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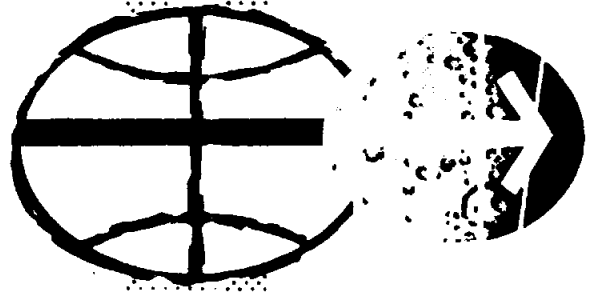
APOLLO 11

TECHNICAL AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

Prepared for

Data Logistics Office  
Test Division  
Apollo Spacecraft Program Office



MANNED SPACECRAFT CENTER  
HOUSTON, TEXAS

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## INTRODUCTION

This is the transcription of the Technical Air-to-Ground Voice Transmission (GOSS NET 1) from the Apollo 11 mission.

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

### Spacecraft:

CDR	Commander	Neil A. Armstrong
CMP	Command module pilot	Michael Collins
LMP	Lunar module pilot	Edwin E. Aldrin, Jr.
SC	Unidentifiable crewmember	
MS	Multiple (simultaneous) speakers	
LCC	Launch Control Center	

### Mission Control Center:

CC	Capsule Communicator (CAP COMM)
F	Flight Director

### Remote Sites:

CT	Communications Technician (COMM TECH)
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### Recovery Forces:

HORNET	USS Hornet
R	Recovery helicopter
AB	Air Boss

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-interruption 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 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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MILA (REV 1)

00 00 00 04 CDR Roger. Clock.

00 00 00 13 CDR Roger. We got a roll program.

00 00 00 15 CC Roger. Roll.

00 00 00 34 CDR Roll's complete and the pitch is programed.

00 00 00 44 CDR One Bravo.

00 00 01 02 CC Apollo 11, Houston. You're good at 1 minute.

00 00 01 06 CDR Roger.

00 00 01 54 CC Stand by for mode 1 Charlie.

00 00 01 57 CC MARK.

00 00 01 58 CC Mode 1 Charlie.

00 00 01 59 CDR One Charlie.

00 00 02 03 CC Apollo 11, this is Houston. You are GO for staging.

00 00 02 17 CDR Inboard cut-off.

00 00 02 19 CC We confirm inboard cut-off.

00 00 02 44 CDR Staging.

00 00 02 46 CDR And ignition.

00 00 02 55 CC 11, Houston. Thrust is GO, all engines. You're looking good.

00 00 02 59 CDR Roger. You're loud and clear, Houston.

00 00 03 13 CDR We've got skirt SEP.

00 00 03 15 CC Roger. We confirm. Skirt SEP.

00 00 03 17 CDR Tower's gone.

00 00 03 19 CC Roger. Tower.

00 00 03 28 CDR Houston, be advised the visual is GO today.

00 00 03 32 CC This is Houston. Roger. Out.

00 00 03 36 CDR Yes. They finally gave me a window to look out.

00 00 03 44 CC 11, Houston. Your guidance has converged; you're looking good.

00 00 03 52 CDR Roger.

00 00 04 01 CC 11, Houston. You are GO at 4 minutes.

00 00 04 04 CDR Roger.

00 00 05 03 CC 11, Houston. You are GO at 5 minutes.

00 00 05 06 CDR Roger. It'll - Apollo 11. Go.

00 00 05 21 CC Stand by the S-IVB to COI capability.

00 00 05 25 CDR Okay.

00 00 05 27 CC MARK.

00 00 05 28 CC S-IVB to COI capability.

00 00 05 30 CDR Roger.

00 00 05 35 CDR You sure sound clear down there, Bruce. Sounds like you're sitting in your living room.

00 00 05 39 CC Oh, thank you. You all are coming through beautifully, too.

00 00 06 00 CDR We're doing 6 minutes. Starting the gimbal motors.

00 00 06 03 CC Roger, 11. You're GO from the ground at 6 minutes.

00 00 06 20 CC Apollo 11, this is Houston. Level sense arm at 8 plus 17; outboard cut-off at 9 plus 11.

00 00 07 01 CDR Apollo 11's GO at 7 minutes.

00 00 07 04 CC 11, this is Houston. Roger. You're GO from the ground at 7 minutes. Level sense arm at 8 plus 17; outboard cut-off at 9 plus 11.

00 00 07 09 CDR Roger.

00 00 07 42 CDR Inboard cut-off.

00 00 07 45 CC Roger. We confirmed.

00 00 08 19 CC Apollo 11, Houston. You are GO at 8 minutes.

00 00 08 22 CDR AGS just got the mixture ratio shift.  
00 00 08 24 CC Roger. We got PU shift down here, too.  
00 00 08 34 CDR Well, it looks like a nice day for it. These  
thunderstorms down range is about all.

GRAND BAHAMA ISLANDS (REV 1)

00 00 08 52 CC 11, this is Houston. You are GO for staging.  
Over.  
00 00 08 56 CDR Understand, GO for staging. And - -  
00 00 08 57 CC Stand by for mode IV capability.  
00 00 08 59 CDR Okay. Mode IV.  
00 00 09 00 CC MARK.  
00 00 09 01 CC Mode IV capability.  
00 00 09 15 CDR Staging -  
00 00 09 16 CDR - And ignition.  
00 00 09 19 CC Ignition confirmed; thrust is GO, 11.  
00 00 10 01 CC Apollo 11, this is Houston. At 10 minutes, you  
are GO.  
00 00 10 06 CDR Roger. 11's GO.  
00 00 10 24 CC Apollo 11, this is Houston. Predicted cut-off  
at 11 plus 42. Over.  
00 00 10 29 CDR 11 42. Roger.  
00 00 11 03 CC Apollo 11, this is Houston. You are GO at 11.  
00 00 11 08 CDR Good deal.  
00 00 11 42 CDR Shutdown.  
00 00 11 45 CMP SECO. We are showing 101.4 by 103.6.  
00 00 11 51 CC Roger. Shutdown. We copy 101.4 by 103.6.  
00 00 12 06 CC Apollo 11, this is Houston. You are confirmed  
GO for orbit.

00 00 12 12      CIR      Roger.  
00 00 12 24      CC      Apollo 11, this is Houston. The booster is safe.  
00 00 12 29      CDR      Roger.

VANGUARD (REV 1)

00 00 13 27      CC      Apollo 11, this is Houston. The booster has been configured for orbital coast. Both spacecraft are looking good. Over.  
00 00 13 35      CIR      Roger.  
00 00 14 33      CC      Apollo 11, this is Houston. Vanguard LOS at 15 35; AOS Canaries at 16 30. Over.  
00 00 14 43      CDR      Okay. Thank you.

CANARY (REV 1)

00 00 17 38      CT      ... Houston COMM TECH. Canary COMM TECH.  
00 00 18 18      CC      Apollo 11, this is Houston through Canary. Over.  
00 00 18 23      CDR      Roger. Reading you loud and clear. Our insertion checklist is complete, and we have no abnormalities.  
00 00 18 30      CC      Roger. And I'd like to pass up your Delta azimuth correction at this time if you're ready to copy.  
00 00 18 36      CDI      Stand by.  
00 00 18 40      CDF      Roger. Go ahead. Ready to copy.  
00 00 18 42      CC      Okay. Delta azimuth correction is plus 0.22, that is plus 0.22, and we do recommend the P52 alignment. Over.  
00 00 18 54      CDR      Okay. We'll go ahead with the P52, and detecting angle plus 0.22.  
00 00 19 01      CC      Roger. And your LOS time at Canary is 23 37. Over.  
00 00 19 09      CDR      23 37.

00 00 19 11 CC Houston. Roger. Out.

00 00 22 41 CC Apollo 11, this is Houston. One minute to LOS Canary; AOS at Tananarive 37 04 in VHF Simplex Alfa. Over.

00 00 23 08 CC Apollo 11, this is Houston. Coming up on LOS Canary; AOS Tananarive at 37 04, Simplex Alfa. Houston. Out.

00 00 23 23 CDR Apollo. Roger.

TANANARIVE (REV 1)

00 00 38 37 CC Apollo 11, this is Houston through Tananarive. Over.

00 00 38 50 CC Apollo 11, Apollo 11, this is Houston through Tananarive. Over.

00 00 39 04 CDR Houston, Apollo 11. Read you on VHF A Simplex. How do you read? Over.

00 00 39 10 CC Roger, 11. This is Houston. We're reading you loud and fairly clearly. For your information, Canary radar shows you in a 103.0 by 103.0 orbit. Over.

00 00 39 25 CDR Beautiful.

00 00 39 27 CC Roger. We concur.

00 00 39 31 CDR ... We're just coming into the terminator here.

00 00 41 44 CC Apollo 11, this is Houston. One minute to LOS Tananarive; AOS Carnarvon is at 52 15. Over.

00 00 41 54 CDR All alone. Roger.

00 00 43 13 CT TAN LOS.

CARNARVON (REV 1)

00 00 53 03 CC Apollo 11, this is Houston through Carnarvon. Over.

00 00 53 08 LMP Houston, Apollo 11. Loud and clear. Over.

00 00 53 11 CC Roger, 11. We're reading you the same. Both the booster and the spacecraft are looking good to us. Over.

00 00 53 26 LMP Houston, Apollo 11. Would you like to copy the alignment results?

00 00 53 31 CC That's affirmative.

00 00 53 35 LMP Okay. NOUN 71: we used 30 and 37, four balls 1; NOUN 93: plus 00016, plus 00033, plus 00152; GET 00 48 15; check star 34. Over.

00 00 54 02 CC Roger. Say again check star.

00 00 54 06 LMP Check star 34.

00 00 54 09 CC Roger. We copy. And the angles look good.

00 00 54 13 CMP And tell Glenn Parker down at the Cape that he lucked out.

00 00 54 17 CC Understand. Tell Glenn Parker he lucked out.

00 00 54 22 CMP Yes. He lucked out. He doesn't owe me a cup of coffee.

00 00 54 26 CC This is Houston. Roger. We'll pass it on.

00 00 57 27 CC Apollo 11, this is Houston. One minute to LOS Carnarvon; AOS at Honeysuckle 59 33. Over.

00 00 57 37 CDL Apollo 11. Roger.

00 00 57 40 CC Roger. And we request you turn up S-band volume for the Honeysuckle pass.

HONEYSUCKLE (REV 1)

00 01 02 48 CC Apollo 11, Apollo 11, this is Houston on S-band. Radio check. Over.

00 01 02 55 CDF Roger, Houston. Apollo 11 reads you loud and clear.

00 01 02 58 CC This is Houston. Roger. Reading you the same. Out.

00 01 04 24 CC Apollo 11, this is Houston. A little over 1 minute to LOS at Honeysuckle. You'll be AOS at Goldstone at 1 29 02; LOS at Goldstone 1 33 55. Over.



00 01 04 47      CMP      Roger, Bruce. Thank you. We expect TV. We've got it all hooked up. We have not yet turned it on. We're ready to do that now.

00 01 04 55      CC      Roger. We copy. We'll be configured and waiting for whatever you want to send down.

GUAYMAS (REV 1)

00 01 29 09      CC      Apollo 11, this is Houston through Guaymas. Over.

00 01 29 14      CDH:      Roger, Houston. Reading you loud and clear.

00 01 29 17      CC      Roger. Reading you the same. Coming up on AOS Goldstone.

00 01 29 20      CDH:      Roger.

END OF TAPE

NOTE

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

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GUAYMAS (REV 1)

00 01 29 27 LMP Cecil B. deAldrin is standing by for instructions.

00 01 29 32 CC Houston. Roger.

00 01 31 15 CC Apollo 11, this is Houston. We are not receiving your FM downlink yet. We are standing by.

00 01 31 56 CC Apollo 11, this is Houston. We are receiving your FM downlink now. We are standing by for TV modulations on the signal.

00 01 32 23 CC Apollo 11, Apollo 11, this is Houston. Radio check. Over.

GOLDSTONE (REV 1)

00 01 32 27 CDR Roger. Loud and clear. We think we are transmitting to you.

00 01 32 31 CC Okay. We are not receiving it yet, 11, although we have confirmed presence of your FM downlink carrier.

00 01 32 39 CDR Which switches do you want us to confirm?

00 01 32 42 CC Stand by.

TEXAS (REV 1)

00 01 33 11 CC Apollo 11, this is Houston. You were just on the fringes of coverage from Goldstone. We have just had LOS at Goldstone, and we'd like to push on and get the PAD messages read up to you here shortly.

00 01 33 26 CDR Roger. We are ready to copy.

00 01 34 33 CC Apollo 11, this is Houston. I am ready with your TLI-plus-90-minute abort PAD.

00 01 34 55 CC Apollo 11, this is Houston. I am ready with your TLI-plus-90-minute abort PAD.

00 01 35 00 CDR Roger. Apollo 11 is ready to copy TLI plus 90.

00 01 35 03 CMP Go.

00 01 35 05 CC Roger. TLI plus 90, SPS G&N: 63481, minus 153, plus 132; GETI 004 10 25 38; NOUN 81, minus 04761, plus 00001, plus 53361; roll 180 193 000; HA is NA; plus 00203 53573 633 53349, sextant star 33 1578 122. The boresight star is not available. Latitude minus 0252, minus 02580 11887 34345 016 03 50. GDC align Vega and Deneb. Roll 071 291 341. No ullage, undocked. I have your P37 for TLI plus 5 hours. Over.

00 01 37 08 CMP Go ahead, TLI plus 5.

00 01 37 11 CC Roger. P37 format, TLI plus 5: 00744 6485, minus 165, 02506. Read back. Over.

00 01 37 31 CMP Roger. TLI plus 90, SPS G&N: 63481, minus 153, plus 132, 004 10 25 38, minus 04761, plus 00001, plus 53361, 180 193 000, not applicable, plus 00203 53573 633 53349, 33 1578 122, not available, minus 0252, minus 02580 11887 34345 016 03 50. Vega and Deneb, 071 291 341. No ullage, undocked. P37, TLI plus 5: 00744 6485, minus 165 02506. Over.

00 01 39 04 CC Apollo 11, this is Houston. Readback correct. For your information, Goldstone reports receiving approximately 1 minute of FM downlink carrier. We were getting ready to request you confirm on the S-band AUX switches, the S-band AUX tape switch to OFF and the S-band AUX TV switch to TV. Over.

00 01 39 29 CDR I confirm that that is the configuration we're in.

00 01 39 33 CC Roger. Let us do a little more detective work here and we'll see if we can come up with something.

00 01 39 38 CDR Okay.

00 01 39 54 CDR Houston, Apollo 11 is ready to go ahead with the - extend the docking probe, and ready to go with the RCS hot fire when you're ready to monitor. Over.

00 01 40 06 CC Roger. Go ahead with the probe, now.

00 01 40 13 CDR Roger.

00 01 41 33 CDR Okay. We're ready to - for the hot fire check when you're ready.

00 01 41 39 CC Roger. We're ready 11. Go ahead.

00 01 41 48 CDR Roger. Here's the pitch.

00 01 42 13 CC Apollo 11, this is Houston. We are seeing the pitch hot firing and it looks good.

00 01 42 18 CDR Roger. Be advised that we are unable to hear them.

00 01 42 22 CC Roger. We copy.

00 01 42 24 CDR Have you seen all three axes fire?

00 01 42 31 CC We've seen pitch and yaw; we've not seen roll to date.

00 01 42 36 CDR Okay. I'll put in a couple more rolls.

00 01 42 42 CC Okay. We've got the roll impulses, and you're looking good here.

00 01 42 48 CDR Roger. Houston, Apollo 11. We're standing by for a GO for sequence logic ON.

00 01 43 03 CC Apollo 11, this is Houston. Go ahead and we'll watch you on TM.

00 01 43 07 CDR Okay. Sequence logic, two of them. Sequence logic 1 and 2 coming up and ON.

GRAND BAHAMA ISLANDS (REV 2)

00 01 43 36 CC Apollo 11, this is Houston. You are GO for PYRO ARM.

00 01 43 40 CDR Roger. Thank you.

00 01 43 57 CC Apollo 11, this is Houston. If you will give us POO in ACCEPT, we have a state vector update for you.

00 01 44 04 CDR Roger.

00 01 44 17 CDR You have POO in ACCEPT.

00 01 44 19 CC Roger. It will probably be another 10 or 15 seconds. We're going to go up through the Vanguard. When you are ready to copy, I have your TLI PAD.

00 01 44 26 CMP Roger. Ready to copy TLI PAD.

00 01 44 30 CC Roger. TLI: 23514 179 071 001, burn time 547 104356 35575. Roll for SEP 357 107 041, 301 287 319. TLI 10-minute abort pitch, 223. Read back. Over.

## VANGUARD (REV 2)

00 01 45 23 CMP Roger. TLI PAD: 23514 179 071 001 547 104356 35575 357 107 041 301 287 319. TLI 10-minute abort pitch, 223. Over.

00 01 46 03 CC Apollo 11, this is Houston. Roger. Would you read back DELTA-V<sub>C</sub> prime again? You were cut out by some noise.

00 01 46 09 CMP Okay. Roger. I'm picking up the squeal here, also. DELTA-V<sub>C</sub> 104356. Over.

00 01 46 25 CC Apollo 11, this is Houston. Readback correct. Out.

00 01 47 06 CC Apollo 11, this is Houston. We've completed the uplink; the computer is yours. You can go back to BLOCK. Would you verify that you have extended the probe? Over.

00 01 47 16 CDR Roger. That's verified; the probe is extended.

00 01 47 19 CC Roger. About 2 minutes to LOS on this stateside pass. AOS Canaries at 1 50 13. Over.

00 01 47 28 CDR Roger. 1 50.

## CANARY (REV 2)

00 01 50 42 CC Apollo 11, this is Houston. Over.

00 01 50 45 CDR Roger. Houston, Apollo 11. Loud and clear.

00 01 50 49        CC        Okay. On your service module RCS quad Bravo package temperature, we're showing it running a little low. Looks like about 20 degrees low - lower than the rest of the quads. Would you confirm that your RCS heater switch for quad Bravo is in PRIMARY? Over.

00 01 51 09        CDR        You're correct. It was not in PRIMARY. It was off. It's on now. Thank you.

00 01 51 16        CC        Roger. Thank you.

00 01 53 50        CC        Apollo 11, this is Houston. Over.

00 01 53 54        CMP        Houston, Apollo 11. Go ahead.

00 01 53 56        CC        Roger. We've checked over the spacecraft and the launch vehicle guidance. They're both looking to be in good shape. We estimate you have better than a 99-percent probability of a guidance cut-off on the launch vehicle, so things are apparently holding in very well. For your information, MILA received approximately 1 minute of a usable TV picture, so apparently the system is working. And you're a little over a minute from LOS at Canary; AOS Tananarive is 2 hours 9 minutes and 18 seconds. Over.

00 01 54 34        CMP        Roger. We like those 99 numbers. Thank you.

00 01 54 38        CC        Roger. Out.

TANANARIVE (REV 2)

00 02 09 17        CC        Apollo 11, this is Houston through Tananarive. How do you read?

00 02 09 45        CC        Apollo 11, this is Houston standing by through Tananarive.

00 02 10 03        CT        Tananarive, Houston COMM TECH NET 1.

00 02 10 12        CT        Tananarive, Houston COMM TECH NET 1.

00 02 10 23        CT        Goddard voice, Houston COMM TECH NET 1.

00 02 10 27        MSFN      Goddard voice, reading you loud and clear.

00 02 10 29 CT Roger. We cannot raise Tananarive.

00 02 10 31 CT Houston COMM TECH, Tananarive.

00 02 10 34 CT Roger, Tananarive. Are you receiving CAP COMM's voice, and are you uplinking it?

00 02 10 39 CT Negative.

00 02 10 41 CT Roger. Monitor again and I'll tell CAP COMM to make one more transmission.

00 02 10 51 CT Roger.

00 02 10 56 CC Apollo 11, Apollo 11, this is Houston standing by through Tananarive. Over.

00 02 11 04 CDR Houston, Apollo 11 ...

00 02 11 06 CC Roger. Reading you loud and clear.

00 02 12 35 CDR Houston, Apollo 11. We have the PYRO's armed.

00 02 12 39 CC This is Houston. Roger. Out.

00 02 15 23 CC Apollo 11, this is Houston. One minute to LOS Tananarive; AOS at Carnarvon 02 25 30.

00 02 15 35 CDR Roger.

## CARNARVON (REV 2)

00 02 25 44 CC Apollo 11, this is Houston through Carnarvon. Radio check. Over.

00 02 25 49 CDR Roger, Houston through Carnarvon. Apollo 11. Loud and clear.

00 02 25 53 CC Roger. You're coming in very loud and very clear, here. Out.

00 02 26 38 CC Apollo 11, this is Houston. You are GO for TLI. Over.

00 02 26 45 CMP Apollo 11. Thank you.

00 02 26 48 CC Roger. Out.

00 02 30 11 CC Apollo 11, this is Houston. Over.

00 02 30 16 CDR Houston, 11.



00 02 30 18        CC        Roger. We'll be coming within range of the ARIA aircraft coverage, here, in about 1 minute. They're going to try uplinking both on S-band and on VHF this time. So if you turn your - make sure your S-band volume is turned up, we'd appreciate it. And we believe that we'll have continuous coverage from now on through the TLI burn. Over.

00 02 30 42        CDR        Very good.

ARIA (REV 2)

00 02 32 20        CC        Apollo 11, Apollo 11, this is Houston through ARIA 4. Radio check. Over.

00 02 32 28        LMP        Houston, we read you strength 4 and a little scratchy.

00 02 32 34        CC        Roger. We're reading you strength 5, readability about 3. Should be quite adequate.

00 02 32 42        CC        Apollo 11, Apollo 11, this is Houston. We're reading you readability about 3, strength 5. Sounds pretty good. Over.

00 02 32 54        CDR        Roger. We've got a little static in the background now.

00 02 37 21        CC        Apollo 11, this is Houston through ARIA 3. Radio check. Over.

