we get anywhere near a situation where we feel we ought to change, we'll go back to PTC or cool it.

04 03 56 33 CDR Okay. Thank you. We'll do our best, but it is kind of hard, though. You are sort of subject of spatial geometry: wherever the stars and the moon happens to be, that's where you point.

04 03 56 44 CC Roger. We understand. We're going to keep an eye on it down here, and we'll keep you appraised.

04 03 56 52 CDR Thank you.

04 04 03 27 CC Apollo 8, Houston.

04 04 03 39	CDR	Go ahead, Houston. Apollo 8.
04 04 03 41	CC	Roger. Pass the word to Jim that on these marks that are coming up, pretty important that he remember to record his DELTA-R and DELTA-V and trunnion. We are working low bit rate down here, and so we're not going to be able to record that data from here. Over.
04 04 04 02	CDR	We are recording them all.
04 04 04 16	CDR	Houston, Apollo 8. Did you read that we are recording all the DELTA-R and DELTA-V and trunnion ...
04 04 04 21	CC	Roger, Frank. Thanks.

END OF TAPE

04 04 13 56	CDR	Jerry, Apollo 8.
04 04 13 59	CC	Roger. Go ahead.
04 04 14 03	CDR	As luck would have it, we got the sun almost directly ahead on top of us here.
04 04 14 10	CC	Roger. We understand, but tank temperature is holding steady, so we are all right.
04 04 14 19	CDR	Okay.
04 04 30 58	CC	Apollo 8, Houston. Over.
04 04 31 02	CDR	Go ahead, Houston. Apollo 8.
04 04 31 05	CC	Roger, Frank. The helium tank temperature that we are watching on quad A has only gone up 1 degree in all this work that you are doing, so we don't consider it to be too terribly serious. What we would like to do, as soon as you finish this P23 work, is rather than go back into PTC, let's just roll her over 180 degrees and put quad A on the cool side, and hold it that way until your next activity comes up, which is around 102:30. Over.
04 04 31 41	CDR	Okay. Fine.
04 04 41 47	CDR	Okay, Jerry. We're through with PROGRAM 23. We're just going to roll here to get the sun off quad A, if that's what you want.
04 04 41 55	CC	Roger, Frank. Good deal.
04 04 50 21	CDR	It should be getting cool now, Jerry.

04 04 50 26	CC	Roger, Frank. So far we haven't seen the temperature start back down again. We expect to see it, though.
04 04 51 25	CDR	Houston, Apollo 8.
04 04 51 27	CC	Apollo 8, Houston. Go.
04 04 51 31	CDR	Roger. Give us the word if you want us to maneuver back here before that time that you ..., please.
04 04 51 38	CC	Wilco.
04 04 51 41	CDR	Thank you.
04 04 53 48	CC	Apollo 8, Houston.
04 04 53 52	CDR	Go ahead, Houston.
04 04 53 54	CC	Roger, Frank. We have some data that was missed on your P23. We'd like you to read it down to us if you have time.
04 04 54 04	CDR	Roger. We will in just a minute.
04 04 54 06	CC	Roger.
04 04 54 13	CDR	Go ahead. What do you want?
04 04 54 15	CC	Roger. On star number 2, the sixth mark, we missed DELTA-R and DELTA-V.
04 04 54 25	CDR	Sixth mark, that's - did Lovell tell you to do this? Come on, Carr; come clean. Did he ask you to ask for this?
04 04 50 43	CC	Who?
04 04 50 46	CDR	Jim Lovell.
04 04 50 48	CC	Negative. Uh-uh. We really missed it.
04 04 50 53	CDR	It's all zeros, and all zeros.

04 04 50 58	CDR	Roger. All zeros, all zeros. Okay. On star number 7, we missed the trunnion on marks 1, 2, and 3.
04 04 55 13	CDR	On 1, trunnion was 03235; on 2, it was 03240; on 3, it was 03241.
04 04 55 31	CC	Okay, Frank. And then the last one is on star number 1; we missed the trunnion on mark 5.
04 04 55 41	CDR	04064.
04 04 55 46	CC	Roger. 04064.
04 04 55 53	CDR	Righto.
04 04 55 55	CC	Thank you, Frank.
04 04 55 58	CDR	You're welcome, Jerry.
04 04 56 00	CC	That Lovell's getting pretty proficient.
04 04 56 07	CDR	Not bad.
04 04 57 41	CC	Apollo 8, Houston.
04 04 57 46	CDR	Go ahead.
04 04 57 47	CC	Was that last number you read down to me mark 2 on star number 1?
04 04 56 59	CDR	That's right. Star number 1, mark 2.
04 04 58 03	CC	Roger. Thank you. Now that one got you on guidance.
04 04 58 16	CDR	Okay.
04 05 03 10	CC	Apollo 8, Houston. You're back under our influence again. Over.
04 05 03 16	CDR	Very good. Things start speeding up now, huh?
04 05 03 21	CC	Roger. You've been in for about 20 minutes.
04 05 03 26	CDR	Very good.

04 05 03 29	CMP	Jerry, this is Jim.
04 05 03 31	CC	Go ahead, Jim.
04 05 03 35	CMP	Find out from the Guidance group if a midcourse maneuver of minus 4.8 to access corridor at 14 hours would be better than the 15.2 I came up with first.
04 05 03 47	CC	Okay. Minus 4.8.
04 05 03 52	CMP	Right.
04 05 03 54	CC	We have already started checking it, Jim. I bet you think you sneaked that P37 past us.
04 05 04 06	CMP	Big brother is watching.
04 05 04 09	CC	Affirm.
04 05 12 29	CDR	Houston, Apollo 8.
04 05 12 32	CC	Apollo 8, Houston. Go.
04 05 12 43	CC	Apollo 8, Houston. Go.
04 05 12 47	CDR	Roger. I just wondered how temp on quad A tank is doing.
04 05 12 54	CC	We have seen no improvement as yet, Frank.
04 05 13 00	CDR	How hot is it?
04 05 13 03	CC	Eighty-six degrees.
04 05 13 07	CDR	Roger.
04 05 17 28	CC	Apollo 8, Houston.
04 05 17 32	CDR	Go ahead.
04 05 17 34	CC	Roger. Frank, we are going to establish a range sequence now. We would like to keep silence on the net for about 3 minutes. Over.
04 05 17 44	CDR	Very well.

04 05 21 21	CC	Apollo 8, Houston. Range sequence complete. Over.
04 05 21 26	CDR	Thank you.
04 05 28 13	CDR	Hello, Houston. Apollo 8. How do you read?
04 05 28 16	CC	Apollo 8, Houston. Loud and clear.
04 05 29 11	CDR	Houston, how do you read? Apollo 8.
04 05 29 14	CC	Apollo 8, Houston. Loud and clear by me.
04 05 29 19	CDR	I wasn't reading you for a while. I read you loud and clear now.
04 05 29 22	CC	Roger, Frank.
04 05 29 28	CDR	I wanted to know what a range sequence test was, Jerry.
04 05 29 35	CC	I was afraid you was going to ask that. Stand by.
04 05 30 53	CC	Apollo 8, Houston.
04 05 30 57	CDR	Go ahead.
04 05 30 59	CC	Roger. This range sequence is a phenomenon. We get on down-voice backup; in this mode, the ranging and the voice share the same channels, so we have to periodically check and make sure that they are not interfering with each other. Over.
04 05 31 16	CDR	Thank you. These flights are very educational.
04 05 31 28	CC	Roger. We are learning a little bit down here, too.
04 05 31 38	CDR	I hope you're not studying reentry.

04 05 31 46	CC	No, we're fat on those, Frank.
04 05 31 51	CDR	Okay.
04 05 39 12	CC	Apollo 8, Houston.
04 05 39 16	CDR	Go ahead, Houston.
04 05 39 18	CC	Roger, Frank. We would like for you to go back into PTC now. Your helium tank temperature is still holding about the same. And we are going to try PTC to even things out. Over.
04 05 39 32	CDR	Okay.
04 05 40 49	CC	Apollo 8, Houston.
04 05 40 53	CDR	Go ahead, Houston.
04 05 40 54	CC	Is Jim listening?
04 05 40 58	CDR	He's off the air right now.
04 05 41 01	CC	Roger, Frank. Let him know that we've compared his latest P37, and the state vectors have converged to - they are very, very close now.
04 05 41 13	CDR	Your state vector and our state vector are very, very close.
04 05 41 16	CC	That's affirmative, Frank.
04 05 41 18	CDR	Is that right, Jerry? Okay. I'll tell him. Thank you.
04 05 41 21	CC	Roger.
04 05 41 27	CC	Don't let his head get big, though.
04 05 41 32	CDR	You guys are going to make it impossible to live with him. It always was pretty hard.

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04 05 51 03	CDR	Houston. How do you read Apollo 8?
04 05 51 09	CC	Apollo 8, Houston. Say again.
04 05 51 13	CDR	Hello Michael, we lost lock and Bill hit COMMAND RESET to get the lock back on again, but you're welcome to the antenna.
04 05 51 21	CC	Okay, Frank. Thank you.
04 06 07 02	CDR	Houston, Apollo 8. Over.
04 06 07 08	CC	Apollo 8, this is Houston. Go ahead.
04 06 07 13	LMP	Good morning, Michael.
04 06 07 15	CC	Good morning.
04 06 07 17	LMP	Or is it afternoon?
04 06 07 23	CC	Apollo 8, Houston. You've got a lot of background noise and about unreadable. We're trying to get a better OMNI.
04 06 07 45	CC	Apollo 8, Houston. How do you read? Over.
04 06 07 50	LMP	Loud and clear.
04 06 07 51	CC	Okay. You're loud and clear. Is this Bill?
04 06 07 57	LMP	None other.
04 06 07 58	CC	I got a message for you while you were asleep. Valerie said to tell you that she and the kids are leaving for church about 11:30 and eagerly awaiting your return. She said presents are magically starting to appear under the Christmas tree again so it looks like a double barrel Christmas. Over.

04 06 08 16	LMP	You can't beat a deal like that. How was Christmas at your house today?
04 06 08 26	CC	Early and busy as usual. I told Michael you guys are up there, and he said who's driving?
04 06 08 39	LMP	That's a good question. I think Isaac Newton is doing most of the driving right now.
04 06 08 51	CC	Say again.
04 06 08 55	LMP	I think Isaac Newton is doing most of the driving right now.
04 06 08 59	CC	Roger. We copy.
04 06 09 40	LMP	Tell Valerie and the kids a Merry Christmas for me, Mike, and tell them I'll see them there in a while.
04 06 09 46	CC	I sure will, and you might tell Frank if he's got any messages his people are about 10 feet away.
04 06 09 57	LMP	He said "bah humbug."
04 06 10 01	CDR	Howdy, how are you all?
04 06 10 06	CC	You've got a whole row of smiling faces in the back room, Frank.
04 06 10 11	CDR	Very good. Will they be proud of me: I'm using the Exer-Genie right now.
04 06 10 19	CC	Don't overdo it.
04 06 10 23	CDR	I won't.
04 06 15 54	CC	Apollo 8, Houston. Over.
04 06 15 59	LMP	Go ahead, Houston. Apollo 8.

04 06 16 01	CC	Roger. Quad Able helium tank temperature has dropped very slightly and is looking pretty good to us now.
04 06 16 11	LMP	Thank you, Michael.
04 06 16 12	CC	Righto, and I've got a procedure for Jim I would like to read up. It involves bringing the LM and the CSM state vectors to the earth serve influence. Over.
04 06 16 27	LMP	Alright. Stand by.
04 06 16 29	CC	Okay.
04 06 16 34	LMP	He's getting his hat on now. Whose procedure is this, Michael?
04 06 16 41	CC	Oh, it's the summation of the opinions of all our experts down here. I got it from Mr. Colossus, Gunther Sabionski.
04 06 16 54	LMP	Very good. I want to make sure it wasn't an Aldrin special.
04 06 17 03	CC	I'm sorry you're broken up. Don't say again. (Laughter)
04 06 17 16	CMP	Merry Christmas, Bud.
04 06 17 25	CC	Yes, Merry Christmas up there, Jim. I've got a procedure when you are ready to copy.
04 06 17 31	CMP	Okay. I just got on my headset; just let me get a pencil and paper, and I will copy it.
04 06 17 36	CC	Okay.

04 06 17 58	CMP	Okay, Mike.
04 06 18 00	CC	Okay. The purpose is to bring the LM and the CSM state vectors to earth's sphere of influence. Step one: Verb 37 ENTER, 23 ENTER. Step two: At NOUN 70, at NOUN 70, load and register 1, 2, and 3 the following numbers. Register 1, 00002; register 2, five balls; register 3, 00210. Step 3: proceed on NOUN 70, NOUN 70. Step 4: proceed on NOUN 25, 25. Step 5: do not proceed on NOUN 18. Wait for 30 seconds; then do VERB 37 ENTER, 00 ENTER. End of procedure. Over.
04 06 19 29	CMP	Okay. As I understand that the reason for this procedure is to bring the LM and CSM state vectors back to the earth's sphere of influence; is that correct?
04 06 19 37	CC	That's correct.
04 06 19 42	CMP	Okay. To do it we go VERB 37 ENTER, 23 ENTER; and at the NOUN 70, we'll load and register 1, four balls 2; register 2, all balls; and register 3, two balls 210. We'll proceed on NOUN 70 and proceed on NOUN 25. We'll not proceed on 18. We'll wait 30 seconds, and we'll do a VERB 37 ENTER, 00 ENTER.
04 06 20 15	CC	That's affirmative. Apollo 8.

04 06 20 21	CMP	I'm just kinda curious, Mike; I thought this was done for us. I thought the computer took care of this little problem.
04 06 20 34	CC	Roger. Normally, it is done automatically, Jim; and had you done the P23's exactly as scheduled, it would have been, but there was some doubt P23 was stopped about 7 minutes prior to the transition point and just to be absolutely sure, we included this procedure. Over.
04 06 20 59	CMP	Okay. Tell Buzz I sure could use his eye-patch.
04 06 21 19	CC	Roger. I understand. Buzz had one on Gemini X, worked real well.
04 06 21 28	CMP	Mike, do you want me to do this procedure now?
04 06 21 31	CC	That's affirmative, Jim. Now at your convenience.
04 06 24 06	CC	Did you see guidance? Is the flag set?
04 06 24 10	CC	We're set, that's right.
04 06 24 50	CC	Apollo 8, Houston.
04 06 24 54	CMP	Go ahead.
04 06 24 56	CC	Thank you, Jim. We copied your DSKY work there, and it's looking just fine to us now.
04 06 25 03	CMP	Okay.
04 06 25 42	CMP	Houston, Apollo 8.
04 06 29 44	CC	Apollo 8, Houston.

04 06 29 50	CDR	You know, one thing you can pass on to the program office - something you might try working on right away is - -
04 06 30 00	CC	Can you stand by, Apollo 8?
04 06 30 02	CC	Apollo 8, can you stand by? We'll try to get you a better antenna; you're just about unreadable.
04 06 30 10	CDR	Alright.
04 06 30 18	CC	Apollo 8, Houston. We are right in between antennas and if you can wait about 5 minutes with your message, we can have better COMM then.
04 06 30 27	CDR	Roger.
04 06 33 44	CC	Apollo 8, Houston. Over.
04 06 33 49	CDR	Go ahead, Houston. Apollo 8.
04 06 33 51	CC	Okay. You're loud and clear now, Frank. Go ahead and say what you were saying about the program office.
04 06 33 57	CDR	They ought to get some moving out on some way to fix these windows. The three windows, the hatch window and the two side windows, really it's a shame, in fact, that they are almost totally unusable, because they got so gummed up.
04 06 34 17	CC	Roger. I sure agree. We copy so far on the windows that 2 and 4 are in excellent shape

and 1 and 5 are sort of mediocre and 3 is just about totally unusable.

04 06 34 34 CDR Three is totally unusable; 1 and 5 are unusable for any kind of photography.

04 06 34 39 CC Roger.

04 06 34 42 CMP And, Mike, that sure puts the CMP in a bad light, you know, when you can't see where you are going.

04 06 34 48 CC Yes. And when you're setting between two guys that won't tell you, too. (Laughter)

04 06 34 54 CMP That's right. You think they will share a window? No soap. You might also note the optics are very good visibility; so far, no coating at all.

04 06 35 04 CC Glad to hear that, Jim.

04 06 42 32 CC Apollo 8, Houston.

04 06 42 36 CDR Go ahead.

04 06 42 38 CC Roger. We copy Jim doing a P52, and I'm standing by with a maneuver PAD for mid-course 5 any time at your convenience.

04 06 43 31 CMP Okay. Ready to copy, Mike.

04 06 43 34 CC Roger, Jim. This is midcourse maneuver number 5, and it's a RCS/G&N, and it's 31700, not applicable, not applicable. Are you with me?

04 06 43 56 CMP With you.

04 06 43 58	CC	Good. 10359 5286, minus 00050, plus all zeros, plus 00001 000 334 001 five zeros, plus 00190 00050 014 00050. Are you still with me? Over.
04 06 45 14	CMP	Still with you.
04 06 45 16	CC	Good. 413020 183, Shaula, down 064, left 06, plus 0747, minus 16410 12988 36301 146 4640; north set of stars, Sirius and Rigel, roll 308, pitch 209, yaw 357. Remarks: use high-speed procedure with minus MA. Over.
04 06 47 00	CMP	Roger, Houston. MCC 5, RCS/G&N - are you with me?
04 06 47 08	CC	I'm with you, Jim.
04 06 47 13	CMP	31700, NA, NA, 10359 5286, minus 00050, plus all zeros, plus 00001 000 334 001, all zeros, plus 00190 00050 014 00050 413020 183, Shaula, down 064, left 06, plus 0747, minus 16410 12988 36301 146 4640; Sirius, Rigel, 308 209 357; use high-speed procedure with minus MA.
04 06 48 23	CC	Roger. And could you go to ACCEPT, please, and we're going to send you a P27 load consisting of a LM state vector and a target load for MCC 5.
04 06 48 37	CMP	Roger.
04 06 50 19	CC	Apollo 8, Houston. Over.
04 06 50 24	CDR	Go ahead, Houston. Apollo 8.

04 06 50 26	CC	Roger. We'd like to dump your waste water tank down to 25 percent; we'd like to do it before the midcourse, for tracking reasons. So if it is convenient with you, if you'll start right now, we'll dump on down to 25.
04 06 51 39	CDR	Roger. We'll get right with it.
04 06 51 41	CC	Thank you.
04 06 55 20	CC	Apollo 8, Houston.
04 06 55 24	CDR	Go ahead.
04 06 55 26	CC	Roger. We got those loads in and verified; you can go back BLOCK at your computer. And George Low says he's working on that window problem at 6, or spacecraft 104. You just happen to have the wrong spacecraft.
04 06 55 40	CDR	That's the wrong statement; we've got the right spacecraft. I'll clue you, if it keeps going this way for 2 more days, we've got not only the right spacecraft, but we've got the best spacecraft.
04 06 55 50	CC	It'll keep going.
04 06 57 13	LMP	Apollo 8. We're starting the dump now, Houston.
04 06 57 17	CC	Apollo 8, Houston. Over.
04 06 57 23	LMP	Okay. We're starting the waste water dump now.

04 06 57 26	CC	Okay, Bill. Thank you.
04 06 57 38	LMP	That's a blizzard.
04 06 57 42	CC	Roger. Understand.
04 06 58 33	CC	Apollo 8, Houston.
04 06 58 39	CDR	Go ahead, Houston.
04 06 58 41	CC	Roger. I need a Pop Romeo Dog on all three and a status report on the LMP.
04 06 59 01	LMP	Roger. The LMP's PRD hasn't moved an inch since we took off. And that's the one the CMP did have, still 0.64. And I just had about 5-1/2 hours sleep, and I'm in the process of scarfing up a meal; and I've been drinking lots of water, feeling good, and that's about it.
04 06 59 29	CC	Okay. And you got a PRD on the other two.
04 06 59 32	CMP	Yes. The CMP is ready to report. The CMP is reading 1.2 rem.
04 06 59 41	CDR	And the CDR: I got stuck with somebody elses, but mine reads now - my new one reads 2.02 rems. I don't know if there is a message there or not.
04 06 59 49	LMP	He's starting to glow in the dark.
04 06 59 55	CC	Yes. You should have hung on to the one you had. It sounded a little bit better. I copy left to right 2.02, 0.12, and 0.64. Over.

04 07 00 10	LMP	Roger.
04 07 00 13	CC	Thank you, sir.
04 07 00 17	LMP	What have they measured in our - what have they measured on that, I guess you would call it the VABABR, or VABD?
04 07 00 42	CC	We're sending the boy to the back room to find out.
04 07 00 51	LMP	Find out what it is, or what it's reading?
04 07 00 55	CC	First one and then the other.
04 07 01 02	LMP	We'll need both answers up here, too.
04 07 03 58	CC	Apollo 8, Houston.
04 07 04 02	CMP	Go ahead.
04 07 04 04	CC	Bill's VA and VR reading that he requested is 0.13. Over.
04 07 04 16	LMP	Roger. Look's like you've got a little discrepancy here.
04 07 04 25	CC	Yes, I agree.
04 07 04 39	LMP	You ought to give those guys a chance to go back to sleep and calibrate those things.
04 07 05 26	CC	Apollo 8, Houston. We've just passed 25 percent, and you can terminate your waste water dump, please.
04 07 05 31	LMP	Okay. Will do.
04 07 05 41	CDR	Believe it or not, our gage is 5 percent behind yours.

04 07 05 48	CC	Yes, John said that he has been noticing that.
04 07 07 23	CC	Apollo 8, Houston.
04 07 07 27	LMP	Go ahead, Houston. Apollo 8.
04 07 07 30	CC	Yes. We are going to switch antennas from Madrid to Goldstone in about 3 minutes. You should hear the glitch.
04 07 07 37	LMP	Thank you.
04 07 08 40	CMP	Houston, Apollo 8.
04 07 08 44	CC	Apollo 8, Houston. Over.
04 07 08 48	CMP	Roger. Just for information, would the perigee reading and NOUN 42 be such a big minus number for such a small burn? We are reading minus 03137 now.
04 07 09 03	CC	Roger. Understand; NOUN 42 perigee reads minus 03137. Over.
04 07 09 12	CMP	Roger. We are going to PROGRAM 30 after you give us the target load, and I didn't think there would be that much of a change for such a small burn.
04 07 09 20	CC	Roger. Stand by. We will check into it, Jim.
04 07 16 54	CC	Apollo 8, Houston. Over.
04 07 16 59	CDR	Go ahead, Houston. Apollo 8.
04 07 17 01	CC	Roger, Frank. We don't think there's any problem or any funnies in this perigee prediction of minus 03137. It's a Keplerian prediction, and it's not very accurate. Now we

have taken your vector from the downlink and run it through a make-believe external DELTA-V maneuver down here, and we get precisely the correct answer. Over.

04 07 17 35	CMP	Roger. Understand that you figure just because of the conics solution that it comes up.
04 07 17 40	CC	That's affirmative. The Kepler solution is just pretty gross.
04 07 17 47	CMP	Okay. I was just kind of curious. I could see differences when we were talking about LOI burns, but this being such a short one, I thought it wouldn't be that much difference. I understand.
04 07 17 58	CDR	Mike, this is Frank.
04 07 18 00	CC	Go ahead.
04 07 18 03	CDR	You are monitoring and seeing if we get any inadvertent engine firing all the time, aren't you?
04 07 18 10	CC	Well, we can't tell when you're in low bit rate. When you're in high bit rate, that's right.
04 07 18 20	CDR	Okay if we crank up high bit rate and just have you take a checkout look at them?
04 07 18 26	CC	Okay.

04 07 19 03	CC	Apollo 8, Houston.
04 07 19 08	CDR	Go ahead.
04 07 19 10	CC	Roger. Since you're on OMNI D (Dog) at this time, we're sort of 180 out of phase for the high-gain lock antennas. As soon as we can get high-gain lock, then we'll - -

END OF TAPE

04 07 19 38	CDR	Okay. We will take the antennas and get on the high gain as soon as we can.
04 07 19 43	CC	Thank you.
04 07 26 49	CC	Apollo 8, Houston.
04 07 26 53	CDR	Go ahead, Houston. Apollo 8.
04 07 26 54	CC	Roger, Frank. We've done some more checking, and we confirm that that is the correct Keplerian prediction on NOUN 42 minus 03137, just like you said.
04 07 29 09	CDR	Thank you.
04 07 35 41	CC	Apollo 8, Houston.
04 07 35 46	CDR	Go ahead.
04 07 35 48	CC	Roger. We are going to be doing a ranging sequence; if we can eliminate voice for a couple of minutes, we would appreciate it.
04 07 35 56	CDR	Roger. We will.
04 07 35 58	CC	Okay.
04 07 42 41	CC	Apollo 8, Houston. Over.
04 07 42 46	CDR	Go ahead, Houston.
04 07 42 48	CC	Roger. Our ranging is complete, and we have been monitoring your thruster firings, and they show what appears to be very normal damp activities. Over.
04 07 42 59	CDR	Thank you. I guess it was associated with the water vent.
04 07 43 05	CC	Roger. Understand, Frank.

04 07 57 08	CC	Apollo 8, Houston. Over.
04 07 57 12	CDR	Go ahead, Houston. Apollo 8.
04 07 57 14	CC	Frank, we've got about 2-1/2 minutes to ignition, and we're still showing some of your SCS switches not set up as per checklist; specifically, rate LOW, deadband MINIMUM, and your BMAG mode at attitude one, rate two.
04 07 57 35	CDR	Okay. Thank you.
04 07 57 37	CC	And your manual attitude switches in RATE COMMAND.
04 07 57 44	CDR	Right.
04 07 58 49	CC	Apollo 8, Houston.
04 07 58 52	CC	MARK.
04 07 58 53	CC	One minute to ignition. Over.
04 07 58 58	CDR	Roger. We concur.
04 07 59 30	CC	Apollo 8, Houston.
04 07 59 32	CC	MARK.
04 07 59 34	CC	Twenty seconds to ignition.
04 07 59 39	CDR	Roger.
04 08 01 33	CMP	Houston, Apollo 8.
04 08 01 35	CC	Go ahead, Jim.
04 08 01 38	CMP	Roger. We burned on time, 14 seconds, attitude nominal. Our residuals were plus 2 in VG_X, minus 1 in VG_Y, nothing in VG_Z. Our EMS stopped about 6.2 and continued counting after the burn.
04 08 02 03	CC	Roger. Understand 14 seconds, burn on time, nominal attitude, two-tenths X, one-tenth Y,

and nothing minus one-tenth Y, and nothing Z; and you put 6.2 on the EMS, and it continued to count after the burn. Is that affirmative?