00 02 37 26        CDR        Roger. Houston, Apollo 11. You are much clearer and adequately loud. Over.

00 02 37 32        CC        Roger, 11. You are coming in five-by-five here. Beautiful signal.

00 02 37 38        CDR        This is a lot better than that static we had previously.

00 02 37 41        CC        Okay.

00 02 37 48        CMP        And we got the time base fix indication on time.

00 02 37 50        CC        This is Houston. Roger. Out.

00 02 40 20        CC        Apollo 11, this is Houston. We just got telemetry back down on your booster, and it is looking good.

00 02 40 30 CDR Roger. Everything looks good here.

00 02 40 34 CC Houston, Roger. Out.

00 02 43 18 CC Apollo 11, this is Houston. Slightly less than 1 minute to ignition, and everthing is GO.

00 02 43 25 CMI' Roger.

00 02 44 19 CMI' Ignition.

00 02 44 27 CC We confirm ignition, and the thrust is GO.

00 02 45 14 CC Apollo 11, this is Houston at 1 minute. Trajectory and guidance look good, and the stage is good. Over.

00 02 45 23 CDF Apollo 11. Roger.

00 02 46 26 CC Apollo 11, this is Houston. Thrust is good. Everything's still looking good.

00 02 46 32 CDF Roger.

00 02 47 54 CC Apollo 11, this is Houston. Around 3-1/2 minutes. You're still looking good. Your predicted cut-off is right on the nominal.

00 02 48 04 CDR Roger. Apollo 11 is GO.

00 02 49 18 CC Apollo 11, this is Houston. You are GO at 5 minutes.

00 02 49 22 CDR Roger. We're GO.

00 02 50 36 CC Apollo 11, this is Houston. We show cut-off and we copy the numbers in NOUN 62.

00 02 50 34 CC Apollo 11, Houston. Do you read?

00 02 51 18 CC Apollo 11, this is Houston. Do you read? Over.

00 02 51 21 LMP Roger, Houston. Apollo 11. We're reading a VI of 35579 and the EMS was plus 3.3. Over.

00 02 51 31 CC Roger. Plus 3.3 on the EMS. And we copy the VI.

00 02 53 03 CDR Hey, Houston, Apollo 11. That Saturn gave us a magnificent ride.

00 02 53 09 CC Roger, 11. We'll pass that on. And, it certainly looks like you are well on your way now.

00 02 53 30 CDR We have no complaints with any of the three stages on that ride. It was beautiful.

00 02 53 38 CC Roger. We copy. No transients at staging of any significance. Over.

00 02 53 44 CDR That's right. It was all - all a good ride.

00 02 53 47 CC Houston. Roger. Out.

00 02 54 09 CC Apollo 11, this is Houston. For your information, we expect the maneuver to separation attitude to begin at 3 plus 05 plus 03, and to be completed at plus 09 plus 20. Separation at 3 plus 15 plus 00.

00 02 54 33 CDR Roger. Time to begin maneuver is 3 05 03, complete 3 09 20. Separation 3 plus 15 00.

00 02 54 46 CC Roger. That separation should be 3 plus 15 03. My error in reading up.

00 02 54 55 CDR Roger.

00 02 55 18 CC Apollo 11, this is Houston. All the booster functions are proceeding normally. The sequencing is in good shape, and it doesn't look like they are having any problems at all. Over.

00 02 55 28 CDR Roger.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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00 03 05 28 CC Apollo 11, this is Houston. Our preliminary data indicates a good cut-off on the S-IVB. We'll have some more trajectory data for you in about half an hour. Over.

00 03 09 01 CC Apollo 11, Apollo 11, this is Houston. Over.

00 03 09 16 CC Apollo 11, Apollo 11, this is Houston. Over.

00 03 09 31 CDR Hello, Houston. Hello, Houston. This is Apollo 11. I'm reading you loud and clear. Go ahead. Over.

00 03 09 37 CC Roger, 11. This is Houston. We had to shift stations. We weren't reading you through Goldstone. We show PYRO bus A armed and PYRO bus B not armed at the present time. Over.

00 03 09 50 CDR That's affirmative, Houston. That's affirmative.

00 03 09 54 CC Roger.

00 03 14 08 CC Apollo 11, this is Houston. You're GO for separation. Our systems recommendation is arm both PYRO buses. Over.

00 03 14 19 CDR Okay. PYRO B coming armed. My intent is to use bottle primary 1, as per the checklist; therefore, I just turned A on.

00 03 14 26 CC Roger. We concur with the logic.

00 03 16 59 CDR Houston, we're about to SEP.

00 03 17 02 CC This is Houston. We copy.

00 03 17 09 CDR SEP is complete.

00 03 17 12 CC Roger.

00 03 17 32 CDR ... and primary and secondary propellant B went ... SEP.

00 03 17 40 CC That was secondary propellant on quad Bravo?

00 03 17 45 CDR Quad Bravo, yes. Both the primary and secondary ...

00 03 17 52 CC Roger. We copy.

00 03 22 07 CC Apollo 11, this is Houston. Radio check. Over.

00 03 23 56 CC Apollo 11, Apollo 11, this is Houston broadcast-  
ing in the blind. Request OMNI Bravo if you read  
us. Request OMNI Bravo. Out.

00 03 24 13 CC Apollo 11, this is Houston. How do you read?

00 03 25 49 CC Apollo 11, this is Houston. How do you read?  
Over.

00 03 26 47 CC Apollo 11, Apollo 11, this is Houston. Do you  
read? Over.

00 03 27 54 CC Apollo 11, this is Houston. Radio check. Over.

00 03 28 11 CC Apollo 11, Apollo 11, this is Houston. Radio  
check. Over.

00 03 29 20 CC Apollo 11, this is Houston. Radio check. Over.

00 03 29 24 CDR Roger. ...

00 03 29 26 CC Roger. We're copying you about five-by-two, very  
weak. Can you give us a status report, please?

00 03 29 35 CDR Roger. We are docked. We do have acquisition  
with the high gain at this time, I think.

00 03 29 44 CC Understand you are using the high gain. Over.

00 03 29 48 CDR That's affirmative.

00 03 29 49 LMP That's affirmative.

00 03 29 51 CC Roger. I read you very loud and clear, Buzz.  
Mike is pretty weak.

00 03 30 00 LMP Roger. We've got the high gain locked on, now,  
I believe; AUTO tracking now.

00 03 30 05 CC Okay. You're coming in loud and clear, but Mike  
is just barely readable.

00 03 30 12 CMP That was Neil. How are you reading Mike?

00 03 30 15 CC Loud and clear now, Mike, and we understand that  
you are docked.

00 03 30 19 CMP That's affirmative.

00 03 30 24 CDR Houston, CDR. How do you read ...?

00 03 30 28       CC       11, CDR, loud and clear, Neil.

00 03 30 30       CDR       Okay.

00 03 32 40       CC       11, this is Houston. Over.

00 03 32 44       CDR       Houston, Apollo 11. Go ahead.

00 03 32 46       CC       Roger. When you commented on that quad Bravo problem at separation, you were a little weak. Could you go through what you did after you noticed the talkbacks barber pole again, please?

00 03 33 20       CC       We copied the - the primary and secondary propellant talkbacks on SM RCS quad Bravo 1 to barber pole on separation.

00 03 33 30       CDR       Roger. Roger. That is affirmative, and we moved that switch to the OPEN position, and they went back to gray. Over.

00 03 33 39       CC       Roger.

00 03 37 51       CC       Apollo 11, this is Houston. Over.

00 03 37 56       CMP       Roger, Houston. Apollo 11. Go ahead.

00 03 37 58       CC       Roger. Could you give us comments on how the transposition and docking went? Over.

00 03 38 07       CMP       I thought it went pretty well, Houston, although I expect I used more gas than I've been using in the simulator. The turnaround maneuver - I went PITCH ACCEL COMMAND and started to pitch up, and then when I put MANUAL ATTITUDE PITCH back to RATE COMMAND for some reason it - it stopped its pitch rate, and I had to go back to ACCEL COMMAND and hit what I thought was an extra PROCEED on the DSKY. During the course of that, we drifted slightly further away from the S-IVB than I expected. I expected to be out about 60 feet. My guess would be I was around 100 or so; and therefore, I expect I used a bit more coming back in. But, except for using a little more gas - And I'd be interested in your numbers on that - everything went nominally.

00 03 38 53       CC       This is Houston. Roger. We copy.

00 03 43 45       CMP       Houston, Apollo 11. Over.

00 03 43 47       CC       Go ahead, 11.

00 03 43 50       CMP       Roger. We're working on the pressurization of the LM now, and working off the decal with CSM-LM pressure equalization. And we're down to step 13, where we're waiting for the cabin pressure to be 5, or it should be roughly 5, before we turn the REPRESS package O<sub>2</sub> valve to FILL. Instead of 5, we're running about 4.4. Over.

00 03 44 16       CC       Roger. Stand by a second.

00 03 44 55       CMP       And Houston, Apollo 11. We did put the REPRESS package O<sub>2</sub> valve to FILL momentarily there at step 13, and we have filled the bottles back up partially. What's the pressure reading in there, Neil?

00 03 45 17       CMP       We have about 450 psi now in the three 1-pound bottles.

00 03 45 23       CC       Roger. Stand by a second, please.

00 03 45 25       CMP       Roger. Standing by. The REPRESS package valve is now in the OFF position. What's the cabin pressure now, Buzz? Cabin pressure is now 4.5.

00 03 47 49       CDR       Houston, Apollo 11. We think these readings are within normal tolerances. We just wanted to get your concurrence before we press down any further with these decals.

00 03 48 01       CC       Okay, Captain.

00 03 48 08       LMP       Houston, Apollo 11. How do you read?

00 03 48 32       CC       Apollo 11, this is Houston. Go ahead.

00 03 48 35       LMP       Roger. LM looks to be in pretty fine shape from about all we can see from here.

00 03 48 43       CC       Okay. In reference to your question on this step 13 on the decal, I understand that you have used up the contents of the REPRESS O<sub>2</sub> package and at that time, instead of being up to 5 psi, you were reading 4.4. Is that correct?

00 03 49 07       CMP       Okay. 4.4. Yes sir.

00 03 49 11       CC       Okay. And you want to know if you can go ahead and use additional oxygen to bring the command module up to 5.0 and continue the equalization? Over.

00 03 49 20 CMP Yes. We think it's within normal tolerances, Bruce. We just wanted to get your concurrence before we press on with this procedure.

00 03 49 33 CC Roger, Apollo 11. Go ahead.

00 03 49 37 CMP Okay. We're pressing on with the procedure.

00 03 49 40 CC And 11, Houston. We have a request for you. On the service module secondary propellant fuel pressurization valve: As a precautionary measure, we'd like you to momentarily cycle the four switches to the CLOSE position and then release. As you know, we have no TM or talkback on these valve positions, and it's conceivable that one of them might also have been moved into a different position by the shock of separation. Over.

00 03 50 11 CMP Okay. Good idea. That's being done.

00 03 50 14 CC Houston. Roger. Out.

00 03 50 29 CC Apollo 11, Houston. We're doing a nonpropulsive vent on the booster at the present time. You may see some sort of a cloud coming out of it. When you're ready, I have your evasive maneuver PAD.

00 03 50 44 CDF Roger. And it's coming out.

00 03 50 48 CC Roger. Out.

00 03 50 50 CDR It's a haze. It's going by toward our minus-X direction, and several small particles are moving along with it. The actual velocity is fairly high - at least it appears to be high. And we've got an O<sub>2</sub> high - it's a little high right now.

00 03 51 13 CC Houston. Roger. Out.

00 03 53 05 CDR And, Houston, you might be interested that out my left-hand window right now, I can observe the entire continent of North America, Alaska, and over the Pole, down to the Yucatan Peninsula, Cuba, northern part of South America, and then I run out of window.

00 03 53 27 CC Roger. We copy.

00 03 57 12 LMP Houston, Apollo 11. All 12 latches are locked.



00 03 57 16 CC Roger. 11, this is Houston. Understand 12 latches locked.

00 03 59 03 CC 11, Houston. Whenever you're possessed of a free moment there, we've got this evasive maneuver PAD.

00 03 59 12 LMP Okay.

00 03 59 20 LMP Go ahead, Houston. Apollo 11 is ready to copy.

00 03 59 24 CC Apollo 11, this is Houston. Evasive maneuver SPS G&N: 63481, plus 095, minus 020; GETI 004 40 0100, plus 00051, plus all balls, plus 00190; roll is your option, pitch 213 357; NOUN 44 is NA; DELTA-V<sub>T</sub> is 00197 003 00152.  
The rest of the PAD is NA. No ullage. LM weight 33 290. Read back. Over.

00 04 01 23 CC Apollo 11, this is Houston. Standing by for your readback. Over.

00 04 02 06 CC 11, Houston. Do you read? Over.

00 04 02 25 CC Apollo 11, this is Houston. Do you read? Over.

00 04 02 31 LMP All of a sudden there, we heard a little click, and the signal strength began to start dropping off. Your transmissions were cut off very abruptly. How do you read now?

00 04 02 42 CC Roger. Loud and clear. We had a handover to Madrid about the time I was - I guess halfway through the PAD. If you could give me the last value you read, I'll pick up there. Over.

00 04 02 52 LMP Okay. Start with DELTA-V<sub>Z</sub>. Over.

00 04 02 56 CC Roger. DELTA-V<sub>Z</sub> is plus 00190, roll your option, pitch 213 357, and NOUN 44 is NA. DELTA-V<sub>T</sub> 00197 003 00152. The rest of the PAD is NA, and no ullage. LM weight 33 290. Read back. Over.

00 04 03 41 LMP Roger, Houston. Evasive maneuver SPS G&N: 63481, plus 095, minus 020 004 40 0100, plus 00051, plus all zeros, plus 00190, roll crew option, 213 357, NA, 00197 003 00152, no ullage, LM weight 33 290. Over.

00 04 04 27 CC 11, this is Houston. Readback correct. Out.

00 04 13 33 CDR Houston, Apollo 11.

00 04 13 36 CC Go ahead, 11.

00 04 13 37 CDR We'd like to arm our logic switches.

00 04 13 42 CC Go ahead with the logic.

00 04 13 45 CDR Okay. Mark logic 1 and 2 armed.

00 04 13 59 CC Roger. We show the logic arm, and you're GO for PYRO arm.

00 04 16 38 CDF Houston, we're ready for LM ejection.

00 04 16 45 CC Roger. You're GO for LM ejection.

00 04 16 48 CDR Thank you.

00 04 17 13 CDR Houston, we are SEP. We have a CRYO PRESS light.

00 04 17 18 CC Roger. Copy. CRYO PRESS light.

00 04 17 46 CC Roger, 11. We recommend you turn the O<sub>2</sub> fans on manually and ensure that the O<sub>2</sub> heaters are in the AUTOMATIC position.

00 04 17 57 CDR Roger. O<sub>2</sub> heaters are ON, and we're going to cycle the O<sub>2</sub> fans now.

00 04 18 02 CC Roger. O<sub>2</sub> heaters to AUTO, or you can watch them in the ON position, and O<sub>2</sub> fans manual ON.

00 04 28 16 CC Apollo 11, this is Houston. Over.

00 04 28 21 CMP Houston, Apollo 11.

00 04 28 23 CC Roger. In reference to your question on RCS usage: it looks like you are about 18, maybe 20 pounds below nominal at the present time. No problem at all. Over.

00 04 28 35 CMP Right.

00 04 28 45 CMP I wanted to be 18 or 20 pounds above nominal, babe.

00 04 28 49 CC Sorry about that.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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00 04 37 40 CC 11, Houston. Your systems are looking good. We're standing by for the burn.

00 04 40 42 CMP Houston, Apollo 11. Could you confirm that pitch gimbal motor number 1 turned off? We just shut all four off, and we got a questionable indication on the ECS on pitch 1.

00 04 41 01 CC Roger. Stand by a second.

00 04 41 22 CMP Houston, did you copy our residuals?

00 04 41 24 CC Apollo 11, this is Houston. Stand by, please.

00 04 41 33 CMP Go ahead, Houston. Did you copy our residuals?

00 04 41 37 CC Roger. We got 00 and 0.2, it looks like.

00 04 41 42 CMP We had 0.1 while ago. It's - just went to 0.2.

00 04 41 46 CC Okay.

00 04 41 47 CIR That EMS DELTA-V counter is minus 4.0.

00 04 41 51 CC Minus 4.0. Roger.

00 04 41 54 CIR And how about pitch gimbal 1? Can you confirm that OFF?

00 04 41 57 CC Can you stand by just a second on that? At the present time we cannot confirm it OFF. We saw a current drop indicating that several gimbal motors had gone off. We'll be back with you in just a second on it. Over.

00 04 42 10 CDR Okay. If necessary, we can recycle it.

00 04 43 47 CC Apollo 11, this is Houston. If you'll go ahead and cycle pitch gimbal motor number 1 on and then off and give us a Mark, and we'll tell you what we see. Over.

00 04 43 54 CDR Okay, fine. It's coming back on. Ready.

00 04 44 01 CDR MARK.

00 04 44 04 CDR And it's going back off. Ready.

00 04 44 06 CDR MARK.

00 04 44 07 CDR And that time we got an onboard indication, Houston. Thank you a lot.

00 04 44 12 CC Roger. We confirm that it is OFF.

00 04 44 16 CDR Yes. We do likewise.

00 04 45 33 CMP Houston, Apollo 11. We're starting our maneuver to observe the S-IVB slingshot.

00 04 45 39 CC Roger, 11. We've got an updated attitude for you on the slingshot observation.

00 04 45 45 CMP Okay. Say the angles please.

00 04 45 48 CC Roger. Roll 002.5, pitch 289.3, yaw 357.5, and there's also an update - minor correction to your attitude for the P52. Over.

00 04 46 15 CMP Roger. I have roll 002.5, pitch 289.3, and yaw 357.5. Over.

00 04 46 23 CC Roger. And for your P52 and optics calibration, it'll be roll 346.5, pitch 345.0, and yaw 007.8. Over.

00 04 46 44 CMP Roger. 346.5, 345.0, and 007.8. Thank you.

00 04 46 49 CC Houston. Roger. Out.

00 04 49 33 CC Apollo 11, this is Houston. Over.

00 04 49 36 CMP Roger. Go ahead, Houston. Apollo 11.

00 04 49 38 CC Roger. We're going to go ahead and enable the S-IVB for the slingshot maneuver. The LOX dump will start about 12 minutes from now. Over.

00 04 49 49 CMP Okay, LOX dump about - I guess that'll make it about 01, huh?

00 04 49 57 CC Right. I'll try to give you a little closer update as we approach it.

00 04 50 01 CMP Alrighty.

00 04 50 53 CC And, 11, for you information, the magnitude of midcourse correction number 1, if we burn, looks like about 17 feet per second. We're presently considering not burning it. This would make midcourse correction 2 tomorrow about 21.3. Over.

00 04 51 18 CDR That sounds good to us.

00 04 51 19           CC           Roger. You're looking good down here.

00 04 52 19           CLR           Well, we didn't have much time, Houston, to talk to you about our views out the window when we were preparing for LM ejection; but up to that time, we had the entire northern part of the lighted hemisphere visible including North America, North Atlantic, and Europe and Northern Africa. We could see that the weather was good all - just about everywhere. There was one cyclonic depression in Northern Canada, in the Athabaska - probably east of Athabaska area. Greenland was clear, and it appeared to be we were seeing just the icecap in Greenland. All North Atlantic was pretty good; and Europe and Northern Africa seemed to be clear. Most of the United States was clear. There was a low - looked like a front stretching from the center of the country up across north of the Great Lakes and into Newfoundland.

00 04 53 24           CC           Roger. We copy.

00 04 53 28           CMP           I didn't know what I was looking at, but I sure did like it.

00 04 53 31           CC           Okay. I guess the view must be pretty good from up there. We show you just roughly somewhere around 19 000 miles out now.

00 04 53 43           CMP           I didn't have much outside my window.

00 04 53 49           CC           We'll get you into the PTC one of these days, and you take turns looking.

00 04 57 35           CMP           Houston, Apollo 11. We've completed our maneuver to observe the slingshot attitude, but we don't see anything - no Earth and no S-IVB.

00 04 57 48           CC           Roger. Stand by. In GET I have a LOX dump start time for you. It's supposed to start at 5 plus 03 plus 07, and stop at 5 plus 04 plus 55. Ullage burn starts at 5 plus 37 plus 47, stops at 5 plus 42 plus 27. Over.

00 04 58 26           CMP           Roger. Thank you.

00 05 00 48           CC           11, Houston.

00 05 00 51           CDR           Go ahead, Houston.

00 05 00 53        CC        Roger. We now recommend the following attitude: roll 307.0, pitch 354.0, yaw 019.5, and the LOX dump has already been enabled, so we can't hold it off any longer.

00 05 01 14        CMP        That's okay. Go ahead. We'll maneuver around to 307, 354, and 19 and a half. Thank you sir.

00 05 01 21        CC        Roger.

00 05 01 42        CC        11, Houston. It doesn't look to us like you'll be able to make it around to this observation attitude in 2 minutes. We recommend that you save the fuel. Over.

00 05 01 54        CMP        Okay, Houston. You got to us just a little late. Our maneuver's already begun, so it's going to cost us about the same amount of fuel to stop it, no matter where we stop it, and we may as well keep going.

00 05 02 04        CC        Roger. Go ahead.

00 05 03 19        CC        11, Houston. LOX dump initiated.

00 05 05 06        CC        11, Houston. LOX dump has been terminated. Over.

00 05 05 10        CMP        Roger.

00 05 05 13        LMP        Roger. We still don't have ...

00 05 05 18        CC        Roger. Out.

00 05 12 58        CC        Apollo 11, this is Houston. Over.

00 05 13 03        CDR        Go ahead.

00 05 13 05        CC        Roger. If you'll give us ACCEPT and stay in POO, we'll set your trunnion bias to zero. And, I have a plan for balancing your oxygen CRYO's. Over.

00 05 13 19        CDR        You got it.

00 05 13 21        CC        Roger.