04 08 02 22 CMP No. We put the burn - we put the burn DELTA-V in the EMS, and after the burn, it was still counting.

04 08 02 31 CC Roger. Understand.

04 08 02 32 CMP Still counting up.

04 08 02 33 CC Understand.

04 08 03 31 CMP Okay, Houston. We transferred the state vector to the LM slot.

04 08 03 36 CC Roger, Jim. Thank you, and I still don't understand you on this EMS. Counted down from 5 to zero normally and then continued through zero in a negative way, and now it's reading minus 6.2? Is that affirmative?

04 08 03 52 CMP Roger. That's right. It was counting up when we shut it off. Last time I saw it, it was 6.9. Now Frank just put it on AUTO again with the DELTA-V function switch in DELTA-V, and it jumped six-tenths. Then he tried the second time, and it stayed at zero so we really don't know what the story is.

04 08 04 16 CC Roger. Understand you.

04 08 05 48 CDR Houston, this is Apollo 8.

04 08 05 51 CC Go ahead, Frank.

04 08 05 57	CDR	I guess you want us to resume PTC, right?
04 08 06 00	CC	Stand by.
04 08 06 29	CC	Apollo 8, Houston.
04 08 06 34	CDR	Go ahead.
04 08 06 35	CC	We'd like you to resume the PTC attitude, pitch 010, yaw 045; and then come out of it again for your P23 that you're scheduled for about another hour and 10 minutes, in another hour and 10 minutes.
04 08 06 55	CDR	Roger.
04 08 07 16	CDR	Mike, this is Frank. Is this TV still scheduled for 104:50?
04 08 07 22	CC	That's affirmative, Frank, if you can manage it.
04 08 07 27	CDR	Okay.
04 08 07 36	CC	How's it going with the TV, Frank? Are we - can the networks count on having it on schedule? Over.
04 08 07 44	CDR	Yes, we can have it on schedule. We don't have much to do, but we'll perform for you.
04 08 07 49	CC	Okay. We have a bunch of filter experts standing by if you need any advice.
04 08 07 55	CDR	Well, we're just going to have to just do it inside today because there are no good shots of the moon or the earth; the sun's too darn bright.
04 08 08 03	CMP	I think it's raining out there.
04 08 08 04	CC	Yes, that's what we thought.

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04 08 09 57	CDR	Houston, Apollo 8.
04 08 10 00	CC	Apollo 8, Houston. Go ahead.
04 08 10 06	CDR	Roger. On this EMS, when I put it in DELTA-V, it was reading zero; then I switched to AUTO. Sometimes it will count to 19 or 20 feet per second. I guess that is what happened.
04 08 10 17	CC	Roger. Understand when you put it to AUTO, it maybe will keep counting up to as much as 19 to 20 feet per second.
04 08 10 27	CDR	Just when you put it to AUTO; it will start counting on some occasion, by itself.
04 08 10 31	CC	Understand.
04 08 21 26	CDR	Mike, we're ready when you are.
04 08 21 28	CC	We're ready.
04 08 21 35	CDR	Say again.
04 08 21 37	CC	Yes, we're reay, Frank. We're all squared away and eagerly standing by.
04 08 22 12	CC	You got your make-up on?
04 08 22 17	CDR	Yes. Have we got a picture?
04 08 22 21	CC	Negative, Frank.
04 08 22 43	CDR	How about now, Houston?
04 08 22 46	CC	Negatie, Frank.
04 08 23 19	CDR	We don't seem to have much luck today, but don't call for a repairman yet. It may be our camera here.
04 08 23 46	CDR	Any results yet, Mike?

04 08 23 49	CC	Negative, Frank. It may be that it hasn't warmed up properly.
04 08 23 56	CDR	Okay. We've had it on for a while. Are you getting our FM okay?
04 08 24 04	CC	Okay, Frank. There, we got it. It's coming in loud and clear. We look like we're looking at your hat and now the MDC.
04 08 24 18	CDR	Okay. Well, good afternoon. This is the Apollo 8 crew. And how is it focusing now, Houston?
04 08 24 27	CC	It's looking good. If you can hold the thing still, there's sort of a time delay. Any motion at all ruins our picture.
04 08 24 39	CDR	Tell me if there is any difference in it now.
04 08 24 42	CC	It's looking good now.
04 08 24 46	CDR	Okay, fine.
04 08 24 48	CC	It looks like you're okay, but somebody else is upside down.
04 08 24 54	CDR	Okay. That's right. That's Jim Lovell. What we thought we'd do today was just show you a little bit about life inside Apollo 8. We've shown you the scenes of the moon, the scenes of the earth, and we thought we'd invite you into our home. It's been our home at least for 4 days as you can see on the instrument panel. We mark off each day on the instrument panel.

We're four down, and we're working on the fifth day. Of course, we're all looking forward to the landing on Friday. Down here in the part of the spacecraft that we call the lower equipment bay, we have the President's adviser on physical fitness, Captain Jim Lovell, about to undergo an exercise program that we do every day. You notice that he floats around very freely. He just bumped his head on the optics, used for our navigating. He's working with an exercise device that's designed to keep the muscles in shape. Now another very important function of our spacecraft is the computer, and I thought you might be interested in seeing what we have here, the displays that give us all the information about our burn, about navigating, and about the velocity that we use during entry and retrofire on earth-orbital missions. You can see it's controlled by a DSKY, or similar to a typewriter keyboard, and the things that go in and out of that are absolutely miraculous. It's done a fantastic job for us, and Jim Lovell has done an excellent job operating it. Now another very important thing whether you're in space or the ground is eating, and I've asked Bill Anders to show you

how we eat up here in the flight. Pardon the picture while we move around here and change cameras. The food that we use is all dehydrated; it comes prepackaged in vacuum-sealed bags. You notice that all Bill has to do to keep it in one place is let go of it. Except for the air currents in the spacecraft, it would stay perfectly still. He gets out his handy, dandy scissors and cuts the bag. The food is varied, generally pretty good. If that doesn't sound like a rousing endorsement, it isn't, but nevertheless, it's pretty good food. You can see that Bill is very clever. He does things swiftly. Actually, those food bags are stuc together because they've been vacuum packed in plastic.

04 08 28 24	CMP	What do you have today, Bill, for dinner?
04 08 28 32	LMP	Well, here we have some cocoa; should be good. I'll be adding about 5 ounces of hot water to that. These are little sugar cookies, some orange juice, corn chowder, chicken and gravy, and a little napkin to wipe your hands when you're done. I'll prepare some orange juice here.
04 08 29 37	CDR	Okay. You can see that he's taking his scissors and cutting the plastic end off a little nozzle that he's going to insert the water gun into.

The water gun dispenses a half-ounce burst of water per click. Here we go; Bill has it in now, and the water is going in. I hope that you all had better Christmas dinners today than us, but nevertheless, we thought you might be interested in how we eat.

04 08 30 51 CC Roger. I haven't heard any complaints down here, Frank. We'll bring you up to speed on your food when you get back.

04 08 30 59 CDR Very good.

04 08 31 01 CC Looks like a happy home you've got up there.

04 08 31 04 CDR Ordinarily, we let these drinks settle for 5 or 10 minutes, but Bill's going to drink it right now. Then, to get on with the program, he cuts open another flap, and you'll see a little tube comes out - -

04 08 31 22 CMP This is not a commercial.

04 08 31 36 CDR - - and he drinks his delicious orange drink. Maybe I should say he drinks his orange drink. He's usually not that fast. Bill is really in a hurry today. Well, that's what we eat. Now another very important part of the spacecraft is the navigation station or the optics panel. And we - just a minute; Bill wants to say something.

04 08 32 04 LMP That's good, but not quite as good as good old California orange juice.

04 08 32 09	CDR	Bill's from Florida.
04 08 32 12	CDR	Okay. Now if you'll let me have the camera, Jim, I'll show the people where you do most of your work. Okay. Bill, can you explain it?
04 08 32 25	CMP	If I can clean up some of Bill's food around here, and have it away - Down in this area is called the LEB or the lower equipment bay, and we have our optics positioning equipment right here. We do all our navigation down here by sighting on stars and on horizons of either the moon or the earth. And this is where we find out exactly where we are in space, what direction, and how fast we are traveling. And our computer, as Frank has mentioned, takes information and tells us how to maneuver to get home safely. I work with the scanning telescope and the sextant, and occasionally, if I get too busy, I just sort of float out of sight and go up into the tunnel which is the tunnel to the hatch of the lunar module which we don't have onboard, of course.
04 08 33 35	CDR	Now that's about all we have for today. I - each and every one of us wish each and every one of you a very Merry Christmas. And, I guess we'll see you tomorrow, and we'll be landing early Friday morning. Merry Christmas from Apollo 8.

04 08 33 53	CC	Roger. Merry Christmas from the ground, Apollo 8, and thank you very much for the guided tour. We really enjoyed it.
04 08 34 00	CDR	Roger.
04 08 35 11	CC	Apollo 8, Houston.
04 08 35 15	CDR	Go ahead, Mike.
04 08 35 16	CC	We're suggesting attitude deadband MAX and rate HIGH.
04 08 35 25	CDR	You're right. Thank you.
04 08 45 29	CDR	Houston, Apollo 8.
04 08 45 32	CC	Go ahead, Frank.
04 08 45 36	CDR	How soon will they tell us what effect the midcourse had on our trajectory, Mike?
04 08 45 42	CC	Oh, the longer we track, the smarter we'll get; but stand by one for a pertinent answer.
04 08 46 39	CC	Apollo 8, Houston.
04 08 46 43	CDR	Go ahead.
04 08 46 44	CC	Tentatively, midcourse correction at 122 hours is zero; and in about an hour and a half, we'll have some track data to confirm that.
04 09 46 57	CDR	Okay. Thank you.
04 09 47 09	CDR	We're going to have something to eat here, Mike; just taking it easy.
04 09 47 16	CC	Roger. Understand, Frank.
04 09 47 39	CDR	Did you get another shotgun for Christmas?
04 09 47 45	CC	No, I'm missing enough with the one I have.

Why the space here?

should these be 04 08 46? Seems reasonable.

04 09 47 50	CDR	That's what Edwin told me; I thought maybe you might want to try another one.
04 09 48 00	CDR	What was it, 40 shots at four birds?
04 09 48 02	CC	Oh, negative, Frank. I'm 100 percent, one bird per box.
04 09 48 12	CDR	Then you and I are in the same fix.
04 09 51 18	CMP	Houston, Apollo 8.
04 09 51 22	CC	Apollo 8, Houston. Go ahead.
04 09 51 26	CMP	It appears that we did a grave injustice to the food people. Just after our TV show, Santa Claus brought us a TV dinner each, which was delicious, turkey and gravy, cranberry sauce, grape punch; outstanding.
04 09 51 45	CC	Roger, Jim. Glad to hear it. Now we're down here eating cold coffee and bologna sandwiches.

END OF TAPE

Should be 04308 ?

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

04 09 10 10	CDR	Houston, Apollo 8.
04 09 10 15	CC	Apollo 8, Houston.
04 09 10 23	CC	Apollo 8, this is Houston. Over.
04 09 10 28	CDR	Roger. We've got an awful lot of these stars to mark on now, Mike, and they were having some concern about the PTC. Will you let us know if we stay in one position too long, or if we have to knock off and do some PTC?
04 09 10 42	CC	Will do, Frank.
04 09 10 45	CDR	Thank you.
04 09 12 46	CC	Apollo 8, Houston. We are monitoring your temperatures. The quads all look good. We will continue to do so, and we expect no difficulty with them during the P23 work.
04 09 12 59	CDR	Thank you.
04 09 13 12	CDR	Our highest tank temperature now is C.
04 09 13 17	CC	Understand; C is the hot one.
04 09 48 39	CC	Apollo 8, Houston. Over.
04 09 49 12	CC	Apollo 8, this is Houston. Over.
04 09 49 17	LMP	Go ahead, Houston.
04 09 49 20	CC	Roger, Bill. We would like to talk about your high-gain antenna sometime when you get a minute.
04 09 49 27	LMP	Okay. Just a second, Mike.
04 09 50 47	LMP	About 5 minutes, Mike, we'll be done here.
04 09 56 22	LMP	Houston, Apollo 8. About the high-gain antenna.

04 09 56 26	CC	Okay, Bill. We think it would be an extremely worthwhile thing to find out how it operates in the AUTO REACQ mode, and we propose running a test on it in that mode from 109 to 111 hours GET. Over.
04 09 56 46	LMP	Okay. We'll do that.
04 09 56 48	CC	Okay. I have about a - -
04 09 56 50	LMP	We'll try it on the way out.
04 09 56 58	CC	We have a detailed procedure which we can read up to you anytime you're ready.
04 09 57 07	LMP	Go ahead.
04 09 57 10	CC	Okay. We suggest the start time 109 hours GET, stop time 111 hours, and you'll be in a PTC. We're requesting a left roll rate, which we notice that you've been preferring, a left roll rate of 1 revolution per hour, and this is in your present PTC attitude (i.e., pitch 10 degrees, 010 degrees, and yaw 45 degrees). The procedure is this: step 1, stop at roll angle 150 degrees; acquire - this is step 2 - acquire in MANUAL mode; three, switch to AUTO NARROW BEAM; four, make sure tracking in AUTO mode then switch to AUTO REACQ mode; five, position the high-gain antenna - -
04 09 58 17	CMP	Wait a minute, Houston.
04 09 58 19	CMP	Whoa, whoa, whoa.
04 09 58 21	CC	Okay. Whoa, whoa. Standing by.

04 09 58 23	LMP	I'm still starting.
04 09 58 30	LMP	Okay. Make sure tracking in AUTO and then what?
04 09 58 34	CC	Make sure tracking in AUTO, and then switch to AUTO REACQ mode. Over.
04 09 58 46	LMP	Okay. Will do.
04 09 58 48	CC	Okay. Step 5, position high-gain antenna pitch and yaw control to predicted earth's rise angles, and those angles are yaw 50 degrees, pitch minus 40 degrees. Over.
04 09 59 18	LMP	Okay.
04 09 59 19	CC	Okay. Two more steps. Step 6, remain on high-gain antenna in this mode for two REV's. Do not switch to OMNI anytime during these two REV's, and maintain mode configuration of voice and data. We expect loss of track should be no more than 15 minutes per REV. Over.
04 09 59 51	LMP	Roger.
04 09 59 53	CC	And the final step, 7, if any problem arises, go back to your initial gimbal angles of 10 degrees pitch, 45 degrees yaw, and 150 degrees roll; reacquire and go to AUTO mode. Over.
04 10 00 18	LMP	Yes, I guess there ought to be a step 4A which says start roll again, right?
04 10 00 29	CC	That's affirmative. Excuse me there, that's affirmative.
04 10 00 38	LMP	Okay. If - let's see, if we - I don't understand your last comment. If we get into a

problem, you want us to go back to 150 degrees roll?

04 10 00 50 CC Well, all we want you to do is go ahead and reacquire in the AUTO mode, Bill. And it looks like that would be one way of doing it. But all we're saying is, you know, if you want to talk to us about something, or you have any other problems, or you don't like the way it looks, anything at all, just go ahead and reacquire in the AUTO mode.

04 10 01 10 LMP Yes, why don't we just say if we do have problems, it doesn't pick it up when it's supposed to, give it a good try, and then call you up on the OMNI'sor position ourselves and we'll talk about it and try for another two REV's.

04 10 01 21 CC That's just fine, Bill.

04 10 01 29 LMP Okay. It's worked. We tried it once or twice on the way out, but the one modification is once it did break lock, and go to its MANUAL position, but I switched to the OMNI's in between. That sounds fine.

04 10 01 45 CC Bill, could you run through that again? We're not reading you too loud, and would you say again what you tried on the way out, please.

04 10 01 55 LMP On the way out, they gave us some REACQ angles which we used, and once it broke lock and repositioned itself, why, it went over to the OMNI's

and waited till we got to near breaking lock again and switched back and snapped right in there.

04 10 02 20	CC	Roger. Thank you. We copy.
04 10 02 28	LMP	We have a few more stars to get, and then we'll give it a try.
04 10 02 33	CC	Roger.
04 10 23 15	CC	Apollo 8, Houston. Over.
04 10 23 20	LMP	Go ahead, Houston.
04 10 23 22	CC	Roger, Bill. We got a bunch of tapes of some of your favorite music down here. You be interested in hearing a little background on the S-band?
04 10 23 32	LMP	Go ahead.
04 10 23 31	CC	Okay.
04 10 27 22	LMP	Houston, Apollo 8.
04 10 27 24	CC	Apollo 8, Houston. Go ahead.
04 10 27 28	CMP	Roger. For some reason, we suddenly got a PROGRAM 01 and no attitude light on our computer.
04 10 27 35	CC	We confirm that.
04 10 27 51	CC	Stand by one, Jim. We're working on a procedure for getting you cranked back up again.
04 10 27 57	CMP	Okay.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

04 10 29 58	CC	Apollo 8, Houston.
04 10 30 02	CMP	Go ahead.
04 10 30 04	CC	Okay. Jim, while we're working on this procedure, we'd like to know did you select 01, did you get a VERB 37 ENTER, 01 ENTER?
04 10 30 15	CMP	Let's see, I'm not too sure, Mike. I might have done that, yes.
04 10 30 20	CC	Okay.
04 10 30 21	CMP	We have star 01 coming up, now that might have been the reason.
04 10 30 25	CC	Okay. We understand. Why don't you just hold what you've got on your DSKY, and we'll be with you shortly.
04 10 30 29	CMP	Okay.
04 10 32 29	CC	Apollo 8, Houston.
04 10 32 33	CMP	Go ahead.
04 10 32 34	CC	Roger. Could you or Bill give us a better OMNI antenna, please?
04 10 32 42	CMP	Stand by.
04 10 37 53	CC	Apollo 8, Houston. Over.
04 10 37 56	CDR	Go ahead, Houston. Apollo 8.
04 10 37 58	CC	Okay. Frank, our procedure is to select P00, and from P00 go to P51, and get a platform alignment. After you've done that, we will send you up a P27, a REFSMMAT, and then you can do P52 REFSMMAT options. Then you'll be back in business. Over.

04 10 38 21	CDR	Okay, Mike. Thank you.
04 10 38 22	CMP	Roger.
04 10 47 55	CDR	Houston, this is Apollo 8.
04 10 48 12	CDR	Houston, Apollo 8.
04 10 48 15	CC	Apollo 8, this is Houston. Go ahead.
04 10 48 24	CC	Apollo 8, this is Houston. Say again. Over.
04 10 48 29	CDR	Okay. We've completed a P51 now. You want us to try a P52, or do you want us to wait till we can put a REFSMMAT in?
04 10 48 39	CC	Stand by one, will you, please, Frank?
04 10 48 43	CDR	Roger.
04 10 48 50	CC	We're putting together a P27 load for you now, Frank; that's the reason for the delay. We just want to make sure we don't overlook anything before we send it up to you.
04 10 49 02	CDR	Okay. We'll just sit tight then. We've got a good P51. We'll just wait till you put in a REFSMMAT, and then, of course, we'll fine align over to that, right?
04 10 49 14	CC	That's right, that's exactly right. Just stand by.
04 10 49 45	CDR	Mike, this is Frank again.
04 10 49 47	CC	Go ahead.
04 10 49 50	CDR	I suggest that we go ahead while you're doing that, do a P52 here, and let it do an automatic and just tweak this up. Jim had to use Rigel

and Sirius, and they're pretty close together. And although we got a zero difference for the star angle, that might not be a bad idea just to try a 52 here.

04 10 50 08	CC	We'd rather not do that, Frank. Stand by one.
04 10 50 14	CDR	Alright. We won't do a thing.
04 10 50 47	CC	Frank, we feel that procedure that you're talking about is really not required, and it's sort of wasting your time. You'd still have to - upon completion of that, we'd have to send you a new REFSMMAT, and you'd have to go ahead and do P52 to that REFSMMAT in addition. Over.
04 10 51 07	CDR	We understand that. Go ahead. We'll wait for your REFSMMAT.
04 10 51 09	CC	Okay. Thank you.
04 10 52 11	CC	Apollo 8, Houston. If you'd go POO and ACCEPT, we have our P27 ready. We'll send you up a REFSMMAT. Over.
04 10 52 20	CDR	Roger. POO and ACCEPT.
04 10 52 23	CC	Roger.
04 10 53 15	CC	Apollo 8, Houston. Frank, we'd like to make sure you understand that when you do your P52, you want to select option 1, the preferred option, because those are the registers we're blinking now with this P27.
04 10 53 31	CDR	Roger. Option 1; thank you.

04 10 55 08	CC	Apollo 8, Houston. We got a good load in; it's your computer. Go to BLOCK.
04 10 55 16	CMP	Okay.
04 10 55 17	CDR	Roger. Stand by.
04 10 55 19	CC	And you can go ahead with your P52 at your convenience.
04 10 55 24	CDR	We're going ahead right now.
04 10 58 47	CC	Apollo 8, Houston. Over.
04 10 58 49	CDR	Go ahead, Houston. Apollo 8.
04 10 58 50	CC	Roger. When Jim gets to the end of P52, he's got a flashing VERB 37. We'd like him to not proceed, to hold at that point; we'd like to read some bits and pieces out of the computer at that time. Over.
04 10 59 10	CDR	Roger.
04 10 59 20	CC	Apollo 8, if Anders has got time to give us a countdown, could we get the BIOMED switch from center to left?
04 10 59 33	LMP	Two, one -
04 10 59 34	LMP	MARK.
04 10 59 38	CC	Did you take that 1.7-second time delay into account?
04 10 59 44	LMP	Sorry about that.
04 11 00 38	CMP	Okay. Houston, you have it.
04 11 00 49	CC	Thank you, Jim. And I'll give you ar estimate here on how long we want to hold at this point; it won't be too much longer.

04 11 00 58	CMP	Roger. It was my goof; I must have put in 3701 instead of 3723 and 501.
04 11 01 11	CC	Roger.
04 11 03 04	CC	Apollo 8, Houston. We have got a flight plan suggestion for you.
04 11 03 11	CDR	Go ahead.
04 11 03 13	CC	Go ahead and delete the remainder of the P23's that you're working on now, go back to PTC attitude, and then pick up where it says 108 hours in the flight plan to pick up again there with your P23, or if you prefer to slip that time a couple of hours, if you want to get some rest in between.
04 11 03 37	CDR	I think that's a good idea; we'll do that.
04 11 03 40	CC	Okay.
04 11 03 59	CMP	Mike, what does this do to our state vector?
04 11 04 02	CC	Not a thing. We've looked at your state vector, and it's good.
04 11 04 08	CMP	So we didn't lose all the NAV we had just accomplished, right?
04 11 04 16	CC	Stand by one on that, Jim. I don't know; I'm checking.
04 11 05 44	CC	Apollo 8, Houston.
04 11 05 49	CMP	Go ahead.
04 11 05 51	CC	Roger. I say again, your state vector is just fine; it's still ticky-poo, and the reason we're

holding here is that we're checking to see if any P23 information was lost. That's reason one, and the second reason is that your W-matrix shares some computer memory cells with P01, and we are getting a clarification on the status of your W-matrix before we proceed. Over.

04 11 06 22	CMP	Roger, Michael.
04 11 06 53	CDR	We'll go ahead and start heading over to the PTC attitude.
04 11 06 57	CC	Very good.
04 11 07 57	CDR	Do you need that high gain any more, Mike?
04 11 08 07	CC	Negative. We don't need it any more.
04 11 18 51	CC	Apollo 8, Houston.
04 11 18 54	CDR	Go ahead.
04 11 18 56	CC	Roger, Frank. We're coming up on time for an oxygen purge on all three fuel cells. It might be a good time to do it while we are waiting here.
04 11 19 04	CDR	Fine.
04 11 19 31	CDR	Alright. Mike, we are going to purge the three fuel cells, oxygen only.
04 11 19 35	CC	That's correct. Thank you.
04 11 23 44	CC	Apollo 8, Houston. That's enough on fuel cell number 1; if you'd start on two please.
04 11 23 51	CDR	Roger.

04 11 32 22	CC	Apollo 8, Houston. We're in low bit rate now. Last time we saw you, you were still purging. Over.
04 11 32 31	CMP	Roger. ...
04 11 32 35	CC	You're unreadable, but request that you end your purge.
04 11 32 42	CMP	Roger. We ended our purge.
04 11 32 45	CC	Thank you.
04 11 38 37	CC	Apollo 8, Houston. Over.
04 11 38 42	CMP	Go ahead, Houston.
04 11 38 44	CC	Roger, Jim. I've got a short procedure I would like to read up to you on your DSKY, and I'd like to explain what it is. Your W-matrix shared some memory locations with P01; therefore, the W-matrix that you have right now is not a good one, and we would not want you to continue your P23 sightings with that matrix. So the procedure I'm going to give you is going to cause the matrix to reinitialize itself prior to your next P23, when you go into P23. And this will put you back with the value of the W-matrix which you loaded after TEI, you remember, that 3303 thing. And if this has any further effects on the flight plan, we're in the process of sorting that out, and if need be, we'll send you up a revised sighting schedule later, both with the COMM and loss of COMM case. Over.

04 11 39 53	CMP	Okay. Stand by, and I'll get something to copy with.
04 11 39 57	CC	Okay.
04 11 40 09	CMP	Okay. Go ahead.
04 11 40 11	CC	Okay. Insert without releasing the flashing VERB 37 the following: VERB 25 NOUN 07 ENTER, 77 ENTER, 40 ENTER, ENTER, VERB 37 ENTER, 00 ENTER. Over.
04 11 40 49	CMP	Understand. We insert VERB 37 without releasing, is that correct?
04 11 40 56	CC	Roger. You should have flashing 37 on your DSKY now, and without releasing that flashing 37, go ahead with the VERB 25, et cetera.
04 11 41 08	CMP	Roger. Okay. I see what you mean. Okay. We'll insert VERB 25, NOUN 07 ENTER, 77 ENTER, 40 ENTER, ENTER, reinsert VERB 37 ENTER, 00 ENTER.
04 11 41 24	CC	That's all correct. Say, if you've got any questions about that, we would be happy to answer them.
04 11 41 35	CMP	Roger. Are we cleared to do that now?
04 11 41 37	CC	That's affirmative, Jim.
04 11 41 39	CMP	Roger.
04 11 42 29	CDR	Hey, Mike, this is Frank.
04 11 42 32	CC	Go ahead, Frank.
04 11 42 36	CDR	Is there any danger that this might have screwed up any other part of memory that would be involved with entry or anything like that?