00 05 13 26        LMP        Houston, Apollo 11. We've got the - what appears to be the S-IVB in sight - at - oh, I'd estimate a couple of miles away. It's at our number 5 window and the dump appears to

be coming out of two radially opposite directions from the S-IVB.

00 05 13 51      CC      Roger. They're continuing with the nonpropulsion vent from the liquid oxygen tank. It would be radially opposite, then. And boosters tell me it's the continuous vent system. They're also dumping a small amount of fuel at this time. We've got about 23-1/2 minutes or so until the APS burn. Over.

00 05 14 25      LMP      Roger.

00 05 14 46      CC      11, Houston. We have a recommended configuration for your CRYO switches to even up the load between oxygen tanks 1 and 2. Over.

00 05 14 55      SC      ...

00 05 14 59      CC      Okay. You're coming in very weakly there. We're recommending O<sub>2</sub> tank 1 heater OFF, O<sub>2</sub> tank 2 heater to AUTO, O<sub>2</sub> tanks 1 and 2 fans both OFF, H<sub>2</sub> tank 1 heaters to AUTO, and H<sub>2</sub> tank 1 heaters to AUTO, and H<sub>2</sub> tank 2 heaters to OFF. Over.

00 05 15 33      LMP      Roger. We have that except the last one was H<sub>2</sub> fans to OFF. Is that affirmative?

00 05 15 49      CDR      We have - The configuration we have now is - Hydrogen heaters: we got 1 AUTO, 2 OFF. Oxygen heaters: 1 OFF, 2 AUTO. And we have all the fans OFF.

00 05 16 02      CC      This is Houston. Roger. We concur. Out.

00 05 16 13      CC      11, this is Houston. We've completed the trunion zero bias setting. You can retrieve the computer and go to BLOCK.

00 05 16 23      CDR      Roger that. Thank you.

00 05 19 21      CC      11, this is Houston. With this maneuvering to observe the slingshot, I guess we missed copying your IM/CM DELTA-P reading. Over.

00 05 19 33      CME      Stand by. We'll give you a ...

00 05 19 35 CC Roger.

00 05 19 47 CMP Right now, reading 0.2, Bruce.

00 05 19 49 CC Roger. 0.2.

00 05 20 00 CC Okay, Mike. And could you verify that your waste compartment valve is in VENT, there?

00 05 20 12 CMP Roger. Waste compartment valve has been in VENT for - oh, I guess, 45 minutes or so.

00 05 20 17 CC Roger. We copy.

00 05 20 31 CMP If we're late in answering you, it's because we're munching sandwiches.

00 05 20 36 CC Roger. I wish I could do the same here.

00 05 20 40 CMP No. Don't leave the console!

00 05 20 42 CC Don't worry. I won't.

00 05 20 47 CMP FLIGHT doesn't like it.

00 05 20 54 CMP How is FLIGHT today?

00 05 20 58 CC Oh, he's doing quite well.

00 05 23 41 CDR Houston, 11.

00 05 23 44 CC Go ahead, 11.

00 05 23 48 CDR Down in the control center you might want to join us in wishing Dr. George Mueller a happy birthday.

00 05 23 55 CC Roger. We are standing by for your birthday greetings.

00 05 24 05 CDR I think today is also the birthday of California, and I believe they are 200 years old, and we send them a happy birthday. And I think it's Dr. Mueller's birthday, also, and I don't think he is that old.

00 05 24 25 CC Roger. We copy. I'm looking back in the viewing room right now. I don't see him back there.

00 05 24 33 CDR He may not be back from the Cape yet.



00 05 24 43 CC Roger. I believe Dr. Mueller is on his way back from the Cape. We will relay his greetings for you.

00 05 24 49 CDR Thank you.

00 05 28 18 CC 11, this is Houston. Over.

00 05 28 22 LMP Go ahead, Houston.

00 05 28 24 CC Roger. At your convenience, we would like to get a waste-water dump to 5 percent remaining. After completion of this one, the next waste-water dump will be at about GET equal to 25 hours. Over.

00 05 28 42 CMP Coming on right now.

00 05 28 44 CC Roger.

00 05 35 27 CMP Houston, Apollo 11. Did you copy our torquing angles?

00 05 35 31 CC Roger. Leave them on there probably a second, please.

00 05 35 34 CMP Will do.

00 05 36 22 CC 11, this is Houston. We copy the angles, but stand by before you go ahead and use them. Over.

00 05 36 29 CMP Standing by.

00 05 36 33 CC 11, Houston. We request that you redo P52, and if the angles come out the same magnitude, go ahead and incorporate them. Over.

00 05 36 42 CME Okay. We'll do that.

00 05 36 44 CC They look a little large right now.

00 05 36 47 CMP Yes. Roll - roll locks a little large, especially, there.

00 05 36 50 CC Roger.

00 05 37 31 CC We're showing a waste-water quantity of about 13 percent on TM now, 11. Over.

00 05 37 43 CMP Roger. It's off, now.

00 05 37 45        CC        Roger. We copy.

00 05 39 32        CMP        Houston, Apollo 11. Torquing angles essentially the same, and we're going to go ahead and torque them now.

00 05 39 41        CC        Roger. We concur.

00 05 39 43        CMP        Okay.

00 05 41 35        CC        Apollo 11, this is Houston. Could you give us a - an AJTO optics check to a third star or a different star from the one you've been using?

00 05 41 45        CMP        Sure, be glad to. I can go back and do the whole thing and pick different stars.

00 05 41 52        CC        I don't think there - there's any need to do that. We'd just like to confirm it with a different star, since that roll angle was a little larger than we expected.

00 05 42 03        CMP        Okay.

00 05 43 25        CC        Apollo 11, Houston. I have a TLI-plus-11-hour PAD when you're ready to copy.

00 05 43 33        LMP        Wait one.

00 05 44 17        CMP        Old star number 30 looks like it is right dab smack in the middle of the sextant.

00 05 44 24        CC        Houston. Roger. Out.

00 05 45 27        LMP        11. Ready to copy.

00 05 45 31        CC        Roger, 11. This is TLI-plus-11-hours, P37 format: 01344 4793, minus 165 04923. Read back. Over.

00 05 45 57        LMP        Roger. 01344 4793, minus 165 04923. Over.

00 05 46 07        CC        This is Houston. Readback correct. Out.

00 05 58 35        CDR        Houston, Apollo 11.

00 05 58 38        CC        Go ahead, 11.

00 05 58 40        CDR        Roger. Do you have any update for the roll, pitch and yaw angles on the top of page 37 in the flight plan, or are they still good?

00 05 58 48        CC        That's for the optics calibration?

00 05 58 51        CDR        Yes, sir.

00 05 58 53        CC        Yes, indeed. I'll give them to you in just  
a second here.

00 05 59 18        CC        Roger, 11. For the optics calibration I've  
got 346.5 for roll, 345.0 for pitch, and  
007.8 for yaw. The pen-and-ink attitude  
corrections in your book for P23 are good. Over.

00 05 59 50        CDR        Okay. Thank you.

00 05 59 55        CC        And we're going to hand over to Hawaii in about  
5 or 6 seconds, here. We'll have a momentary  
COMM dropout.

00 06 00 02        CDR        Roger.

00 06 09 17        CC        Hello, Apollo 11. Houston. Be advised your  
friendly White Team has come on for its first  
shift, and if we can be of service, don't  
hesitate to call.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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00 06 09 31 CMP Thank you very much. And we're about to take our marks, Charlie, on this P23 optics CAL. I've got it in the sextant now, and I'm about to split the image and Mark.

00 06 09 42 CC Roger, Mike. We're watching.

00 06 19 23 CC Hello, Apollo 11. Houston. We have scrubbed the midcourse 1. Over.

00 06 19 30 CMP Roger. Understand you've scrubbed midcourse 1.

00 06 19 33 CC Roger.

00 06 21 39 CC Hello, Apollo 11. Houston. We see your middle gimbal angle getting pretty big. Over.

00 06 21 45 CMP Well, it was, Charlie, but in going from one AUTO maneuver to another, we took over control and have gone around gimbal lock; and we're about to give control back to the DAP.

00 06 21 56 CC Roger, Mike. We see it increasing now.

00 06 25 25 LMP Hey, Charlie.

00 06 25 45 LMP Houston, Apollo 11.

00 06 25 46 CC Go ahead, 11. Over.

00 06 25 47 LMP Hey, maybe you better call Lou and tell him we might be a little bit late for dinner.

00 06 25 51 CC Okay. Sure will. We'd like for you to turn on - the fan on in O<sub>2</sub> tank number 2, Buzz. And, 11, did you - On your optics calibrations, did you proceed or recall the program? Over.

00 06 26 08 LMP We recalled the program.

00 06 26 12 CC Roger.

00 06 26 13 LMP And O<sub>2</sub> fan number 2 is on.

00 06 26 15 CC Roger.

00 06 26 42 LMP Houston, Apollo 11. I've got a CRYO pressure light and a MASTER ALARM. It's reset.

00 06 26 51 CC Roger. We expected that. That's why we had you turn the fan on. We were getting pretty

close to the caution and warning limits. We were trying to prevent that.

00 06 27 00 LMP Okay.

00 06 34 30 CMP Houston, Apollo 11.

00 06 34 36 CC Go ahead, 11. Over.

00 06 34 39 CMP Roger. You're looking at our DELTA-R DELTA-V. It looks like DELTA-R is pretty large, there. We wanted to talk to you about it before we incorporate it.

00 06 34 44 CC Stand by, Mike. We don't have anything on our downlink here, I don't think, on the DSKY. Stand by.

00 06 34 50 CMP Okay. Our NOUN 49 is reading: register 1, plus 08793; register 2, all balls.

00 06 35 01 CC Copy.

00 06 36 15 CC 11, Houston. Guidance is looking at the NOUN 40 - 49 stuff. We'll be back with you momentarily. Over.

00 06 36 23 CMP Okay, Charlie. Thank you. We'll just hold right here in the program.

00 06 36 26 CC Roger. We got the downlink now. Over.

00 06 36 27 CMP Okay.

00 06 36 57 CC Hello, Apollo 11. Houston. We'd like you to reject the NOUN 49 stuff on the DSKY right now, Mike, and try it again. Over.

00 06 37 01 CMP Okay. Will do.

00 06 38 46 CMP Okay, Houston. Apollo 11. Here's another 49 for you. Are you getting it on the downlink?

00 06 38 51 CC Roger. We see it. Stand by.

00 06 40 22 CC Hello, Apollo 11. Houston. We recommend you accept the NOUN 49 display on the DSKY now. Over.

00 06 40 34 CMP Okay. It looks like an awful big one. We noticed that you'd moved star number 2 to the

tail end of the listing, and we should be marking first on star 40. Did that have anything to do with it?

00 06 40 47 CC Negative. We don't believe so, Apollo 11. We think that this is possibly due to some TLI dispersions, and it's probably satisfactory. So go ahead and accept this. It fits our criteria anyway that if you repeat the mark and you get an equivalent size to go ahead and accept it. And this is an equivalent size error. Over.

00 06 41 09 CMP Okay. We'll do it.

00 06 41 14 CC And 11, Houston. Your state vector in the LM slots are - is good. Over.

00 06 41 22 CMP Roger. Thank you.

00 06 42 55 CMP Houston, Apollo 11. If you like this, we'll accept it as well.

00 06 43 00 CC Stand by.

00 06 43 46 CC Hello, Apollo 11. Houston. We recommend you accept the NOUN 49. Over.

00 06 43 51 CMP Okay, Charlie. Thank you. We'll do that now.

00 06 43 53 CC Thank you.

00 06 44 39 CMP And we're going to proceed on this one, too, Charlie.

00 06 44 41 CC Roger. Copy.

00 06 48 35 CMP Houston, Apollo 11. Another NOUN 49 for you.

00 06 48 40 CC Roger. We copy. Stand by.

00 06 49 00 CC Hello, Apollo 11. Houston. We'd like you to recycle and do this one over again. Over.

00 06 49 07 CMP Okay.

00 06 53 41 LMP Houston, Apollo 11.

00 06 53 43 CC Go ahead, Apollo 11. Over.

00 06 53 45 LMP Roger. Why don't you sing out when you think we've done enough battery charging on B.

00 06 53 50        CC        Roger. Stand by, Buzz. Over.

00 06 55 50        CC        Hello, Apollo 11. Houston. We'll be charging battery B up until the sleep period. We'll discontinue charging at that time. Also, at about 12 25 in the flight plan, we have battery A charge. That has been deleted. Over.

00 06 56 05        LMP       Roger. Understand. We'll charge until the sleep period on B and delete the battery A charge.

00 06 56 10        CC        Affirmative.

00 06 56 17        CMP       And, Houston, Apollo 11. These AUTO optics maneuvers or P23's, AUTO maneuvers, don't seem to be going to the substellar point. Can you come up with the roll, pitch, and yaw angle for the substellar point on this star? It's our second star.

00 06 56 31        CC        Roger. Stand by.

00 06 57 21        CC        Hello, Apollo 11. Houston. Your angles in the flight plan we feel are still good. 198.6 130.7, 340.0. Just slightly off than those in the flight plan. Over.

00 06 57 36        CMP       Okay. We'll try that.

00 06 58 28        CMP       Charlie, state those three angles one more time. I'd like to confirm them before I maneuver.

00 06 58 32        CC        Roger. Roll and pitch are slightly off than what's in the flight plan, 11. Roll is now 198.6, pitch is 130.7. Over..

00 06 58 47        CMP       Roger. Roll 198.6, pitch 130.7, and yaw 34000.

00 06 58 55        CC        That's affirmative.

00 07 03 32        CMP       Houston, Apollo 11. I think the problem here is that that attitude just is not too close to the substellar point. I'm having to maneuver quite a bit; and that's in progress now, so stand by for some marks.

00 07 03 45        CC        Roger. We copy it all.

00 07 09 24        CC        Hello, Apollo 11. Houston. We've run the angles given in the flight plan for the P23

attitude through the machines down here, and they come up the same thing every time. We think everything's going correctly, Mike, and we're wondering if the nonsymmetrical horizon might be giving a problem. Over.

00 07 09 51       CMP       Yes, I'd say - It could be, Charlie. Stand by here. We'll get another mark for you.

00 07 09 55       CC        Okay.

00 07 10 30       CMP       Houston, Apollo 11. NOUN 49 for you.

00 07 10 34       CC        Roger. Copy.

00 07 10 41       CC        Stand by.

00 07 11 05       CC        Hello, Apollo 11. Houston. We recommend you accept the NOUN 49. Continue through your sequence of sightings, and then we'll analyze the data afterwards. Over.

00 07 11 15       CMP       Okay.

00 07 20 56       CMP       Houston, Apollo 11. Star 40 has just disappeared now in the sextant. Could the trunnion angle 47 - something be a little high?

00 07 21 05       CC        Stand by.

00 07 21 21       CC        Hello, Apollo 11. Houston. We'd like you to press on to star 44. Over.

00 07 21 26       CMP       Yes. Roger. All right. How many marks have you recorded on star 40?

00 07 21 29       CC        Stand by, Mike.

00 07 21 32       CMP       Okay.

00 07 21 45       CC        11, Houston. We copied two good marks. Over.

00 07 21 49       CMP       Okay.

00 07 33 00       CMP       Houston, Apollo 11.

00 07 33 01       CC        Go ahead. Over.

00 07 33 03       CMP       Roger. Forty-four is just not bright enough for this. There's a reddish glow filling the black area of the sextant, and the star is lost somewhere in there, and I cannot see it.



00 07 33 17 CC Roger. Stand by. We'll come up with another star. Over.

00 07 33 21 CMP Yes. I'd appreciate that.

00 07 33 48 CC Hello, Apollo 11. Houston. We'd like you to go on to star 45. Over.

00 07 33 53 CMP Okay.

00 07 33 54 CC And, Mike, we think these large DELTA-R's, NOUN 49, you're getting is really meaningful since it's been way before TLI since we had a state vector update; and we think it's normal. Over.

00 07 34 09 CMP Okay. Could be, Charlie. Some of the early markings, I might not have had precisely the substellar point. I think as time goes by they've been coming more accurate but old Enif here is just flat invisible.

00 07 34 21 CC Roger.

00 07 34 49 CMP And, Houston, Apollo 11. Understand that the same three gimbal angles you gave me should be valid for star 45 as well. Is that affirmative?

00 07 34 58 CC I'm believe that's right. Stand by one. Over.

00 07 35 00 CMP Okay.

00 07 35 03 CC That is negative. Stand by one.

00 07 35 04 CMP Okay. Because there's quite a difference between the gimbal angles you have and the gimbal angles the program wants, but with inaccurate state vector, I'm inclined not to believe the program.

00 07 35 16 CC Stand by.

00 07 35 31 LMP Houston, Apollo 11. LMP is back on the line.

00 07 35 36 CC Roger. Copy.

00 07 35 40 LMP Read you five-by.

00 07 35 42 CC Roger. Same, Buzz. And, 11, the angles for you are 1978 for roll, 1285 pitch, 3400 yaw.

00 07 35 58      CMP      Okay. Just as a matter of comparison, P23 for this star would like to go to 235.66, 154.31, and 31365. Over.

00 07 36 15      CC      Roger. We copy, 11. We understand that the program can give you almost an infinite combination of angles in P23, and it's not too unreasonable. If you'll stand by, we'll look at these that we see on the DSKY. Over.

00 07 36 31      CMP      Okay. Then in the meantime I'll just go ahead and maneuver to yours. 197.8, 128.5, and 340.0.

00 07 36 38      CC      Roger.

00 07 43 24      CMP      Houston, Apollo 11.

00 07 43 26      CC      Go ahead. Over.

00 07 43 28      CMP      Okay, Charlie. If the attitude you gave me on star number 45 - The reticle is off, I'd say, a good 30 degrees in roll, and the star is not in sight. Over.

00 07 43 44      CC      Roger. Stand by.

00 07 43 47      CMP      I think something's wrong with those attitudes.

END OF TAPE

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00 07 45 14 CC Hello, Apollo 11. Houston. I wondered if you have AUTO optics selected. Over.

00 07 45 21 CMP That's affirmative.

00 07 45 26 CC Roger. Looks like to us we need a PROCEED, Mike, to get the sextant pointed at the star. Over.

00 07 45 35 CMP Okay. Stand by.

00 07 46 30 CC 11, Houston. Those shaft and trunnion angles were exactly what we were computing on the ground. Over.

00 07 46 45 CMP Okay. I'm going to trim up the attitude here and give it another try.

00 07 47 55 CMP Okay. I have this star loud and clear now, Charlie, so I might as well do a bunch of marks on this one to get a good horizon count.

00 07 48 03 CC Roger. Stand by.

00 07 48 10 CMP It still looks like I'm far from the substellar point. However, I'm off quite a bit in roll.

00 07 48 18 CC Roger. We'd like you to mark right where it is now, Mike, and we'd like two sets of marks on this. Over.

00 07 48 28 CMP Okay. Fine. But the reticle is not parallel to the horizon. I'd have to move off quite a bit in order to get it parallel to that.

00 07 48 40 CC Apollo 11, Houston. Our procedures guys are saying that the reticle does not have to be parallel. Over.

00 07 48 51 CMP Well, then we're not at the substellar point if we're not.

00 07 48 54 CC Roger.

00 07 51 39 CMP Houston, you copy that NOUN 49?

00 07 51 41 CC Roger. We see it, 11. Stand by.

00 07 52 09 CC Apollo 11, Houston. We would like you to accept this one and every mark thereafter. Over.

00 07 52 16 CMP Okay.

00 07 52 55       CMP       Do you need me to wait in the NOUN 49 display  
for any length of time?

00 01 53 01       CC       Negative.

00 07 53 01       CMP       Okay.

00 07 54 29       CMP       Okay, Charlie. I'll be glad to give you as many  
of these as you like.

00 07 54 34       CC       Roger. We'd like six marks on star 45, Mike,  
and then we'll probably go back to star 2 again.  
Stand by. We'll have further word on that.

00 07 54 43       CMP       Okay.

00 07 55 20       CMP       They seem to be getting smaller, Charlie.. Are  
you sure you wouldn't like some more?

00 07 55 23       CC       Stand by, Mike.

00 07 55 28       CMP       It's no trouble.

00 07 55 31       CC       Roger. Stand by. Out.

00 07 56 07       CC       Apollo 11, Houston. We'd like you to do two  
more on star 45. Over.

00 07 56 14       CMP       Okay.

00 07 58 02       CMP       Okay, Charlie. There's your two more marks.  
Where do you want to go from here?

00 07 58 06       CC       Stand by.

00 07 58 21       CC       Hello, Apollo 11, Houston. We'd like you to go  
back to star number 2 with an attitude as follows:  
roll 1952, pitch 1239, yaw 3400. Mike, that'll  
give you a trunnion angle of about 31.4. Over.

00 07 58 45       CMP       Okay. I understand star number 2 and roll 195.2,  
pitch 123.9, and yaw 340.0. Over.

00 07 58 57       CC       That's affirmative.

00 07 59 01       CMP       Okay.

00 08 02 07       CMP       Okay, Charlie. I'm there, and I've got a trun-  
nion angle of 30.5 degrees. Again, misaligned  
considerably in roll and I do believe that's  
important to getting good marks.

00 08 02 20       CC       Stand by.

00 08 02 40       CMP       See, if my reticle's not parallel, then I'm not marking normal to the horizon and I'm not marking at the substellar point. I'm marking off somewhere else.

00 08 02 50       CC       Stand by one. Over.

00 08 02 52       CMP       Okay.

00 08 03 24       CC       Apollo 11, Houston. The ground-computed values for your shaft and trunnion are just what you're getting on the DSKY there, Mike. The horizon looks cocked off to you - You look like you're off in roll because the angles that we gave you to maneuver to, to prevent LM reflection from fouling up your optics, we feel like a - You should go ahead and mark on the stars just as is. Over.

00 08 03 53       CMP       Okay.

00 08 04 08       CMP       I'll bet you a cup of coffee on it.

00 08 04 14       CC       Copy.

00 08 05 08       CMP       VERB - NOUN 49 for you, Charlie.

00 08 05 13       CC       Roger. Stand by.

00 08 05 45       CC       Apollo 11, Houston. We'd like to accept this one and give us two more and that will be enough. Over.