04 11 42 53	CC	Frank, all indications are that there is absolutely no problem with anything in the computer memory other than the W-matrix. However, we are continuing to look at it, and if there is any doubt in our mind, we will ask you to dump the memory locations for us later. Over.
04 11 43 15	CDR	Okay. Fine.
04 11 56 41	CC	Apollo 8, Houston.
04 11 56 45	CMP	Go ahead, Houston.
04 11 56 47	CC	Roger, Jim. We thought you might be interested in knowing, based on 2-1/2 hours worth of track after your last midcourse, and looking ahead, we're predicting the midcourse correction at 122 hours will be less than 1 foot per second. And keep it on going to entry interface minus 2 hours, we're predicting 2 foot per second midcourse at that time. Now those numbers will be refined; we'll get about another 8 hours of track on you before we amend them. Over.
04 11 57 21	CMP	Sounds like we're on pretty good trajectory.
04 11 57 25	CC	Can't hardly beat it.
04 11 57 33	CMP	After we do these next P23's, I'll see what our P37 gives us. What's that midcourse, 122 hours that has practically zero?
04 11 57 44	CC	Yes. It's looking to be less than 1 foot per second, about four-tenths of a foot per second

right now. And then the one before entry, at 2 hours before entry interface, is looking to be about 2 feet per second.

04 11 58 00 CMP Roger. Well, okay. I'll run a P37, and we can just compare the difference.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

04 12 07 59	LMP	Houston, Apollo 8. Over.
04 12 08 45	LMP	Houston, Apollo 8. Over.
04 12 08 50	CC	Apollo 8, Houston. Over.
04 12 08 53	LMP	Roger. Got the JOD back on watch again. We want to make sure we don't overdo the star sightings at the expense of thermal control, so you might keep an eye on us and give us a NO-GO if we start getting too hot on one side.
04 12 09 09	CC	Roger. Will do, Bill. Has Jim gone to bed?
04 12 09 18	CMP	No, I'm right here. We're going to start doing cislunar NAV right now, and Bill's up in the left-hand seat.
04 12 09 28	CC	Roger. Understand; you're going to do some P23's now. We thought you were going to take a rest and do them later.
04 12 09 38	CMP	No, Frank is asleep now. We'll get these out of the way. So I'm coming over to do a trunnion alignment at this time, and then we'll go into the P23.
04 12 09 56	CC	Okay, Jim. There's one thing before you get started on the P23. What we told you before, we still think is absolutely correct. The only thing in the computer memory that is changed by that P02 is the W-matrix. However, as an additional precaution, we'd like to dump the computer memory and go through it and check it bit

by bit and make sure everything is exactly copacetic. Over.

04 12 10 31 CMP Okay. Do you want to do that now?

04 12 10 34 CC Affirmative. We're getting Goldstone configured for it; it'll be just a minute. And while we're doing that, I can read you this procedure if you're ready to copy.

04 12 10 43 CMP Okay. Stand by one, and I'll be ready to copy pretty soon.

04 12 10 47 CC Thank you.

04 12 11 01 CMP Go ahead.

04 12 11 03 CC Okay. We'd like a VERB 01 NOUN 01 ENTER, 333 ENTER, and then we'd like for you to read us register 1. Register 1 we expect will be a 10 000, and if register 1 is equal to that, then what that means is that the computer will dump its erasable memory twice. That's 10 000 numbers, twice number for the erasable memory dump. If it's not reading 10 000, then we'll ask you to make it read 10 000 by going VERB 21 NOUN 01 ENTER, 333 ENTER, 10 000 ENTER. After you've done that, the dump VERB is VERB 74 ENTER, and that will automatically dump the total erasable memory twice, and return you to the proper configuration.

04 12 12 13 CMP Okay. The procedure will be VERB 01 NOUN 01 ENTER, 333 ENTER, and read out register 1. Then

10 000 - the memory - the computer will then dump the memory twice as properly configured. If not, we have to load in 10 000, and we do that by going VERB 21 NOUN 01 ENTER, 333 ENTER, 10 000 ENTER, and VERB 74 ENTER. Now if register 1 does read 10 000, then we'll still have to do the VERB 74 ENTER, is that correct?

04 12 12 49	CC	That's affirmative. That VERB 74 ENTER is what starts the dump. Then we just prior to that want to make sure we got 10 000; we made sure. And just hang loose one on Goldstone down here; we're getting it configured.
04 12 13 10	CMP	Roger. You need the high gain, Mike?
04 12 13 13	CC	Negative. We won't need the high gain.
04 12 15 21	CC	Apollo 8, Houston. Goldstone is all ready, and you can go ahead with that procedure, Jim.
04 12 15 28	CMP	Roger.
04 12 15 55	CMP	Okay. Register 1 reads 10 000.
04 12 15 58	CC	Okay. Thank you.
04 12 16 07	CMP	And do you want VERB 74 now?
04 12 16 09	CC	That's fine.
04 12 17 59	CC	Apollo 8, Houston.
04 12 18 03	CMP	Go ahead.
04 12 18 04	CC	Roger. Have you done the VERB 74 ENTER yet?
04 12 18 07	CMP	No, I'm waiting for your command.
04 12 18 10	CC	Okay. I'm sorry; you must have missed it. You can go ahead right now, Jim; we're all set.

04 12 18 17	CMP	Roger. VERB 74.
04 12 18 23	CMP	On its way down.
04 12 18 25	CC	Thank you.
04 12 20 18	CC	Apollo 8, Houston. Jim, the dump is complete. You can go ahead and do whatever you like with your computer now.
04 12 20 26	CMP	Roger.
04 12 20 34	LMP	We're going to be restricted to P23 for a while.
04 12 20 38	CC	Just don't let Anders touch the computer.
04 12 20 45	LMP	I haven't yet, and 2 don't plan to.
04 12 20 50	CC	Roger. We concur with that decision.
04 12 22 17	CC	Oh, we've just been honored by the presence of Mr. Neil Armstrong who is now standing by the CAP COMM console, alert and eager.
04 12 22 28	CMP	Roger. Ask him how the stock market is doing.
04 12 22 31	CC	Tears are rolling down his face.
04 12 26 25	CC	Apollo 8, Houston..
04 12 26 29	LMP	Go ahead.
04 12 26 31	CC	With the computer, we sort of got behind in our promise of music. Do you still want it?
04 12 26 38	LMP	Go ahead.
04 12 26 40	CC	Okay.
04 12 26 44	LMP	Just so Neil doesn't accompany it.
04 12 27 00	CC	... choir.
04 12 27 09	CC	Neil says you're in luck; he has a cold today.
04 12 29 18		(Music of "Joy to the World" and a choir singing another song)

04 12 32 09	LMP	Must be the wrong speed.
04 12 33 01	LMP	Houston, Apollo 8.
04 12 33 21	CC	Apollo 8, Houston. Over.
04 12 33 25	LMP	Roger, Mike. That's real nice, but if you don't mind, you'd better hold it off until we get this tracking test done. ...
04 12 33 45	CC	Roger, Bill. We concur.
04 12 33 54	LMP	Sounds like it is being run at the wrong speed.
04 12 33 58	CC	It doesn't sound very good to us either.
04 12 34 02	LMP	Coming through nicely, though, Mike. You're coming through nicely, Mike; maybe you could just sing a little bit.
04 12 34 10	CC	Yes, I'll get my harmonica.
04 12 56 36	LMP	Houston, Apollo 8.
04 12 56 39	CC	Apollo 8, Houston. Over.
04 12 56 42	LMP	Roger, Mike. How are our temperatures looking across the service module? Could it be GO here for a shoot in another couple sets on this next start?
04 12 56 53	CC	Yes. I'm monitoring them, and they look real good to me, Bill. Just a second and I will check with the experts. Yes, you are just fine, Bill, on your quad temps.
04 12 57 08	LMP	And SPS is okay?
04 12 57 13	CC	Affirmative. SPS is looking good also.
04 12 57 19	LMP	Okay.

04 12 57 28	CC	Apollo 8, Houston.
04 12 57 32	LMP	Go ahead, Mike.
04 12 57 34	CC	Roger, Bill. Because of this W-matrix thing, we would like to add some more star sightings when Jim gets through with the series that he is currently on. And I have the information relevant to them when you are ready to copy.
04 12 57 53	LMP	Stand by.
04 12 58 00	LMP	Go ahead.
04 12 58 02	CC	Okay. This is - we would like him to do them, as I say, whenever he is through the series he is on now, and they are the same ones that are printed on your flight plan page 2-86. The first one we'd like to increase to two sets; the second one we'd like to increase to two sets, making a total of five sets on those stars on page 2-86. Do you copy?
04 12 58 34	LMP	Roger.
04 12 58 44	CC	Okay. The other change is on an elapsed time of 120 - a hundred and twenty hours: we'd like to increase that P23 work, the first star change, from one set to two sets. The second star from one to two - -
04 12 59 07	LMP	Wait a minute, wait a minute.
04 12 59 08	CC	Okay.
04 12 59 12	LMP	Okay. Looking for the page; I got it now.

04 12 59 16	CC	Okay. The first star, make two sets; second star, two sets; for a total of five sets.
04 12 59 25	LMP	Okay.
04 12 59 27	CC	And if you're in a copying mood, I have - would you believe - a couple of changes to your entry checklist which I'd like to read up to you sometime today or tomorrow.
04 12 59 43	LMP	Okay. Why don't we get them here after this one set of stars.
04 12 59 46	CC	Very good.
04 13 00 01	CC	Roger, Bill. I was just given a new one here. While you've got your flight plan out, this would be 130 hours CET. Have you got that page?
04 13 00 15	LMP	I just put it away, but I'll get it out again.
04 13 00 17	CC	I'm sorry about that.
04 13 00 24	LMP	... if you want me.
04 13 00 33	CC	Roger. At 130 hours GET, star 02: where it is printed two sets, we'd like to make that only one set; and then we would like to add star 11 (star one - one) lunar far horizon, two sets. Over.
04 13 01 05	LMP	Okay.
04 13 01 08	CMP	Hey, Mike. Is MIT slipping in the back door?
04 13 01 14	CC	Not really, Jim. It has to do with this W-matrix. You remember that we reinitialized it in lunar orbit, and then we worked on it as you came back

on the previous sightings you made, and now we've gone on reinitialized it again at this point. And we'd like to restore it to its former size and shape and whatnot.

04 13 01 40	CMP	Okay. I understand.
04 13 12 12	CMP	Houston, Apollo 8.
04 13 12 15	CC	Go ahead, Jim.
04 13 12 20	LMP	Mike, I have got the entry checklist right now. You want to give me an update?
04 13 12 24	CC	Okay, Bill. Thank you. The first one is on page E-7.
04 13 12 32	LMP	Okay. Stand by.
04 13 13 08	LMP	Okay, Mike. Ready to go. Now I know why Neil was over there.
04 13 13 14	CC	No. You can't blame it on him. Page E-7 under CM RCS preheat, halfway down where it says "UP TELEMETRY BLOCK" - Are you with me?
04 13 13 31	LMP	I am with you.
04 13 13 33	CC	Okay. After UP TELEMETRY BLOCK, insert "RCS CM heaters circuit breakers to CLOSE."
04 13 13 58	LMP	Okay.
04 13 14 00	CC	All they are doing there is just making sure you get your heater circuit breakers closed. The next one is on page E-9.
04 13 14 25	LMP	Ready to copy.
04 13 14 27	CC	Roger. On E-9 up near the top under "terminate CM RCS preheat" and the middle there, after

		"CM RCS heaters OFF, LMP confirm," insert "RCS CM heaters circuit breakers to OPEN." That's just opening those two breakers back up.
04 13 14 54	LMP	Roger.
04 13 14 56	CC	And the last change is on page 14.
04 13 15 20	LMP	Okay.
04 13 15 22	CC	Yes. This one should be a favorite of yours. Near the top where it says "tape recorder, RECORD FORWARD" - Are you with me?
04 13 15 35	LMP	Roger.
04 13 15 36	CC	Insert between "tape recorder" and "RECORD FORWARD," insert "COMMAND RESET high bit rate." Over.
04 13 16 08	LMP	Okay. We got them.
04 13 16 10	CC	Thank you, Bill. That's all.
04 13 16 14	LMP	Okay, Michael.
04 13 16 24	CC	How is it going? Do you want any systems dope?
04 13 16 29	LMP	Yes, they are hanging together. I haven't even looked at them for the last half hour. I have been over here in the sun.
04 13 16 35	CC	Yes, they sure are, Bill. They can get you any specific numbers, whatnot, if you're interested.
04 13 16 50	LMP	Well, I hate to say I wasn't interested, but I don't need any specific numbers right now.
04 13 16 56	CC	Okay. Very good. We concur.
04 13 17 03	CC	That's an outer space first.

04 13 17 10	LMP	On second thought, how's the evaporator outlet TEMP doing?
04 13 17 25	CC	Forty-six degrees, Bill.
04 13 17 31	LMP	Cancel that outer space first.
04 13 17 35	CC	Roger.
04 13 17 49	CC	How's Magellan coming along?
04 13 17 55	CMP	I am getting a crossed eye looking at this thing. Hey, Mike, just as a matter of interest, I have been just looking at the earth the last hour and a half and there are two tremendous storms down there. I am not sure just where they are, but the vortices are huge.
04 13 18 14	CC	Roger. Understand.
04 13 18 15	LMP	That's your first space weather report at the manned weather forecast from space, and he's not so sure where it's raining, but it is raining somewhere.
04 13 18 26	CC	Roger - -
04 13 18 27	CMP	I'd also like to point out that Magellan is not a good analogy. I would also like to point out that Magellan is not a good analogy. I don't think he made it around.
04 13 18 36	CC	Very good.
04 13 18 39	CMP	How about Alford Chitister? Chichester
04 13 18 44	CC	Roger. Alf.
04 13 19 27	CC	I don't know how much detail you can see, Jim, but your subspacecraft point is out in the

middle of the Pacific Ocean about halfway between Australia and South America.

04 13 19 45 CMP Roger. The next time I take a look, I'll see what I - we are maneuver to the moon now. We'll see if we can see our shadow.

04 13 20 06 LMP Seriously, has anyone been able to see the spacecraft from earth? Optically?

04 13 20 18 CC We don't think so, Bill. We haven't been able to confirm that they have.

04 13 20 26 LMP Okay.

04 13 20 33 CC You are coming right down the center line of the airways. If you see the airliners going the other way, you better move over.

04 13 20 42 LMP That's the first time old Lovell's been on track for a long time.

04 13 20 48 CC Roger.

04 13 20 53 LMP Mike, an interesting viewpoint of the NAV sightings: maneuvering with the minimum impulse controller on the way home is a lot more difficult than going out because of all the fuel we don't have now. Every little pulse really moves the spacecraft around.

04 13 21 08 CC Roger. Understand you have too much control for you.

04 13 21 14 LMP Now, yes.

04 13 21 19 CMP Let Bruce beware.

04 13 23 48	CC	Apollo 8, Houston.
04 13 23 52	CMP	Go ahead.
04 13 23 54	CC	Howdy, Jim. Dick Underwood is over here. They're getting their film processing all prepared for your film when you get back and tentatively, can you give us some idea of how much you exposed?
04 13 24 08	CMP	Let me - - let me introduce you to the great film man. He will tell you all about it.
04 13 24 12	CC	Thank you.
04 13 24 15	LMP	Tell him I hope he can account for haze through the windows. We - on our departure from the moon, we tried to burn up as much as - much of what we had left over, which was quite a bit, and tell him I hope he can develop the high-speed film taken at normal film settings.
04 13 24 47	CC	Roger. Understand you used just about everything and a lot of the high speed; you used it to normal setting.
04 13 24 56	LMP	Roger. We got it in the wrong bucket there a couple of times.
04 13 24 59	CC	Okay.
04 13 25 06	LMP	We never did have a chance to do anytnight earthshine stuff.
04 13 25 14	CC	Say again about the earthshine, Bill.
04 13 25 18	LMP	We never did have a chance to do any earthshine photography.

04 13 25 21 CC Roger. Understand.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

04 01 55 51	CC	Apollo 8, Houston.
04 01 55 57	CMP	Go ahead.
04 01 56 00	CC	Apollo 8, Houston. How are you coming along with your P23 marks?
04 01 56 06	CMP	My eyeballs are getting square. That's what we have been doing most of the day, Ken. Are you receiving the data down below?
04 01 56 20	CC	Roger. Looks like you are getting some pretty good marks. We have a pretty good hack on the vector and the matrix, and looks like if you wanted to terminate at this point, that we do have good data.
04 01 56 38	CMP	Sounds good. I'll terminate after his - -
04 01 56 41	CC	Roger.
04 01 56 43	CMP	- - trying to do star 01 again.
04 01 56 44	CC	Roger.
04 01 59 20	CMP	Ken, did you have a nice Christmas?
04 01 59 31	CC	Apollo 8, Houston. Did you call?
04 14 15 52	LMP	Houston, Apollo 8.
04 14 16 07	LMP	Houston, Apollo 8. Over.
04 14 16 10	CC	Go ahead, Apollo 8.
04 14 16 17	LMP	Who is this, Ken or Jerry?
04 14 16 20	CC	Say again, please.
04 14 16 24	LMP	This Ken?
04 14 16 29	CC	Here's Ken. Go ahead.

04 14 16 35	LMP	Okay, Ken. We are getting back to the PTC attitude. Would you like us to do this high-gain REACQ test now on the first roll?
04 14 16 42	CC	Affirmative.
04 14 16 55	LMP	Okay. Look, how about if I just went to REACQ right now?
04 14 17 28	LMP	Matter of fact I'm in REACQ. If you want me to stay here, why we'll just press on.
04 14 17 40	CC	Okay, Apollo 8. That is fine.
04 14 17 44	LMP	I guess this step about stopping in roll 150 really doesn't matter too much then.
04 14 18 10	CC	That's right, Bill. That was just to let you acquire.
04 14 18 17	LMP	Man, we can acquire on the run here.
04 14 18 21	CC	Hey, you are getting good at that.
04 14 18 25	LMP	That's all they'll let me do.
04 14 18 30	LMP	Okay. We will keep it here for two REV's, Ken. Frank and - Frank and Jim are asleep, and ... so I'll just keep it going here for two rolls.
04 14 18 44	CC	Okay. Real fine.
04 14 35 59	LMP	Houston, Apollo 8. Over.
04 14 36 02	CC	Go ahead, 8.
04 14 36 14	CC	Go ahead, 8.
04 14 36 19	LMP	Well, the REACQ didn't work as advertised. It looked like it went on by the scan limit and into the mechanical limit and followed MSFN around looking out of the corner of its eye

on WIDE BEAM. And when MSFN came back underneath the spacecraft, why it snapped back on it to NARROW BEAM. It apparently never broke lock; or if it did, it was only instantaneously.

04 14 36 56 CC Roger. It looked like we did break lock there for about 8 minutes.

04 14 37 05 LMP Well, we might have broken two way lock, but I was still having about AGC right at the noise level, at the minimum reception level.

04 14 37 17 CC Roger.

04 14 37 30 LMP When we get out here in the clear zone, when we're definitely out of the scan limit, why, I'll go ahead and go to the MANUAL and AUTO lock-on sequence and switch over to REACQ and see what it does next time around.

04 14 37 43 CC Roger.

04 14 38 06 LMP Houston. Were you able to get high bit rate from the OMNI's now, by the way?

04 14 39 21 CC Apollo 8, Houston. The OMNI high bit rate capability is noisy, but usable.

04 14 39 31 LMP Okay. I think what we'll do here is, if I see the high gain definitely going past the scan limit before it gets the mechanical limit, I'll go ahead and ask - you could ask if the REACQ feature hasn't taken over I'll just go ahead and shut it down so that it'll remain in stops.

04 14 40 00	LMP	How's that sound?
04 14 40 01	CC	We are talking about it now, Bill.
04 14 40 05	LMP	Okay. It's my understanding that the scan warning limit of this thing is supposed to stop tracking; and break of lock, it'll travel on over to the thumb-wheel settings.
04 14 40 28	CC	Roger. That's my understanding, Bill. We are talking about it right now. I'll let you know in just a second.
04 14 40 33	LMP	Probably, Ken, we are not ever losing the earth's present signal.
04 14 40 38	CC	That's correct.
04 14 42 01	CC	Hey, Bill, can you tell us what angles this went through? The curve that we have plotted is apparently the RF limit rather than the mechanical limit; and discussing the function of the AUTO REACQ mode, it looks like it is supposed to shift when it hits the RF limit, which is your - should be your ENTER set of numbers as opposed to the scan warning limit. And if it went inside of that number, could you tell us about what kind of numbers it did go to?
04 14 42 35	LMP	Roger. It went past the caution warning limit to the scan or RF limit, as I understand it. And let me give you a rundown on what it did here.

04 14 42 44	CC	Okay. Say it slow so I can copy it.
04 14 42 50	LMP	Okay. The antenna went to about 330 to 270 yaw, plus 60 to 80 pitch. Copy?
04 14 43 15	CC	Roger.
04 14 43 19	LMP	Okay. The AGC dropped off to what I call our noise level, that was the voltage level on the AGC measured at - integrated when the noise broke in. It was about 11 o'clock position on the gage, and it looked like it was switching beam widths there off and on. It would pulse up and down, and a couple of times dropped to full-scale low very briefly.
04 14 43 52	CC	Okay. You got some marks on that AGC that should register in volts, I believe. Do you have an indication other than 11 o'clock?
04 14 44 06	LMP	Unfortunetely, the numbers never got on here. If you will look on that chart that Fred Haise has, it shows one at 11 o'clock position which is the noise level. I don't remember what the voltage was. I might have it on my systems book, though.
04 14 44 24	CC	Bill, - -
04 14 44 25	LMP	When the antenna - when the antenna did snap back in, it went to yaw 80, pitch minus 5, with VERB 64 reading plus 67 for yaw and minus 10 for pitch.

04 14 44 45	CC	Okay. Yes, copy all that. I think you have four or five marks on that power meter, don't you? From what you are saying, I take it, it's between marks 2 and 4.
04 14 45 01	LMP	Yes. Stand by a second.
04 14 45 15	LMP	Stand by, Ken. I'll tell you what that mode is.
04 14 45 18	CC	Thank you.
04 14 45 50	LMP	Okay. It went to about - hovering around 2.4 to 3 volts.
04 14 45 57	CC	Okay. Thank you.
04 14 46 02	LMP	Closer to 2.4.
04 14 46 03	CC	Roger.
04 14 50 11	CC	Apollo 8, Houston.
04 14 50 15	LMP	Go ahead.
04 14 50 19	CC	Okay. It's not real clear that it did, in fact, get to the mechanical stop, and if it does, the back room people say we can stay up against that stop for a maximum of 15 minutes without doing any damage. And we would kind of like to track it through one more time as is. We do have the high bit rate capability on OMNI's. So we would like to follow through that same configuration for one more REV.
04 14 50 55	LMP	Stand by.
04 14 51 08	LMP	Well, since we are not sure that it did get up against the mechanical stop last time for

		10 minutes or so, I don't think it would be too smart to do it this time because we may end up having to switch field to high gain position.
04 14 51 32	CC	I am sorry, Bill. You didn't come through. Say again, please.
04 14 51 38	LMP	Since we are not - it is not clear to me that we weren't up against mechanical stops for a while on the last time around. That might account for 10 minutes of that 15 minutes, and there is no sense pushing our luck. I think we ought to - if it starts dropping off again, we just ought to go and put it back into MANUAL and take it back where it belongs. We are still a long way from home, and if that antenna switch fails, it's going to fail the high-gain position, and that's all we got.
04 14 52 18	CC	Roger, Bill. And we will be making a handoff on stations at 5:5.
04 14 52 27	LMP	Okay.
04 14 53 39	LMP	Ken, we are going to switch COMM carriers here a second.
04 14 53 42	CC	Okay, thank you.
04 14 53 52	LMP	Belay that. We'll hold this configuration for a while.
04 14 53 55	CC	Okay.
04 14 56 03	CC	Apollo 8, Houston through Honeysuckle.

04 14 56 10	LMP	Roger. Read you five-by.
04 14 56 12	CC	Thank you.
04 15 07 24	LMP	Houston, Apollo 8. Over.
04 15 07 27	CC	Loud and clear, Apollo 8.
04 15 07 32	LMP	It did the same thing that time, Ken. This time the voltage AGC did drop to full-scale low for several seconds, but the antenna does seem to have the capabilities to look right through the spacecraft, and I guarantee, the earth went where the antenna was not supposed to be able to go.
04 15 07 53	CC	Okay. I would just like to confirm with you that it never did go back to the present numbers.
04 15 08 02	LMP	No, it apparently never lost earth presence signal. It sounds like it was trying to pick up one-way lock all the time, and we usually hovered around 2-volts AGC except for brief periods.
04 15 08 17	CC	Okay. Thank you very much.
04 15 08 21	LMP	It looks like if they had - should have not had the ... switch into WIDE BEAM until after it had gone to those preset limits.
04 15 09 04	LMP	We are back in AUTO on the OMNI.
04 15 09 06	CC	Okay. Thank you.
04 15 12 59	LMP	Houston, CDR is up and manning the helms. We are going to switch COMM carriers. We'll be off the air for a little bit.

04 15 13 04 CC Okay. Thank you.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

04 15 16 24	CDR	Hey, Ken. This is Frank.
04 15 16 26	CC	Good morning, sir.
04 15 17 01	CDR	Houston, Apollo 8.
04 15 17 03	CC	Go ahead, Apollo 8. Loud and clear.
04 15 17 08	CDR	How far are we from home, Ken?
04 15 17 10	CC	Oh, about 152, looks like. That's pretty gross; I get you a real number in just a minute.
04 15 17 17	CDR	152?
04 15 17 37	CC	148 550; that's a good number.
04 15 17 44	CDR	Very good.
04 15 17 58	CC	And your velocity is about 4650.
04 15 18 07	CDR	Increasing, huh?
04 15 18 09	CC	That's affirm.
04 15 31 21	LMP	Houston, Apollo 8.
04 15 31 23	CC	Go ahead, Apollo 8.
04 15 31 26	LMP	We are trying to get back on our normal sleep cycle, and I just woke up here a little while ago, so I'm going to try to hit the hay again. It'd probably be a good idea to try another Seconal to try to get with it. What do you guys think down there?
04 15 31 46	CC	Okay. Sounds like a good idea, and if we can get Frank to tell us how much sack time he got, why that'll go in the log, too.
04 15 32 04	CDR	I was in bed for 7 hours, Ken, and I probably slept for about 4-1/2 to 5 hours of it, anyway.

04 15 32 10	CC	You're getting better. Good.
04 15 32 53	CDR	If you - if you're interested in further reports, we've all had three meals today, and we have drunk a lot of water, and Jim's asleep now. He worked pretty hard this afternoon, but I think we are all in pretty good shape now.
04 15 33 06	CC	Real fine. Thank you.
04 15 33 11	CDR	Used the exerciser.
04 15 34 10	CDR	Well, Ken, that just leaves you or I - how about you and I - did anything exciting happen today?
04 15 34 16	CC	I think you know about all the things that are exciting up on your end, and it's real quiet down here. Everybody is smiling; Santa was good to most of the folks in the world, and everything is pretty calm, like it should be on Christmas.
04 15 34 35	CDR	Very good.
04 15 34 42	CC	Milt says we're in a period of relaxed vigilance.
04 15 34 46	CDR	Very good.
04 15 34 51	CDR	We'll relax; you be vigilant.
04 15 34 54	CC	That's a fair trade. (Laughter)
04 15 37 24	CDR	Hey, Ken, has anybody got any good idea why that quad A tank is running hot, hotter than the rest by so much?
04 15 37 34	CC	Okay. I didn't have an answer when I came on; just a second and we'll check again.
04 15 39 44	CC	Apollo 8, Houston.
04 15 39 49	CDR	Go ahead, Houston.

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04 15 39 52	CC	Okay, Apollo 8. Let me tell you what the subjects are that we're going over down here: number one, we're making a review of all the entry procedures and this type of information, and we're going to actually go through and review the entry checklist. We have people that are still working on verification of your erasable memory, and we are looking at the EMS problem, and we're discussing the quad temperature, so I'll feed up some of these pieces of information as they come along, and right now we are just sort of having a status review.
04 15 40 34	CDR	I don't think the EMS is much of a problem; it just jumps when you go into AUTO. I don't believe it will bother us for entry. I - I'm doing the same thing; I am looking over my entry checklist. One of the first things I see here is a coldsoak, and I don't think we want to evaporate between the last midcourse and entry, do we?
04 15 55 27	CC	Apollo 8, Houston.
04 16 09 33	CC	Apollo 8, Houston.
04 16 09 56	CC	Apollo 8, Houston.
04 16 10 00	CDR	Go ahead, Houston. Apollo 8.
04 16 10 03	CC	Roger. Looking at the flight plan, you have a P52 coming up at a 115 hours, and we'll have to do another one at 119:45 in preparation for the P23.

And it's acceptable with the ground procedures if you would like to delay about 115-hour alignment, and do it just once at 119:45, or you can do it there in flight plan location. If you want to skip the 115-hour alignment we could go ahead and start in on the pitch and yaw free PTC mode at this time.

04 16 10 48	CDR	What does that mean, Ken?
04 16 10 54	CC	Okay. We have a DTO that requires that we do a PTC and go ahead and do it in minimum impulse mode so that we're not putting any attitude hold corrections in. And we're going to be tracking the attitude excursion, and they want this somethink like 6 hours - or until we reach a limit.
04 16 11 19	CDR	Okay.
04 16 11 30	CDR	Cabin's running a little bit warmer today than normal.
04 16 11 35	CC	I'm sorry; say it again.
04 16 11 38	CDR	I say the cabin is running a little bit hotter today than it has been. It looks like this particular PTC alignment gets more sun in the cabin than the PTC before.
04 16 11 51	CC	Roger. What kind of temperature are you recording now?
04 16 11 56	CDR	About 78.
04 16 12 04	CDR	I just put the window shades up. That'll cool it down.

04 16 12 07	CC	Okay.
04 16 12 12	CDR	Do you want me to take the pitch yaw out of RATE COMMAND, right?
04 16 12 20	CC	That's affirmative. You just put it MINIMUM IMPULSE, and then we'll watch it.
04 16 12 34	CDR	There you are.
04 16 12 36	CC	Okay. Thank you.
04 16 12 38	CDR	Have fun.
04 16 12 41	CC	Roger. And on that quad temperature - the upper limit of that thing is 105 degrees on the bottle. You are well below that. We have been watching it, and it is tracking, although it is tracking very slowly. As you roll the spacecraft, the temperature excursions seem to be a little sluggish, but it isn't a frozen sensor. And talking a little bit more about that one right now, you might tell Jim the next time he goes to work with the optics, when he works with the trunnion, if he'll go ahead and recycle the ZERO OPTICS switch, he can avoid the problem we had prior to midcourse correction 4.
04 16 13 24	CDR	We've done that. And the midcourse correction 4 - -
04 16 13 25	CC	Roger.
04 16 13 26	CDR	- - the midcourse correction number 6 right now looks like zero, and midcourse correction number 7 is approximately 2 feet per second.

04 16 13 38	CDR	Okay, Jim. Now we've got on the checklist to initiate cabin coldsoak. This involves evaporating, and I don't think we want to do that.
04 16 13 48	CC	Okay. Now we talked that over with FIDO, and at 12 hours out, everyone seems to think that we don't need to do it there. But in close, it doesn't seem to have any effect on the trajectory, and what's been suggested if you'd like - we can go over the entry checklist and just kind of walk through it on the air with all the people on the console. Right now, you have the team that will be performing the entry session with you so we can go over the checklist and run down any questions that you might have. That's up to you.
04 16 14 44	CDR	That's fine. Let's do that. I've got one right here. I'm lonesome anyway.
04 16 14 48	CC	Okay. Give us a few minutes to pull ourselves together and get on the air.
04 16 22 23	CC	Apollo 8, Houston.
04 16 22 28	CDR	Go ahead.
04 16 22 29	CC	Okay. We've drifted off now about 25 degrees in pitch. I'd like to have you take it back and set up the PTC plane again at pitch of 10 and yaw 45 and set up the PTC under control, and turn your pitch back to minimum impulse. And give us a mark when you have done that, and we'll time the drift rates down here.

04 16 22 56	CDR	Okay.
04 16 25 01	CDR	Okay, Ken. I've got them all damped out about as low as I can get them.
04 16 25 05	CC	Okay. Fine.
04 16 25 08	CDR	I'll put in a roll right now.
04 16 25 10	CC	Thank you.
04 16 25 14	CDR	It takes me three actuations to get about - just about a degree and a half, or a tenth of a de - 0.15 degrees per second.
04 16 25 23	CC	Okay. And give a mark when you release the RATE COMMAND in pitch and yaw.
04 16 25 31	CDR	I haven't even got them on.
04 16 25 33	CC	Oh, okay. Fine.
04 16 25 35	CDR	When I gave you - when I gave you that mark, that was it.
04 16 25 38	CC	Real fine. Thank you.
04 16 25 57	CDR	It's much more sensitive today than it was when it was heavy.
04 16 26 01	CC	Roger.
04 16 26 18	CDR	Well, the old earth is getting bigger.
04 16 26 20	CC	Good show. Going in the right direction, then.
04 16 26 25	CDR	Yes. I was beginning to get worried.
04 16 27 38	CDR	Ken, be sure and call me if you see the gimbal angles start to get near gimbal arc or anything. I'm a little drowsy still. I don't want to end up with another null attitude, like one is enough.
04 16 27 50	CC	Roger. Will do.

04 16 42 57	CC	Apollo 8, Houston.
04 16 43 00	CDR	Go ahead, Ken.
04 16 43 01	CC	Okay. Would you reinitialize the PTC attitude, and let's try that one more time.
04 16 43 09	CDR	Okay.
04 16 45 22	CDR	You re_dy?
04 16 45 23	CC	Okay.
04 16 45 24	CDR	Okay. Three blips.
04 16 45 25	CC	Thank you.
04 16 45 33	CDR	There she goes.
04 16 45 35	CC	Roger.
04 16 45 52	CDR	Is it sleepy out down there, too?
04 16 45 54	CC	Say again, please.
04 16 45 58	CDR	I say, is it sleepy out down there?
04 16 46 02	CC	Roger. It's getting pretty good now. I figure it's getting sleepy up there, though.
04 16 46 08	CDR	Yes.
04 16 46 11	CC	Okay. Well would you believe that the North beat the South 3 to nothing, and they did that all with a first-quarter field goal.
04 16 46 24	CDR	Very good. When was the East-West game?
04 16 46 31	CC	Oh, about Saturday.
04 16 46 36	CDR	Next Saturday?
04 16 46 37	CC	Yes, sir.
04 16 46 51	CC	And, Frank, we are going over the checklist right now, and I'll get back with you on the entry checklist in a few more minutes.

04 16 46 58	CDR	Okay, Ken. I think it is a pretty good one; that's one thing we have practiced a lot. But we might as well let everybody know what we're doing.
04 16 47 07	CC	Roger.
04 16 47 43	CDR	Ken, while we are just killing time here, there are a couple of anomalies we've noticed. The booties, you know, for the inflight coveralls: mine have frayed very badly, and I had to take them off. Also, we had one Y adapter with an open in it, and the lightweight headsets were kind of useless.
04 16 48 04	CC	Roger.
04 16 48 12	CDR	I take that back. I really didn't mean to say that. The lightweight headset - what I really meant to say was - the lightweight headsets are useless.
04 16 48 22	CC	Okay.
04 16 48 30	CDR	But these Snoopy hats are pretty comfortable. We have worn them the whole time.

END OF TAPE

04 16 51 58	CDR	Ken, one thing we are going to do on these suits, we're going to stow them one under each seat, the way North American suggested.
04 16 52 06	CC	Roger. And you'll be putting the helmets in the food stowage.
04 16 52 16	CDR	Yes, I think we'll put the helmets in the food stowage; and any stuff we have to take out of there, we'll just stick in a suit.
04 16 52 22	CC	Okay.
04 16 52 30	CDR	Is the weather still good out there?
04 16 52 33	CC	It's not quite as clear as it was yesterday; it sure is nice and balmy.
04 16 52 40	CDR	No, I mean out at 165 west.
04 16 53 45	CC	Okay. Frank, we've got a weather picture here. The forecast shows 2000 scattered and 4000 broken with a high overcast. You might see that as you come down through it, and wave heights 4 feet, wind about 070 at 12 with 10 miles visibility and perhaps some scattered showers in the area, and this is forecast for the twenty-seventh at 16:00 Zulu.
04 16 54 19	CDR	Very good; we'll be there.
04 16 54 22	CC	Yes, I'm sure you will.
04 16 54 28	CDR	I don't think those waves are too high. We're going to have to sit in this heap for about 45 minutes.
04 16 54 39	CC	Okay. We'll put in a kit for some small waves.
04 16 54 47	CDR	Tell Jerry Hammack if the waves get high, it's his fault.

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04 17 09 51	CC	Apollo 8, Houston.
04 17 09 55	CDR	Go ahead.
04 17 09 56	CC	Okay. Why don't you drive it back over to the PTC attitude and put it back in ATTITUDE HOLD for the roll, and we're going back in and review the DTO requirement. You have about the same results, it looks like, on a cursory analysis all three times. So we're going to take another look and see if there is any reason to do it again. If so, we'll call you. You can go ahead and put it back in ATTITUDE HOLD now.
04 17 10 23	CDR	Okay, Jim. Thank you.
04 17 45 03	CDR	Houston, Apollo 8. Radio check.
04 17 45 05	CC	Loud and clear, Apollo 8.
04 17 45 11	CDR	Okay, Ken. Thank you.
04 17 45 13	CC	Roger. It is taking us a little longer to go through and rehash all of the entry checklist than I thought, and we are just about to wrap it up now.
04 17 45 24	CDR	No problem. Just watch my gimbal angles for me, and give me a call if they get too close.
04 17 45 29	CC	Roger. We will watch them.
04 18 19 19	CC	Apollo 8, Houston.
04 18 19 24	CDR	Go ahead.
04 18 19 26	CC	We would like to look at a couple more DELTA-V tests on the EMS, and the general consensus is that we don't think there is any particular problem.

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.

04 22 38 54	CC	Okay. That's what - the second portion of this really is asking that we do this with the Hasselblad, and again we won't be using the red and blue filters so we have our baseline.
04 22 29 08	LMP	Taking a picture of the earth with the Hasselblad is no big deal because it does swing by the earth now and then. But trying to get the TV and the Hasselblad all pointed to the earth at the same time would really be tough.
04 22 29 21	CC	Roger. I don't think that it's that time-critical, but I'll ask.
04 22 59 15	LMP	Houston, Apollo 8.
04 22 59 18	CC	Go ahead, 8.
04 22 59 26	CC	Go ahead, 8.
04 22 59 29	LMP	We're going to hold up on the LiOH change for about a half an hour. The PCO_2 reading is low, and we don't want to wake up the CDR. It's right by his feet.
04 22 59 40	CC	Good headwork.
04 23 02 46	CC	Apollo 8, Houston.
04 23 02 50	LMP	Go ahead, Houston.
04 23 02 53	CC	Okay, Bill. We are coming up on the P52 and then the P23 sightings, and there is some concern that if we just go directly to P23 attitude that we are liable to overheat quad Charlie. So we would like to have you maneuver to place the minus X-axis towards the sun now. And I have some gimbal angles

here for you. And if we take it over there and point the minus X at the sun between now and the time we have to start into the alignment, then the P23 business - we will tend to coldsoak Charlie, and then we will be able to go through the P23 operations without worrying about the temperatures.

04 23 03 45	LMP	Okay. Give me them.
04 23 03 47	CC	Okay. Roll 183.3, pitch 136.7; yaw 13.5.
04 23 04 27	LMP	Right. 183 roll, 137 pitch, and 14 yaw.
04 23 04 31	CC	Okay.
04 23 04 36	LMP	Actually, we worked out up here on Lovell's slide rule and got 183.25 roll.
04 23 06 15	LMP	Houston, you wanted to go to this coldsoak attitude prior to the P52, did you not?
04 23 06 21	CC	We would like to go to the coldsoak attitude now.
04 23 06 27	LMP	And that was to keep from heating up quad D, was it?
04 23 06 30	CC	Negative. That's quad Charlie.
04 23 06 36	LMP	Okay.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

04 23 33 52	CC	Apollo 8, Houston.
04 23 33 57	LMP	Roger, Houston. Apollo 8.
04 23 34 00	CC	Roger. The P23 that is coming up next - we will want to do a water dump as soon as we are through with that P23. We'll dump down to 30 percent, and this ought to be the last dump of the mission. Over.
04 23 34 15	LMP	Okay. You think that we will end up generating enough water to fill her up prior to entry.
04 23 34 20	CC	Affirmative.
04 23 34 31	LMP	Okay. We are at that attitude you gave us, so we stopped the roll a little bit short. We're more like 150 degrees roll right now.
04 23 34 39	CC	Okay, Bill. On that water dump, we expect to have 90 percent.
04 23 34 46	LMP	Okay.
04 23 41 54	LMP	Houston, Apollo 8. Over.
04 23 41 57	CC	Apollo 8, Houston. Over.
04 23 42 06	CC	Apollo 8, Houston. Go.
04 23 42 11	LMP	Roger. We are done with the P52 and arranged for the P23. Was there any constraint you wanted, for length of time you wanted to stay in this attitude?
04 23 42 25	CC	Negative, Bill. When you are finished with P23, we will go back into PTC.
04 23 42 35	LMP	Okay. We are going to maneuver for P23 now.

04 23 42 38	CC	Roger. We are watching your tank pressures.
04 23 42 43	LMP	Okay. Thank you. We will do an optical first and then do the P23.
04 23 42 46	CC	Okay.
04 23 44 51	CC	Apollo 8, Houston. We are handing over to Madrid in about 15 seconds. Over.
04 23 45 58	LMP	Roger. And good morning, Jerry, or good afternoon, or whatever it is.
04 23 45 03	CC	Good morning, Jim. It's about 6:30 in the morning.
04 23 45 35	CC	Apollo 8, Houston. How do you read?
04 23 45 40	CMP	Loud and clear. How us?
04 23 45 41	CC	Roger; the same.
05 00 17 49	CC	Apollo 8, Houston.
05 00 17 53	CDR	Go ahead, Houston. Apollo 8.
05 00 17 54	CC	Morning, Frank. Looks like we have lost the transducer on the primary radiator OUT temperature. We are showing an off scale high. The rest of the loop looks real fine, though. When you get a chance, would you take a look at it and see if you're in the same position. Over.
05 00 18 15	CDR	Which one is it?
05 00 18 16	CC	Primary radiator OUT temperature.
05 00 18 22	CDR	Ours is showing 100 off scale high, also.
05 00 18 25	CC	Roger.
05 00 21 57	LMP	Houston, Apollo 8. Over.

05 00 21 59	CC	Apollo 8, Houston. Go.
05 00 22 09	CC	Apollo 8, Houston. Go.
05 00 22 14	LMP	Roger. About this RAD output temp: does your telemetry show that it happened all of a sudden?
05 00 22 20	CC	That's affirmative, Bill.
05 00 22 25	LMP	Okay. I'm on malfunction 23, step 2. It looks to me like there is a small possibility we might be boiling, but I doubt it. So you just want to hop over to step 4 and consider that a closed case.
05 00 22 48	CC	Roger. We consider it closed.
05 00 25 25	CC	Apollo 8, Houston.
05 00 25 31	CDR	Go ahead, Houston.
05 00 25 33	CC	Roger. Frank, all of your primary loop temperature readings look just fine. Your EVAP IN temperatures are normal and indicate you are getting normal mixing.
05 00 25 47	CDR	Okay. Thank you.
05 00 27 44	CC	Apollo 8, Houston.
05 00 27 48	CDR	Go ahead, Houston. Apollo 8.
05 00 27 50	CC	Roger. For the P23 attitude that you are in right now, your quad tank temperatures are better than we expected. We're still monitoring, and it's looking good.
05 00 28 05	CDR	Thank you. After we complete this, do you want us to return to the PTC attitude? Is that correct?

05 00 28 15	CC	That is affirmative, Frank.
05 00 28 19	CDR	Would you have someone get up the gimbal angles for us to point the X-axis at the earth at the TV time, please?
05 00 28 25	CC	Wilco.
05 00 28 59	CDR	Also, Jerry, I would like to know our range and velocity at that time.
05 00 29 05	CC	Roger, Frank. You want the range and velocity at TV time.
05 00 29 11	CDR	Right.
05 00 33 33	CC	Apollo 8, Houston.
05 00 33 36	CDR	Go ahead, Houston. Apollo 8.
05 00 33 39	CC	Roger. At 128 hours, your altitude is 97 413, your velocity is - -
05 00 33 48	CDR	Stand by just a minute.
05 00 33 49	CC	Okay.
05 00 33 53	CDR	At 128 hours, you say?
05 00 33 55	CC	Roger. That's TV time.
05 00 34 01	CDR	Okay.
05 00 34 02	CC	Your altitude is 9 413; velocity is 6072; roll is 1 degree, pitch is 58, yaw 0.
05 00 34 25	CDR	Thank you.
05 00 34 26	CC	You are welcome.
05 00 34 35	CC	I just got a newspaper, Frank. I will go through it and pick out the news items for you.

05 00 34 40	CDR	Good. That will be great. We're just eating breakfast.
05 00 34 45	CC	How are you having your eggs this morning?
05 00 34 50	LMP	Bacon. All except Lovell. He's having eggs Benedict.
05 00 34 59	CC	It figures.
05 00 35 05	LMP	That Timber Cove crew, you know, they -
05 00 35 09	CC	That's the gourmet crowd.
05 00 35 17	CMP	Silk-stocking set.
05 00 35 20	CDR	Jerry, in doing these P23's, we were just about over Africa most of the time. At least, it was in view; nice weather over there this time of year.
05 00 35 29	CC	Roger. You want to go down there?
05 00 35 34	CDR	Do a little hunting.
05 00 42 43	CDR	Jerry, Jim Lovell just checked the P30, P21, and says you are right, 97 800 miles.
05 00 42 54	CC	Roger. Thank you, Jim.
05 00 43 00	CC	We ought to have these computers flight qualified in another couple of missions.
05 00 43 08	CDR	Yes.
05 00 43 50	CMP	Houston, Apollo 8.
05 00 43 51	CC	Apollo 8, Houston. Go.
05 00 43 53	CMP	Roger. Was MCC 6 determined for exactly 122 hours, when you came up with that six-tenths of a foot per second?

05 00 44 21	CC	Roger. Jim, at exactly 122 we were figuring 0.5.
05 00 44 27	CMP	Roger. I'll try it again now at the same time using the P37 with MA. The last time we did it, before the last sightings, I got 2 feet per second. I'm going to see what I come up with this time.
05 00 44 39	CC	Roger.

END OF TAPE

05 00 52 59	CC	Apollo 8, Houston.
05 00 53 19	CC	Apollo 8, Houston. Over.
05 00 53 21	CDR	Go ahead, Houston. Apollo 8.
05 00 53 24	CC	Apollo 8, this is Houston. We are ready for you to start your waste water dump anytime now. Could we have a crew status report?
05 00 53 33	CDR	You may, we had a good night sleep. Everyone slept at least 7 hours yesterday, and we have just finished breakfast, drunk a lot of water, and I think we are in very good shape; just used the exerciser.
05 00 53 54	CC	Roger, Frank.
05 00 53 55	CDR	What would you like to know about?
05 00 54 02	CC	That's about it. Are you ready for some morning news?
05 00 54 04	CDR	Yes.
05 00 54 07	CC	Okay. There is really not a whole lot in the news this morning. Things are kind of quiet. I guess the biggest news is the accident rate - the holiday deaths - which is certainly not very pleasant news, but we had 233 people killed nationally, and 9 of them were in Houston on Christmas Eve, and Christmas. In the world news, the families made the news again. This is Associated Press: "The families of Apollo 8 crew sent a Christmas message to Navy Commander Lloyd

Bucher, Captain of the USS Pueblo crew, released this week by North Korea. The message, addressed to Commander and Mrs. Bucher, at San Diego Navy hospital read 'You have been in our thoughts and our prayers. Your reunion has brought great joy into our heart this Christmas day. Our best to you personally and to all of the families under your command'." And it was signed "Families of the crew of Apollo 8." Space officials said that the message had been suggested and written by Mrs. Frank Borman.

05 00 55 15 CDR Thank you.

05 00 55 16 CC Let see. Elsewhere in the national news, the newlyweds, David and Julie Eisenhower, came away from their secret honeymoon hideaway to have Christmas dinner with President-elect Nixon and the family. In New York city, the world's busiest harbor was reduced to almost complete inactivity Christmas day, due to a 5-day old longshoreman strike and a rare hiatus in shipping schedule. No ships arrived or left the harbor. Ferries, running on reduced holiday schedule, provided the only marine activity.

05 00 56 01 CC Here is an interesting little feature item that is kind of good to hear. It seems that up in Ann Arbor, Michigan, they have a new youth gang.

It's called the Gilnet Gang. It roams the streets of Ann Arbor, acting in secret, and sometimes by-passing the law. They call themselves the Guerillas for Good. Some of the things they have done is, painted a bridge that was covered with obscenities. They painted it one night. A condemned house with - it's popular with neighborhood children, but dangerous, was boarded up. Downtown planters unfilled because of a debate over which group was responsible, business or government, were filled with flowers. A hedge, thought to be hampering vision, at busy intersection was trimmed, and the owner was angered. Trash along a portion of the Huron River was picked up. Members of the gang are anonymous teenagers who ask for no individual recognition. Their aim is to slice red tape, to get things - good things in their opinion - done. The organization has a faint religious overtone. It's sort of an ecumenical group, said an assistant professor at the University of Michigan who acts as an informal sounding board for the gang's ideas. The name is from St. Peter, the Fisherman's Net. And it is remote enough not to be identified with any particular church. There is a thread of Robin Hood running through this thing, said their

teacher, who also prefers to remain anonymous. A lot of their activities are extra-legal. When the system bogs down, they directly administer good, rather than go through the red tape channels. The gang is made up of about 55 high-school kids, boys and girls, and there's another 40 or 50 who belonged to the gang before they graduated. The idea for the gang evolved from a trip to Detroit slum area, where a church group - youth group noted the way that street gangs operate. They were impressed with the methods of operation and decided to organize for somewhat different reasons. "It was the chance to do things for the pure sake of giving," said the gang's advisor.

05 00 58 18 CC That is about it as far as the world and national news and the features is concerned. On the sport page, Hank Stram of the Kansas City Chiefs was named as the AFL coach of the year. This is the second time for him in three seasons. The voting was done by an Associated Press panel of 30 sports writers and sportscasters, three from each city. The nearest one to him was Weeb Ewbank. Other coach's that received votes were Sid Gilman of San Diego, and Lou Sabin of Denver. As for the Shriners College All Star game yesterday, the

North cooled the South 3 to 0. Michigan State's Dick Berlinsky booted a 23 yard field goal in the first quarter and it was all the North needed to beat the South Wednesday, in the Shrine's College All Star football game. Let's see, I guess the interesting things about this are that first downs, North 19, South 16; rushing, North 214, South 169; passing was North 96, South 109. So, all in all, it looks like they were evenly matched. Looks like Parseghian and his Notre Damers weren't as strong as ole Howard was worrying about.

05 00 59 52 CDR Roger. We are dumping the water now, Jerry.

05 00 59 54 CC Okay, Frank.

05 00 59 59 CC For the big Astro Blue Bonnet game, the big basketball clasic followed by the Astro Blue Bonnet Bowl in the Dome: SMU and Oklahoma have arrived. They are getting ginned up for the big game. Doesn't say here which are favored. I will look that up and let you know later, if one is favor here. The Davis Cup is underway now, down in Australia, and the US is bidding to recapture that again, and apparently we're favored to recapture the supremecy today. Another item in the news, is O. J. Simpson; he was named player of the year in college football for the second consecutive season by the Walter Camp Football

Foundation. Woody Hayes, as I told you yesterday, was named coach of the year.

05 01 01 01 CDR Roger.

05 01 01 13 CC Well, I guess that is about it Frank.

05 01 01 17 CDR Thank you, Jerry. I appreciate that.

05 01 01 27 CMP Jerry, this is Jim. We concur on that midcourse 6.2 of a foot per second - is what we get.