00 08 05 52       CMP       Okay.

00 08 08 25       CC       Apollo 11, Houston. We see your termination on P23. Thank you very much. Mike, we'll have a - We're trying to work up a story here for you; we'll be with you momentarily on an explanation of what's happening. Over.

00 08 08 38       CMP       Okay, Charlie. It just appears to me that you have to have a reticle tangent to the horizon at the point at which you mark or else you're not at the substellar point; you're off laterally, and therefore you're measuring a larger trunnion angle than you should.

00 08 08 56       CC       Seems so to me. Our procedures people are working on this, and we'll be back with you momentarily. Over.

00 08 09 03       CMP       Thank you, sir.

00 08 11 00 CC Hello, Apollo 11. Houston. We'd like you to go P00 in ACCEPT. We'll have a PTC REFSMMAT for you momentarily. Over.

00 08 11 13 CMP Roger. Going P00 in ACCEPT.

00 08 13 55 CC Hello, Apollo 11. Houston. We're through with the load. You can go back to BLOCK.

00 08 14 02 CMP You're BLOCK. Thank you.

00 08 24 44 CC Hello, Apollo 11. Houston. We'd like you to do a P52, option 1 preferred, and establish PTC as listed in the flight plan at 12 hours. We'd like you to commence that right now, Mike. And we have some stars recommended for you. For stars 26, 30, and 24, when you get to attitude 000. Over.

00 08 25 19 CDR Okay, Charlie. He's off the wick right now. Understand you're ready for us to do a P52, option 1?

00 08 25 31 CC 11, it's a P52, option 1 preferred. Over.

00 08 25 36 CDR Roger. And, let's see, that is Spica, Menkent, and what else?

00 08 25 43 CC Roger. Stars - Codes are stars 26, 30, and 24. Over.

00 08 25 49 CDR 24. Okay.

00 08 35 42 CC Hello, Apollo 11. Houston. We notice your PROGRAM ALARM, Mike, was due to using these stars in the P23 attitude. If you'll go to 000, the stars we gave you will work. Over.

00 08 36 02 CMP Okay. Understand.

00 08 41 19 CC Hello, Apollo 11. Houston. Prior to you starting your P52, we'd like to give you a new CSM state vector. Over.

00 08 41 29 CDR Roger. Wait till we finish the maneuver and we'll give you the DSKY.

00 08 41 37 CC Roger. We're standing by.

00 08 53 07 CMP Houston, Apollo 11. The DSKY is yours.

00 08 53 12 CC Apollo 11, Houston. Go ahead. Over.

00 08 53 15       CMP       Roger. The DSKY is yours.

00 08 53 29       CC       Roger. Stand by.

00 09 00 59       CC       Hello, Apollo 11. Houston. You can do the  
VERB 66. The computer is yours, and then the P52,  
option 1 preferred. Over.

00 09 01 06       CMP       Roger.

00 09 16 10       CC       Hello, Apollo 11. Houston. Do you read? Over.

00 09 18 11       CC       Hello, Apollo 11. Houston. If you read, this  
attitude 000 is pretty bad for our COMM. In  
fact, we've lost all data with you, and unread-  
able on the voice. We recommend you do the P52,  
option 1 preferred ...

00 09 18 25       CMP       ... not a very good attitude at all for COMM,  
and as soon as we finish our alignment, we'll  
maneuver it to a different attitude. Over.

00 09 18 34       CC       Roger, 11. We copy. Recommend you go to this  
P52, option 1 preferred, and then go to PTC  
attitude. Over. Then we'll get some COMM.  
When you get there to PTC attitude, it'll be  
pitch 90, yaw 0 on the high gain. Over.

END OF TAPE

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00 09 21 17       CMP       Houston, Apollo 11. Over.

00 09 21 19       CC       Roger, 11. You're about one-by. Go ahead.

00 09 21 38       CC       Apollo 11, Houston. You're about one-by. Go ahead. Over.

00 09 22 40       CMP       Houston, Apollo 11. Over.

00 09 22 43       CC       Roger, 11. Read you about four-by. How me? Over.

00 09 22 46       CMP       You're loud and clear, Charlie. We pitched down some to get a better COMM attitude.

00 09 22 51       CC       Roger. Did you copy our recommendation on proceeding with the P52, Mike? Over.

00 09 22 58       CMP       Negative. We didn't. I've got that in work. I'm starting on P52.

00 09 23 01       CC       Roger.

00 09 35 56       CMP       Houston, Apollo 11.

00 09 35 59       CC       Go ahead, 11. Over.

00 09 36 01       CMP       Roger. Copy our torquing angles. We're about to torque them.

00 09 36 05       CC       Roger. Stand by.

00 09 36 08       CMP       Roger. The reason for delay, Charlie, is that - difficult to find two stars that are not occulted by the LM and also are not in the midst of a manmade star field up here with dumps.

00 09 36 21       CC       Roger. We copy.

00 09 36 38       CC       Hello, Apollo 11. Houston. You can torque the NOUN 93. Over.

00 09 36 44       CMP       Okay.

00 09 40 34       CMP       Okay, Houston. That completes the P52. We verified the third star with Antares, and AUTO optics are pointing at it pretty closely. How do our platform drift angles look so far, Charlie?

00 09 40 46       CC       Stand by.



00 09 40 56        CC        Hello, Apollo 11. Houston. We didn't have a chance to get a good check for you. We're going to run a drift check from this alignment until the next one, approximately 12 hours, and we'll have something for you later. Over.

00 09 41 07        CMP        Okay.

00 09 41 46        CC        Hello, Apollo 11. Houston. We'd like you to establish your PTC. We recommend you select quads Alfa and Delta. Over.

00 09 42 14        CDR        Roger. Understand. Alfa and Delta quads.

00 09 42 19        CC        That's affirmative.

00 09 52 53        CC        Hello, Apollo 11. Houston. Would you verify that the ATTITUDE SET switch is in GDC? Over.

00 09 53 06        CDR        The SET switch. Stand by one, Charlie.

00 09 53 09        CC        Roger.

00 09 53 11        CDR        It is now.

00 09 53 14        CC        Roger. It was on IMU.

00 09 53 17        CDR        That's affirmative.

00 09 53 19        CC        Roger. Thank you.

00 10 03 29        LMP        Houston, Apollo 11. How many miles out do you have us now?

00 10 03 34        CC        We have you - Stand by, Buzz. Roughly about 50 000. Stand by.

00 10 03 41        LMP        It's a beautiful sight.

00 10 03 46        CDR        Charlie, on that PTC, we're just waiting our 20 minutes here for all thruster activity to damp out. You might let us know how that's coming.

00 10 03 54        CC        Roger. Will do. We have you about 48 000 miles now.

00 10 03 58        LMP        Thank you.

00 10 05 33        LMP        Houston, Apollo 11. We still have our oxygen fan on for tank 2. Is that what you want?

00 10 05 40        CC        Stand by.

00 10 05 45 LMP Hey, Charlie, I can see the snow on the mountains out in California, and it looks like LA doesn't have much of a smog problem today.

00 10 05 57 CC Roger, Buzz. Copy. Looks like there's a good view out there then.

00 10 06 00 CC And, Apollo 11, Houston. We'd like you to keep the O<sub>2</sub> fan on. It will give you an ECS configuration prior to sleep. Over.

00 10 06 14 LMP Okay. Thanks.

00 10 06 46 LMP Charlie, with the monocular, I can discern a definite green cast to the San Fernando Valley.

00 10 06 56 CC Roger.

00 10 07 00 CC How's Baja California look, Buzz?

00 10 07 07 LMP Well, it's got some clouds up and down it, and there's a pretty good circulation system a couple of hundred miles off the west coast of California.

00 10 07 21 CC Roger. 11, we'd like you to close the waste storage vent valve right now.

00 10 07 28 CMP Okay.

00 10 07 49 CMP Waste storage vent valves closed.

00 10 07 51 CC Copy.

00 10 08 51 CC Hello, Apollo 11. Houston. We'd like - The rates are looking pretty good right now on the PTC, but we'd like you to continue holding. Over.

00 10 09 01 CMP Okay. Fine.

00 10 20 28 CC Hello, Apollo 11. Houston. Your rates look really great, now. You can start your PTC.

00 10 20 33 CMP Okay. Thanks, Charlie.

00 10 21 51 CDR Houston, you read 11?

00 10 21 53 CC Roger. Go ahead, 11. Over.

00 10 21 56 CDR Roger. If you'd like to delay PTC after - for 10 minutes or so, we can shoot you some TV of a seven-eights earth. That's - We'll leave that up to you.

00 10 22 12 CC Roger. Stand by.

00 10 22 50 CC Hello, Apollo 11. Houston. We'll have our answer for you on the TV in about 1 minute. Over.

00 10 25 56 CC Apollo 11, Houston. We're ready at Goldstone for the TV. It'll be recorded at Goldstone and then replayed back over here. Neil, any time you want to turn her on, we're ready. Over.

00 10 26 14 CDR Okay. It'll take us about 5 minutes to get rigged.

00 10 26 16 CC Roger.

00 10 26 31 CC Apollo 11, Houston. Could you verify the reading on your O<sub>2</sub> flow indicator? Over.

00 10 26 45 LMP We're still on 0.2. We just inadvertently touched the RAPID REPRESS button. That made a temporary glitch in the flow.

00 10 26 55 CC Roger. During that glitch there, did it go almost a peg high? Over.

00 10 27 05 LMP I'd believe that.

00 10 27 14 CC Apollo 11, Houston. Could you tell us if the O<sub>2</sub> flow indicator was pegged high prior to closing the waste storage vent valve? Over.

00 10 27 26 LMP No, it was not.

00 10 27 29 CC Roger. Thank you.

00 10 30 59 CC Hello, Apollo 11. Houston. While ago we tracked into the scan limits and disabled the AUTO drive on the high gain. We'd like you to position the antenna at pitch 30, yaw 270, go to REACQ and that will give us narrow beamwidth. Over.

00 10 31 27 CDR That yaw 270 and pitch 3 - What was the pitch?

00 10 31 32 CC Pitch 30, Neil.

00 10 31 35 CDR Okay. I think we've got you.

00 10 31 44 CC Roger. We've got a good signal there. Thank you much.

00 10 32 24 CDR Okay, Houston. We are sending picture of Earth down right now, so you can - Let us know if they're receiving at Goldstone.

00 10 32 36 CC Roger, 11. Goldstone is receiving the TV. Stand by. We'll let you know on the quality. Over.

00 10 33 34 CC Hello, Apollo 11. Houston. Goldstone says that the TV looks great. Over.

00 10 33 44 CDR Roger. We're zooming in on the Earth now.

00 10 33 54 CC Hello, Apollo 11. Houston. Did you copy? Over.

00 10 34 00 CDR Roger. We copied, Charlie.

00 10 34 04 CC Roger. Your transmissions the last couple of times have been about two-by. Over.

00 10 34 10 CDR Okay. How do you read me now?

00 10 34 11 CC Roger. You're five-by now.

00 10 34 12 CDR Okay. We're zooming the lens on in until it will just about fill the monitor.

00 10 34 20 CC Roger.

00 10 34 35 CDR Okay. It's in full zoom, now.

00 10 34 40 CC Copy, 11.

00 10 34 43 CDR And how about the f-stop? Is 22 going to be accurate?

00 10 34 49 CC Stand by. We'll get with the Goldstone TV guy. We don't have anything here at Houston. Stand by.

00 10 34 55 CDR It looks good on the monitor, as far as the f-stop goes. Therefore, we just assumed it's okay at Goldstone.

00 10 35 26 CC Hello, Apollo 11. Houston. Goldstone says it - TV looks really great, five-by; we don't - The AGC looks like it's working fine. The f:22 is good; we have no real white spots. They're real pleased with it. Over.

00 10 35 42 CDR Okay. You just cut out, Charlie. We understand that it's looking great. We'll leave it the way it is and wait for you to come back on.

00 10 35 51 CC Roger. How do you read me now? Over.

00 10 35 54 CDR Five-by.

00 10 35 55 CC Okay. My comments were - My comments were from Goldstone that they see no white spots as we saw in 10. Looks like the AGC's working real well. The f:22 looks good. Over.

00 10 36 08 CDR Okay. Very good. Well, we shut out the Sun coming in from the other windows into the spacecraft, so it's looking through a - the number 1 window, and there isn't any reflected light now. So, it ought to be a pretty good picture.

00 10 36 24 CC Roger.

00 10 37 05 CC Hello, Apollo 11. Houston. We'd like you to keep the TV on for about 10 minutes or so, so we can get some good comparison on the camera. You can do anything your heart desires on the TV: interior, exterior, pan in and out, anything you'd like. Over.

00 10 37 46 CC 11, Houston. Over.

00 10 38 05 CMP Houston, Apollo 11. Over.

00 10 38 06 CC Roger. Go ahead. Over.

00 10 38 09 CMP Charlie, I'm sorry; you keep cutting out. We heard up to "you can do anything," and then after that we didn't hear anything, and we knew that wasn't right anyhow because we can't. But what do you want us to do?

00 10 38 21 CC Roger. We'll check this uplink on our voice. That transmission on the TV was - We'd like to get about 10 minutes worth of signal at Goldstone so we can look at the camera quality back here at Houston for about 10 minutes or so when they patch it back into us. What we were saying was that you can go interior or exterior on the camera. On the exterior shots, we'd like to look - -

00 10 38 47 CMP You cut out again.

00 10 38 48 CC Stand by.

00 10 38 55 CMP Start over with, "we were saying."

00 10 39 36 CMP Okay, Houston. You suppose you could turn the Earth a little bit so we can get a little bit more than just water?

00 10 39 45 CC Roger, 11. I don't think we got much control over that. Looks like you'll have to settle for the water.

00 10 40 01 CC 11, Houston. We're going to change - thinking about changing our voice uplink to another site. If you'll stand by, we'll see if we can improve the quality. Over.

00 10 40 11 CMP Okay, Charlie.

00 10 40 12 CDR We'll stand by for your call.

00 10 40 48 CC Apollo 11, Houston. We'll try once more on this TV request. We'd like 10 minutes worth of TV. And we'd like a narrative, if you could give us one, on the exterior shots. You could also - we also suggest you might try the - an interior position. Over.

00 10 41 10 CDR Roger. We're seeing the center of the Earth as viewed from the spacecraft in the eastern Pacific Ocean. We have not been able to visually pick up the Hawaiian Island chain, but we can clearly see the western coast of North America. The United States, the San Joaquin Valley, the High Sierras, Baja California, and Mexico down as far as Acapulco, and the Yucatan Peninsula; and you can see on through Central America to the northern coast of South America, Venezuela, and Colombia. I'm not sure you'll be able to see all that on your screen down there ...

00 10 42 04 CC Roger, Neil. We just wanted a narrative such that we can - When we get the playback, we can sort of correlate what we're seeing. Thank you very much.

00 10 42 19 CMP I haven't seen anything but the DSKY so far.

00 10 42 23 CC Looks like they're hogging the window.

00 10 42 29 CDR You're right.

00 10 46 58        CC        Hello, Apollo 11. Houston. On your CRYO's, we'd like at this time for you to place all four CRYO heaters to AUTO and turn off all four CRYO fans. Over.

00 10 47 15        LMP        Okay. All four CRYO heaters are AUTO. And all four CRYO fans are off. ...

00 10 47 25        CC        Roger. That's going to be your sleep configuration.

00 10 47 29        LMP        Okay.

00 10 47 30        CC        And, Buzz, we'll be terminating the battery charge in about a half hour.

00 10 47 35        LMP        Roger.

00 10 47 58        CC        Hello, Apollo 11. Houston. You can terminate the TV at your convenience. We've got enough take. And you can start PTC at your convenience. The rates look super for starting up. Over.

00 10 48 14        CDR        Roger, Charlie

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

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00 10 57 32 CC Apollo 11, Houston. We have a flight plan update for you and some P37 block data, if you're ready to copy. Over.

00 10 57 41 CDR Stand by.

00 10 58 19 CDR Okay, Houston. PTC is started now; looks good to us, and we'll be ready to copy in a minute or two.

00 10 58 24 CC Roger. Copy, 11.

00 10 58 59 LMP Houston, Apollo 11. Ready to copy the flight plan update and P37.

00 10 59 04 CC Roger. Stand by one, Buzz.

00 10 59 21 CC Apollo 11, Houston. Coming at you with the P37 block data. Over.

00 10 59 28 LMP Okay.

00 10 59 29 CC Roger. 027 44 5363, minus 165 073 14 037 44 8016, minus 165 072 46; GETE 046 44 6141, minus 165 097 03 055 44 8209, minus 165 096 42. Ready for your readback. Over.

00 11 01 01 LMP Roger. 027 44 5363, minus 165 073 14 037 44 8016, minus 165 072 46 046 44 6141, minus 165 097 03 055 44 8209, minus 165 096 42. Over.

00 11 01 54 CC Roger, 11. That was a good readback. That was the block data scheduled for 12 hours. We'd like to just say that on a flight plan update here, just to remind you of some things, and you can do them at your convenience and then go to sleep early if you'd like. We don't have anything else planned, but we'd like to just remind you on the filter change, the O<sub>2</sub> fuel cell purge. And we'd like a LM/CM DELTA-P and accomplish the presleep checklist.

00 11 02 34 CDR Okay. We've completed the filter change, and we'll get started on the fuel cell purge, and stand by for the LM/CM DELTA-P.

00 11 02 42 CC Roger, 11. Would you hold off on the fuel cell purge? EECOMM is saying we might not have to do that. Over.

00 11 02 51 CDR Okay.



00 11 03 05       CMP       Charlie, the LM/CM DELTA-P is 0.5.

00 11 03 17       CC       Copy. 0.5. Out.

00 11 03 10       CC       Hello, Apollo 11. Houston. We've just decided to delete the O<sub>2</sub> fuel cell purge. Over.

00 11 03 56       CDR       Roger. Delete the O<sub>2</sub> fuel cell purge.

00 11 06 21       CC       Hello, Apollo 11. Houston. We've been noting some funnies on the O<sub>2</sub> flow indicator transducer. We've kind of got a suspicion that the transducer - We expected to see an O<sub>2</sub> flow pegged high with the waste stowage vent to VENT. It was not. We also noted some funny indications when you closed the waste stowage vent valve. We're going to continue to take a look at this through the night, and we'll be with you in the morning with an assessment of the problem. Also, we'd like to ask specifically, when you place the waste stowage vent valve to VENT, does the detent - correction - Does the arrow line up with the detent? Over.

00 11 07 18       CMP       Stand by one, Charlie. We'll give you something on the detent.

00 11 07 21       CC       Roger.

00 11 07 28       CMP       Right now it's at CLOSED, and I lined up with CLOSED before I was at VENT; and best I can recall, it was quite accurately lined up with VENT. Would you like me to go to VENT again momentarily and see where it lines up?

00 11 07 42       CC       That's negative. That question's answered. Thank you much.

00 11 07 46       CMP       Okay.

00 11 09 52       CC       Hello, Apollo 11. Houston. We have an S-band configuration for you. Over.

00 11 10 00       LMP       Roger. Go ahead.

00 11 10 02       CC       Roger, Buzz. We'd like you to place the S-band antenna OMNI A switch to the Bravo position. S-band antenna OMNI switch to the OMNI position, the high gain track to MANUAL, and the high gain angles will be yaw 270, pitch minus 50. Over.

00 11 10 27       LMP       Roger. Understand. OMNI to Baker and OMNI, MANUAL. And the angles are yaw 270, pitch minus 50, and was that narrow or wide? Over.

00 11 10 47 CC Stand by. Roger. We'd like it in WIDE, and you can set that configuration up now. Over.

00 11 10 56 LMP It's in work.

00 11 13 04 CC Hello, Apollo 11. Houston. You can terminate battery Bravo charge, and we'd like a crew status report. We're about to tell you good night. Over.

00 11 13 14 CDR Roger. Stand by.

00 11 18 08 CDR Houston, Apollo 11. The battery charging is complete, and the crew status report is as follows: radiation, CDR 11002, CMP 10002, LMP 09003; negative medication; fit as a fiddle. Over.

00 11 18 33 CC Roger. Copy, 11. Thank you much. We'd like to ask one question. Have you tried the gas separator on the water? How is that working? Over.

00 11 18 45 CDR Yes. Mike's got a couple of comments on that.

00 11 18 49 CMP It's working good so far, Charlie. We've got one installed on the water gun and the other one installed on the spigot down in the LEB, and we mention one problem with them is that they leak at the junction between the food bag and the water filter. However, with that exception, they seem to be working pretty good. We were getting some gas through initially, and I think that was just getting the system purged out to begin with; and the last tubeful we poured was almost free of bubbles. Over.

00 11 19 31 CC Roger. Sounds good. We'll check in on that problem with the SPAN guys and let you know in the morning. If you have to call us tonight, we'd like you to do it on DOWNVOICE BACKUP. We're configuring the MSFN for that mode; and as far as we can see, you're cleared for some z's. Over.

00 11 19 53 CMP Okay. Maybe we'll get around to lunch.

00 11 19 57 CC How about a peanut butter and jelly?

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOCS NET 1)

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00 12 36 34        CC        Hello, Apollo 11. Houston. Hope you aren't -  
we aren't disturbing you. We'd like you to  
terminate the NOUN 65 now. Over.

00 12 36 43        CMP        Roger.

00 12 46 00        CC        Apollo 11, Houston. Over.

00 12 46 05        LMP        Houston, Apollo 11 ...

00 12 46 08        CC        Roger, Buzz. When you stopped - or, correction  
- When you terminated the NOUN 65, it appears  
to us, you get a VERB 46 which collapsed the  
deadband back to 0.5. We're okay as long as  
you do not turn on any AUTO RCS SELECT switches.  
Over.

00 12 46 30        LMP        Okay. I thought that was a - better way to  
clear the DSKY but evidently it isn't. Roger.

00 12 46 36        CC        Roger. VERB 34 would have been a better proce-  
dure.

00 12 46 41        LMP        Yes. Thank you.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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REST PERIOD - NO COMMUNICATIONS

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

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REST PERIOD - NO COMMUNICATIONS

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REST PERIOD - NO COMMUNICATIONS

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REST PERIOD - NO COMMUNICATIONS

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REST PERIOD - NO COMMUNICATIONS



*Sample 207(1)*

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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00 22 50 15        CC        Apollo 11, Apollo 11, this is Houston. Over.

00 22 50 21        CDR        Good morning, Houston. Apollo 11.

00 22 50 24        CC        Roger, Apollo 11. Good morning.

00 22 50 32        CC        When you're ready to copy, 11, I've got a couple of small flight plan updates and your consumables update, and the morning news, I guess. Over.

00 22 51 55        LMP        Apollo 11. ...

00 22 51 58        CC        Go ahead, 11.

00 22 52 02        LMP        Roger. Standing by for your updates. Over.

00 22 52 10        CC        Okay, 11. This is Houston. At time approximately 22 30 in the flight plan, in your postsleep checklist, and in all other postsleep checklists, we'd like you to delete the statement that says "AUTO RCS JET SELECT, 16 to ON," and what we're doing here is picking this up in the procedure for exiting PTC that's in your CSM checklist. And in the CSM checklist on page Foxtrot 9-8: if you want to turn to that, we'd like to change the order of the steps in that. Over.

00 22 53 13        LMP        Stand by.

00 22 53 37        LMP        Okay. Page F 9-8. Go ahead.

00 22 53 40        CC        Okay. Right now it reads, "To exit G&N PTC," then you've got a pen-and-ink change that says, "AUTO RCS SELECT, 12 MAIN A and B." And you come down to the printed step 1. We'd like to take and move the "AUTO RCS SELECT, 12 MAIN A and B" down to be the second step, so the procedure would read, "Step 1, MANUAL ATTITUDE 3, ACCEL COMMAND; Step 2 AUTO RCS SELECT, 12 MAIN A B." Step 3 would be, "Verify DAP load," and so on. Over.

00 22 54 16        LMP        Roger. I copy. Is that AUTO RCS SELECT, 12 MAIN A, MAIN B to be the ...

00 22 54 25        CC        Roger. It should be the second step in that procedure. At time 22 40, or when you get to it, we'd like to commence a charge on battery A. And at time 24 10, we have an updated attitude for your P52 and optics calibration. Over.

00 22 55 06        LMP        Okay. 24 10. Go ahead.

00 22 55 09 CC Roger. P52 and optics calibration attitude: roll 330.5, pitch 086.3, yaw 000.0. The nominal attitude that's pen-and-inked in for the P23 is still good. At time 25 30, approximately, after you complete P23, we're requesting a waste-water dump down to a nominal 25 percent. Over.

00 22 56 48 CC Apollo 11, this is Houston. Did you copy the attitudes and the waste-water dump? Over.

00 22 56 59 LMP Roger, Bruce. ...

00 22 57 14 CC 11, this is Houston. We're not reading you at the present time. You're way down in the noise level. Stand by, please.

00 22 57 23 LMP Okay. Standing by.

00 22 59 04 CC Apollo 11, this is Houston. How do you read? Over.

00 22 59 10 CMP Roger, Houston. Apollo 11. Loud and clear. How me?

00 22 59 12 CC Okay. Beautiful. Did you copy the attitudes for the P52 and the waste-water dump? Over.

00 22 59 20 CMP Roger. Okay. We note the battery charge as soon as we get around to it, and the attitude for the P52 optics CAL: roll 330.5, pitch 086.3, and yaw all zeros. The attitude for the P23 as in the flight plan is okay; and I copy your battery charge. Crew status report as follows. Sleep CDR 7, CMP 7, LMP 5.5. And we've completed the postsleep checklist. Standing by for a consumable update. Over.

00 23 00 04 CC Roger. We're requesting a waste-water dump at GET 25 30 down to a nominal 25 percent, and here we go with the consumables update. At GET of 22 hours, RCS total is minus 3.5 percent. Alfa minus 3.5 percent, Bravo minus 1.5 percent, Charlie minus 5.0 percent, minus 4.0 percent, H<sub>2</sub> minus 2 pounds, O<sub>2</sub> minus 4 pounds. Over.

00 23 00 59 CMP Okay. Stand by.

00 23 01 08 CMP I copied those consumables, and I'll read you back our RCS quantities. We got 86 percent in Alfa, 87 in Bravo, 88 in Charlie, and 90 in Delta. Over.

00 23 01 37 CC Roger. I copy.

00 23 01 46 CC And did you copy the waste-water request?

00 23 01 50 CMP Roger. Waste water at - and we got the time on that, and it will be down to 25 percent.

00 23 01 56 CC Okay.

00 23 06 45 LMP Houston, 11.

00 23 06 51 CC Apollo 11, this is Houston. Over.

00 23 06 55 CMP Roger. We've started charging battery A, and voltage started off a lot higher than I expected. It was just a little bit shy of 40. It looks like it's dropping down some now, the battery charge holder. Seemed to me yesterday when we were doing this on battery C, it started out initially, and it went lower, the battery charge holder. Over.

00 23 07 20 CC Roger. Stand by a second, and I'll get some reading on that.

00 23 07 29 CMP On charging battery A: now, it's at about 39.3 and - oh, about 1.5 amps. Looks like it's gradually increasing in the ...

00 23 07 42 CC Roger. On our CM, we're showing you at 39.11, and your current's about what you reported.

00 23 07 51 CMP Okay. I guess you're happy, then.

00 23 07 58 CC I think we're losing you in the noise again, 11. Stand by.

00 23 10 33 CC Apollo 11, this is Houston. Over.

00 23 10 39 CMP Houston, Apollo 11. Go ahead.

00 23 10 41 CC Roger, 11. On your battery charging question, we feel that it's probably a difference between individual batteries; and it does seem to have gone away as sort of a startup transient here. Other factors that might conceivably have an influence on it would be battery temperature, things of this sort. EECOMM seems to feel that it's operating within the normal design limits. Over.

00 23 11 12 CMP All right. Very good. Thank you.

00 23 11 14 CC Okay.

00 23 14 09      CC      11, this is Houston. If you are interested in the morning news, I have a summary here from PAO. Over.

00 23 14 20      CDR      Okay. We're all listening.

00 23 14 23      CC      Okay. From Jodrell Bank, England, via AP: Britain's big Jodrell Bank radio telescope stopped receiving signals from the Soviet Union's unmanned Moon shot at 5:49 EDT today. A spokesman said that it appeared the Luna 15 space ship "had gone beyond the Moon." Another quote: "We don't think it has landed," said a spokesman for Sir Bernard Lovell, Director of the Observatory. Washington UPI: Vice President Spiro T. Agnew has called for putting a man on Mars by the year 2000, but Democratic leaders replied that priority must go to needs on Earth. Agnew, ranking government official at the Apollo 11 blastoff Wednesday, apparently was speaking for himself and not necessarily for the Nixon administration when he said, "We should, in my judgment, put a man on Mars by the end of this century." Laredo, Texas, AP: Immigration officials in Nuevo Laredo announced Wednesday that hippies will be refused tourist cards to enter Mexico unless they take a bath and get haircuts. Huberto Cazaras, Chief of Mexican Immigration in Nuevo Laredo, said authorities in Mexico City, Acapulco, and other popular tourist spots have registered complaints about the hippies. By United Press International: Initial reaction to President Nixon's granting of a holiday Monday to Federal employees so they can observe a national day of participation in the Apollo 11 Moon landing mission mostly was one of surprise. Rodney Bidner, Associated Press, London AP: Europe is Moon-struck by the Apollo 11 mission. Newspapers throughout the continent fill their pages with pictures of the Saturn V rocket blasting off to forge Earth's first link with its natural satellite. And the headline writers taxed their imagination for words to hail the feat. "The greatest adventure in the history of humanity has started," declared the French newspaper Le Figaro, which devoted four pages to reports from Cape Kennedy and diagrams of the mission. The tabloid Paris Jour proclaimed, "The whole world tells them bravo." The Communists daily L'Humanite led with the launch picture and devoted its entire back page to an enthusiastic Moon report describing the countdown and launch, the astronauts' wives and families, and backgrounding lunar activities.

Hempstead, New York: Joe Namath officially reported to the New York Jets training camp at Hofstra University Wednesday following a closed door meeting with his teammates over his differences with pro football Commissioner Peter Rozelle. London UPI: The House of Lords was assured Wednesday that a midget American submarine would not "damage or assault" the Loch Ness monster. Lord Nomay said he wanted to be sure anyone operating a submarine in the Loch "would not subject any creatures that might inhabit it to damage or assault." He asked that the submarine's plan to take a tissue sample with a retrievable dart from any monster it finds can be done without damage and disturbance. He was told it was impossible to say if the 1876 Cruelty to Animals Act would be violated unless and until the monster was found. Over.

00 23 18 07        CDR        Roger. Thank you, Bruce. Another thing on that number 2 item, we all ... before we left, and we hope we get a chance to see him another time. Over.

00 23 18 27        CC        Roger. And I understand he was down there and really enjoyed watching the launch. We all think it was pretty magnificent, and you all are doing a great job up there.

00 23 18 40        CDR        Thank you.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

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00 23 57 03        CC        Apollo 11, this is Houston. Over.

00 23 57 08        CDR        Roger. Go ahead, Houston.

00 23 57 10        CC        Roger. Mike, we've got some comments on performance of P23 for today if you've got a minute to talk.

00 23 57 20        CDR        He's all ears.

00 23 57 22        CMP        Yes. Go ahead.

00 23 57 25        CC        Okay. For today, we'd like you on P23 to make a trunnion bias determination, prior to P23 sightings as called out in procedures, and also one afterwards. Our intent here is to check out the possibility that some sort of thermal effect may be giving you errors in the angular read-out in the sextant. The bias that you get beforehand should be incorporated, that is a PROCEED on NOUN 87 after you get two consecutive measurements equal to within 0.003 degrees. And, of course, move the trunnion off a couple of degrees between the measurements. The Earth should be a lot smaller in your field of view today. I'm sure you're a lot more qualified to tell us about that than we are, but to ensure that you're getting a good angle measurement between the star and the Earth horizon, the sextant M-line, which is the line that runs through the two hash marks and is perpendicular to the R-line, should be parallel to the Earth horizon at the substellar point. And then the actual superimposition of the star upon the horizon can be made at any point in the field of view of the sextant: above, below, or on the M-line. We recommend the marks be made as rapidly as possible after AUTO maneuver. If you feel that the amount of time between the AUTO maneuver and the time you get ready to mark is excessive, or that you don't like that AUTO maneuver attitude when you get ready to mark, of course, you can use a VERB 94 - VERB 94 to get you back to the flashing 51 position to redo the AUTO maneuvers. Over.

00 23 59 41        CMP        Roger. Stand by one. We're going to stop PTC, and then we'll talk about this P23.

00 23 59 49        CC        Okay.

01 00 02 10        CMP        Houston, Apollo 11.

01 00 02 11        CC        Go ahead, ll.

01 00 02 13        CMP        Okay. We're stopping PTC now and maneuvering to our P52 and optics CAL attitude. In regard to that P23, what I was trying to tell you yesterday was about that. The M-line is not anywhere parallel to the horizon at the roll, pitch, and yaw which you gave me to go to for the sub-stellar point, and I was trying to maneuver off to get it parallel to the horizon when you all said that was not necessary.

01 00 02 47        CC        Roger, ll. I guess in keeping the cups of coffee score, why you get that one.

01 00 02 57        CMP        Well - Okay - Well, this morning, let's just see how close it comes to being parallel to the M-line. Before we started marking for the first time, it appeared that the computation of - of those three angles was somewhat off, and that  $\tau$  was wasting a lot of gas by going to those three angles and then having to make large attitude changes after that to get the M-line parallel. In some cases it appeared to be just an accepted attitude required, and you all said that it wasn't needed. So I was marking in some cases with the M-line not parallel. I thought perhaps you had some processor for computing that offset and making sense out of that data, but as far as I know, we've got to have the M-line parallel to the horizon.

01 00 03 49        CC        Roger, ll. We don't have that capability. We do require that the M-line be parallel to the horizon in order to get a good mark. We feel that possibly the - the state vector information that you were using for your maneuver basis yesterday may have needed to be updated a little. And if you'll stand by a second, we'll give you an evaluation of what we feel you'll get today by the AUTO maneuver.

01 00 04 25        CMP        Okay.

01 00 10 56        CMP        Houston, Apollo 11. Over.

01 00 11 01        CC        Go ahead, ll.

01 00 11 03        CMP        Roger. I'm getting ready to do an O<sub>2</sub> fuel cell purge. Do you have any particulars on this? And I assume you want these one at a time, or can I triple up? Over.

01 00 11 13 CC We'd like them one at a time, and stand by. I don't think we have any sequence. You can do them in any order you want.

01 00 11 23 CMP Okay.

01 00 11 26 CC And we're watching you on TM down here.

01 00 15 03 CMP Houston, Apollo 11. You want to look at these NOUN 93's before I proceed on?

01 00 15 11 CC Yes, please. Stand by a second.

01 00 15 14 CMP Okay.

01 00 16 12 CC 11, this is Houston. On our TM, here, we're only seeing values in two registers. Can you read us out the contents of register 3, please?

01 00 16 22 CMP Register 3: minus three balls 24.

01 00 16 25 CC Roger. Minus three balls 24. And you can go ahead and proceed.

01 00 16 36 CMP Okay. Proceeding at this time.

01 00 16 58 CC 11, Houston. After you've completed P52, we'd like to uplink you a new state vector so we can start out clean on this P23. Over.

01 00 17 09 CDR Okay.

01 00 17 22 CMP Houston, are you observing the higher O<sub>2</sub> flow on fuel cell 3?

01 00 17 34 CDR Houston, Apollo 11. It's triggered the MASTER ALARM three times, now. There goes number 4. It goes up to about 1.4, then oscillates back down to about 1.1. Over.

01 00 17 50 CC Roger. We saw them 1.3 now on TM. Stand by a second.

01 00 18 01 CMP And we're in P00, now, for a state vector.

01 00 18 06 CC Roger. Give us ACCEPT, please.

01 00 18 13 CMP Roger. Done.

01 00 18 41 CC 11, Houston. On your O<sub>2</sub> flow, fuel cell 3: apparently it was flowing a little higher than the other two during purge, but the flow rate is acceptable. Over.



01 00 18 56      CMP      Roger. It seems to be flowing a little bit more, and actually putting out more current than the other two, also. Over.

01 00 19 05      CC      Roger. We copy.

01 00 19 51      CC      11, this is Houston. We've completed the uplink; the computer is yours; you can go back to BLOCK.

01 00 19 59      CMP      Okay. Thank you.

01 00 20 31      CC      Go ahead, 11.

01 00 20 47      CDR      Houston, 11. I don't believe we were calling you right then.

01 00 20 55      CC      Roger. Out.

01 00 23 53      CMP      Houston, Apollo 11.

01 00 23 56      CC      Apollo 11, this is Houston. Go ahead.

01 00 24 00      CMP      Roger. I'm in a good attitude here to do - I have in the sextant this last P52 star, star 37. Is that all right for the optics calibration to save some gas, or do you want to go over to star 40?

01 00 24 23      CC      Star 37 will be fine for the optics calibration. And we haven't noticed a VERB 66, yet, after our state vector uplink. Over.

01 00 24 33      CMP      Okay.

01 00 24 37      CC      When you move into P23, we recommend that you use the CMC-computed angles for your AUTO maneuver and see how that works out. If it doesn't bring you up with the M-line parallel to the horizon to the substellar point, we will see if we can get you some ground-computed angles. I guess the big thing here is to make sure that the M-line is parallel to substellar points so we can get a good angular measurement. Over.

01 00 25 06      CMP      Yes. I believe.

01 00 25 08      CC      Roger. Over.

01 00 29 25      CMP      Houston, Apollo 11. Marking on this star, I get a NOUN 87 twice in a row of five balls, so that's sufficient for a count.

01 00 29 33      CC      That's certainly very sufficient.

01 00 29 40       CMP       Okay. Now I want to go to P00, and I am going to take your three angles and do a verify of 49 maneuver to your substellar point. Okay?

01 00 29 53       CC        Okay. We recommend that for the first star, if we gave you a new state vector, we'd like to try the CMC-computed angles for your AUTO maneuver.

01 00 30 07       CMP       Okay.

01 00 30 18       CC        And have you hit PROCEED on this display to enter the zero?

01 00 30 23       CMP       Not yet.

01 00 30 24       CC        Okay.

01 00 30 54       CC        11, Houston. Over the past 2 hours we have seen a slight continuing increase in partial pressure of CO<sub>2</sub>. Have you in fact changed the CO<sub>2</sub> canister yet this morning? We don't need to do it right now; we'd just like to confirm it on our instrumentation - is in good shape. Over.

01 00 31 13       CMP       No. We haven't changed any canisters this morning.

01 00 31 19       CC        Okay. Then you can plan on accomplishing that after P23 is over and you've got the LEB clear.

01 00 31 22       CMP       All right.

01 00 31 57       CMP       Houston, Apollo 11. We're in process of maneuvering to P23 in desired attitude. It likes roll 8.37, pitch 61.33, and yaw 339.87. Over.

01 00 32 13       CC        Roger. We copy. And that is for star 01?

01 00 32 19       CMP       Star 01, right near the horizon. Code 110.

01 00 32 22       CC        Roger.

01 00 41 07       CMP       Houston, Apollo 11. On this star, the AUTO maneuver works just fine. I am right at the substellar point. Everything looks beautiful except there is no star in sight. It is just not visible.

01 00 41 20       CC        Roger. Is this for star 01?

01 00 41 23       CMP       That's correct.

01 00 41 29       CC       You are not getting any reflections or anything like that that would obscure your vision, are you?

01 00 41 40       CMP       Well, of course, the Earth is pretty bright, and the black sky, instead of being black, has sort of a rosy glow to it. The star, unless it is a very bright one, is probably lost somewhere in that glow, but it is just not visible. I maneuvered the reticle considerably above the horizon to make sure that the star is not lost in the brightness below the horizon. However, even when I get the reticle considerably above the horizon so the star should be seen against the black background, it still is not visible.

01 00 42 16       CC       Roger. We copy. Stand by a minute, please.

01 00 42 47       CC       11, this is Houston. Can you read us the shaft and trunnion angle off the counters?

01 00 42 55       CMP       Yes. I will be glad to. Shaft 331.2 and trunnion 35.85.

01 00 43 04       CC       Roger. Thank you.

01 00 45 35       CMP       It's really a fantastic sight through that sextant. A minute ago, during that AUTO maneuver, the reticle swept across the Mediterranean. You could see all of North Africa, absolutely clear; all of Portugal, Spain, southern France; all of Italy, absolutely clear. Just a beautiful sight.

01 00 45 54       CC       Roger. We all envy you the view up there.

01 00 45 59       CMP       But still no star.

01 00 47 19       CC       11, this is Houston. Over.

01 00 47 23       CMP       Roger. Go ahead, Bruce.

01 00 47 25       CC       On our ground computers we confirm the shaft and trunnion angle that you have as being pointed at the star. However, it looks as though that shaft and trunnion angle is also pointing into the structure of the LM, so that while you will be getting the Earth's horizon, the star ... is obscured by the LM. We recommend an AUTO maneuver to the attitudes pen-and-inked into the flight plan. Roll 1772, pitch 2982 and yaw 330.0. Over.

(GROSS NET 1)

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01 00 48 04

CMP

Okay. Fine. Let's try that.

01 00 53 59

SC

...

END OF TAPE

(GOSS NET 1)

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01 01 06 54 CC 11, this is Houston. While you're maneuvering, could we get a LM/CM DELTA-P reading from you? Over.

01 01 07 01 CMP Roger. Just a tad under 1, Bruce, 0.95.

01 01 07 05 CC Roger. 0.95.

01 01 11 14 CC Apollo 11, Houston.

01 01 11 17 CMP Go ahead.

01 01 11 21 CC Is the Commander aboard?

01 01 11 36 CDR This is the Commander.

01 01 11 39 CC I was a little worried. This is the backup Commander still standing by. You haven't given me the word yet. Are you GO?

01 01 11 48 CDR You've lost your chance to take this one, Jim.

01 01 11 53 CC Okay. I concede.

01 01 13 36 CMP Houston, Apollo 11.

01 01 13 41 CC Go ahead, 11.

01 01 13 43 CMP Okay. Our maneuver is complete, and at this attitude the M-line is exactly 90 degrees out of phase. It is exactly pointed along the vector toward the center of the Earth instead of being parallel to the right.

01 01 14 00 CC Roger.

01 01 14 16 CMP I'm going to hold right here for your next suggestion.

01 01 14 21 CC Roger.

01 01 18 19 CMP Okay, Houston. It appears to be okay now. We've changed our attitude slightly, and I have a star and I'm maneuvering to get the M-line parallel.

01 01 18 34 CC This is Houston. Roger. We copy.

01 01 20 29 CDR Houston, Apollo 11. You - Stand by one.

01 01 36 08 CMP Houston, Apollo 11. Are you copying these NOUN 49's that have been going through?

01 01 36 14        CC        Yes. We surely are. Let's see: plus 0.1 and a plus 0.2 on nautical miles and feet per second. Over.

01 01 36 22        CMP        Roger.

01 01 43 45        CC        11, this is Houston. Over.

01 01 43 54        CMP        Go ahead.

01 01 43 56        CC        Yes, Mike. We show you in VERB 59 right now. Over.

01 01 44 01        CMP        That's right. I - I haven't entered - I gave the - I gave it back to the computer for a second. I put the mode switch from MANUAL back to CMC while I fooled with the DSKY, and the computer drove the star off out of sight. So the delay here has been in going back to MANUAL and finding the star again, which I've finally done. And - Just a second here, I'll go to ENTER and get a 51 and mark on it. As I say, for some reason the computer drove the star off out of sight.

01 01 44 47        CC        Okay. Roger. Out.

01 01 48 14        CC        Apollo 11, this is Houston. Over.

01 01 48 21        CMP        Go ahead.

01 01 48 24        CC        Roger. We show you as a little less than an hour to the midcourse correction number 2 burn. We recommend that you terminate the P23 activities here and press on with the waste-water dump, which we need from you, and get it ready for the burn. Over.