05 01 01 33 CC Real fine, Jim.

05 01 01 41 CC Do you just want to turn off your radios and come back without us?

05 01 01 49 LMP No. We can't read out the amazing erasable memory if we have to go into PROGRAM 01 again. (Laughter)

05 01 01 56 CMP I'd tried to get us back on the launch pad a little bit earlier.

05 01 03 55 CC Frank, one other little item in the news here, I thought might be interesting is - . Stand by.

05 01 04 15 CC Apollo 8, Houston.

05 01 04 18 CDR Go ahead. You are loud and clear.

05 01 04 20 CC Okay. I got interrupted there for a minute. Bob Hope is back out in Viet Nam again with his troups, doing a great job as usual. One little name in the news story here is from the USS New Jersey. Bob Hope joked from atop of a hugh gun turret yesterday - or Wednesday - to delight the 1500 men aboard the battle ship New Jersey on its 20th

Christmas entertaining US troops abroad. Hope and his 27 member troop entertained the New Jersey seamen after attending a Christmas mass aboard the carrier Hancock, both off Viet Nam. "This must be the biggest Cris Craft in the world," Hope told the seamen. "It looks like Wake Island with a rudder." "I think it was nice of them to take the ship out of mothballs just to give me a 21-gun salute," he said. Hope joked while standing on one of the ships 16 inch gun turrets. The sailors were particularly impressed by a squad of long legged girls who came aboard with Hope including Actress Ann-Margaret and Miss World.

05 01 05 28	CDR	Did you say that was his 20th trip over there at Christmas time, or overseas at Christmas time?
05 01 05 33	CC	That's right, it's the 20th time he has been over - overseas for Christmas with the troops.
05 01 05 41	CDR	He's as old as Jack Benny.
05 01 05 43	CC	Roger. Hey, you can turn off the water dump now.
05 01 05 44	CDR	We're in the process, or as we say in the aerospace business: that's in work.
05 01 05 58	CC	Roger. You do good work.
05 01 06 17	CC	That other aviator that's going around the world, Max Conrad with his light plane - he spent Christmas day in the Antarctics - at Puento Aranes in Chili; he's waiting for good weather so he can

continue his flight down to the South Pole. He hopes to get around the world. He is going around both Poles, and he's going to fly from Palmer to Byrd, from Byrd to the South Pole, and then return home to the United States by way of New Zealand, Australia, and Hawaii.

05 01 06 50	CDR	Brother. He had better take some No Doze with him.
05 01 06 53	CMP	I tried to talk Frank into the same trip.
05 01 07 21	LMP	You can give him a weather report from Apollo 8. The South Pole was really clobbered - or at least it was the other day.
05 01 07 24	CC	Roger.
05 01 07 44	CC	I don't imagine there are many alternates down there.
05 01 07 49	CDR	No, I don't think so.
05 01 07 52	CDR	We have some pretty clear weather up here.
05 01 07 55	CC	No fog, huh?
05 01 07 59	CDR	Not outside.
05 01 08 06	CDR	Actually, it's snowing outside right now with that waste water dump that Bill just did.
05 01 08 11	CC	Roger. Does it look a little bit like Christmas?
05 01 08 15	CDR	Right.
05 01 08 29	CDR	Jerry, do you have a decision about what we are going to do about this next midcourse?
05 01 08 39	CC	No, Frank. We don't need it.
05 01 08 44	CDR	Okay. I just wanted to make sure officially we'll scrub MCC 6?

05 01 08 49	CC	Affirmative.
05 01 08 53	CDR	I guess - Jim said that was already official. I was sleeping at the time. I didn't hear it.
05 01 08 57	CC	Okay. Frank, by the way, how do you feel about your EMS now? You feel like you've got all the answers to the little funnies you saw earlier?
05 01 09 08	CDR	Yes. The answer is don't turn it into AUTO fast. It seems to be very sensitive to jerks, or separation.
05 01 09 16	CC	Okay, you, you figure it's all pretty much just a switch throwing anomaly and if you play it by the numbers and then slow and deliberate you will be okay?
05 01 09 25	CDR	Yes. Ken, I'm getting razzed up here because I said it was sensitive to jerks.
05 01 09 33	CC	(Laughter) We thought of that, too, down here.
05 01 09 37	CDR	Yes, I figured you did.
05 01 09 39	CMP	I told Ken last night at separation after TLI, when we separated from the S-IVB, we got a nice bang out of the pyros and the EMS jumped over 100 feet per second.
05 01 11 20	CDR	Jerry, do you want to - I've got it in the flight plan to start charging our battery B. Do you want that started at 100 now also?
05 01 11 29	CC	Affirmative, Frank.
05 01 11 33	CDR	Okay.

05 01 11 38	CC	Frank, we expect it will take about 3 or 4 hours.
05 01 11 40	CDR	We're starting it.
05 01 11 44	CC	Okay.
05 01 11 58	CDR	And we're happy to report the earth is getting larger.
05 01 12 01	CC	Roger, that's comforting. Looks like you are going to make earth instead of Venus, huh?
05 01 12 08	CDR	Right.
05 01 13 08	CC	Apollo 8, Houston. Your friendly guidance officer has got a LM vector update for you and a CNC time update. Over.
05 01 13 17	CDR	Okay. We'll go to POO. POO in ACCEPT.
05 01 13 29	CC	Roger.
05 01 19 56	CC	Apollo 8, this is Houston. The updates are complete. The computer is yours. You can go to BLOCK.
05 01 20 05	CDR	Roger; BLOCK.
05 01 20 50	CDR	Houston. We won't transfer that state vector, since we are not going to do that MCC. Is that all right?
05 01 20 58	CC	Okay. Real fine, Frank.
05 01 21 03	CDR	Roger.
05 01 22 53	CDR	Houston, Apollo 8.
05 01 22 56	CC	Apollo 8, Houston. Go.
05 01 23 00	CDR	We are proceeding with the chlorination.
05 01 23 03	CC	Roger.

05 01 56 27	CC	Apollo 8, Houston. BIOMED switch to CENTER, please.
05 01 56 34	CDR	Ten, nine, eight, seven, six, five, four, three, two, one.
05 01 56 40	CDR	MARK.
05 01 56 41	CC	Roger.
05 01 56 45	CMP	Old joke.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

05 02 30 56	CDR	Houston, Apollo 8. How do you read?
05 02 31 00	CC	Apollo 8, Houston. Loud and clear.
05 02 31 03	CDR	Okay, thank you, we are starting the P23.
05 02 31 09	CC	Roger, Frank.
05 02 32 41	CC	Apollo 8, Houston.
05 02 32 44	CDR	Go ahead.
05 02 32 45	CC	Apollo 8, this is Houston. We have lost all CNC data on you. The last data we had showed a high and middle gimbal angle. Over.
05 02 32 56	CDR	No. I'm fine. How come you lost those CNC data.
05 02 33 01	CC	I think maybe it was just your movement - movement out of PTC.
05 02 33 07	CDR	I see, fine. Thank you, it was high. I was watching it though.
05 02 33 11	CC	Okay. We have data now.
05 02 50 33	CDR	Houston, Apollo 8.
05 02 50 36	CC	Apollo 8, Houston.
05 02 50 39	CDR	We are noticing our quad A helium tank is starting to go up again. You got any ideas on that.
05 02 50 45	CC	Yes. We are watching it to, Frank. So far, it's still okay and we are talking about it.
05 02 50 54	CDR	Okay.
05 02 51 26	CC	Apollo 8, Houston.
05 02 51 30	CDR	Go ahead.
05 02 51 31	CC	Roger, Frank, this helium tank in quad A - it looks like we may have bothered you up unnecessarily on

this thing. It appears to be no problem as best as we can tell. We got a few of the minds together talking about it, and it's been down rated quite a bit. Also there - the folks down here monitoring the P23 suspect that Jim is shooting on star number 22 rather 02, so he may be having some problems.

05 02 52 01	CMP	Oh no. We've changed; we are on star 02 on the moon.
05 02 52 07	CC	Okay.
05 02 52 25	CC	Frank, I may have to add some names to my chicken list.
05 02 52 31	CDR	About what?
05 02 52 33	CC	Helium tank A, quad A.
05 02 52 37	CDR	Roger. I just don't want to be the one that proves the fracture mechanics people are right.
05 02 52 45	CC	Roger, Frank.
05 02 52 54	CDR	This attitude is going to have us right square into the sun, too.
05 02 53 00	CC	Roger.
05 03 22 08	CC	Apollo 8, Houston.
05 03 22 13	CDR	Go ahead.
05 03 22 14	CC	Apollo 8, Houston. We are going to need some data from your past P23 marks. We missed some items, and so don't put it away and when you finish this next P23 we'll get it all together.

05 03 22 27	CDR	Okay.
05 03 22 28	CC	Roger. Got some information for you on this PTC that we'll be going to right after this next P23 exercise. We'd like you this time to try the nose north attitude, that's pitch of 180, and a yaw of 315, and also we'd like to give another look at this mode free type of PTC and we think maybe we'll get a little bit of spin stabilization if we try it at 0.3 degrees per second on the roll rate rather than 0.1. So if you figure on doing that at 124:30 we'll see what kind of information we can get out of it.
05 03 23 14	CDR	Okay. You know what I think of that, don't you? I'll be happy to do it, but I think it's playing games.
05 03 23 22	CC	Roger, Frank, you're burning right now 1.4 pounds per hour with attitude hold in pitch and yaw. We're kind of interested to see if 0.3 degrees per second will reduce your RCS usage due to spin stabilization.
05 03 23 40	CDR	Yes, I know. I predict that it will not.
05 03 23 45	CC	Okay.
05 03 23 48	CDR	Jerry, I'm a little concerned about the temperature. We're getting kind of warm in here, and also the evaporator outlet temperature is up around 45 degrees. Do you have any trend that

we're getting less efficient operation of the radiators?

05 03 24 15 CC Frank, EECOM says everything looks nominal down here. You might try a change in your cabin temperature heat exchanger there.

05 03 24 26 CDR No, we don't have the fans on, but what we have done is put up a window shade. That seems to help it. We've been getting a lot more sun in the cabin this way.

05 03 24 35 CC Roger. We'll keep a sharp eye on things and keep you posted.

05 03 24 40 CDR Roger. I don't mind playing games because you guys have been very nice in the five and a half days. If you want to play games in the next half hour, we'll play.

05 03 24 48 CC Roger, Frank.

05 03 25 09 CDR Jim is trying this set with the eye relief optics so we can give you some information on that.

05 03 25 15 CC Okay.

05 03 25 49 CDR I think it would be very difficult to extrapolate anything that you are getting out of this bit business to a LM-command module combination, because the spacecraft handles quite a bit different just with the change of fuel load, including the difference in drifting off and roll.

05 03 26 07	CC	Roger, Frank. We just got finished discussing that, too. We agree with your point of view on that one. I think this is more of a curiosity thing than anything at all.
05 03 26 18	CMP	I think it's fine. No sweat. We don't have anything else to do here for about another 10 hours.
05 03 26 20	CC	Okay.
05 03 26 27	CMP	Jerry, what I'm kind of curious about is the fuel usage. Now with P23 and what we were doing, we have a lot more fuel.
05 03 26 57	CC	Jim, we'll take a look at that fuel usage bit. Right now, the trend looks like it is getting better as we would expect with a lighter weight.
05 03 27 10	CC	We'll try to get a little more definitive for you here.
05 03 27 14	CMP	Okay.
05 03 27 15	CDR	We really - we shouldn't complain about the fuel usage on that SPS engine though, because we're sure getting a lot of miles per gallon out of it.
05 03 27 27	CC	Roger, Frank. Frank, we'll enter you in the Shell road test on that.
05 03 27 29	CDR	Yes, we don't have any TCP in it, or what is that, TCP? Yes. That's the problem. If we'd had that, we would have probably used only half the fuel.

05 03 27 47	CC	Oh, you mean Platformate?
05 03 27 50	CDR	That's right, Platformate.
05 03 28 02	CDR	If you will get the people to spread out one of those banners around the target area, we'll try to break it, you know, and coast through it.
05 03 28 11	CC	Okay. We'll call some of the paper companies and see if they can find a roll big enough.
05 03 28 17	CDR	It won't take a big roll, just about 30 feet.
05 03 28 21	CC	Roger.
05 03 28 26	CMP	Onboard NAV.
05 03 28 36	CDR	Tell the doctors that we put William to sleep.
05 03 28 41	CC	Roger. You won't leave any scars will you?
05 03 28 47	CDR	No. No, he's got his tape recorder with him.
05 03 29 10	CDR	Bill said to call Valerie and have her to rewind the tape recorder - his tape recorder at home.
05 03 30 55	CC	Apollo 8, Houston.
05 03 30 57	CDR	Go ahead.
05 03 30 58	CC	I hate to tell you this, Frank, because Jim probably won't even be able to wear his COMM carrier anymore, but that last set of marks put your state vector right on top of the MSFN state vector.
05 03 31 10	CMP	Come off that, Jerry. Come on; you promised.
05 03 31 14	CMP	I'll get you that bottle of brandy when I get home, Jerry.

05 03 31 19	CDR	Maybe we can get him to go to PROGRAM 01 again today, too.
05 03 31 24	CC	Roger. That sounds good.
05 03 32 04	CC	Apollo 8, Houston. Also, on the flight plan for 124:30, we would like for you to run an O_2 purge on the fuel cells.
05 03 32 17	CDR	Okay.
05 03 33 24	CDR	Hey, Jerry. We were going over the checklist on entry here, you know?
05 03 33 28	CC	Roger, Frank.
05 03 33 30	CDR	I've got a question. Is John Harpold around?
05 03 33 40	CC	Roger. He is listening.
05 03 33 44	CDR	John, I can't remember. Is the lift vector up head-down or - -
05 03 33 59	CMP	Jerry, I'm beginning to worry up here.
05 03 34 03	CC	Roger. It depends on which way your nose is pointing.
05 03 34 08	CDR	Touché.
05 03 34 16	CDR	You might note for the people at MIT that the next series of stars will be shot by the master navigator with a space helmet on and long eye relief eyepieces.
05 03 34 32	CC	Roger. That ought to cut his speed down a little bit.
05 03 34 36	CDR	Right.

05 03 35 25	CC	Frank, while you are talking about the entry checklist, this cold soak - have you decided exactly where you want to do it there prior to entry?
05 03 35 37	CDR	Well, I understood that EECOM talked that over with Bill, and we do it 1 hour prior to entry. We'll do it wherever you say is the best.
05 03 35 43	CC	Okay. One hour is fine. It's just a matter of finding time in the time line to do it.
05 03 35 50	CDR	I think we can initiate it 1 hour before SEP.
05 03 35 53	CC	Okay. Fine. Sounds like a winner.
05 03 37 06	CMP	Really got all zeroes with that helmet on.
05 03 37 09	CC	Roger. We just noticed that.
05 03 37 32	CDR	Jim's going to leave the helmet off now for the rest of them, I think; it gets a little anoxic in there. These helmets don't have face plates, and we have a difficult time breathing with that on.
05 03 37 44	CC	Roger.

END OF TAPE

05 04 02 26	CDR	Okay. Jerry, that completes the P23. Did you have something else you want us to do now? You wanted to check on something from the last SEP.
05 04 02 37	CC	Roger, Frank. We need to get some numbers that we weren't able to copy down here. Stand by just one. Frank, on your first P23, we missed three marks on star number 2. We missed mark number 3 trunnion.
05 04 03 07	CDR	Okay. Three trunnion is 05650.
05 04 03 11	CC	Okay, 05650. Then star number 1, mark 2. We need the trunnion on that one, too.
05 04 03 21	CDR	04216.
05 04 03 25	CC	And on star number 1, mark 3, the DELTA-R and DELTA-V.
05 04 03 31	CDR	DELTA-R is 00006, DELTA-V 00001.
05 04 03 38	CC	Roger. Four balls 6 and four balls 1. Okay. Frank, your PTC attitude is pitch 180, yaw 315, and roll rate 0.3 degrees per second. The reason for wanting to point it north is not because we are concerned at all about any changes due to venting, there's been, as we can tell, no effects on your trajectory by venting. We just want to try out that direction on it.
05 04 04 16	CDR	That's fine. We are going to stay in for about two more seconds while Jim takes the pictures through the sextant for the optics people.

05 04 04 24	CC	Okay, Frank. And then, also, we are looking for a fuel cell O_2 purge when you get a chance.
05 04 04 30	CDR	That's right. At - I got the word now; it's supposed to be at 124:30.
05 04 04 37	CC	Right.
05 04 04 39	CDR	Okay. We'll do it.
05 04 11 14	CC	Apollo 8, Houston.
05 04 11 17	CDR	Go ahead.
05 04 11 18	CC	Roger. For your P37 that's coming up that you are going to run, use a midcourse 7 time of 144:46. Also just a little note here, the trajectory is looking so good, it looks like you can make the corridor without even making a midcourse 7.
05 04 11 37	CDR	Roger. 144:46 for the P37.
05 04 11 44	CC	Affirmative.
05 04 11 47	CDR	Thank you.
05 04 13 40	CMP	Jerry, this is Jim.
05 04 13 43	CC	Go ahead, Jim.
05 04 13 46	CMP	We are going to set this up for the normal PTC mode for a few minutes until Frank gets through with the - another step of the call.
05 04 14 01	CC	Roger, Jim. When the time is auspicious, would you shift the BIOMED switch over to left side?
05 04 14 09	CMP	I think we ought to shift it over right now.
05 04 14 12	CC	Okay. No, they say hold it up for a little while.

05 04 14 15	CMP	... so you can see, the same data that Dr. Berry got on me in Gemini VII is also good for Frank on Apollo 8.
05 04 14 33	CC	Roger. He heard that.
05 04 19 25	CMP	Houston, Apollo 8. - -
05 04 19 28	CC	Apollo 8, Houston.
05 04 19 31	CMP	Do you see that PROGRAM ALARM we got when we went through P37, 1302?
05 04 19 35	CC	Affirmative.
05 04 19 39	CMP	I'll run through it again and see what happens here.
05 04 19 41	CC	Roger. We're monitoring.
05 04 21 23	CC	Apollo 8, Houston.
05 04 21 36	CMP	Go ahead.
05 04 21 37	CC	Looks like you loaded the wrong time in P37. You should load 144:46 for your midcourse time; looks like you loaded 146:46.
05 04 21 46	CMP	Okay. I'm sorry. Yes, I have it here. I wrote it down, 146:46. Okay.
05 04 21 55	CC	Roger.
05 04 21 57	CMP	I guess the best way to terminate this is by going back to POO, is that right?
05 04 22 00	CC	Affirmative.
05 04 28 02	CMP	Houston, Apollo 8. It looks like a plus 2.8 foot per second correction at midcourse 7.
05 04 28 11	CC	Roger, Jim.

05 04 41 25	CDR	Houston, Apollo 8.
05 04 41 30	CC	Apollo 8, Houston. Go.
05 04 41 33	CDR	Started the fuel cell purge, and I'm going to 183:15, and I'll start that three-tenths of a degree per second roll stabilization test for you.
05 04 41 42	CC	Roger, Frank. Thanks.
05 04 41 55	CDR	Okay. There we are, and we are going to start rolling now.
05 04 41 57	CC	Roger.
05 04 42 16	CC	Frank, on this free pitch and yaw, if either one of them gets outside of 15 degrees from the nominal values, we'll call it off.
05 04 42 32	CDR	Okay.
05 04 45 00	CC	Apollo 8, Houston. I would like to have the BIOMED switch left now, if you can.
05 04 45 09	CDR	Roger, it's LEFT.
05 04 47 39	CMP	The fuel cell purged to complete, O_2.
05 04 47 47	CC	Say again, Apollo 8.
05 04 47 51	CMP	O_2 fuel cell purge complete.
05 04 47 53	CC	Roger, thanks.
05 04 50 50	CC	Apollo 8, Houston.
05 04 50 55	CDR	Go ahead, Houston. Apollo 8.
05 04 50 58	CC	Looks like you've exceeded your 15 degrees offset PTC attitude, so you can go to attitude HOLD in pitch and yaw.

05 04 51 05	CDR	Okay. I'll go back to the attitude. We didn't even get around once, did we?
05 04 51 09	CC	Doesn't look like it. So much for spin stabilization.
05 04 51 15	CDR	Well, we tried that last night several times 0.5 to 0.2 degree per second.
05 04 51 51	CDR	I think there is the phenomena known as inertial coupling that has something to do with that, huh?
05 04 51 57	CC	Roger. That could be.
05 04 52 01	LMP	Put a bigger rudder on it.
05 04 52 05	CC	Need some feathers, Frank.
05 04 52 08	CDR	(Laughter)
05 04 52 35	CC	Apollo 8, Houston. On the P37 comparison; using the MSFN vectors, we get a minus 1.4 on that midcourse, compared to your 2.8. We ran your solutions through our computer and we also get a 2.8, so your P37 looks good. We are busy still fiddling with the vectors and comparing them and we'll keep an eye on the difference.
05 04 53 03	CMP	Roger. It looks like we came up with a plus 2.8 though, and you say you came out with a minus 2. something.
05 04 53 10	CC	Affirmative.
05 04 53 28	CC	Jim, that 4 feet per second difference is worth 0.28 degrees on the flight path angle.
05 04 53 35	CMP	Roger. Thank you.
05 05 07 10	CC	Apollo 8, Houston.

05 05 07 13	CDR	Go ahead, Houston.
05 05 07 15	CC	Roger, Frank. How is your cabin temperature looking now?
05 05 07 20	CDR	It's getting cooler, thank you. We put those shades up, and that really helps.
05 05 07 22	CC	Okay. The primary loop down here still looks real good, so it looks like you are in fine shape. Your battery B charge ought to be done by about 127 hours, and we think you shouldn't even try to charge battery A, since it looks like, at entry interface, it is going to have 38 amp-hours on it.
05 05 07 45	CDR	I'll tell Bill that.
05 05 07 47	CC	Okay.
05 05 08 48	CDR	How is the weather down there, Jerry?
05 05 08 52	CC	That's loud and clear.
05 05 08 55	CDR	Cold?
05 05 08 57	CC	No, it's pretty balmy around here today.
05 05 09 13	CC	Yes, the temperature is about in the 70's here. It's a real nice day.
05 05 09 22	CDR	Fine.
05 05 09 54	CDR	Say, Jerry, last night, Jim was saying something about turning on VHF Simplex A about 20 000 miles out. I wrote it down, but I can't seem - I can't remember where I put it. ...
05 05 10 11	CC	Roger, Frank. We've got it in the checklist here as right around 4 minutes - 4 hours before EI,

right after your nominal P23, P37 onboard comparisons, KG-1, page E-1.

05 05 30 00	CC	Apollo 8, Houston.
05 05 30 04	CDR	Go ahead.
05 05 30 07	CC	Roger. We're showing some garbage on your computer. If you will hit ERROR RESET, we can clear that PROGRAM ALARM so the next one can be identified. Over.
05 05 30 15	CDR	We don't have any PROGRAM ALARM.
05 05 30 18	CC	I think this - this is a carryover from your last PROGRAM ALARM there on that P37.
05 05 30 23	CDR	Okay. ERROR RESET. Thank you.

END OF TAPE

05 05 30 38	CDR	That do it?
05 05 30 41	CC	Stand by. Okay. Thank you, Frank. That did it.
05 05 30 49	CDR	Roger.
05 06 38 28	CC	Apollo 8, Houston.
05 06 38 31	CDR	Go ahead, Houston. Apollo 8.
05 06 38 33	CC	Roger. Your battery is full; you can terminate charging. You've got 40 amp-hours on it now, and we've got a couple of requests for data here.
05 06 38 41	CDR	Roger.
05 06 38 42	CC	- - requests.
05 06 38 45	CDR	Okay. We were just talking about that. I tell Bill stop. Okay. What are your requests?
05 06 38 52	CC	The first one is - the first time somebody is down in the equipment bay, we would like to get another reading on your RCS temperatures - those six temp meter readings - -
05 06 39 00	CDR	Okay.
05 06 39 02	CC	- - and the other one is of the boys in the back - -
05 06 39 04	CDR	We just read them again.
05 06 39 05	CC	Beg your pardon?
05 06 39 06	CDR	We just read the RCS thruster temperatures again, and they are all pegged high.
05 06 39 14	CC	Okay. Good deal, Frank. The other one is - the boys in the back room would like some time when

everybody is awake - if you would fire up both cabin fans for about 5 minutes, they would like to see what the DELTA temperature is on the telemetry when you get the stagnation broken down and get some flow going over it. So if you can see your way clear to do that, we would like to see it some time when everybody is up.

05 06 39 43	CMP	We had that running before in the flight. Did they check it then?
05 06 39 49	CC	You mean early in the game, when you were cool?
05 06 39 52	CDR	Yes. When we were cool. Right.
05 06 39 55	CC	Yes. They got that data, and they were kind of interested in seeing what it looks like when the cabin is nice and warm and the temperature indicator is reading on the high side, to see how the DELTA works in the other direction.
05 06 40 07	CDR	Okay. Coming on.
05 06 40 08	CC	Okay. Thank you.
05 06 40 22	CDR	What else, Jerry?
05 06 40 25	CC	That's it, Frank.
05 06 40 30	CC	Another thing, Frank, is we just want to remind you that there is no charge needed on A battery.
05 06 40 36	CDR	Hey, listen, these cabin fans - one of them sounds like it's got a bad bearing. We are going to turn it off. It's got a real squeal to it.
05 06 40 42	CC	Okay, Frank.