01 01 48 40        CMP        Okay.

01 01 48 44        CC        And I have your midcourse correction number 2 PAD when you're ready to copy.

01 01 48 50        CMP        Stand by.

01 01 49 15        CMP        Roger, Houston. Apollo 11, ready to copy MCC 2.

01 01 49 20        CC        Apollo 11, this is Houston. Midcourse correction number 2. SPS/G&N 63059, plus 097, minus 020, GET ignition 02644 5792, plus 00118, minus 00003, plus 00177, roll 277 355 015, NOUN 44 BLOCK is NA, DELTA-V<sub>T</sub> 00213 003 00168, sextant star 30 2082 370.

The rest of the PAD is NA. GDC align: Vega and Deneb. Roll align 007 144 068. No ullage. LM weight: 33302. For your information, your heads will be pointed roughly towards the Earth on this burn. Read back. Over.

01 01 51 12       CMP       Roger. Midcourse correction number 2. SPS/G&N: 63059, plus 097, minus 020 02644 5792, plus 00118, minus 00003, plus 00177 277 - Are you still copying?

01 01 51 50       CC       Roger. Still copying. Go ahead. Apollo 11, this is Houston. I copied your transmission about roll 277, and go ahead from roll 277. Over.

01 01 52 19       CMP       Roger. 355 015, NA, 00213 003 00168 30 2082 370. Vega and Deneb 007 144 068. No ullage. LM weight: 33302. Heads towards the Earth. Over.

01 01 52 46       CC       11, this is Houston. Readback correct. Out.

01 01 54 02       CC       Apollo 11, Houston. Over.

01 01 54 08       CMP       Go ahead, Houston. Apollo 11.

01 01 54 09       CC       Roger. We'd like you to terminate battery A at GET 26 hours and reinitiate battery A charge after midcourse correction 2. Over.

01 01 54 23       CMP       Apollo 11. Roger.

01 01 54 27       CC       Roger. Out.

01 01 59 37       CC       11, this is Houston. Over.

01 01 59 41       LMP       Go ahead.

01 01 59 43       CC       Roger. If you can give us ACCEPT, we'll send you up a state vector and a target load for the maneuver.

01 01 59 52       LMP       Okay. Give us 1 minute to check the P23 damage.

01 01 59 58       CC       Sure thing.

01 02 00 31       LMP       Houston, Apollo 11. The DSKY's yours.

01 02 00 35       CC       Houston. Roger. Out.

01 02 03 49       CC       11, this is Houston. We've completed the uplink. The computer's yours.

01 02 03 54       LMP       Thank you.

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01 02 07 17       CMP       Houston, Apollo 11.

01 02 07 21       CC        Apollo 11, this is Houston. Over.

01 02 07 24       CMP       Roger. Wonder if you have a star that might be a little closer to the direction we're burning than the one you gave us.

01 02 07 33       CC        Roger. We're going to rework the attitude in the sextant star for you in order to improve the high-gain antenna coverage, and we'll have that for you in a few seconds.

01 02 07 43       CMP       Fine. We're already maneuvering ...

01 02 07 51       CC        Roger.

01 02 08 02       CMP       Maybe you can make it just the change in roll.

01 02 08 07       CC        Roger.

01 02 08 45       CC        Apollo 11, this is Houston. Over.

01 02 08 49       CMP       Go ahead.

01 02 08 51       CC        Roger. On your attitude for the burn: we'd like you to use roll 096, pitch 356, yaw 018. That will give you a sextant star of 01, shaft 253.8, trunnion 24.2. Over.

01 02 09 36       CMP       ... 356 ...

01 02 09 51       CC        11, this is Houston. We are having difficulty reading you through the noise. Could you read back again, please? Over.

01 02 10 05       CMP       Roger, Houston. Apollo 11. Do you copy?

01 02 10 10       CC        Roger. Very weakly in the noise, but I think I can copy. Go ahead.

01 02 10 19       CMP       Okay. Roll 096 356 018 ... star 01 ...

01 02 10 38       CC        Roger. I got all of that except trunnion. It's trunnion 242. Over.

01 02 12 19       LMP       Houston, Apollo 11. How do you read me now on OMNI A?

01 02 12 22       CC        Roger. Loud and clear, 11.

01 02 12 26       LMP       Okay. We'll stay on OMNI A for a while, then.



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01 02 12 30      CC      Okay. I got all your readback except the value  
for trunnion. If it's 242, confirm, please.

01 02 12 36      CMP      Roger. 242.

01 02 12 38      CC      Okay.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

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01 02 38 29 CDR Houston, Apollo 11. Could you give us a couple of high-gain antenna angles, please?

01 02 38 35 CC Roger. Stand by, 11.

01 02 38 44 CC Roger, 11. Pitch minus 35, yaw 0. Over.

01 02 38 50 CDR Thank you.

01 02 39 03 CDR We got them.

01 02 39 05 CC Okay.

01 02 39 28 CDR Houston, Apollo 11. How do you read high gain?

01 02 39 30 CC Read you loud and clear on high gain down here, and everything's looking good from our standpoint for your burn. Over.

01 02 39 36 CDR Okay, Bruce.

01 02 45 18 CDR Houston, burn completed. You copying our residuals?

01 02 45 40 CC That's affirmative.

01 02 46 00 CDR And, Houston, looked like we saw about 87 or 88 psi on chamber pressure that time. I'd like you to look at that on the ground.

01 02 46 13 CC Roger, 11. We'll take a look at that and get back in a few minutes.

01 02 46 38 CC 11, Houston. On our real-time telemetry we saw 95 to 97 psi on chamber pressure. We'll - We will look at the recordings down here, though, and get back with you again. Over.

01 02 46 41 CDR Okay. Thank you.

01 02 46 50 CC And we've copied your residuals, 11.

01 02 46 56 CDR Roger. No, we're not going to trim those ...

01 02 49 51 CC 11, Houston. Could we get your DELTA-V counter reading, please, from this burn?

01 02 50 00 LMP That's minus 3.8.

01 02 50 02 CC Minus 2.8?

01 02 50 04 LMP 3.8.

01 02 50 06       CC       Roger. Copy minus 3.8.

01 02 51 04       CDR       Houston, is there anything else you need on the  
burn status report?

01 02 51 15       CC       This is Houston. Negative, 11.

01 02 51 23       CDR       Roger. Thank you.

01 02 54 41       CC       Apollo 11, this is Houston. Over.

01 02 54 45       CMP       Roger. Apollo 11.

01 02 54 47       CC       Roger. I just wanted to remind you that we  
haven't noticed on the TM the VERB 66 after the  
burn. And for your information, we played the  
recorded TV back last night, I believe, after you  
all turned in for your rest period, and the pic-  
tures came out quite well. Over.

01 02 55 10       CMP       Did you get any usable pictures out of MILA on  
that first pass?

01 02 55 15       CC       Not that we've seen. We had word on the voice  
loop that MILA reported that they had gotten a  
minute's worth of TV signal, and Goldstone reported  
that they had gotten about a minute's worth of  
modulation but that they weren't able to get  
anything off of it.

01 02 55 35       CMP       Okay. Thanks.

01 02 55 40       CC       Okay. We have another input here, 11, that the  
MILA data was recognizable as a picture, but we  
don't have any evaluation as to the quality of the  
picture. Over.

01 02 55 53       CMP       Okay.

01 02 55 55       CC       And for our information, we've been watching a  $PCO_2$   
again. Did you change a lithium hydroxide canister  
this morning? Over.

01 02 56 08       CDR       Yes. We did, and we've been seeing 1.7 percent in  
the spacecraft ever since.

01 02 56 14       CC       Roger. That agrees with our data.

01 02 56 19       CDR       1.7 millimeters.

01 02 56 21       CC       Roger. We copy.

01 02 57 00 CDR Houston, Apollo 11. We're starting our maneuver to PTC attitude.

01 02 57 05 CC Roger.

01 02 59 21 CC 11, this is Houston. Over.

01 02 59 26 LMP Go ahead.

01 02 59 27 CC Roger. From a propellant-balancing standpoint, we recommend that you use quads Alfa and Bravo to start the PTC maneuvers. Over.

01 02 59 39 LMP Roger. Understand Alfa and Bravo.

01 02 59 41 CC Roger. Out.

01 03 06 14 CC 11, this is Houston. Over.

01 03 06 19 CDR Go ahead, Houston.

01 03 06 21 CC Roger. For CRYO-balancing purposes, we'd like you to turn the heater and oxygen tank number 1 off at this time. Over.

01 03 06 32 CDR Okay. Stand by.

01 03 06 35 CC Everything else in the CRYO system remains the same.

01 03 06 39 CDR Okay.

01 03 06 56 CMP Okay. We have O<sub>2</sub> heater tank 1 off.

01 03 07 01 CC Houston. Roger. Out.

01 03 07 10 CMP How is EECOMM today? Is he happy with all those good things?

01 03 07 14 CC Oh, EECOMM is happy, and after you get PTC set up, we've got a little procedure from EECOMM here to check out the O<sub>2</sub> flow and the O<sub>2</sub> flow sensor in your cabin enrichment. Over.

01 03 07 29 CMP Okay.

01 03 07 35 CMP It'll be a while, Bruce. We're just now arriving in PTC attitude, and we're going to our 20 minutes of monitoring thruster activity.

01 03 07 42 CC Roger. We copy. He'll be here.

01 03 13 03       CMP       Houston, Apollo 11. Are you going to take control of the OMNI's now and switch us between B and D?

01 03 13 08       CC       This is Houston. Stand by one.

01 03 13 35       CC       11, Houston.

01 03 13 38       CMP       Go ahead.

01 03 13 40       CC       Mike, how about selecting Bravo at this time, and I'll give you a COMP configuration here, shortly.

01 03 13 49       CMP       Okay.

01 03 14 24       CMP       That PTC sure worked well last night.

01 03 14 28       CC       Outstanding.

01 03 14 55       CC       11, Houston.

01 03 15 00       CMP       Go ahead.

01 03 15 02       CC       Okay. Roll for the COMM situation: have S-band antenna OMNI A in Bravo, S-band antenna OMNI to OMNI, high-gain track to MANUAL, and the pitch is minus 50 and yaw is 270.

01 03 15 24       CMP       You may have to repeat some of that, James. We've got a LM guy taking care of the high gain right now.

01 03 15 30       CDR       Yes, and he is eyeballing the Earth.

01 03 15 32       CMP       He's got his head out the window.

01 03 15 35       CC       I understand. I had trouble on 12 with him, too.

01 03 15 42       LMP       Say again what you'd like.

01 03 15 44       CC       Okay. The S-band antenna OMNI A switch to Bravo which you have now, and S-band antenna OMNI to the OMNI position, and the high-gain track to the MANUAL position, and the pitch and yaw angles are minus 50 for pitch and yaw is 270.

01 03 16 10       LMP       Minus 50 and 270.

01 03 17 09       LMP       Hey, Jim, I'm looking through the monocular now, and to coin an expression, the view is just beautiful. It's out of this world. I can see all the islands in the Mediterranean. Some larger and smaller islands of Majorca, Sardinia, and Corsica.

A little haze over the upper Italian peninsula, some cumulus clouds out over Greece. The Sun is setting on the eastern Mediterranean now. The British Isles are definitely greener in color than the brownish green that we have in the islands, in the peninsula of Spain. Over.

01 03 18 03      CC      Roger. I understand that the Northern Africa - Mediterranean area is fairly clear today, huh?

01 03 18 12      LMP      Right.

01 03 18 14      CDR      Yes. We see a bunch of roads with cars driving up and down, too.

01 03 18 19      CC      Do you find that the monocular is any good to you, Buzz?

01 03 18 27      LMP      Yes. It would be nicer if it had another order of magnitude of power on it. Of course, it has a tendency to jiggle around a little bit, and you might want to have some sort of a bracket. I hate to use that word though.

01 03 18 53      LMP      Got an anticyclone going in the southern hemisphere southeast of Brazil, and some - Well, the diameter of it must be over 2000 miles across.

01 03 19 15      CC      How does the weather look up in the southern part of the western hemisphere, or up in the United States area?

01 03 19 26      LMP      Well, you all are just beginning to come over the limb now. I can see parts of Central America, and it looks to be fairly clear there. The islands in the Caribbean are beginning to come in and rather a few streaming lines of clouds. Looks like there is a system up to the - well, off of Greenland that has some large cloud streamers extending back down to the southwest. The east coast of the U.S. is just coming into view now, and it doesn't look too bad that I can see right now. We may have some pretty good shots later on this afternoon. Over.

01 03 20 16      CC      Roger. Thank you.

01 03 21 50      LMP      Houston, Apollo 11.

01 03 21 54      CC      Go ahead, 11.

01 03 21 56 LMP I've got a comment about the point on the Earth where the Sun's rays reflect back up toward us. In general, the color of the oceans is mostly uniform and it's bright and darker blue except for that region that's about one-eighth of an Earth's radius in diameter; and in this circular area, the blue of the water turns a grayish color, and I'm sure that's where the Sun's rays are being reflected back on up toward us. Over.

01 03 22 41 CC Roger, Buzz. We noticed the same thing. It's very similar to looking at a light shining on something like a billiard ball or a bowling ball. You get this bright spot in the blue of the water, and that turns it to sort of a grayish color.

01 03 22 57 LMP Yes. Is there a Navy term for that?

01 03 23 00 CC (Laughing.) A lot of gray paint.

01 03 25 27 CC ll, Houston.

01 03 25 32 CMP Go ahead, Houston.

01 03 25 38 CC Mike, are you satisfied with P23 now?

01 03 25 43 CMP Yes, I'm happy with the last updates we got, you know, in terms of what it did to our state vector. Still not altogether happy with the various procedures. If we could pick stars within the smaller range of trunnion angles so that you could allow P23 to pick its own maneuver and go to that sub-stellar point and then have that star visible, that would seem to me to be the simplest and best way to do it.

01 03 26 14 CC How about the - -

01 03 26 19 LMP ... correction on that last ...

01 03 26 20 CC How about the horizon now? Is it pretty well defined for you and no longer hazy?

01 03 26 24 CMP Yes. We're far enough out now that the - I think the horizon definition variation is lost in the North.

01 03 26 57 LMP Hey, Jim.

01 03 27 03 CC Go ahead, Buzz.

01 03 27 06 LMP Looks like the best way to get a steady view through the monocular is just steady it out and let it close when it's in front of your eye, and then you kind of float up next to it so that you're not touching it at all. It has a very slow drift, and you get a better - steadier view that way.

01 03 27 25 CC Sounds good.

01 03 27 47 CC How does it feel to be airborne again, Buzz?

01 03 27 51 LMP Well, I'll tell you, I've been having a ball floating around inside here, back and forth up to one place and back to another. It's like being outside, except more comfortable.

01 03 28 04 CC It's a lot bigger than our last vehicle.

01 03 28 06 CMP ... kept me busy, I'm ...

01 03 28 10 CMP Say again about Buzz -

01 03 28 11 LMP Yes. It sure is nice in here.

01 03 28 13 CC I said it's a lot bigger than the last vehicle that Buzz and I were in.

01 03 28 17 CMP Oh, yes. It's been nice. I've been very busy so far. I'm looking forward to taking the afternoon off. I've been cooking, and sweeping, and almost sewing, and you know, the usual little housekeeping things.

01 03 28 30 CC It was very convenient the way they put the food preparation system right next to the NAV station.

01 03 28 43 CDR Everything is right next to everything in this vehicle.

01 03 28 43 LMP Not if you're in the ...

01 03 28 53 CDR Jim, it's been a little warm in the machine throughout yesterday and last night during the PTC. It cooled off somewhat with the windows buttoned up, and we've seen suit temperatures of about - the high 40's and cabin temperatures in the low 60's. But this seems to be still a little bit on the warm side.

01 03 29 28 CC I understand that it got a little warm during the day and cooled down a little bit when you put the shades up, but you're still a little bit warm. Do you have any moisture condensation or anything like that on the wall?



01 03 29 40 CDR No, we haven't been able to detect any moisture anyplace in the spacecraft. It seems to be fine.

01 03 29 50 LMP One of the hydrogen filters - the one that we've got on the hot water - seems to keep flowing when you remove one of the food bags from it. Its flow rate is quite small, right near the end of one out, and that contributes a little bit of moisture to the atmosphere.

01 03 30 16 CMP Yes, that hydrogen thing, it's - I'm not sure, but I think it's a backpressure problem. If the thing sees any backpressure at all, like when the bag is attached, well the flow rate will slowly decrease to where it's almost zero, and you wait, and you wait, and you wait for that last ounce. You think you have it, and you remove the bag, and then you very rapidly thereafter see maybe a glob the size of a dime or a quarter come out and just hang there. That appears to be true even though the opening into the bag is not restricted.

01 03 30 49 CC Understand.

01 03 30 54 LMP In general, I think they do quite a good job, especially on the guns, in removing a lot of the hydrogen bubbles.

01 03 31 04 CC Have the water temperatures been good? Are you getting hot water?

01 03 31 12 LMP Yes. It seems reasonably warm.

01 03 31 17 CMP We made three cups of coffee today. The last one - you know when all the plumbing was warmed up, the hydrogen gun and everything, was warmest of the three. I don't know who had that one - Neil, did you have that one? How was your coffee? You didn't drink it till later, did you? Anyway, it's pretty good. It's not piping hot, but it sure beats stone-cold coffee.

01 03 31 49 CMP Jim, we've been sitting here a little over 20 minutes now. How does the thruster firing activity look? Are you ready to go on with this PTC?

01 03 31 56 CC Roger. Stand by.

01 03 32 00 CC We're all set to go, Mike.

01 03 32 04 CMP Okay. I'll press on then.

01 03 35 59       CMP       Houston, Apollo 11. PTC has started and it looks good.

01 03 36 06       CC        11, Roger. This is Houston. Roger. Out.

01 03 47 22       CC        Apollo 11, this is Houston. Over.

01 03 47 27       CDR       Go ahead, Houston.

01 03 47 29       CC        Roger. If you're free for a couple of minutes, we have a procedure here that will let us verify the O<sub>2</sub> flow transducer and at the same time get some more of our cabin enrichment out of the way. Over.

01 03 47 46       CDR       Stand by.

01 03 48 37       CDR       Go ahead, Houston. We're ready to copy.

01 03 48 41       CC        Roger. The primary purpose of this is, as I mentioned, to let us check out your O<sub>2</sub> flow transducer. However, we still need about 2 hours' worth of cabin enrichment, so we'd like to keep the vent that we're going to set up going for this purpose. Okay. We want you to install the cabin vent quick disconnect which you'll find in compartment R-6, that is Romeo 6, on the urine connector on panel 251. When this is completed, verify that the waste stowage vent valve is closed, and then open or position the waste management overboard drain to the DUMP position. Over.

01 03 49 10       CDR       Okay. Understand that. Install the cabin quick disconnect out of R-6 on the 251 urine connector and verify that the waste dump valve is closed, and say again the last part.

01 03 50 02       CC        Roger. And then put the waste management overboard drain valve into the DUMP position. Over.

01 03 50 16       CDR       Roger. Put the waste management overboard drain valve to the DUMP position.

01 03 50 20       CC        Right. That's the one down on panel 251 also. And we'll watch your O<sub>2</sub> flow on telemetry down here.

01 03 52 49       CDR       Okay, Houston. That configuration is set up.

01 03 52 57       CC        11, this is Houston. Say again, please.

01 03 53 02 CDR You do have the O<sub>2</sub> flow transducer checkout setup accomplished.

01 03 53 08 CC Okay. Understand you have opened the drain valve at this time.

01 03 53 13 CDR That's ... It's in DUMP.

01 03 53 15 CC Roger. We're not getting telemetry data from you right due to low signal strength. There it comes back. I expect it'll probably take us anywhere from 15 minutes to half an hour to see an increase in O<sub>2</sub> flow due to the size of the cabin and of course of the small size of the drain. Over.

01 03 53 36 CDR Roger.

01 04 07 16 CMP Houston, Apollo 11.

01 04 07 18 CC Go ahead, 11.

01 04 07 21 CMP Roger. I've got the world in my window for a change and looking at it through the monocular, it's really something. I wish I could describe it properly. The weather is very good. South America is coming around into view. I can see on the - what appears to me to be upper horizon, a point that must be just about Seattle, Washington, and from there I can see all the way down to the southern tip of Tierra del Fuego and the southern tip of the continent.

01 04 07 55 CC Roger. Sounds like you've got a beautiful view up there.

01 04 08 01 CMP Absolutely fantastic. I hope the pictures come out. We're rotating around where it's going out of view again.

01 04 08 09 LMP I'm waiting to pick it up in the sextant.

01 04 08 14 CC Sounds like one of these rotating restaurants.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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01 04 30 33 CC Apollo 11, this is Houston. Over.

01 04 36 09 LMP Houston, Apollo 11. Do you need some help keeping OMNI's locked on us?

01 04 36 15 CC Apollo 11, this is Houston. Negative. We had a command computer at the Madrid site go down. We had to switch over to Ascension temporarily. We're now back remoting through Madrid, and the computer is back, and we're ready to resume control of your OMNI's and full communication. Over.

01 04 36 38 LMP Okay. You've got it.

01 04 36 39 CC Okay. One thing that we did miss in the dropout in the noise here is your LM/CM DELTA-P reading for about 28 hours GET. Over.

01 04 37 05 LMP Okay. The LM/CM DELTA-P is 0.98.

01 04 37 10 CC Roger. 0.98, and what have you been reading for O<sub>2</sub> flow on your onboard gage? Over.

01 04 37 23 LMP Well, right now, after we put that gadget in, we've got it back to 0.35. Before that, we were reading on scale level. I think ours is relatively correct, at least when time comes for the water accumulator to kick in at 10 seconds, it goes on up to about 0.75, 0.8, something like that.

01 04 37 50 CC This is Houston. Roger. Out.

01 04 38 43 CC And, 11, this is Houston. A little more information based on our analysis of your last SPS burn: it looks like you got a good solid burn there. We show 94 psi chamber pressure and it looks like the SPS is definitely GO. Over.

01 04 39 06 LMP Good to hear it.

01 04 39 08 CC Roger. We thought you'd feel that way about it.

01 04 39 21 LMP We're right in the middle of - well either ... or salmon salad, or something like that. That's probably why we're not answering you right away.

01 04 39 32 CC Okay. Well, we don't want - -

01 04 39 33 LMP My compliments to the chef, that salad salmon is outstanding.

01 04 39 41 CC Roger. Understand that's the salad salmon. Over.

01 04 39 49 LMP Something like that, salmon salad.

01 04 39 51 CC There we go, the salmon salad, very good.

01 04 39 57 LMP Okay. Bruce, we're coming up on the water accumulator activity, and it's going on up to 0.85, oh, about 0.95 and it reached a peak there and then gradually dropped back on down to 0.6 now, 0.4, and it looks like it's pretty well - pretty well leveling off back down to 0.35. Over.

01 04 40 30 CC Roger. We're copying that.

01 04 41 27 CC 11, Houston.

01 04 41 31 CDR Go ahead.

01 04 41 32 CC Roger. On that 20 flow transducer down here on telemetry, our values are agreeing pretty well with what you read out onboard, and the EECOMM's have been noticing this cycle, but it still looks like the indicated rate is lower than what we would expect. We're still working on the problem, and we'll let you have a more complete diagnosis on it in a little while.

01 04 42 03 CDR Okay. It's a tight fix then.

01 04 42 04 CMP We run a tight ship.

01 04 42 08 CC Roger. Is that music I hear in the background?

01 04 42 15 CMP Buzz in singing.

01 04 42 16 CC Okay.

01 04 42 31 CMP Pass me the sausage, man.

01 05 32 09 CC Apollo 11, this is Houston. Over.

01 05 32 13 CDR Go ahead, Houston.

01 05 32 14 CC Roger, 11. We've been watching your activity on the DSKY there, and by selecting another major program with a VERB 37 ENTER and all that, we show you collapsing the deadband in PTC and having driven the CMC rate from 0.3 degrees per second down to 0 degrees per second, although of course, with all the AUTO RCS coils shut off, you're not firing any thrusters. Over.

01 05 32 54 CDR Okay. What do you recommend?

01 05 32 59 CC Well, you can just continue in your present configuration in PTC. However, if you go to turn any thrusters on, the CMC would then try to bring you into an attitude hold position rather than continuing with the PTC. Over.

01 05 33 20 CDR Roger. I understand.

01 05 33 21 CC Okay.

01 05 33 38 CDR And, Houston, we're just looking at you out our window here. Looks like there's a circulation of clouds that just moved east of Houston over the Gulf and Florida area. Did that have any rain in it this morning?

01 05 33 59 CC Roger. Our report from outside says that it's raining out here, and looks like you've got a pretty good eye for the weather there.

01 05 34 09 CDR Yes. Well, it looks like it ought to clear up pretty soon from our viewpoint. The western edge of the weather isn't very far west of you.

01 05 34 20 CC Okay.

END OF TAPE

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(GOGG: NET 1)

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01 05 58 15       CC       Apollo 11, this is Houston. Over.

01 05 58 22       CDR       Go ahead, Houston.

01 05 58 23       CC       11, this is Houston. As a result of our venting through the waste management drain, we've concluded that your O<sub>2</sub> flow rate sensor is, in fact, malfunctioning. I mentioned when you talked us through the cyclic water accumulator dump that even though it was moving, probably indicating a higher flow rate, it didn't seem to be indicating a flow rate that is high enough; and based on that and the flow that we're getting right now, we've concluded that the transducer is malfunctioning. We'd like to continue the O<sub>2</sub> flow for about another hour, shutting it off at about 31 hours GET, to get the O<sub>2</sub> concentration in the vehicles up to - in the vehicles up to where it will be acceptable for LM checkout. Over.

01 05 59 27       CDR       Okay. Does it look to you like it just has a bias on it?

01 05 59 45       CC       Roger, 11. It does seem to be a bias. Looks like it has a fairly high threshold before it starts indicating. EECOMM seems to think, though, that for high flow rate purposes, it will still give you a relative indication during the mission. Over.

01 06 00 10       CDR       Okay. We understand. Thank you.

01 06 12 20       CC       Apollo 11, this is Houston. We would like you to terminate charging on battery A at CET 30 plus 15. Over.

01 06 12 31       CDR       Okay. 30 plus 15 for battery A charge terminate.

01 06 12 36       CC       Roger. Out.

01 06 15 34       CC       Apollo 11, this is Houston. Over.

01 06 15 41       CDR       Go ahead, Houston.

01 06 15 42       CC       Roger. If you're free for a minute, I've got some updates to the P37 PAD's that we passed up to you yesterday afternoon, I guess. As a result of doing midcourse correction number 2, the DELTA-V required in the TLI plus 35, 44, and 53 PAD's have changed slightly. Over.

01 06 16 18 CDR Roger. Standing by to copy.

01 06 16 21 CC Okay. TLI plus 35 PAD: the DELTA-V<sub>T</sub> should be 7992 instead of 8016. TLI plus 44 - It should be 6112 instead of 6141. And TLI plus 53 - It should be 8172 instead of 8209. Read back. Over.

01 06 16 57 CDR Roger. Understand. 7992, 6112, 8172. Over.

01 06 17 05 CC Roger. Readback correct. Out.

01 06 29 28 CC Apollo 11, this is Houston. Over.

01 06 29 34 CDR Go ahead, Houston.

01 06 29 39 CC 11, this is Houston. Goldstone reports they are receiving a TV picture coming down from you all, a little snowy, but a good TV picture. Over.

01 06 29 54 CDR Roger. We're just testing the equipment up here.

01 06 29 59 CC Roger.

01 06 30 03 CDR Ask them if they can read the numbers.

01 06 30 06 CC Okay. Stand by.

01 06 30 24 CC Goldstone, this is Houston CAP COMM. Over.

01 06 30 42 CT Houston CAP COMM, Goldstone M&O. Go ahead.

01 06 30 45 CC Roger. Stand by a minute, Goldstone.

01 06 30 51 CC 11, this is Houston. What numbers are you referring to? Over.

01 06 31 00 CDR Well, I guess if they can't see any numbers, why, it's kind of a lost cause.

01 06 31 04 CC Negative. Stand by. We wanted to know - -

01 06 31 06 CDR ...

01 06 31 07 CC We wanted to know what numbers before we asked them.

01 06 31 12 CDR Okay. I'm showing them the DSKY, and I'd like to know whether they can read what's showing on the DSKY, and also whether they can see P-R-O-G, V-E-R-B, and N-O-U-N. Over.

01 06 31 22 CC Roger. Stand by a second.



01 06 31 26 CC Goldstone M&O, Houston CAP COMM. Over.

01 06 31 29 CT CAP COMM, Goldstone. Go ahead.

01 06 31 31 CC Roger. Did you copy the spacecraft request?

01 06 31 34 CT That's affirmative. I am reading the numbers on our monitor here.

01 06 31 38 CC Okay, that's - Roger. That's both the numbers on the DSKY itself, and the little words like PROGRAM and VERB, NOUN, COMPUTER ACTIVITY, things of this sort?

01 06 31 58 CT Roger. I can read the numbers clearly. We can't distinguish what the words are, because it is a little snowy.

01 06 32 09 CC Roger.

01 06 32 11 CT Okay. I read VERB, NOUN, and PROGRAM.

01 06 32 19 CC Roger. Do you see - Over in the lefthand corner, there's a big square one that says COMPUTER ACTIV- ITY, COMP ACTIVITY?

01 06 32 25 CT Roger. I see a flash occasionally in that area.

01 06 32 28 CC Roger. That's the one.

01 06 32 31 CT Okay. It looks like he's moved the camera at this time.

01 06 32 34 CC Roger.

01 06 32 36 CC 11, this is Houston. Goldstone M&O reports that they can read the numbers on the DSKY. They can also read VERB, NOUN, PROGRAM, and see the COMP ACTIVITY light flashing. Over.

01 06 32 49 CDR Very good. Thank you.

01 06 32 51 CC And they also report you appear to have panned the camera over to another location now.

01 06 32 57 CDR Yes, we're going to work on something else.

01 06 33 01 CC Roger.

01 06 51 11 CMP Houston, Apollo 11.

01 06 51 14 CC Go ahead, 11.

01 06 51 18       CMP       Oh, Charlie. That you?

01 06 51 20       CC        That's me. How are you there?

01 06 51 25       CMP       Oh, just fine. How's the old White Team today?

01 06 51 27       CC        Oh, the old White Team's bright-eyed and bushy-tailed. We're ever alert down here.

01 06 51 33       CMP       Ever alert and ... Hey, you got any medics down there watching high grade? I'm trying to do some running in place down here, and I'm wondering just out of curiosity whether it brings my heart rate up.

01 06 51 44       CC        Well, they will spring into action here momentarily. Stand by.

01 06 52 12       CC        Hello, 11. We see your heart beating.

01 06 52 18       CMP       Okay, Well - look at the CDR's and the CMP's and see if they go up any. We're all running in place up here. You wouldn't believe it.

01 06 52 26       CC        I'd like to see that sight. Why don't you give us a TV picture of that one.

01 06 52 31       CMP       I think Buzz is trying. You got it.

01 06 52 36       CC        Okay. It's coming in at Goldstone, Buzz. As Bruce said, we don't have it here in the center.

01 06 52 58       CMP       I'm afraid this isn't going to help out the PTC very much.

01 06 53 05       CMP       Yes. I don't know if it's a vibration or what it is, but it makes the pitch and yaw rate needles on FDAI number 1 jump up and down a little bit when we jump up and down.

01 06 53 19       CC        Roger. Goldstoners say they see you running there, Mike.

01 06 53 29       CMP       Okay.

01 06 53 31       CDR       Ask him what he's running from.

01 06 53 48       CC        11, Houston. Mike, we see about a 96 heartbeat now.

01 06 53 56       CMP       Okay. Thank you.

01 06 54 27       CMP       Well, that's about all that is reasonable,  
without getting hot and sweaty.

01 06 54 32       CC       Roger. We copy.

01 06 58 00       CMP       Goldstone should be getting about the best  
picture of the Earth we can give them right  
now, Charlie.

01 06 58 03       CC       Roger, Mike. Thank you much.

01 06 58 07       LMP       We've got a little distortion in the horizontal  
direction from banding on our monitor. I wonder  
if they're getting the same thing?

01 06 58 17       CC       Stand by, Buzz. I'll let you know.

01 06 58 29       LMP       I guess it would be more described as a waviness.

01 06 58 31       CC       Goldstone M&O, Houston CAP COMM.

01 06 58 37       CT       Goldstone M&O.

01 06 58 58       CC       Okay. The crew is complaining of some horizontal  
banding on their monitor. Do you see that on the  
picture?

01 06 59 05       CT       Stand by.

01 06 59 14       LMP       They wouldn't see anything now. We don't have  
anything in focus, Charlie.

01 06 59 20       CC       Roger. He's checking on it. I'll see if they  
had it earlier. Stand by.

01 06 59 28       CMP       I guess when we're showing the DSKY or when we're  
showing the Earth might be the better time.

01 06 59 34       CC       Okay.

01 06 59 40       CT       Houston CAP COMM, Goldstone.

01 06 59 42       CC       Go ahead.

01 06 59 43       CT       Okay. Our TV people confirm they see this hori-  
zontal band.

01 06 59 46       CC       Okay.

01 06 59 51       CC       11, Houston. The Goldstone TV people also see  
the banding when - at the same time you do. Over.

01 07 00 02 LMP Okay. Would they call it a horizontal waviness, instead of banding, maybe?

01 07 00 06 CC I'm not talking to them directly. Stand by, Buzz. Let me see how they describe it.

01 07 00 13 CC Goldstone M&O, Houston CAP COMM. Could you put the TV guy on the loop, please?

01 07 00 19 CT CAP COMM, Goldstone. Roger.

01 07 01 01 CT Houston CAP COMM, Goldstone M&O NET 1.

01 07 01 04 CC Go.

01 07 01 05 CT The TV people do not have access to NET 1 in that area. Suggest we use NET 2 for that purpose.

01 07 01 10 CC Okay. Going to NET 2.

01 07 02 02 CC Hello, Apollo 11. Houston. The Goldstone TV guys say they have some horizontal banding across the upper part of the picture and across the lower part. They would consider the lines just straight, no waviness to them at all. Over.

01 07 02 24 LMP Roger. Understand. They do seem to distort vertical lines though.

01 07 02 30 CC Say again about the vertical lines, Buzz.

01 07 02 35 LMP Roger. When there's a vertical line, these horizontal bands tend to put small waves in it.

01 07 02 44 CC Roger. I copy. He didn't mention that. Stand by. I'll check again.

01 07 03 30 CC Hello, 11. Houston. The Goldstone TV said that when you get a sharp vertical line on the picture, when the horizontal banding goes across, it does appear to bend it slightly. The same as Apollo 10, they said. Looks okay to them. Over.

01 07 03 47 LMP Okay. Understand. It's not our monitor. It must be the transmitter or the system.

01 07 03 52 CC Roger. I guess so, Buzz. We'll have them look into it, and see if they can suggest anything.

01 07 05 12 CC Hello, Apollo 11. Houston. We've lost our command interface with Goldstone. We'd like you to switch to OMNI Delta. Over.

01 07 05 24 LMP Roger. Going to Delta.

01 07 05 26 CC Roger.

01 07 07 20 CC Hello, Apollo 11. Houston. We'd like you to terminate the O<sub>2</sub> purge if you have not done so already, and the TV camera people say that the lines are inherent in the camera, Buzz; and it's something that we expected. Over.

01 07 07 41 LMP Roger. Understand about the camera. Say again about the O<sub>2</sub> purge.

01 07 07 44 CC Roger. We can terminate the O<sub>2</sub> purge at this time. Over.

01 07 07 50 LMP Oh, okay. Fine. Will do.

01 07 13 18 CC Hello, Apollo 11. Houston. Please select OMNI Bravo on board. Over.

01 07 13 26 CMP Okay. Going to Bravo, Charlie.

01 07 13 28 CC Roger.

01 07 13 32 CMP How's everything going down there? You guys happy with the spacecraft systems?

01 07 13 37 CC Roger. Affirmative. Everything's looking really good to us. Over.

01 07 13 44 CMP Okay. Same here.

01 07 14 23 CMP Charlie, how far out can you pick up TV off the OMNI?

01 07 14 27 CC Stand by.

01 07 14 47 CC Hello, Apollo 11. Houston. We're just about to the limits where we can get any kind of picture at all on the OMNI's on the TV. It - The picture, I guess, would be just almost zero at this point.

01 07 15 02 CMP Okay. Well, for this TV program coming up in a couple of hours, you might give some thought to how you want us to stop PTC, if you do, for the best high gain angle; and also it would be nice if you could stop us at such an attitude that we'd have the Earth out of one of our windows.

01 07 15 21 CC Roger, 11. We're thinking about that.



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01 07 22 25 LMP Boy, you sure get a different perspective in this thing in zero g. Right now, Neil's got his feet on the forward hatch, and he can with his arms reach - all five windows. He can reach down into - the LEB where the over-board drain is. He can practically reach over in the cockpit.

01 07 22 33 CC Sounds like Plastic Man to me.

01 07 23 00 CMP I'm hiding under the left-hand couch trying to stay out of his way.

01 07 23 04 CC Be a good idea, Mike.

01 07 25 18 LMP Houston, Apollo 11. You got a cloud over the Houston area right now?

01 07 25 24 CC Roger. We just had a really big thunderstorm here about a hour ago. Couple of storms around the area ... Over.

01 07 25 28 LMP Yes. I see one fairly large and isolated one. There are couple of more off to the left, but this one looks fairly good size. It could very well be the one that just passed over you.

01 07 25 33 CC Roger.

01 07 25 34 LMP Yes, and it looks like the Cape has been having a little bit of rain, too.

01 07 25 47 CC Roger. The one we had here came in from the west and is moving east - or nearly so, as far as I could tell.

01 07 25 59 LMP That view through this sextant is fantastic. I can see Alaska right up - right up along the LM, and I'm running the crosshairs right now down the coast of California, the west coast of Mexico, Yucatan Peninsula, up around the Gulf, Florida, Cuba, down Central America, and I'm running into the stop right now, on the sextant.

01 07 26 44 CC Roger. It sounds like a pretty fantastic view.

01 07 26 51 LMP The guys in the weather office at Patrick wanted a report on the tops but I guess all we can say is we're above them.

01 07 26 58 CC Roger. We'll pass it on to METRO.

01 07 27 09       CC       11, Houston. Do you see any predominant weather systems as far as frontal type or any buildup of tropical-storm type? Over.

01 07 27 25       LMP       Not any large ones. There are a couple of smaller disturbances. Well, there's one maybe 300 miles north of Cuba, but it doesn't look cyclonic.

01 07 27 39       CC       Roger.

01 08 24 58       CC       Hello, Apollo 11. Houston. We got a TV attitude for you and also an update to your CMC erasable load and your alternate contingency checklist, if you could break that out too. Over.

01 08 25 16       LMP       Roger. I'm not sure I caught all of that. Go ahead with what you have.

01 08 25 23       CC       Roger, 11. If you'll break out your alternate and contingency checklist for the CSM, we got an update to some of the erasable loads on page F2-20. Over.

01 08 25 42       LMP       Okay. Be getting that out, and you can give us the attitude for TV.

01 08 25 48       CC       Roger, 11. Your TV attitude will be roll 261, pitch 090, yaw 000. High gain angle: pitch plus 28, yaw 271. That puts the left-hand window pointed at the Earth. We recommend exiting PTC with your updated procedure in the checklist. Over.

01 08 26 29       LMP       Roger. We copy roll 21 - 61, pitch 090, yaw 000, high gain pitch plus 28, yaw 271. And we'll like this with the DELTA-V that we have in the book. Over.

01 08 26 46       CC       That's affirmative.

01 08 27 01       CMP       Charlie, Apollo 11. I have a couple of questions on stopping the PTC. It seems to me the easiest way to stop it would be - we're essentially, of course, at 0 degrees yaw and closing up to 90 degrees pitch, so it's just a question of stopping at 260 roll, roughly, and - How about for a procedure going MANUAL ATTITUDE, three to RATE COMMAND and then, seeing as how our deadband has already collapsed, I'll turn on the panel 8 RCS thrusters, at which time it should stop at whatever attitude it finds itself in. And if I do all of that as it comes up on 261 degrees roll, we should stop right there. Is that sufficient?



01 08 27 46 CC Sounds pretty good. Stand by one.

01 08 27 50 CMF Sounds like it might save a little gas.

01 08 29 06 LMF Houston, Apollo 11. What page do you want in that revision? Over.

01 08 29 11 CC Roger, 11. If you'll turn to page F2-20. Over.

01 08 29 28 LMF Okay, Tim -

01 08 29 32 CC Roger, 11. Under column A on page F2-20, line 5, line 05, the new data is 01042; line 07, the new data is 00256. Skipping down to line 11, 00070; line 12 is 00042; line 13 is 77730. In column Bravo, lines 3, 4, and 5, which are blank, should be all zeros for line 3; line 4 is 20017; line 5 20616. Over.

01 08 31 10 LMF Roger. Page F2-20, column Alfa: 05, 01042; 07, 00256; 11, I'll say again. 11, 00070; 12, 00042; 13, 77730. Column Bravo: 03, 00000; 04, 20017; 05, 20616. Over.

01 08 32 09 CC Roger. Good readback, Buzz. And stand by, Mike, on the coming-out-of-the-PTC recommendation. Over.

01 08 32 17 CMP Okay. Fine.

01 08 33 06 CC Hello, Apollo 11. Houston with a recommendation on exiting PTCM. Over.

01 08 33 13 CMP Go ahead.

01 08 33 14 CC Roger, Mike. We'd like to see you go to ACCEL COMMAND on the MANUAL ATTITUDE switches. Then to turn on the AUTO RCS SELECT switches, and then go RATE COMMAND. That will prevent us from firing jets uncoupled. Over.

01 08 33 36 CMP Okay. Fine. And I would guess go RATE COMMAND and roll first and then followed by pitch and yaw.

01 08 33 45 CC Okay. That sounds good if - And when you get to the roll attitude desired, just go RATE COMMAND at that time and it'll stop us right on.

01 08 33 58 CMP Yes. I agree, Charlie. That sounds right.

01 08 34 00 CC Roger.

01 08 39 11 CC Hello, Apollo 11. Houston with some more words on exiting PTC. Over.

01 08 39 18 CME Go ahead, Charlie.

01 08 39 20 CC Roger. Mike, when you were playing with the P37 a while ago and we collapsed the deadband back down, the DAP assumed that the deadband was centered around the new attitude that we happened to be at, at that time. Since then, we've drifted out a couple of degrees in both pitch and yaw from that attitude such that if we did the procedure as we called it up to you of going ACCEL COMMAND, turning on all of the AUTO RCS SELECT switches and then RATE COMMAND, it would attempt to fly back to the pitch and yaw attitude that it had when the deadband collapsed. We can prevent that by - just immediately prior to going to RATE COMMAND on the MANUAL ATTITUDE switches, if you cycle the SPACECRAFT CONTROL switch to SCS, then back to CMC. Over.

01 08 40 13 CME Sounds like a winner.

01 08 40 14 CC Okay.

01 08 40 33 CME I'm not going to let these LM guys play with my DSKY anymore.

01 08 40 38 CC You sound like you'd better protect it. It looks like just about anything that you do with that DSKY is going to collapse that deadband back down.

01 08 40 49 CME Understand.

01 08 43 14 CME Charlie, we just STABED to 261 degrees roll, and it looks like whoever figured it out did a good job. It's right there, dab-smack in the middle of window number 1.

01 08 43 23 CC Sounds great.

01 08 46 00 LMF Looks like Houston's still got a little smog over it, Charlie.

01 08 46 04 CC We've got a constant overcast here in the room. We'll be right there. Stand by.

01 08 46 08 LMP Of course, a little cloud from up here probably covers 8 or 10 states.

01 08 46 31 CC ll, Houston. Some of our guys just came in from outside and said it's pretty clear over the center here. It's cleared up completely. All the storms have moved on.