05 06 40 45	CDR	Sounds like it's got something in it.
05 06 40 50	CC	That must be Bill's teddy bear.
05 06 40 54	CDR	Say again.
05 06 40 55	CC	That must be Bill's teddy bear.
05 06 40 59	CDR	I don't know, but there is something in there.
05 06 41 46	CDR	We will try them again, one at a time, and see if we can determine which one's got the noise.
05 06 41 50	CC	Roger.
05 06 42 15	CDR	Number 2 is really bad. It's got a bad bearing, and it whines like mad, so we are not going to turn it on.
05 06 42 22	CC	Roger. Thank you.
05 06 42 26	CDR	We are not going to try number 1 either; there may have - something might have got in both of them, Jerry.
05 06 42 31	CC	Okay, Frank. That's fine.
05 06 42 46	CDR	Sounds like that MG starter of yours.
05 06 42 55	CC	I'm afraid to turn my starter on now. It's been so long.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

05 07 14 36	CDR	Houston, Apollo 8.
05 07 14 39	CC	Apollo 8, Houston. Go.
05 07 14 42	CDR	Roger. We would leave the PTC long enough to go orient toward the earth for a TV shot to see if this TV thing is going off on 128.
05 07 15 20	CC	Roger, Frank. That is fine. Do you have the gimbal angles you need?
05 07 15 26	CDR	Yes, thank you. I got them earlier today.
05 07 15 29	CC	Okay.
05 07 15 43	CDR	I'd like to keep this one kind of short because we're trying to get some sleep earlier than yesterday.
05 07 15 52	CC	Say again, Frank. You are getting pretty garbled.
05 07 16 03	CDR	How is that antenna?
05 07 16 05	CC	Loud and clear, Frank.
05 07 16 07	CDR	I said, will this be a short one? We are trying to hurry things up a little bit to see if we can get as much sleep as possible.
05 07 16 15	CC	Roger.
05 07 16 38	CC	Apollo 8, Houston. Would you put the BIOMED switch on the right side now, please?
05 07 16 44	CDR	Roger.
05 07 16 50	CC	Frank, do you intend to start your TV before 128?
05 07 17 02	CDR	Negative; no.

05 07 17 04	CC	Roger.
05 07 17 05	CDR	That is what you wanted, isn't it? I thought that is what it was all squared away for.
05 07 17 10	CC	Affirmative.
05 07 18 22	CC	Apollo 8, Houston. Are you planning on using the wide angle lens?
05 07 18 28	CDR	I think that would be best.
05 07 18 31	CC	Okay. Jack says you want to be sure and use the red filter and the filter holder for that one. It takes a little darker filter.
05 07 18 40	CDR	Okay.
05 07 18 57	CDR	Do you want to take both red filters on there or just the one for the filter holder?
05 07 19 10	CC	He thinks just the red one on the filter holder will do, but might not hurt to have the other one ready, just in case.
05 07 19 38	CDR	How about if we use the telephoto? It will be a little harder to focus, but it might end up a better picture.
05 07 19 52	CC	Roger, Frank. If you want to use the telephoto lens, you ought to use the same combination you used going out, the 25A.
05 07 20 02	CDR	Okay.
05 07 22 12	CDR	Hey, Jerry.
05 07 22 17	CC	Roger, Frank.
05 07 22 19	CDR	Ask your EECOM how many gallons of fuel we burned for TEI, will you?

05 07 22 24	CC	Roger. In work, he's breaking out his sathometer now.
05 07 23 04	CC	Apollo 8, Houston. We will be handing over to Goldstone in 2 minutes. Over.
05 07 23 14	CDR	Roger, Jerry.
05 07 23 58	CC	Frank, the doctors say they are not getting anything on Bill yet. Apparently, he is not plugged up.
05 07 24 07	CDR	He is down underneath the couch getting some stuff out; he doesn't have his umbilical on.
05 07 24 12	CC	Okay.
05 07 24 17	CDR	Tell them to look at the stuff they got yesterday. He hasn't changed at all, just as mean as ever.
05 07 24 30	CC	Roger.
05 07 24 43	CC	Hey, Frank, this simulation has really been great. What do you say after these photos we recycle back to TLI again?
05 07 24 54	CDR	That's fine. Bring on the backup crew.
05 07 24 57	CMP	Hey, Jerry, yesterday I tried to cycle back to the pass and 01 was lunar.
05 07 25 05	CC	Jim, we missed that. Say it again when you get a better antenna.
05 07 25 14	CDR	Don't blame your antenna problems on us ...
05 07 25 29	CC	Apollo 8, Houston. We are not reading you; stand by one.

05 07 26 50	CDR	Houston, do you read now?
05 07 26 51	CC	Roger. Loud and clear.
05 07 26 57	CDR	I say, Bill will be ready in a minute; he is cycling back and forth under the couch trying to get the TV stuff out.
05 07 27 01	CC	Okay.
05 07 27 06	CC	Backup crew says they are ready to go.
05 07 27 12	CDR	Great. A most fantastic voyage.
05 07 27 24	CC	Sure was.
05 07 27 27	CDR	We're not through yet. We've still got 100 000 miles to go. You know, we kind of feel like it was all over with TEI, but we're still a long way.
05 07 27 40	CMP	Jerry, what I was saying before: I tried to hurry up the voyage home by calling up PROGRAM 01 to get us back on the PAD, but it didn't work.
05 07 27 54	CC	Well, that's the best excuse I've heard so far, Jim.
05 07 27 59	CDR	The best of many.
05 07 39 35	CC	Apollo 8, Houston.
05 07 39 39	CDR	Go ahead, Houston. Apollo 8.
05 07 39 41	CC	Roger, Frank. On TEI, you burned 1480 gallons.
05 07 39 47	CDR	Thank you.
05 07 40 31	CC	Frank, are you going to need Jim's slide rule for that calculation?

05 07 40 36	CDR	I got 162.
05 07 41 30	CMP	Houston, Apollo 8.
05 07 41 32	CC	Apollo 8, Houston. Go.
05 07 41 35	CMP	Roger. This is one of those rare occasions where Bill left his seat and I am now sitting in it, and for the first time, I can see the earth. I'm looking through his monocular; it's pretty nice.
05 07 41 54	CC	Roger.
05 07 41 55	CMP	You had a little weather today it appears.
05 07 41 57	CC	Last word from the weather guys here was that it was clear.
05 07 42 06	CMP	Well, we could see South America and Florida and through the lower part of the U.S. Looks like there is a weather front going over into the central part of the United States, lot of clouds over the northwest area. Florida is clear; it looks like the east coast is pretty clear.
05 07 42 24	CC	Roger. Clear but cold.
05 07 42 30	CMP	Lot of clouds up in Canada.
05 07 42 35	CC	Maybe the geese will go home.
05 07 43 30	CDR	Jerry, we are going to turn it on and see how the picture is.
05 07 43 33	CC	Roger.
05 07 43 56	CC	Nothing yet, Frank.
05 07 44 00	CDR	Takes a while to warm up, I think.

05 07 45 03	CDR	Any luck yet, Jerry.
05 07 45 05	CC	Not yet, Frank.
05 07 45 33	CC	We got a picture now, Frank. It's twitching.
05 07 46 00	CC	The earth is on now, Frank.
05 07 46 04	CDR	How's it look?
05 07 46 06	CC	We are seeing about half of it. You moved in the wrong direction. Okay. It's coming back, a little more. Good, now a shade toward the terminator.
05 07 46 30	CC	A little bit more toward the terminator and in the same direction you were moving it before. Right; you have got it centered right in the middle.
05 07 47 01	CC	Now move it away from the terminator just a bit.
05 07 47 11	CC	Good picture.
05 07 47 15	CDR	Okay. You want us to wait until 128, right?
05 07 47 19	CC	Affirmative. Frank, move your camera to the right; I want to see which way the earth moves on my screen.
05 07 47 30	CC	Okay. Moving your camera to the right moves the earth to the left on our screen. On our screen, the terminator is almost parallel to the horizontal direction, and the dark part is on the top.
05 07 47 52	CDR	Okay. We will turn it back on at 128, then.
05 07 47 55	CC	Okay, Frank.

05 07 48 02	CC	Apollo 8, Houston. Are you on a high-gain antenna?
05 07 48 05	CDR	Roger.
05 07 48 07	CDR	Roger.
05 07 48 14	CC	What beam width are you on, Apollo 8?
05 07 48 19	CDR	NARROW.
05 07 48 21	CC	Roger. NARROW.
05 07 49 16	LMP	This is Apollo 8. Do you read?
05 07 49 18	CC	Apollo 8, Houston. Loud and clear.
05 07 49 22	LMP	Roger. Radio check.
05 07 49 24	CC	Roger.
05 07 49 34	LMP	Houston, Apollo 8. How do you read now? Over.
05 07 49 37	CC	Apollo 8, Houston. Loud and clear.
05 07 49 40	LMP	Roger. We're just trying something - -
05 07 52 59	CC	Apollo 8, Houston. You are in the scan limit right now on the high-gain antenna; although you may have NARROW beam width selected, you are in WIDE. To improve the situation would take a pitch down and a yaw left, and we will have FAO check it and give you some angles if we need to change it.
05 07 53 22	CDR	We just got out of the scan limit by pitching up and yawing right.
05 07 53 40	CC	Roger. You are right, Frank.
05 07 53 45	CDR	Are we still in wide band, or are we in narrow band now?
05 07 53 49	CC	We are checking.

05 07 55 05	CC	Apollo 8, Houston. EECOM says you are in good shape now.
05 07 55 09	CDR	Okay.
05 07 56 52	CC	Apollo 8, Houston. COMM check.
05 07 56 55	CDR	Loud and clear.
05 07 56 56	CC	Roger.
05 08 01 13	CC	Apollo 8, Houston. We're getting television.
05 08 01 16	CDR	Roger. How's the picture?
05 08 01 21	CC	Roger. The picture is on the lower right hand of our screen.
05 08 01 30	CC	Camera should go down away from the terminator and to the right.
05 08 01 50	CC	Still down and about the same place; a little worse; now it's coming in.
05 08 01 59	CMP	Are you getting it now, Jerry?
05 08 02 01	CC	Roger. We've got most of it; keep moving off to the right. Good. You have it centered right now.
05 08 02 11	CMP	Well, the earth looks a little bigger to us today, not much, but it's somewhat bigger. I'm sitting over in the right hand seat now; Bill has got the TV camera; Frank is helping him out aiming it directly to hit the earth. I hope we have a good picture. Can you see the clouds?
05 08 02 28	CC	Affirmative. We sure can. Move it up toward the terminator - correction, away from the terminator just a shade.

05 08 02 38	CMP	At the tip of South America, there is a great swirl of clouds down there. It looks like a great storm. I wonder if you can see it.
05 08 02 45	CC	Roger. We see a large swirl just south of the terminator.
05 08 02 52	CMP	Roger. And then up to the left hand side, or towards the north, we can see the light waters around the West Indies, and we can actually see Florida. I'm looking through Bill's monocular, and I can see the various land masses, South America and the central part and southern part of the United States.
04 08 03 11	CC	Roger. Move a little bit away from the terminator now, a little left with the camera and a little further from the terminator.
05 08 03 27	CMP	Say it again, Jerry.
05 08 03 30	CC	Okay. You're moving it toward the center of the screen now, and the earth is off on the left side of our screen.
05 08 03 40	CC	Real fine. That's good. Hold it right there.
05 08 03 56	CMP	What we're thinking about right now, Jerry, is hitting that wedge angle, about 2 degrees their limit. When we come back, the earth looks pretty small right from here.
05 08 04 06	CC	Roger.
05 08 04 10	CMP	You got it, Bill.

05 08 04 22	LMP	As I look down on the earth here from so far out in space, I think I must have the feeling that the travelers in the old sailing ships used to have: going on a very long voyage away from home, and now we're headed back, and I have that feeling of being proud of the trip, but still - still happy to be going back home and back to our home port. And that's - that's what you're seeing right here.
05 08 04 50	CC	Roger, Bill. We'll sure be glad to get you back, too.
05 08 04 59	CDR	This is Frank Borman. We've enjoyed the television shows, and we'd like you to stay tuned in in the future because there'll be flights and rendezvous and earth orbit, and then, of course, there'll be television from the lunar surface itself in the not too far distant future. So, until then, I guess this is the Apollo 8 crew signing off, and we'll see you back on that good earth very soon.
05 08 05 27	CC	Roger, Frank. Adios.
05 08 06 53	CC	Apollo 8, Houston.
05 08 06 57	CMP	Go ahead.
05 08 06 58	CC	We'd like you to go back to PTC. Pick either attitude that's easiest to fly to.
05 08 07 06	CMP	Roger. In work.

05 08 11 26	CC	Apollo 8, Houston.
05 08 11 28	CDR	Go ahead, Houston. Apollo 8.
05 08 11 30	CC	Roger. Your PTC attitude ought to be either a 1045 or a 18315. We'd recommend 18315. That will keep your windows out of the sun.
05 08 11 42	CDR	180, that's right. I got them mixed up, didn't I? It's 18315.
05 08 11 46	CC	Roger.
05 08 17 03	CDR	Okay, Jerry ...
05 08 17 15	CC	Apollo 8, this is Houston. You're unreadable due to background noise. Over.
05 08 17 23	CDR	How now, Jerry?
05 08 17 25	CC	Loud and clear.
05 08 17 27	CDR	I say we're starting to stow the spacecraft and get all squared away and then be sleeping and eating. We'll be all thinking about entry from now on.
05 08 17 34	CC	Roger, Frank. And now that Bill's up, we'd like to get a redundant components check.
05 08 17 40	CDR	Alright. He's putting helmets in the food boxes. Just a minute, I'll get him to do it for you.
05 08 17 45	CC	Roger. There is no great hurry, Frank. We're - -
05 08 17 47	CDR	Roger.
05 08 17 49	CC	We're mostly interested in looking at the secondary loop.

05 08 17 54	CDR	That's what I was going to say. I can't see any reason to check anything other than the secondary loop, can you?
05 08 17 58	CC	That's affirmative.
05 08 18 08	CDR	Now in that cabin cold soak, we won't have any cabin fans.
05 08 18 13	CC	Roger. I understand.
05 08 19 52	CMP	Jerry, this is Apollo 8.
05 08 19 54	CC	Apollo 8, go.
05 08 19 57	CMP	Roger. I just got on the sextant and now looking at Texas, and the weather man is right, it looks like a pretty good day. Full of clouds down there, but not bad.
05 08 20 06	CC	Real fine, Jim. Can you see the kids out in the yard waving?
05 08 20 14	CMP	Would you tell Pete Conrad to get his kids off my roof?
05 08 20 16	CCWilco.	
05 08 20 22	CC	Jim, do you see the bright spot out in the Pacific Ocean through the sextant?
05 08 20 31	CMP	I'll try. We saw it, of course, through the windows and through the monocular. I'll see if I can spot it.
05 08 20 37	CC	Roger.
05 08 21 32	CMP	Yes, Jerry, I can see the bright spot. It's - I guess it's the subsolar point. It's off of South America, it appears to me. It is a grayish

		spot compared to the blue waters surrounding it. It's undefined in diameter, though, I mean, it's not a clear round spot at all; it's just a raggedy one.
05 08 21 53	CC	Roger. That showed up real well on the TV's picture.
05 08 22 12	CC	Apollo 8, Houston. We'd like to delay that request for a secondary loop check to a little better point as far as thrusting is concerned.
05 08 22 22	CDR	Fine. We can wait for a long time on that.
05 08 22 27	CC	Okay.
05 08 24 10	CC	Apollo 8, Houston.
05 08 24 13	CMP	Go ahead, Houston.
05 08 24 14	CC	Roger. Jim, we've got some bird watchers in the viewing room.
05 08 24 20	CMP	Bird watchers, huh?
05 08 24 21	CC	Roger.
05 08 24 22	CMP	Sounds good. Who are they?
05 08 24 26	CC	Marilyn.
05 08 24 28	CMP	Oh, well, good. Say hello to her for me.
05 08 24 31	CC	Yes, and she's got a few troops with her, too.
05 08 24 38	CMP	Did she see the TV, I wonder?
05 08 24 41	CC	Affirmative. Barbara and Jay are with her.
05 08 24 45	CMP	Good.

05 08 26 38	CC	Apollo 8, Houston. We're replaying your television pictures now. We can see the Chilean coast and Florida.
05 08 26 45	CDR	Very good.
05 08 26 48	LMP	That's a pretty good little television camera, isn't it?
05 08 26 50	CC	It sure is. With the right filters on it, it's great. That was a Schmitt input.
05 08 27 05	CMP	He must be a Jack of all trades.
05 08 27 10	CC	Beautiful.
05 08 30 01	CDR	Houston, Apollo 8.
05 08 30 03	CC	Apollo 8, Houston. Go.
05 08 30 06	CDR	Bill would like to ask the friendly Flight Surgeon's permission to take a Seconal so he can sleep.
05 08 30 17	CC	Roger. Copy.
05 08 30 31	CC	Apollo 8, Houston. That's a "yes."
05 08 30 36	CDR	Thank you.
05 08 32 37	CC	Apollo 8, Houston.
05 08 32 40	CMP	Go ahead.
05 08 32 42	CC	Roger. Before Bill falls asleep, we'd like to have him go ahead and do that secondary EVAP check now at any time at his convenience, and if we don't happen to be able to monitor it with high bit rate, just let us know when you did it.

05 08 32 57	CMP	Roger. I'll tell him that evaporator check at any time.
05 08 33 02	CC	Roger.
05 08 40 38	CC	Apollo 8, Houston. BIOMED switch to the CDR. Over.
05 08 40 44	CMP	Roger. In work.

END OF TAPE

05 08 48 00	LMP	Houston, Apollo 8. Over.
05 08 48 04	CC	Apollo 8, Houston. Go.
05 08 48 09	LMP	Good afternoon, Jerry.
05 08 48 11	CC	Howdy.
05 08 48 14	LMP	Okay. Somebody said something about checking out the evaporator - evaporators. What do you want to do?
05 08 48 20	CC	Roger. Before we get too far along, we'd like to see, essentially with the secondary evaporator check, what we got on the redundant components check.
05 08 48 31	LMP	Okay. Stand by.
05 08 48 33	CC	Roger. EECOM says to be sure and let it go for at least 5 minutes.
05 08 48 39	LMP	Roger. Now you want to check out the primary evaporator also, or did you decide it's not necessary?
05 08 48 46	CC	I guess they decided it's not necessary, Bill.
05 08 48 52	LMP	Okay.
05 08 49 31	LMP	Okay. Secondary glycol loops coming on the line.
05 08 49 34	CC	Roger, Bill.
05 08 49 59	LMP	And the secondary evap's coming on the line.
05 08 50 02	CC	Roger.
05 08 51 07	LMP	And it's stabilized the leg, oh, for about 5 minutes.
05 08 51 11	CC	Roger.

05 08 53 29	LMP	Houston, Apollo 8.
05 08 53 30	CC	Apollo 8, Houston. Go.
05 08 53 42	CC	Apollo 8, Houston. Go.
05 08 53 48	LMP	Alright. What do you have in mind here in the way of activating the secondary loop prior to separation? It looks like if we do have a cabin fan problem, we won't be able to do a full-blown coldsoak. Is there anything that we can do that'll do any good?
05 08 54 05	CC	Well, right now, Bill, in the checklist, we're showing this activation at about minus 1 hour. Let me check with EECOM for a minute and see if they got any more words considering the cabin fan situation.
05 08 54 19	LMP	Roger.
05 08 54 59	CC	Apollo 8, Houston. Looks like a good time. One hour before SEP - entry interface would be fine.
05 08 55 10	LMP	Okay. It won't do any good, then, to fool around with these cabin temp valves. ...
05 08 55 21	CC	Bill, stand by. You're - got a lot of background noise.
05 08 55 39	CC	Go ahead now, Bill.
05 08 55 40	LMP	Read me now, Jerry?
05 08 55 41	CC	Loud and clear.
05 08 55 45	LMP	Okay. This coldsoak is built around the premise that you've got a cabin heat exchanger, in my

		view; and if you haven't got a cabin heat exchanger, I'm wondering just what you can do.
05 08 56 02	CC	He's thinking.
05 08 56 28	CC	Apollo 8, Houston. We think it'll still do a little bit of good so we'd just as soon go through with it.
05 08 56 39	LMP	Okay. Even bypassing the suit heat exchanger and that part of it too, huh?
05 08 56 44	CC	That's affirmative.
05 08 56 48	LMP	Okay.
05 08 56 49	CC	Also, Bill, your secondary loop is looking good.
05 08 56 54	LMP	Okay. We just had 5 minutes. I'll deactivate it now.
05 08 56 57	CC	Roger.
05 09 08 01	LMP	Houston, Apollo 8. Over.
05 09 08 04	CC	Apollo 8, Houston.
05 09 08 13	CC	Apollo 8, Houston. Go.
05 09 08 16	LMP	Hey, Jerry, when do you want to crank up the VHF, anyway?
05 09 08 26	CC	Roger. VHF Simplex - well, we had that on the checklist for about minus 4 hours.
05 09 08 37	LMP	Okay. We wanted - we wanted to put it out prior to MAX range, don't you think? Get an idea of when we're picking it up?
05 09 08 50	CC	Roger. Stand by, Bill. They're talking about it.

05 09 12 44	CC	Apollo 8, Houston.
05 09 12 47	CDR	Go ahead.
05 09 12 48	CC	Roger. Entry interface minus 4 hours is just about right for the VHF. That is about - oh, 142 GET.
05 09 13 03	CDR	Roger. Thank you.
05 09 13 11	CC	The next voice you hear will be that of the smiling Irishman.
05 09 13 20	CMP	Outstanding.
05 09 22 39	CC	Apollo 8, Houston. Over.
05 09 22 42	CMP	Go ahead.
05 09 22 43	CC	Good morning, James.
05 09 22 46	CMP	Oh, it's Michael Collins, is it? Good morning to you.
05 09 22 50	CC	Righto. And we're looking at your pitch CDU readout down here and looks to us like you are about 25 degrees off the 180 for your PTC, and we were just wondering how come?
05 09 23 03	CMP	We've been looking at that, too. It keeps wandering off in pitch for some reason more than yaw. I was just about ready to go back to it again. I had to go back one time, and I was just seeing how far she would drift. I thought it would drift out a ways and come back by itself, but it is not doing it.
05 09 23 18	CC	Okay.
05 09 23 21	CMP	We'll get back there.

05 09 32 11	CDR	Houston, Apollo 8. We're in the process of doing the trunnion bias check; then we will go to P23.
05 09 32 20	CC	Roger. Thank you, Frank.
05 09 33 07	CDR	Houston, Apollo 8.
05 09 33 11	CC	Apollo 8, Houston. Go.
05 09 33 13	CDR	We like to have the PTC attitude to comply with P23 requirement.
05 09 33 23	CC	Roger, Frank. Stand by.
05 09 34 09	CC	Apollo 8, Houston.
05 09 34 12	CDR	Go ahead.
05 09 34 13	CC	Any time you want to start on those P23's is just fine.
05 09 34 18	CDR	Okay. I was just checking. I just wanted to know how our thermal control was going before we left.
05 09 35 15	CC	Apollo 8, Houston. Over.
05 09 35 18	CDR	Go ahead, Houston. Apollo 8.
05 09 35 20	CC	Your temperatures are looking good, Frank. There is still a differential temperature between quads, but nothing that would cause us in the slightest to worry about doing P23.
05 09 35 31	CDR	Roger. Understand.
05 09 47 22	CC	Apollo 8, Houston. Over.
05 09 47 27	CMP	Go ahead.
05 09 47 28	CC	Roger, Jim. We've been looking at these stars that we gave you this time for P23. It looks

like the second star, number 11, has a trunnion angle right out to the limit, about 49.7 degrees. And we're thinking it might be a good idea to switch you over to star 1, which has a much smaller trunnion angle. What do you think? Star 1 is Alpheratz.

05 09 47 54	CMP	Fine with me; I would just as soon take star 1.
05 09 47 58	CC	Okay. That will be then in place of star 11, star 1, and in place of lunar far horizon, lunar near horizon; and it remains two sets. Over.
05 09 48 12	CMP	Roger. Star 1, lunar near horizon, two sets.
05 09 48 15	CC	Thank you.
05 10 13 24	CC	Apollo 8, Houston. Over.
05 10 13 55	CC	Apollo 8, Houston. Over.
05 10 13 59	CDR	Go ahead, Houston. Apollo 8.
05 10 14 01	CC	Roger. Fine. Old golden fingers there is getting so swift we missed some marks on the downlink. I wonder - if you hand recorded them, could you read us your three marks - trunnion angles, your three trunnion angles on star 2 and the last four trunnion angles on star 1. Over.
05 10 14 30	CDR	Do you read me still, Mike?
05 10 14 32	CC	Stand by. We're not reading you good enough, so we'll wait until you get a better OMNI.
05 10 14 38	CDR	That ought to be a good one.

05 10 14 40	CC	That is a good one. That's loud and clear.
05 10 14 43	CDR	Okay. Star 2 trunnion angle, first one 05245, second one 05243, next one 05241; last 4 trunnion angles 04133, 04133, 04132, 04132.
05 10 15 07	CC	Thank you kindly.
05 10 15 25	CDR	Can you give me some idea on the updates from the midcourse that we might need, and all that good stuff, Mike?
05 10 15 30	CC	Yes, sure can, Frank. Stand by.

END OF TAPE

05 10 17 55	CC	Apollo 8, Houston. Over.
05 10 17 58	CDR	Go ahead, Mike.
05 10 18 00	CC	Okay. We're predicting at the nominal time of your next midcourse, which is entry interface minus 2 hours - we're predicting 1.4 foot per second burn which changes your gamma at entry interface by a tenth of a degree. Right now with no further maneuvers, your gamma is minus 6.39degrees, and we're going to steepen it up very slightly to hit the center of the target line, and it will be after the maneuver minus 6.51. Over.
05 10 18 35	CDR	Very good.
05 10 18 38	CC	Anything else you want like that?
05 10 18 42	CDR	No. I just wondered - we hadn't heard whether we were going to do it or not and so on.
05 10 18 48	CC	Roger.
05 10 18 52	CDR	When we get the PAD data, we'll get it all out here.
05 10 18 58	CC	Yes. We'll be sending the PAD data up to you in about another 2 hours, Frank; about 132 hours GET.
05 10 19 06	CDR	Okay. We - this will be the last set of star sightings we do now nominally, and even if we lose COMM, we'll just come on in with what we got.
05 10 19 19	CC	Okay, Frank.

05 10 19 22	CDR	Incidentally, that COMM has been fantastic. I don't know how you've heard us, but boy, it's just like you are next door even in lunar distances.
05 10 19 31	CC	Yes. It has really been great with rare exceptions when you are on a bad OMNI right before you switch. Then we get an awful lot of background noise, but in general, it has been excellent, and boy, we are really thankful for it because reading all these updates would be bad news with bad COMM, as you know.
05 10 19 48	CDR	Right.
05 10 19 50	CMP	Say, Mike, have you noticed the confidence the Captain has in his navigator?
05 10 19 56	CC	He hasn't called you Goldfinger yet.
05 10 20 00	CMP	No. He is disregarding anything I can do. We're coming in anyway.
05 10 20 13	CC	I suspect he is right on that point.
05 10 20 18	CMP	Well, back to the drawing board.
05 10 20 21	CDR	As usual, we are all a little pooped. I've got Bill sleeping now, and then Jim and I will swap just as soon as we get through with these stars.
04 10 20 30	CC	Well, you're sounding real good, and you are doing good work.
05 10 20 34	CDR	Thank you.

05 10 56 40	CC	Apollo 8, Houston.
05 10 56 43	CDR	Go ahead, Houston. Apollo 8.
05 10 56 45	CC	Roger, Frank. If you get a chance to, we'd like for you to read us down your trunnion calibration number. We missed that one on the downlink, and we have an update for your passive thermal control attitude.
05 10 56 56	CDR	Okay. The trunnion calibrations were all zeros.
05 10 57 00	CC	Roger. Thank you, and on page 2-104 the PTC attitudes should read zero pitch and 45 degrees yaw. Over.
05 10 57 14	CDR	Zero pitch and 45 degrees at 2-104.
05 10 57 17	CC	Roger. And we'd like some PRD readings for those of you who are up and around.
05 10 57 57	CDR	Zero pitch, 45 yaw, it is?
05 10 58 01	CC	Roger. Thank you.
05 10 58 07	CDR	I'm asking. I wasn't sure I copied it right.
05 10 58 10	CC	Yes. That's affirmative, Frank. Zero pitch, 45 degrees yaw.
05 10 58 15	CDR	My PRD now reads 2.85.
05 10 58 21	CC	2.85.
05 11 33 39	CC	Apollo 8, Houston. Radio check. Over.
05 11 33 45	CMP	This is 8. Loud and clear. How us?
05 11 33 47	CC	Roger. You're loud and clear, Jim. We'd like to get your PRD reading while we've got you up and a flight plan change we're suggesting on page 2-107 when you're ready to copy.

05 11 34 03	CMP	Roger. Stand by.
05 11 34 12	CMP	I'm the only person up, and my PRD is reading 0.15.
05 11 34 18	CC	Roger. I understand; 0.15.
05 11 34 22	CMP	And I'll bet that Bill's is still reading 0.64.
05 11 34 27	CC	That's okay; don't bother him with it. He's asleep.
05 11 34 48	CMP	Okay. Go ahead with your flight plan change.
05 11 35 11	CMP	Houston, Apollo 8. Go ahead with your flight plan change.
05 11 35 14	CC	Okay, Jim. On page 2-107, we're recommending that you delete that P52 and just stay in PTC attitude. Your platform is real good, and we don't feel that alignment's necessary. One is coming up again at 139 hours anyway. And also, on that same page, we'd like to delete the "begin cabin cold soak." Over.
05 11 35 44	CMP	Righto. Will delete the "begin cabin cold soak," and we'll delete the P52.
05 11 35 49	CC	Okay. Thank you.

END OF TAPE

05 12 04 57	CMP	Houston, Apollo 8. Over.
05 12 04 59	CC	Roger, Apollo 8. This is Houston. Over.
05 12 05 03	CMP	Roger. Mike. Are you still planning to send up these updates at 132 hours?
05 12 05 08	CC	Yes; affirmative, Jim. We're getting them together now.
05 12 05 13	CMP	Roger.
05 12 06 06	CC	Apollo 8, this is Houston. Would you please go to POO and ACCEPT, Jim, and we'll send you a P27.
05 12 06 27	CMP	We're ready for you.
05 12 06 29	CC	Okay. Sending up a state vector to LM slot.
05 12 06 35	CMP	Roger.
05 12 10 03	CC	Apollo 8, this is Houston. Over.
05 12 10 07	CMP	Go ahead, Houston.
05 12 10 08	CC	Roger, Jim. You can go back to BLOCK; we got the P27 in and verified. It was a state vector update to the LM slot, and I'm standing by for the midcourse correction number 7 and the entry PAD at your convenience. Over.
05 12 10 27	CMP	Roger. Stand by.
05 12 10 50	CMP	Go ahead with midcourse number 7.
05 12 10 52	CC	Okay. Midcourse correction number 7, RCS/G&N: 31600, not applicable, not applicable, 14445 5799, minus 00014, plus five zeros, plus 00001. Are you with me so far? Over.
05 12 11 49	CMP	Roger. With you.

05 12 11 51	CC	Good. 000 304 000, not applicable, 000 191 00014 004 00014 450 - -
04 12 12 38	CMP	Hey, Mike, hold it. Hold it, Mike.
05 12 12 39	CC	Okay. Holding.
05 12 12 45	CMP	You said not applicable for HA and HP; I started to copy it down, and then I didn't get the right number sequence. Did you skip down to what, V_T?
05 12 13 04	CC	No. Let's go back to apogee is not applicable, and then I just started reading the numbers again. From there, I've got a perigee and then a DELTA-V_T and then a burn time and so forth. Over.
05 12 13 15	CMP	Okay. I didn't hear a plus or minus on the HP, and I only got four numbers off of it. So could you start with HP again?
05 12 13 22	CC	Okay. Going back to apogee, not applicable; perigee, plus 00191. And you weren't hearing things; it was my mistake. Over.
05 12 13 39	CMP	Roger.
05 12 13 43	CC	Okay. Picking up with DELTA-V_T 00014 004 00014 45 0459 225, Shaula, up 236 000, plus 0813 minus 16503 12202 36301 146 4641; north set of stars, Sirius and Rigel, roll 308, pitch 209, yaw 357; remarks: perigee in P30 equals plus 22.2 nautical miles. Over.

05 12 16 04	CMP	Roger. Midcourse number 7 RCS/G&N: 31600, not applicable, not applicable, 14445 5799. Are you with me?
05 12 16 17	CC	I'm with you.
05 12 16 20	CMP	Minus 00014, plus all zeros, plus 00001 000 304 000, not applicable, plus 00191 00014 004 00014 45 0459 225 Shaula, up 236 000, plus 0813, minus 16503 12202 36301 146 4641, Sirius, Rigel, 308 209 357, HP, and P30 is 22.2 nautical miles.
05 12 17 24	CC	That's all correct, Jim, and I have the entry PAD at your convenience.
05 12 17 32	CMP	Roger. Stand by one.
05 12 17 50	CMP	Ready to copy. Mike.
05 12 17 52	CC	Okay. Entry PAD: area mid-Pacific, 357 152 359 146 29 13 268, plus 0813, minus 16503 068 36221 651 12202 36301 146 46 13 0028, not applicable four times, in other words, DL MAX, DL MIN, VL MAX, and VL MIN - all not applicable. Starting with TO: 400 0207 0025 0333 0816 16 0590 312. And your vortex star is Zeta Persei, which is half way between Mirfak and Aldebaran, up 165, right 34 up. Remarks: use nonexit EMS pattern. Over.
05 12 21 09	CMP	Right, Mike. Stand by.
05 12 21 13	CMP	Entry as follows: mid-Pacific, 357 152 359 146 2913 268, plus 0813, minus 165 03 068 36221

651 12202 36301 146 4613 0028, NA 4 times, with TO 400 0207 0025 0333 0816 16 0590 312, Zeta Persei, up 165, right 34, up. And remarks: use nonexit EMS pattern. And Zeta Persei is between Mirfak and Aldebaran, and Frank can never find it anyway.

05 12 22 25	CC	Okay. That's all correct.
05 12 23 13	CMP	We certainly don't waste much time getting down to drogue deploy, do we?
05 12 23 19	CC	Roger. That's - that's true.
05 12 34 41	CC	Apollo 8, Houston. Over.
05 12 34 43	CMP	Go ahead, Houston.
05 12 34 45	CC	Roger, Jim. In your computer, we'd like to do an erasable memory dump again, like we did the other day, and the reason we'd like to do it is, when you did that P37 about 8 hours ago, and you remember you put that EI time for TIG and got that POO do thing; we'd like to - We don't think there's anything in the world wrong with it. We think everything is just perfect inside the computer, but we'd like to do an erasable dump as we did the other day; go through it bit by bit. Give us something to do down here. Over.
05 12 35 23	CMP	Okay. Any time.

05 12 35 26	CC	And I have the procedures for you when you're ready to copy.
05 12 35 32	CMP	Go ahead.
05 12 35 33	CC	Okay. VERB 01 NOUN 01 ENTER, 333 ENTER, and then read out register 1, and that register 1 should be 10 000. And then if it's not, I can give you procedures for getting it to 10 000. If it is 10 000 as we expect, then VERB 74 ENTER, and that will do the dump. Over.
05 12 36 10	CMP	Roger. When do you want it?
05 12 36 22	CC	And, Apollo 8, you can do the first part of that now at your convenience to verify that register 1 is reading 10 000, but would you hold up on the dump itself until we get our ground stations configured, please. Over.
05 12 36 38	CMP	Will do.
05 12 38 37	CC	Jim, we're getting noisy down here. Could you switch OMNI antennas, please?
05 12 38 50	CC	Thank you, sir.
05 12 38 57	CC	That works pretty well, doesn't it?
05 12 39 01	CMP	Not bad. I was amazed at the communication at the moon, too.
05 12 39 13	CC	Apollo 8, Houston. We're configured for the dump. VERB 74 ENTER at your convenience.
05 12 39 19	CMP	Roger.
05 12 40 34	CC	Apollo 8, Houston. The dump is complete, and it's your computer. Thank you.

05 12 40 39	CMP	Roger.
05 13 06 33	LMP	Houston, Apollo 8. Over.
05 13 06 38	CC	Apollo 8, Houston.
05 13 06 48	CC	Apollo 8, this is Houston. Over.
05 13 06 56	LMP	Good morning, Mike. We had a little change of the guard here.
05 13 07 00	CC	You sound real bright eyed and bushy tailed. How's it going up there?
05 13 07 04	LMP	Real great.
05 13 07 44	CC	Apollo 8, Houston. How about giving us a count-down to PRD reading. Over?
05 13 07 52	LMP	Just mine?
05 13 07 55	CC	Just on you, Bill. We got the other two while you were sacked out.
05 13 08 04	LMP	The one that I have now, and the one that Jim took off, which is obviously broken, it's still at 0.64.
05 13 08 10	CC	Okay. Thank you.
05 13 11 38	CC	Apollo 8, Houston. Over.
05 13 11 45	CC	Roger, Bill. On your PTC attitude, we're requesting a pitch angle zero, and we're showing you about 27 degrees pitch and increasing. Over.
05 13 11 56	LMP	Roger. I've been trying to work it down to ENTER again.
05 13 12 00	CC	They're letting you drive, after all?
05 13 12 06	LMP	I have to every now and then just to square this thing away.

05 13 13 28	LMP	Mike, I'll just give you my status here before the rest of them go to sleep; had about 3 hours sleep, another meal, and everybody's doing fine.
05 13 13 41	CC	Roger, Bill. Thank you.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

05 13 49 11	CC	Apollo 8, Houston. Radio check. Over.
05 13 49 16	LMP	Loud and clear.
05 13 49 19	CC	Roger. Thanks, Bill.
05 14 36 50	CC	Apollo 8, Houston.
05 14 37 04	CC	Apollo 8, Houston. Over.
05 14 37 26	CC	Apollo 8, this is Houston. Over.
05 14 37 59	CC	Apollo 8, this is Houston. Over.
05 14 38 02	LMP	Roger, Mike. How do you read?
05 14 38 04	CC	I read you loud and clear now, Bill. I wasn't hearing here for a couple of calls. How do you read me?
05 14 38 09	LMP	I had my hands full; I was putting something down. I read you fine.
05 14 38 13	CC	Okay. Understand. If it'll be any help to you in your PTC driving, we've computed that as you look out plus X in the COAS or just out the window, you should be pointed right at Acrux when you're in a perfect PTC attitude. We don't know if that's a help to you or not, but we thought you might enjoy trying an alternate mode of keeping the attitude under control.
05 14 38 40	LMP	Okay. From my present position, we're going to have to move Acrux a little bit.
05 14 38 50	CC	Well, whatever you think. We just thought you might appreciate knowing.
05 14 39 03	LMP	I'll give it a try, Mike.

05 14 39 07	CC	Can you see it all right?
05 14 39 09	LMP	Yes, I think so. There's a star out there anyway.
05 14 40 58	LMP	Houston, Apollo 8. Do you read?
05 14 40 59	CC	Go ahead, Bill.
05 14 41 02	LMP	Actually, Mike, it's so easy to do it with the eight-ball within a reasonable sloppy limit that it's hardly worth the trouble to scootch way up in the seat to look out the COAS, and it's enough light in the cockpit where the star really isn't too easy to see. So I'm kind of inclined to use the IFR technique here where you can see the rest of the instrument panel.
05 14 41 27	CC	Okay.
05 14 41 41	LMP	I thought you were an all-weather pilot.
05 14 41 44	CC	Well now, you just caused Flight down here to get a "Got Ya" on CAP COMM and FAO.
05 14 41 59	LMP	Give you a little warning next time.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

05 15 07 08	CC	Apollo 8, Houston. Could you give us a better OMNI, please?
05 15 07 26	CC	Apollo 8, Houston. We will be changing the antennas in 3 minutes. You can expect a COMM glitch. Over.
05 15 07 34	LMP	Okay, Mike.
05 15 21 10	CC	Apollo 8, Houston. Can you switch us to OMNI Charlie, please.
05 15 21 24	CC	Thank you, sir.
05 15 21 28	LMP	De nada.
05 16 01 21	LMP	Houston, Apollo 8.
05 16 01 30	LMP	Houston, Apollo 8. Are you still there?
05 16 01 33	CC	Apollo 8, this is Houston. Go ahead. Over.
05 16 01 38	LMP	I was just seeing if you were still there, Mike. The Old Grey Eagle is taking over the show from here.
05 16 01 47	CC	Which one of them?
05 16 01 53	LMP	Old Super Chief.
05 16 03 18	CC	Apollo 8, Houston. Over.
05 16 03 23	LMP	Go ahead, Houston.
05 16 03 25	CC	Roger, Bill. We had an erasable memory dump a few hours back. I think it was while you were asleep, but anyway we've checked the computer's erasable memory bit by bit, and everything agrees 100 percent. Over.
05 16 03 40	LMP	Mighty fine. Glad to hear it, Mike. Thank you.

05 16 03 44	CC	Roger. Are you going to brief Frank on your tape recorder before you go to sleep?
05 16 03 54	IMF	He can't handle it. It's to complicated.
05 16 03 58	CC	Roger.
05 16 13 25	CC	Apollo 8, Houston. Give us a different OMNI, please.
05 16 13 38	CC	Thank you, sir.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

05 16 34 23	CC	Apollo 8, Houston. Over.
05 16 34 38	CC	Apollo 8, this is Houston. Over.
05 16 34 42	CDR	Go ahead, Michael.
05 16 34 43	CC	Roger. We are going to switch our ground antennas in about a minute and a half. You can expect a COMM glitch then.
05 16 34 51	CDR	Thank you.
05 16 35 47	CDR	..., Mike.
05 16 37 09	CC	Apollo 8, this is Houston through Carnarvon. Were you calling a minute ago, Frank?
05 16 37 17	CDR	Y'all in Australia, do you hear us?
05 16 37 21	CC	Yes, we are reading you loud and clear now.
05 16 38 03	CDR	Carnarvon, how do you read? Apollo 8.
05 16 38 06	CC	Apollo 8, this is Houston. Reading you loud and clear through Carnarvon.
05 16 38 54	CDR	Hello, Houston.
05 16 38 57	CC	Go ahead, Frank.
05 16 38 59	CDR	We are just listening to all the guys around the NET.
05 16 39 02	CC	Can you hear them?
05 16 39 05	CDR	I could that time, all the way from Carnarvon to Texas.
05 16 39 18	CDR	How did they ever get an old maintenance officer on the midnight shift?
05 16 40 15	CC	Frank, you are on GOSS Conference if you would like to be brave. Over.

05 16 40 21	CDR	Okay.
05 16 50 47	CC	Apollo 8, Houston. OMNI Bravo, please.
05 16 51 11	CC	Thank you, sir.
05 17 11 48	CDR	Houston, Apollo 8.
05 17 11 56	CC	Apollo 8, this is Houston. Over.
05 17 12 09	CC	Apollo 8, this is Houston. Over.
05 17 12 13	CDR	Have you noticed how long I've stayed locked in this PTC mode?
05 17 12 34	CC	Just about an hour and a quarter looks to us like, Frank.
05 17 12 38	CDR	I haven't even touched the hand control here for about 20 minutes, and it just hasn't moved outside that zero; I've never see it like this before.
05 17 12 55	CDR	Be sure and have your troops give me a call if it gets close to gimbal lock, will you? I'm snoozing a little bit now and then up here.
05 17 13 01	CC	Yes, we sure will, Frank.
05 17 13 05	CDR	Thank you.
05 17 13 13	CDR	And if you'd switch the antennas, you'd really be good guys.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

05 18 18 46	CC	Apollo 8, Houston.
05 18 19 12	CC	Apollo 8, this is Houston. Over.
05 18 19 27	LMP	Houston, Apollo 8.
05 18 19 30	CC	Roger. Just a check on the radio, and if it's practical, BIOMED switch left, please.
05 18 19 38	LMP	Okay, Mike. We had a crew change in the watch again.
05 18 19 44	CC	Well, that was quick. Did you decide you didn't want to sleep after all?
05 18 19 52	LMP	Well, it wasn't my decision.
05 18 19 59	CC	Yes, that's what I figured.
05 18 21 28	CC	Apollo 8, Houston. We will be changing antennas in about 2-1/2 minutes; you can expect a COMM glitch.
05 18 21 36	LMP	Roger. What are you changing to?
05 18 21 43	CC	We're switching from Carnarvon to Honeysuckle, Bill.
05 18 21 50	LMP	Roger.
05 19 08 18	CC	Apollo 8, Houston. Over.
05 19 08 24	LMP	Go ahead, Houston.
05 19 08 26	CC	Roger, Apollo 8. Your Green Team will be signing off in a few minutes, and before we do, Charlesworth and the rest of us would like to say we have enjoyed it and look forward to seeing you back in Houston. Over.
05 19 08 40	LMP	We have sure enjoyed it, too, troops, and you guys have really done a good job. We really do appreciate it.

05 19 08 45	CC	Well, nice words there. We will be seeing you, Bill.
05 19 08 47	LMP	Okay, Mike. We will see you, Buddy. Tell old Cliff adios for me, too.
05 19 08 57	CC	Sure will.
05 19 19 04	CC	Apollo 8, Houston.
05 19 19 11	LMP	Go ahead, Houston.
05 19 19 13	CC	Apollo 8, we'd like to have you, before you get in a P52 going here, we'd like to have you rezero the optics and read us the mechanical CDU's. We're trying to collect a little data for trouble-shooting.
05 19 19 29	LMP	Roger. Stand by.
05 19 19 31	CC	Thank you.
05 19 19 45	LMP	What's the trouble you are trying to troubleshoot?
05 19 19 51	CC	This goes back to some of the problems we had prior to LOI; trying to see if the softwear readouts we're getting down here compare with the mechanical readouts. It's not a current problem as far as we know.
05 19 20 08	LMP	Okay.
05 19 21 27	CC	Apollo 8, Houston.
05 19 21 31	LMP	Go ahead, Houston.
05 19 21 33	CC	Okay. Why don't you just read me the mechanical CDU's there now, and then it looks from the ground like you're clear to go ahead with the P52.

05 19 21 44	LMP	Okay. We'll get the navigator squared away here in just a minute.
05 19 21 51	CMP	Good morning, Captain.
05 19 21 53	CC	Good morning, sir.
05 19 21 57	CMP	This will be a piece of stew out of a deep sleep. Okay, stand by one.
05 19 22 17	CMP	Trunnion mechanical CDU looks like it's reading about 1/100.
05 19 22 25	CC	Roger.
05 19 22 52	CMP	And the shaft mechanical CDU looks like it is reading about 4/100 below zero, which would be about 364. Yes.
05 19 23 12	CC	Understand, Jim. That is 4/100 below zero on that shaft; is that affirm?
05 19 23 17	CMP	Yes. Stand by one. About 35996 on the shaft.
05 19 23 27	CC	Okay. Thank you. You can go ahead with P52 now.
05 19 23 35	CMP	Okay.
05 19 25 36	LMP	I always said he did better in his sleep.
05 19 26 28	CC	Apollo 8, Houston.
05 19 26 32	LMP	Go ahead, Houston.
05 19 26 34	CC	Okay. It looks like we're getting down on the service module RCS to the place where we ought to go ahead and activate the secondary service module RCS propellant.
05 19 26 48	LMP	Okay. Stand by.
05 19 28 30	CC	Apollo 8, Houston.

05 19 28 34	LMP	Go ahead.
05 19 28 36	CC	Okay. We've got a new PTC attitude. For the pitch 180, and the yaw 315.
05 19 28 45	LMP	Roger. Yaw 315.
05 19 28 48	CC	Roger. And pitch 180.
05 19 28 52	LMP	Okay.
05 19 28 57	LMP	Can't you pick one a little further away?
05 19 29 02	CC	Not in our normal sphere.
05 19 29 48	CMP	Ken, this is Jim.
05 19 29 51	CC	Go ahead.
05 19 29 52	CMP	Aren't we still a little high on the quantity side to activate the secondary?
05 19 30 01	CC	Negative. We have quad Bravo and quad Delta which are getting right down, according to the calculated numbers, next to where we ought to be activating them. The numbers you are reading are going to be a little bit high, but the computer data on the ground shows that you have about 134 pounds in Bravo and Delta, and about 130 pounds is where you ought to be on the secondary.
05 19 30 33	CMP	Okay. Roger. We will activate the secondary and turn off the primary.
05 19 30 40	CC	Okay. It's just to keep you from running one of them up.
05 19 30 44	CMP	Roger.

05 19 31 54	CMP	Secondary activation.
05 19 31 57	CC	Roger.

END OF TAPE

05 20 28 11	CDR	Houston, Apollo 8.
05 20 28 14	CC	Go ahead.
05 20 28 17	CDR	Ken, on this maneuver, MCC 7, are you going to - are we going to burn the PAD data that we got some time ago, or is there n few maneuver coming up, or what's going on in that regard?
05 20 28 35	CC	Okay, Apollo 8. If required, we'll give you a new one. Right now, we are looking at not making a maneuver burn at all.
05 20 28 46	CDR	You say we may not even have another one now?
05 20 28 48	CC	That's right.
05 20 29 04	CDR	Okay. You're the boss.
05 20 31 03	CC	Apollo 8, Houston.
05 20 32 57	CC	Apollo 8, Houston.
05 20 33 11	CC	Apollo 8, Houston. Could you try another OMNI?
05 20 33 37	CC	Apollo 8, Houston. Try another OMNI, please.
05 20 34 22	CC	Apollo 8, Houston.
05 20 35 47	CC	Apollo 8, Houston.
05 20 35 50	CDR	Go ahead, Houston. Apollo 8.
05 20 35 52	CC	Okay. Read you loud and clear now. Just wanted to remind you that in the event of a loss of COMM, we don't want you to burn MCC 7. Your present entry PAD is good. We'll be updating your landing points at the same time that you would have gotten MCC 7, and I'd like to have a crew status report from you when it's convenient.

05 20 36 38	CDR	Okay, Ken. I understand. If we would lose COMM, you do not want us to burn MCC 7, just go ahead and use the entry PAD you've given us?
05 20 36 46	CC	That's affirmative. You'll be within 0.06 degrees of your entry angle target line.
05 20 36 54	CDR	Alright. The crew status is everybody has gotten real good rest last night, and everybody is in good shape. Jim is just waking up, and Bill is starting the initial stowage, and we all feel very well.
05 20 37 12	CC	Okay.
05 20 37 17	CC	Okay. And we'd like to - guess we need a PRD reading from you. And we'll be needing one in the neighborhood of 145-hour period, somewhere when it's convenient in there again.
05 20 45 20	CDR	Houston, Apollo 8.
05 20 45 24	CC	Go ahead, 8.
05 20 45 41	CC	Apollo 8, Apollo 8, Houston. Go ahead.
05 20 45 45	CDR	Roger. Could you give us cur range - correction, our velocity and range from the earth now?
05 20 45 50	CC	Stand by.
05 20 46 59	CC	Apollo 8, Apollo 8, Houston. At time 51, your velocity will be 9526, altitude 42946. Over.
05 20 47 14	CDR	Thank you.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

141:33 05 21 33 43	CC	Apollo 8, Houston. You call?
05 21 34 17	CC	Apollo 8, Apollo 8. Did you call?
05 21 34 22	CDR	Negative, this is Apollo 8. We did not call you.
05 21 34 25	CC	Okay. Thank you.
05 21 34 29	CDR	Roger.
05 21 41 31	CC	Apollo 8, Houston.
05 21 41 34	CDR	Go ahead, Houston. Apollo 8.
05 21 41 37	CC	Okay. I've got some weather and recovery force status and a couple of last minute items to run down any time it is convenient for you.
05 21 41 47	CDR	Alright. It's convenient right now, any time.
05 21 41 50	CC	Okay. For the mid-Pacific, the general condition is good. You can expect cloud bases 2000 foot scattered, visibility 10 miles, wind 070 at 12, wave heights 4 feet, altimeter 2974. Sunrise will be 17:10 Zulu, and first light 16:49 Zulu. The recovery forces: ship will be Yorktown; the aircraft will be Airboss number 1 and 2, and Recoveries 1, 2, and 3. The estimated time to a target point: the ship is - Yorktown is on the target point, Airboss aircraft 15 minutes and will be on-scene commander. Recoveries 1, 2, and 3 are SH3 Alfas, and they go with the Yorktown, so they are at the target point. All of them have swimmers aboard. If the recovery aircraft do not hear from the spacecraft, they will go ahead and

put swimmers in the water, and if you are in good shape and give them a call, then they will hold off on dropping swimmers until sunrise.

05 21 43 45 CDR Roger. Say again the sunrise and first light time for me, would you, please?

05 21 43 53 CC I say again, 8.

05 21 44 23 CC Apollo 8, Houston. Notice the rather large middle gimbal angle. Over.

05 21 44 32 CDR Thank you.

05 21 44 38 CDR Would you say again the daylight time, please, sunrise, and first light.

05 21 44 44 CC Okay. Sunrise is 17:10 Zulu, and first light is 16:49 Zulu.

05 21 45 01 CDR Thank you.

05 21 46 05 CC Okay. Looking over the weather I gave you was - the 2000 foot scattered at the target point may have a 6000 foot broken layer above that. At the MAX lift point, you will have about the same thing, and altimeter is the same down the range. As you go further to the east, the weather should improve slightly; there is no problem with thunderstorms or rain showers in any of your recovery area.

05 21 46 42 CDR Very good; thank you.

05 21 46 51 CC The items that we still need will be a PRD reading as late as you can do it conveniently prior to a final stowage. And we don't have any numbers

on the last crew sleep period. I'd like to verify that the secondary RCS was activated on all four quads. And I have about five comments on the entry checklist procedures to verify.

05 21 47 24 CDR It was activated on all four quads; that's correct. Our final stowage is completed. We'll read out the PRD's for you now.

05 21 47 35 CC Alright. Thank you.

05 21 47 40 CDR The LMP's reads 0.64; I believe it's been that way throughout the flight. The CMP's reads 0.11, that's 1.11.

05 21 47 58 CC Roger.

05 21 48 02 CDR Stand by a minute. Let me look at it closely. That's 0.11.

05 21 48 09 CC Roger. 0.11.

05 21 48 13 CDR And the one I ended up with reads 3.10.

05 21 48 18 CC Okay. Thank you.

05 21 48 37 CDR Okay. Go ahead, Ken. What else do you want to talk about?

05 21 48 41 CC Okay. To make everybody happy, we can use an estimate of the number of hours sleep the people got.

05 21 48 52 CDR Just a minute, I'll give you that; I forgot. Bill Anders got about 5 hours, and Jim Lovell got about five, and I got about five and a half or six.

05 21 49 09 CC Sounds good. Okay. We went through an exercise with the mockup on the preentry preparations, and

we noticed that in the LMP's checklist on page S-12, when you go to top off the repress bottles, I believe it is a misprint; it should read the PLSS fill valve rather than the REPRESS valve, and we should be going to the FILL position as opposed to going to ON.

05 21 49 47 CDR Roger. That's what we do.

05 21 49 51 CC Okay. And on - go ahead.

05 21 50 01 CDR Go ahead. We agree that's what we do.

05 21 50 04 CC Okay. On page E-7 of the entry checklist and under step 34, as long as you have panel 382 open, that's a convenient time to go ahead and have the evaporator water controls, both primary and secondary, to AUTO, and the suit heat exchanger for the secondary glycol to FLOW.

05 21 50 27 CDR Those items are already accomplished.

05 21 50 29 CC Very good. On page E-9, when you are getting ready to transfer the RCS to the command module position, if you want to avoid having the engines fire as a result of attitude correction, you might want to take the manual attitude switches to ACCEL COMMAND or MINIMAL IMPULSE. And again on E-9 Alfa at step 41 Bravo, if you want to go back to attitude hold, bring your manual attitude switches back to RATE.

05 21 51 13 CDR What was that last step?

05 21 51 15 CC Step 41 Bravo on page E-9 Alfa. It's if you decide to use either MINIMAL IMPULSE or ACCEL COMMAND of

page E-9, step 41 Bravo would be a good place to go back to RATE COMMAND.

05 21 51 31	CDR	Okay. We do a purge or - -
05 21 51 35	CC	Okay, fine. And - -
05 21 51 39	CDR	I didn't put all those control configurations changes on the checklist, but that's exactly whta we did, used MINIMUM IMPULSE.
05 21 51 47	CC	Okay. Real fine.
05 22 00 51	CDR	Houston, Apollo 8.
05 22 00 54	CC	Go ahead, 8.
05 22 01 07	CC	Apollo 8, Apollo 8. Go ahead.
05 22 01 11	CDR	I'd like to confirm one item on the PAD message, please.
05 22 01 15	CC	Roger.
05 22 01 17	CDR	Time to retro-drogues, reference you last time to drogues, please.
05 22 01 28	CC	Okay. I'll check that one out.
05 22 01 31	CDR	And also, Ken, we are going to turn on our VHF now, about 4 hours before entry.
05 22 01 37	CC	Real fine. Thank you. I'll let you know when we pick it up.
05 22 01 41	CDR	A Simplex.
05 22 01 42	CC	Affirm.
05 22 17 33	CC	Apollo 8, Houston.
05 22 17 35	CDR	Go ahead, Houston.
05 22 17 37	CC	Okay. We have checked into your drogue time, and the number of 08:16 on your entry PAD is

correct. We'll be giving you an updated entry PAD on the scheduled time of 143:30. At the same time, we'll be giving you an update of your state vectors for the LM and CSM. The midcourse correction number 7 was less than seven-tenths foot per second, and we will not execute it. You have a P52 scheduled at 143:30 which is not required. It's your option. However, if you decide to delete the P52, the CMC self-check and DSKY condition light test are still requirements. Over.

05 22 18 32	CDR	What do you mean, they are still requirements? We weren't planning to do the CMC self-test.
05 22 18 53	CDR	On that DSKY check ...
05 22 21 07	CC	Apollo 8, Houston. That's my mistake on CMC self-check and DSKY condition light. That's an optional test. Over.
05 22 21 16	CDR	That's what we thought, Ken. Gosh, if that's been working perfectly for 6 days, I don't see any reason to test it.
05 22 21 24	CC	I agree.
05 22 21 26	CDR	Thank you.
05 22 21 36	CMP	Morning, Ken. How's Houston this morning?
05 22 21 39	CC	Just fine. Nice and balmy.
05 22 21 44	CMP	Good.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

142:51

05 22 51 28	LMP	Houston, Apollo 8. Over.
05 22 51 31	CC	Go ahead, Apollo 8.
05 22 51 45	CC	Apollo 8, go ahead.
05 22 51 49	LMP	I am just - It is my understanding that we are to bring up the secondary loop at 1 hour prior to SEP, isn't that right?
05 22 51 54	CC	That is affirmative, about page Echo 9.
05 22 52 10	LMP	Okay.
05 22 52 16	CC	And Bill, ... suggested if we have the water boiler going on the primary loop, that you - you might wait about 5 minutes or so before you initiate the secondary loop.
05 22 52 38	LMP	Wait 5 minutes from what? From the time the primary loop starts or from 1 hour?
05 22 52 43	CC	From the time the primary loop starts; this will give you a check to see if it had a chance to dry out or not.
05 22 53 04	LMP	Oh, I am with you. Okay.
05 22 53 09	CC	And for your information, we already have a VHF downlink. It's poor quality, but we do have contact.
05 22 53 22	LMP	Okay. We haven't turned anything over to VHF yet.
05 22 53 25	CC	Okay.
05 22 53 27	LMP	We tried to call you on the VHF though, Ken.
05 22 53 30	CC	Roger. I say, the quality is pretty poor; they may not be able to understand you.

05 22 53 36	LMP	Roger.
05 22 56 59	CDR	Houston, Apollo 8. Over.
05 22 57 01	CC	Go ahead, Apollo 8.
05 22 57 14	CC	Apollo 8, Houston. Go ahead.
05 22 57 17	LMP	Ken, we got two things going here which make this suit heat exchanger flow a little different. One of them is we are not doing a coldsoak, and the other one is we are powering down the secondary loop prior to SEP. And I wonder if it is a good idea to have the suit heat exchanger only on a secondary loop in that case. And plus the fact that we haven't got any cabin heat exchanger.
05 22 57 45	CC	I don't think that was the intent, Bill. What they had in mind, we have the suit heat exchanger on both loops; and if they got too cold, you could use the panel switching to shut down the primary loop through the heat exchanger. But in any event, you would always have something going to the suit heat exchanger. I recognize that we are going to be shutting down the secondary heat exchanger pre-SEP and then turning it back on prior to entry, but the idea was to have both primary and secondary loops on the suit heat exchanger simultaneously.
05 22 58 24	LMP	Yes, my checklist doesn't reflect that. I think that's a good idea because we are a little suspect of our cabin fans and don't plan to use them.

05 22 58 31	CC	Roger.
05 23 01 54	LMP	Houston, Apollo 8. Over.
05 22 01 58	CC	Go ahead, 8.
05 22 02 08	CC	Apollo 8, Apollo 8. Go ahead.
05 22 02 12	LMP	Roger. What's Rod's estimate of our postseparation main bus voltage?
05 23 12 41	CC	Apollo 8, Houston. We will be making a handover from Carnarvon to Honeysuckle at 15.
05 23 12 50	CDR	Roger.
05 23 16 16	LMP	Houston, Apollo 8. Over.
05 23 16 19	CC	Apollo 8, go ahead.
05 23 16 24	LMP	I am still a little bit confused on that - on this activating the secondary loop. You indicated inactivating it at 1 hour or 5 minutes after the primary evaporator comes on the line. My checklist shows that the primary evaporator probably won't come on the line until we bypass the radiators. Have you got something else in mind I don't know about?
05 23 16 56	CC	Okay, Bill. We passed up an update some time back on page E-9 step 38 right at the beginning, and you have got a final GET drift check. And between there and the step 39 where it says terminate CM RCS preheat, that was the place we wanted to activate the primary loop by putting the glycol evaporator water switch to AUTO and the glycol evaporator steam pressure to AUTO.

05 23 17 41	LMP	Roger. I don't expect it to boil, though. Do you?
05 23 17 45	CC	Okay, Bill. We are hoping that it will there. It looks like we will have had a stable attitude for sometime, and we anticipate that it will be warm enough to make it boil. That is the reason it's suggested if it is boiling, that you wait. If it isn't, go ahead and turn on the secondary loop.
05 23 18 04	LMP	Okay. Well, that's where I was confused. I am waking up. Thank you.
05 23 18 08	CC	Yes, sir.
05 23 20 06	CC	Apollo 8, Houston.
05 23 20 09	LMP	Go ahead, Houston.
05 23 20 11	CC	Okay, Apollo 8. We would like to update your LM state vector, CSM state vector, and target point. If it is convenient now, why, we will go ahead and do that if you will go to POO and ACCEPT.
05 23 20 27	LMP	Roger. POO and ACCEPT.
05 23 29 20	CC	Apollo 8, Houston.
05 23 29 22	CDR	Go ahead, Houston. Apollo 8.
05 23 29 25	CC	Okay. The loads are in and verified, and the computer is yours.
05 23 29 29	LMP	Okay.
05 23 29 30	CC	You can take it back to BLOCK, and for Bill's information, latest guess from the main bus post-SEP voltage to 27.5
05 23 29 41	LMP	Guess! You mean the EECOM's are guessing?

05 23 29 57	LMP	At least, they are honest for a change.
05 23 30 02	CC	That is more than you can say for the computers.
05 23 30 06	LMP	Or the crew.
05 23 36 40	CC	Apollo 8, Houston.
05 23 37 00	CC	Apollo 8, Houston.
05 23 37 03	LMP	Go ahead, Houston. Apollo 8.
05 23 37 05	CC	Okay, 8. We have an entry PAD for you.
05 23 37 10	LMP	Good. Just a minute.
05 23 37 33	LMP	Ready to copy, Houston.
05 23 37 38	CC	Okay. This will be the mid-Pacific, 357 152 359 146 29 00 268, plus 0813, minus 16503 065 36221 645 12122 36301 14646 14 0028. The next block is November Alfa: D_0 400 02 12 0025 0334 08 14 16 0590 312; Zeta Persei, up 165, right 34, up. Use nonexit EMS pattern, GDC align; primary star Sirius, secondary Rigel, roll 308, pitch 209, yaw 357; this entry will not involve P65. Over.
05 23 40 25	CMP	Houston, Apollo 8. Entry PAD as follows: mid-Pacific, 357 152 359 146 2900 268 plus 0813 minus 16503 065 36221 645 12122 36301 14646 14 0028, next block not applicable, 400 0212 0025 0334 0814 16059 312, Zeta Persei, up 165, right 35 up, use nonexit EMS pattern, backup alignment; Sirius, Rigel, roll 308, pitch 209, yaw 357, and we won't need P65.

05 23 41 37	CC	Okay, Apollo 8. I would like to verify sextant star shaft 0590, and the boresight star.
05 23 41 49	CMP	Roger.
05 23 41 50	CC	The last one is right 34. Over.
05 23 41 56	CMP	Roger. Boresight star is right 34. And I have the sextant shaft; that's 0590.
05 23 42 03	CC	That's correct, Apollo 8.
05 23 59 37	CC	Apollo 8, Houston.
05 23 59 50	CC	Apollo 8, Apollo 8, Houston.
05 23 59 56	CMP	Go ahead, Houston.
05 23 59 58	CC	Okay, Apollo 8. Can you tell us if you've done anything with your potable water? We've noticed our readout has gone from 100 percent down to 56 in the last couple of minutes.
06 00 00 17	CMP	We're reading about 50 percent right now.
06 00 00 22	CC	Roger. That correlates with what we see. Have you done anything to change configuration? Over.
06 00 00 44	CMP	Yes, we noticed the venting here, too, Houston.
06 00 01 10	CC	Jim, did you mean you could visually see it?
06 00 01 14	CMP	Yes, we're - oh, stand by, Ken. Bill just dumped urine, so that might have been urine we were seeing.
06 00 01 45	CMP	Bill just shut the potable inlet, Ken.
06 00 01 48	CC	Okay. Thank you.
06 00 04 44	CMP	Houston, Apollo 8.
06 00 04 47	CC	Go ahead, 8.
06 00 04 58	CC	Apollo 8, Apollo 8, go ahead.

06 00 05 01	CMP	Roger, Houston. We're still showing about 52 percent, and we had our switch on waste so we don't know whether it dropped from a higher value or not. Has yours been stabilized now?
06 00 05 15	CC	That's affirmative; ours has stabilized now. It was reading full just a few minutes ago.
06 00 05 25	CMP	Roger. I don't think - we can't account for any sudden drop in water.
06 00 05 31	CC	Okay. We looked in the malfunction procedures, and number 28 doesn't reveal anything very startling.
06 00 05 42	CMP	Bill is looking there now.
06 00 08 53	LMP	Houston, Apollo 8. Over.
06 00 08 57	CC	Go ahead, 8.
06 00 09 00	LMP	Okay. I'm looking at malfunction 28, and it takes you to box 6, but I don't really think that's the problem because the waste tank quantity hasn't changed any. Over.
06 00 09 11	CC	Okay. I concur. We're watching the same thing.
06 00 09 15	LMP	Look, we don't care about the potable tank, but we do about the waste tank, so just in case there is a problem somewhere, I'm going to shut the potable tank off and leave the waste tank inlet valve open. How does that sound to you?
06 00 09 29	CC	Stand by. Okay, 8. We concur.
06 00 09 37	LMP	If I see any water floating around, I'll give you another call.

06 00 09 40	CC	Roger. Thank you.
06 00 18 30	CC	Apollo 8, Houston. Radio check.
06 00 18 47	CC	Apollo 8, Apollo 8. Radio check.
06 00 18 51	CMP	Read you loud and clear.
06 00 18 53	CC	Roger. We had a momentary loss of COMM on the ground then. Read you loud and clear.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

06 00 25 28	CC	Apollo 8, Houston.
06 00 27 13	CDR	Houston, Apollo 8. Did you call?
06 00 27 17	CC	Apollo 8, Houston. You are loud and clear. We've taken a look at this water - -
06 00 27 23	CDR	Houston, Apollo 8.
06 00 27 27	CC	Apollo 8, Apollo 8, Houston. Read you loud and clear. We have taken a look at your potable water quantity problem, and it appears to be a transducer problem. Suggest that you leave the potable tank isolated. You have sufficient water in the waste tank to continue the entry. Over.
06 00 27 48	CDR	Roger. Thank you, Houston.
06 00 27 58	LMP	Does that mean we're GO for entry?
06 00 28 21	CDR	Houston, Apollo 8.
06 00 28 24	CC	Apollo 8, Apollo 8, go ahead.
06 00 28 27	CDR	Roger. Is our thermal stability good enough we can leave the PTC attitude and go to entry gimbal angles now?
06 00 32 03	CDR	Houston, how do you read? Apollo 8.
06 00 32 06	CC	Read you loud and clear, Apollo 8, and we're checking on the PTC problem now.
06 00 32 19	CC	Apollo 8, Houston. You are cleared with entry attitude at this time.
06 00 32 23	CDR	Okay. Fine. Thank you.
06 00 46 22	CC	Houston voice. Go to voice 925.
06 00 56 46	LMP	Houston, Apollo 8. Over.

06 00 56 51	CC	Apollo 8, loud and clear. Go.
06 00 57 00	CC	Apollo 8, Apollo 8, go ahead.
06 00 57 05	LMP	Roger. We have completed the checklist down to the 1-hour point, and we'll stand by for 1 hour.
06 00 57 14	CC	Roger.
06 00 57 44	CC	Apollo 8, Apollo 8, Houston.
06 00 57 49	CDR	Go ahead, Houston.
06 00 57 52	CC	Just for information, did you folks end up having to use any command module RCS heaters?
06 00 57 59	CDR	Negative. All our indicators are pegged either high or at 5 volt.
06 00 58 06	CC	Okay. Thank you.
06 00 58 28	CT	Carnarvon, network GOSS conference voice check. How do you read?
06 00 58 36	CT	Network, Carnarvon. Read you weak but clear.
06 00 58 41	CT	Roger, Carnarvon. I read you loud and clear.
06 00 58 44	CT	You are loud and clear now. Thank you.
06 00 58 57	CC	Apollo 8, Houston. Stand by for hand over to Carnarvon.
06 00 59 02	CDR	Roger.
06 01 02 05	CC	Apollo 8, Houston.
06 01 02 09	CDR	Go ahead.
06 01 02 16	CMP	Go ahead, Houston.
06 01 02 19	CC	Okay, Apollo 8. If you will go to POO and ACCEPT, we would like to update your LM and CSM state vectors. Over.

06 01 02 27	CDR	Roger.
06 01 06 18	CC	Apollo 8, Houston. State vector load is complete. Verify the computer is yours.
06 01 06 35	CC	Apollo 8, Apollo 8, Houston. State vector load is complete; the computer is yours.
06 01 06 47	CDR	Roger, Houston. We are going to BLOCK.
06 01 06 50	CC	Roger.
06 01 10 54	CC	Apollo 8, Houston.
06 01 10 58	CDR	Go ahead, Houston.
06 01 11 00	CC	Okay. Two fast items: number one, it has been suggested that since Marezine takes some time to take effect, you might consider whether you would be interested in taking some now. And I have an entry PAD which has some very small updates to go on it if you would like to copy that.
06 01 11 22	CDR	Okay. Stand by. Let me get out the entry PAD.
06 01 11 38	CMP	Okay. Go ahead with the entry PAD, Houston.
06 01 11 42	CC	Okay. We are still going to the mid-Pacific, 357 152 359 146 2913 267, plus 0813, minus 16503 066 36221 647 12166 36301 14646 13 0028, the next block is November Alfa, V_0 400 0210 0025 0335 0816 160590 312; Zeta Persei, up 165, right 34, up nonexit EMS pattern; Sirius and Rigel, roll 308, pitch 209, yaw 357, no P65 involved. Over.
06 01 14 11	CMP	Roger, Houston. Entry PAD as follows: mid-Pacific, 357 152 359 146 2913 267, plus 0813, minus 16503 066 36221 647 12166 36301 14646 13 0028, NA, 400

		0210 0025 0335 0816 160590 312, Zeta Persei, up 165, right 34, up. Use nonexit EMS pattern; Sirius, Rigel, 308, 209, 357, no P65.
06 01 15 11	CC	That's correct, Apollo 8.
06 01 15 46	CC	Apollo 8, Houston. You are clear to initiate cabin coldsoak at your discretion. Over.
06 01 15 52	CMP	Roger, Houston. We're starting that now.
06 01 19 44	CC	... your mike is stuck.
06 01 19 46	CDR	You have a hot mike, Houston.
06 01 19 49	CC	Roger.
06 01 23 13	LMP	Houston, Apollo 8. Over.
06 01 23 17	CC	Go ahead, 8.
06 01 23 19	LMP	Okay. It doesn't appear that we are going to be able to trigger the primary evaps, so I'm going to go ahead and start up the secondary loop.
06 01 23 34	CC	Okay, Apollo 8. We concur.
06 01 26 43	CDR	Houston, Apollo 8.
06 01 26 46	CC	Go ahead, 8.
06 01 26 58	CC	Apollo 8, Apollo 8, go ahead.
06 01 27 01	CDR	Roger. Since we're going as smoothly as we are here - we've got good COMM - let's start this pyro circuit check about 10 minutes early. What do you say?
06 01 27 25	CC	Apollo 8, Apollo 8. We can conduct the pyro check just any time.
06 01 27 31	CDR	All right. Why don't we do it here just momentarily then?

06 01 27 36	CC	Roger.
06 01 27 38	CDR	We'll give you a call when we're ready.
06 01 27 40	CC	Roger.
06 01 27 58	CDR	Houston, we are ready to proceed with the pyro circuit check.
06 01 28 04	CC	Roger. Go ahead.
06 01 31 07	CDR	MSFN, are you monitoring the sequential test now?
06 01 31 15	CDR	Houston, Apollo 8.
06 01 31 23	CC	Apollo 8, Apollo 8. That's affirmative.
06 01 31 38	CDR	Hello, Houston. Apollo 8.
06 01 31 43	CC	Apollo 8, Apollo 8. Loud and clear. Affirmative we are monitoring.
06 01 31 48	CDR	Okay.
06 01 32 07	LMP	Standing by for GO and PYRO ARM.
06 01 32 13	CC	Apollo 8, Apollo 8. You have a GO.
06 01 32 17	LMP	Roger.
06 01 41 41	CDR	Houston, this is Apollo 8. How is your tracking looking?
06 01 41 47	CC	Looking great.
06 01 41 50	CDR	Okay. Everything went fine with the check. We are all armed and ready to go here.
06 01 41 55	CC	Okay. If you have done everything else, how about let's make a VHF check.
06 01 42 02	CDR	Okay. I'll turn off my S-band; the other two will be on S-band.
06 01 42 06	CC	Roger. I'll give you a count in just a second.

06 01 42 30	CC	Apollo 8, Houston. Simultaneous VHF and S-band. Over.
06 01 42 37	CDR	Roger. I'm not reading you on VHF.
06 01 42 40	CC	Roger. Stand by one.
06 01 43 31	CC	Apollo 8, Houston. Simultaneous VHF and S-band. Do you verify that you are on the left hand VHF antenna? Over.
06 01 42 48	LMP	We can verify the antenna, but we can't verify reading you on S-band or on VHF.
06 01 42 54	CC	Okay. We are receiving some downlink, although it is considered to be poor quality.
06 01 51 34	CC	Apollo 8, Houston. We'd like to try the right VHF antenna, if you have time.
06 01 51 45	LMP	We're - we're on right, Ken.
06 01 51 48	CC	Okay. This is a simultaneous VHF and S-band transmission: one, two, three, four, five. How do you read on VHF? Over.
06 01 51 59	CDR	Read you loud and clear.
06 01 52 03	CC	Understand that's on VHF. Is that affirm?
06 01 52 18	CDR	Houston, this is Apollo 8. I answered your call on VHF. Did you receive?
06 01 52 22	CC	Okay. It's not piped back here. MOKR'll have to check and see if they have it on the ground station.
06 01 52 28	CDR	You were loud and clear, Ken.
06 01 52 30	CC	Roger. Thank you.

06 01 52 37	CC	Okay, Apollo 8. We receive you loud and clear on VHF through Carnarvon.
06 01 52 45	CDR	Roger.
06 01 57 21	CC	Apollo 8, Houston. Stand by for handover from Carnarvon to Guam on the hour. We should have continuous contact except for the blackout period beginning at 146:51.
06 01 57 36	CDR	Roger.

END OF TAPE

APOLLO 8 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

146:26

06 02 26 54	CMP	Houston, Apollo 8. Confirm GO for PYRO ARM.
06 02 26 57	CC	Apollo 8, Apollo 8, Houston. You are GO for PYRO ARM.
06 02 27 13	CC	Apollo 8, Apollo 8. You are GO for PYRO ARM. Everything is looking good.
06 02 27 18	LMP	Roger. Everything is looking good here, Ken.
06 02 29 10	CC	Apollo 8, Apollo 8. It appears that your primary evaporator may have dried out. If you get a chance, go ahead and give it a try to reservice. Over.
06 02 31 28	CC	Apollo 8, Apollo 8. Ground data indicates the primary evaporator may have dried out. If you have a chance, you might try reservicing. Over.
06 02 31 38	LMP	Roger.
06 02 32 51	CC	Apollo 8, Apollo 8. Your secondary loop looks good.
06 02 32 56	CMP	Roger, Houston.
06 02 39 20	CC	Apollo 8, Houston. Looking good; both primary and secondary loops look good.
06 02 39 52	CC	Apollo 8, through the Redstone. You're looking good; both primary and secondary loops are holding good.
06 02 40 26	CC	Apollo 8, Apollo 8, through Redstone. Over.
06 02 40 32	LMP	Go ahead, Houston. This is Apollo 8.
06 02 40 34	CC	Roger. Read you loud and clear. You're looking good.
06 02 40 39	CDR	Roger.

06 02 45 15	CC	Apollo 8, Houston. One minute to RRT.
06 02 45 20	CDR	Roger.
06 02 48 44	CDR	Good point, too.
06 02 49 15	CC	Apollo 8, Houston. Radio check.
06 02 49 43	CC	Apollo 8, Houston through Huntsville. Over.
06 02 51 32	CC	Apollo 8, Apollo 8, this is Houston through ARIA. Say again, 8.
06 02 51 47	CDR	Houston, Apollo 8. Over.
06 02 51 50	CC	Go ahead, Apollo 8. Read you broken and loud.
06 02 51 51	CDR	We've got a real fireball. It's looking good.
06 02 51 56	CC	Outstanding!
06 02 52 15	CDR	We are in real good shape, Houston.
06 02 52 17	CC	Real fine.
06 02 52 31	CC	Apollo 8, Houston. Yorktown has radar on you.
06 02 53 57	CC	Apollo 8, Houston.
06 02 53 60	CDR	Go ahead, Houston.
06 02 54 01	CC	If you get a chance, we'd like to have your DSKY readings before drogues.
06 02 54 04	CDR	Stand by.
06 02 54 08	CMP	Roger. DSKY reading plus four balls 7, plus two balls 812, minus 16522.
06 02 56 13	CDR	... This is Apollo 8. Over.
06 02 59 53	R3	The spacecraft is down to 1000.
06 02 59 58	YORK	Be ready for code 3.
06 03 01 40	R3	Yorktown, Rec 3. At this time, the command module is in the water. Over.

06 03 01 44 YORK Roger.

06 03 02 03 YORK Recovery 3 reports splashdown time was 51 and 50 seconds, and rescue is underway.

END OF TAPE

can be (see previous page)