01 08 46 42 LMP Very good.

01 08 49 17 LMP Oh, yes, Charlie. I can see it through the sextant now, and I can see the coastline is clear. Those clouds are just inland a few miles.

01 08 49 26 CC Okay. We copy.

01 08 49 49 LMP Looks like the southeast part of the country is all socked in.

01 08 50 04 LMP California looks nice. The San Joaquin Valley shows up as a real dark spot with a lighter brown on either side of it. You can't tell that it's green. It looks just sort of dark gray or maybe even real dark blue.

01 08 50 16 CC How does the Mojave look? Is it clear?

01 08 50 26 LMF Yes. As usual.

01 08 50 28 CC Roger. The - around -

01 08 50 29 LMF It looks like there's some clouds just to the west of the Sierras, northeast of Bakersfield a little bit; and crossing over into the Mojave from Bakersfield looks clear; and then as you get on further to the southeast of there, there's a few clouds.

01 08 50 48 CC Roger, 11. Can you pick out Edwards in the sextant? Over.

01 08 50 58 LMP I can see a 104 taxiing out for takeoff on the runway.

01 08 51 03 CC Hey, man. That's super.

01 08 51 07 LMP These dang bastards almost always have a 104 taxiing out for takeoff.

01 08 51 48 CC 11, Houston. Could you pick out anything around Edwards, a dry lake or anything? Over.

01 08 51 56 LMP Negative, Charlie. I just - I don't have that resolution. But to give you some idea, I can - on the lower Texas coast, I can see - knowing what I'm looking for, I can see Padre Island. I can just barely make out the fact that there's a thin spit of land and then there's a little dark zone which is the Laguna Madre between it and the mainland.

01 08 52 22        CC        Roger, ll. That's pretty significant. Thank  
you much, Buzz.

01 08 52 27        LMP        Right.

01 08 52 39        LMF        How far out are we, Charlie?

01 08 52 41        CC        Stand by. I'll give it to you exactly. Looks  
like around 130 000, but stand by.

01 08 52 47        LMF        Okay.

01 08 53 16        CC        ll, Houston. The exact range is 125 200 miles,  
and you're traveling 4486 feet per second.

01 08 53 29        LMF        Pretty far and pretty slow. Just past halfway.

01 08 53 48        LMP        Hey, Charlie, what the latest on Luna 15?

01 08 53 53        CC        Say again, Buzz? Over.

01 08 53 58        LMF        Roger. What's the latest on Luna 15?

01 08 54 02        CC        Stand by. I'll get the straight story for you.

END OF TAPE

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01 09 37 44        CC        Hello, Apollo 11. Houston. Over.

01 09 37 48        CMP        Go ahead, Charlie.

01 09 37 50        CC        Roger. Latest on Luna 15 - TASS reported this morning that the spacecraft was placed in orbit close to the lunar surface, and everything seems to be functioning normally on the vehicle. Sir Bernard Lovell said the craft appears to be in an orbit of about 62 nautical miles. Over.

01 09 38 17        CMP        Okay. Thank you, Charlie.

01 09 38 20        CC        And also, President Nixon has reported - or declared a day of participation on Monday for all federal employees to enable everybody to follow your activities on the surface. Many state and city governments and businesses throughout the country are also giving their employees the day off, so it looks like you're going to have a pretty large audience for the EVA.

01 09 38 46        CMP        Oh, that's very nice, Charlie. I'll tell Neil about it.

01 09 47 57        CDR        Houston, Apollo 11. We've stopped PTC. We're in the right position; we're setting up for TV.

01 09 48 02        CC        Roger.

01 09 52 31        CC        Apollo 11, Houston. We have you stopped in the PTC; attitude looks good to us. Mike, I would like to get a COMM check. The last couple of the transmissions from the spacecraft has been garbled from especially Buzz. Could you both give me a COMM check? Over.

01 09 52 51        LMP        Roger, Charlie. Buzz here. How do you read? 1, 2, 3, 4, 5; 5, 4, 3, 2, 1.

01 09 52 56        CC        Roger. You are about four-by with a slight decrease/increase in volume, sort of a wavy volume to it. Over.

01 09 53 09        LMP        Okay. I moved my mike around. How about now? Is this any better?

01 09 53 12        CC        Hey, that's beautiful right there. Thank you.

01 09 53 17        CMP        Okay, Charlie. 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. How do you read me?

01 09 53 21      CC      Roger. You're five-by. Is Neil on?

01 09 53 25      CDR      1, 2, 3, 4, 5; 5, 4, 3, 2, 1.

01 09 53 27      CC      Roger, Neil. You're five-by.

01 09 59 11      CC      Hello, Apollo 11. Houston. We got the network all configured for the TV. You can start any time you want. Over.

01 09 59 45      CC      Okay, 11. We have a picture. We see the Earth right in the center of the screen. Over.

01 09 59 52      CDR      Roger, Houston. Apollo 11 calling in from about 130 000 miles out. And we'll zoom our camera in slowly and get the most magnification we can. Over.

01 10 00 06      CC      Roger.

01 10 01 16      CC      11, Houston. The definition is pretty good on our monitor here. The color is not too ..., at least on this set. Could you describe what you're looking at? Over.

01 10 01 31      CDR      Roger. You're seeing Earth, as we see it, out our left-hand window, just a little more than a half Earth. We're looking at the eastern Pacific Ocean, and the north half of the top half of the screen, we can see North America, Alaska, United States, Canada, Mexico, and Central America. South America becomes invisible just off beyond the terminator or inside the shadow. We can see the oceans with a definite blue cast, see white bands of major cloud formations across the Earth, and can see coastlines, pick out the western U.S., San Joaquin Valley, the Sierra mountain range, the peninsula of Baja California, and we can see some cloud formations over southeastern U.S. There's one definite mild storm southwest of Alaska, looks like about 500 to 1000 miles, and another very minor storm showing the south end of the screen near the - or a long ways off of the equator, probably 45 degrees or more south latitude. Can pick out the browns in the land-forms pretty well. Greens do not show up very well. Some greens showing along the north-eastern - northwestern coast of the United States and northwestern coast of Canada.

01 10 03 44      CC      Roger, 11. It's a pretty good picture on clarity here. We're having - can you tell us - It appears to us that there are two distinct cloud formations

trending east/west, one approximately about along the equator, and one around 30 or so south latitude. Could you tell us exactly where those cross the landmasses? Over.

- 01 10 04 13 CDR Yes. They cross just south of the lower part of Mexico, probably through Central America. That is the equatorial band which we assume to be the intertropical convergence zone. The other band, which stands about 30 south, correctly appears to join the equator at the far left, or just beyond the horizon on the left edge of Earth, or at least it looks like it's going to join it. We don't have an explanation for that banding.
- 01 10 04 53 CC Roger, Neil. Thank you. It also appears that just to the left of the terminator, up in the northern hemisphere, there's a cloudband trending - a gap in the cloud, trending northwest/southeast. It appears to us that that comes in about over the northern United States, or perhaps the central United States. Is that about correct? Over.
- 01 10 05 26 CDR I can see on the monitor the thing you were talking about, but right now I can't get my eye to the window to pick out just where it crosses the shoreline.
- 01 10 05 35 CC Roger.
- 01 10 05 42 CC You guys are doing a good job. It's a real steady picture, here. We're - Clarity is excellent. The color, it's - the clouds are - The whites are distinct. The rest of it looks like, to me anyway on the monitor I'm observing, is a fairly greenish blue is the way I'd describe it. Over.
- 01 10 06 09 CC It appears that the - -
- 01 10 06 11 CDR Well, we can't observe much green from the spacecraft.
- 01 10 06 18 CC Roger. On this monitor, the landmasses appear to be just a darker grayish color rather than a brown.
- 01 10 06 31 CDR Well, it's true that we do not have the depths of color at this range that we enjoyed at 50 000 miles out. However, the oceans still are a definite blue and the continents are generally brownish in cast,

although it is true that they're tending more toward gray now than they were at the closer range.

01 10 07 03        CC        Roger, 11. We've been - I've just been vectored to another monitor and sure enough, the browns are coming in a lot more distinctly on the Eidephor that we have up on our screen in the control center. Over.

01 10 07 21        CDR        Okay, world, hold on to your hat. I'm going to turn you upside-down.

01 10 07 50        CC        11, that's a pretty good roll, there.

01 10 08 03        CDR        Oh, I'd say sloppy, Charlie. Let me try that one again.

01 10 08 12        CC        You'll never beat out the thunderbird.

01 10 08 37        CC        Apollo 11, Houston. That practice did you some good. It's looking - real smooth roll, there.

01 10 08 43        CC        Oops! Spoke too soon.

01 10 08 53        CDR        I'm making myself seasick doing it, Charlie. I'll just put you back rightside-up where you belong.

01 10 08 58        CC        Roger.

01 10 09 01        CDR        You don't get to do that every day.

01 10 09 12        CC        11, Houston. Could you describe, from your view, the polar cloudcap? It appears to us to extend down the western coast of North America. Would you estimate how far it extends down? Over.

01 10 09 47        LMP        Trying to fit everybody into the window.

01 10 09 50        CDR        It appears that the cloudcap comes down a little bit below the southern extremity of Alaska.

01 10 10 03        CC        Roger.

01 10 10 11        CC        We've - 11, we've lost our picture here, now.

01 10 10 24        CC        Okay. Apollo 11, Houston. We've got the picture back now.



01 10 10 36 CDR Unfortunately, we only have one window that has a view of the Earth and it's filled up with the TV camera, so your view now is probably better than ours is.

01 10 10 47 CC Roger. We copy.

01 10 10 51 CC 11, Houston. If you could comply, we'd like to see a little smiling faces up there, if you could give us some interior views. I'm sure everybody would like to see you. Over.

01 10 11 06 CDR Okay. We'll reconfigure the TV for that.

01 10 11 08 CC Roger.

01 10 12 31 CC Apollo 11, Houston. It appears to us that we're seeing a view from outside plus a little of the inside. It appears you've taken the camera away from the left window now. Over.

01 10 12 45 CDR That's correct. We're moving it back and reconfiguring for interior lighting.

01 10 12 50 CC Roger.

01 10 12 56 CC We can still see the Earth through the left window, and it appears that we can see a floodlight off to the left, either that or some Sun shafting through the hatch window.

01 10 13 10 CDR It's a floodlight.

01 10 13 11 CC Roger.

01 10 13 14 CC Now we're coming in. Can't quite make out who that ...

01 10 13 24 CC That's big Mike Collins, there - -

01 10 13 25 CMP You got a little bit of - Yes, hello there sports fans. You got a little bit of me, plus Neil is in the center couch, and Buzz is doing the camera work at this time.

01 10 13 34 CC Roger. It's a little dark now, 11. Maybe a bigger f-stop might help.

01 10 13 44 CMP Yes, that's in work.

01 10 14 05 CC It's getting a lot better now, 11. Mike, you're coming in five-by. I got a good -

01 10 14 14      CMP      I would have put on a coat and tie if I'd known about this ahead of time.

01 10 14 18      CC      Is Buzz holding your cue cards for you. Over.

01 10 14 25      CMP      Cue cards have a no. We have no intertions of competing with the professionals, believe me. We are very comfortable up here, though. We do have a happy home. There's plenty of room for the three of us and I think we're all learning to find our favorite little corner to sit in. Zero g is very comfortable, but after a while you get to the point where you sort of get tired of rattling around and banging off the ceiling and the floor and the side, so you tend to find a little corner somewhere and put your knees up or something like that to wedge yourself in, and that seems more at home.

01 10 15 05      CC      Roger. Looks like Neil is coming in five-by there, 11. Mike, see you in the background. The definition is really outstanding. The colors are good. It's a real good picture we're getting here of Commander Armstrong. We - Buzz, when you take the camera over towards the window where the Sun's shafting through, it tends to blank it out, though.

01 10 15 35      CMP      Yes, Neil's standing on his head again. He's trying to make me nervous.

01 10 15 40      CC      Roger.

01 10 15 50      CMP      He's disappearing up into the tunnel, of course, as he would going into the lunar module, only backwards.

01 10 15 57      CC      Roger. We can see portions of the LEB now. The systems test meter panel, in the lower part of the picture, or we did have it, anyway.

01 10 16 09      CMP      Okay. And then directly behind his head are our optical instruments, the sextant and the telescope that we use to take sightings with.

01 10 16 19      CC      Roger. Copy. And we see the DSKY flashing with a 651. In fact, we can read registers 1 and 2 quite clearly.

01 10 16 31      CMP      We have the old high gain angles telling us which way the Earth is.

01 10 16 35      CC      Copy. That's a beautiful picture. Clarity is outstanding.

01 10 16 47      CMP      We can also give you the time of day in our system of mission elapsed time. Elapsed time: 34 hours 16 minutes and umpteen seconds. Can you see that clearly enough, Charlie?

01 10 16 59      CC      Roger, Apollo 11. We can see it counting up every - every second. We got 34 17 02 now.

01 10 17 13      CMP      Okay. Back to the high-gain angles.

01 10 17 15      CC      Roger.

01 10 17 18      CMP      Now we have amputated those.

01 10 17 45      CC      11, Houston. We have a beautiful rainbow there now as you move the camera around. ... That looks like the star charts coming into view, now. Over.

01 10 17 58      CMP      Yes. Those are Buzz's two star charts that he is using right now as sun shades over the right-hand window, window number 5.

01 10 18 07      CC      Roger. We see the sun shining in through it behind him and plotting out the equatorial - correction, ecliptic plane, and the stars that you're using for the navigation.

01 10 18 20      CMP      Roger. He doesn't really need the charts. He's got them memorized. They're just for show.

01 10 18 27      CC      We copy.

01 10 18 28      LMP      While we're pointing up in this direction, we see out our side windows the Sun going by and, of course, out one of our windows right now we've got the Earth. Now right behind my window, of course, we have the Sun, because the Sun is illuminating the star charts that we see. This line represents the ecliptic plane and these lines, vertical lines, represent our reference system that the spacecraft is using at this time. As we approach the Moon, the Moon will gradually grow larger and larger in size and eventually it will

be in - it will be eclipsing the Sun as we go behind it, as we approach the lunar orbit insertion maneuver.

01 10 19 19      CC      Roger, 11. We've - Could you attempt a little bit better focus there, 11? Over.

01 10 20 01      CC      11, Houston. That's a lot better on the star chart now. We can make out the ecliptic plane and the planets and the Sun and the Moon as they have gone at various places throughout the ecliptic plane. Over.

01 10 20 19      CMP      Okay, Charlie.

01 10 20 41      LMP      If we can get some of the wires untangled here, we'll give you a demonstration of how easy push-ups are up here.

01 10 20 52      CC      11, Roger. Good view of Buzz, there.

01 10 21 24      LMP      When it gets pretty hard doing it that way, we just roll over and do it the other way.

01 10 21 30      CC      Roger. We copy. We couldn't figure out whether that was a chinup or a pushup. Just take your choice, I guess.

01 10 22 05      CMP      Well, it looks like it's probably almost your dinner time down there, Earth. We'll show you our food cabinet here in a second.

01 10 22 14      CC      11, Roger.

01 10 22 38      CC      11, Houston. We see a box full of goodies there. Over.

01 10 22 43      CMP      We really have them, Charlie. We've got all kinds of good stuff. We've got coffee up here in the upper left and various breakfast items, bacon in little small bites, beverages like fruit drink, and over in the center part we have, oh, all kinds of things. Let me pull one out here and see what it is.

01 10 23 04      CC      Roger.

01 10 23 11      CMP      Would you believe you're looking at chicken stew, here? All you have to do is - 3 ounces of hot water for 5 or 10 minutes. Now we get our hot water out of a little spigot up here with a

filter on it that filters any gases that may be in the drinking water out, and we just stick the end of this little tube in the end of the spigot and pull the trigger three times for 3 ounces of hot water and then mush it up and slice the end off it and there you go, beautiful chicken stew.

01 10 23 46       CC       Sounds delicious.

01 10 23 56       CMP       Yes. The food so far has been very good. We couldn't be happier with it.

01 10 24 00       CC       Roger.

01 10 24 01       CMP       Could I borrow that flashlight a second?

01 10 24 05       CC       The surgeons are saying thank you, there, for that.

01 10 24 10       CMP       And it is sort of down in a dark corner, so we have a flashlight here to help us see things; and if I can let go of it carefully, it'll just hold itself right where it is.

01 10 24 24       CC       Roger.

01 10 24 25       CMP       As long as it's ..., it will.

01 10 24 36       CC       Apollo 11, Houston. That's a pretty good demonstration. You started off really stable there, Mike. It's -

01 10 24 44       CMP       Well, the problem is, no matter how carefully you let go, you bump it just a tiny little bit and set it in motion, and once in motion there she goes. Try that again.

01 10 25 00       CC       It looks fairly stable now with slow rotation.

01 10 25 29       CMP       Well, so much for the food department. I'm going to close up the store down here.

01 10 25 33       CC       Roger. We copy.

01 10 25 39       LMP       Charlie, we checked out the cable lengths, and we're thinking we might want to see if we can take the TV into the LM with us tomorrow for part of the time. Over.

01 10 25 49       CC       Roger. Good show. We'd like to see it if it'll reach that far. Over.

01 10 25 57       LMP       We'll give it a try.

01 10 25 59       CC       Roger.

01 10 26 31       CMP       And where we sleep is down underneath this couch.

01 10 26 37       CC       Houston. Roger.

01 10 26 42       CC       Slowly sinking into the sack there.

01 10 26 51       CMP       It's really comfortable.

01 10 27 01       CMP       Forgot to give Buzz his flashlight back.

01 10 27 22       CC       Apollo 11, Houston. Could you give the folks a view of your patch on your CWG's? Over.

01 10 27 37       CMP       Stand by one, Charlie; we'll try and give you a closeup.

01 10 27 40       CC       Roger.

01 10 27 52       CC       11, Houston. We have the patch. Could you attempt to improve the focus slightly? Over.

01 10 28 13       CC       11, Houston. The scan on the camera makes the - that's a little bit better now. The flashlight seems to flicker, due to the scan on the TV. We can't see the eagle. Now it's a little bit better. Over. Could you open the f-stop a little bit more? Over.

01 10 28 41       CMP       It's open all the way. We're going to have to move Buzz around a little bit.

01 10 28 44       CC       Roger.

01 10 29 23       CC       Apollo 11, Houston. The color is better now. It's coming in. We could attempt a little bit better focus on it. There we go; it focuses a lot better now. We see the eagle coming right in on the lunar surface. Over. That's very good now.

01 10 29 56       CC       Apollo 11, Houston. That's very good now. We can see the Earth in the background, Apollo 11, and the eagle coming in.

01 10 30 05      CMP      It's probably pretty hard to see the olive branch,  
isn't it?

01 10 30 08      CC       Roger. It is.

01 10 30 12      CMP      Well, that's what he has in his talons, is an  
olive branch.

01 10 30 16      CC       Copy.

01 10 30 39      CC       Apollo 11, Houston. We're really impressed with  
the clarity and the detail that we have in the  
picture. The colors are - now, it's really an  
excellent picture now that I'm looking at it on  
our monitor, which is about 12 seconds before the  
networks can get it out due to the conversion that  
we have here on our TV converter. We're looking  
at the controls in the main display console. We  
can see the DSKY up on the panel. Over.

01 10 31 32      CMP      That would be nice if you could take a look at all  
the circuit breakers; make sure the right ones are  
in and the right ones are out.

01 10 31 38      CC       Roger. Big Bubba's watching.

01 10 31 43      CMP      And we're glad of it.

01 10 31 53      CMP      Boy, you guys have sure been doing a good job of  
watching us, Charlie. We appreciate it.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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01 10 32 00 CC The spacecraft's been beautiful, 11. We've really no complaints at all. Looks - Things are really great.

01 10 32 12 CMP Can you see this DSKY on the MDC?

01 10 32 15 CC That's affirmative. It appears that - can't quite tell what program ... went PCO. We see you punching in a VERB 35, I think it is. Over.

01 10 32 28 CMP Yes. Might as well tell the EECOMM's - or tell the GNC and everybody to hold on to their hat and I'll push the ENTER button.

01 10 32 36 CC Roger.

01 10 32 51 CC Roger. We see a real display now.

01 10 32 56 CC That's a good demonstration of how the crew has the interface with the computer, talking to the programs and all that we have in the computer.

01 10 33 09 CMP Well, that's right, Charlie. Sometimes it tells us things and sometimes we tell it things and mostly it talks to us.

01 10 33 14 CC 11, Houston. We just lost our pic - I see we're going back outside now. Over.

01 10 33 29 SC ...

01 10 34 31 CC 11, Houston. We copy. Over.

01 10 34 35 CDR Roger. We copy, And as we pan back out to the distance at which we see the Earth, well, it's Apollo 11 signing off.

01 10 34 50 CC Roger, Apollo 11. Thank you much for the show. It's a real good half hour. Appreciate it. Thank you very much. Out.

01 10 35 22 CMP Okay. That's it, Charlie.

01 10 35 24 CC 11, Houston. We appreciate the show. Thank you very much. Over.

01 10 35 29 CMP Right.

01 10 35 49 CC Apollo 11, Houston. Would you key ERROR RESET on the DSKY, please? Over.



01 10 36 00 CDR Okay. We should be straightened out now, Charlie, and back in POO.

01 10 36 43 CMP Houston, Apollo 11. How do we stand on this O<sub>2</sub> fuel cell purge? You want to go ahead and do that as scheduled in the flight plan?

01 10 36 51 CC Stand by, 11. Over.

01 10 36 54 CMP Okay.

01 10 36 58 CC 11, Houston. You can commence the O<sub>2</sub> fuel cell purge now if you'd like. Over.

01 10 37 04 CMP Okay. Fine.

01 10 37 13 CMP While Buzz is doing that, I'll change the lithium hydroxide.

01 10 37 16 CC Roger.

01 10 41 42 CC Hello, Apollo 11, Houston. Over.

01 10 41 47 LMP Go ahead, Houston. Apollo 11.

01 10 41 49 CC Roger, Buzz. The attitude that we're in right now is a convenient one to start PTC in. We'd be satisfied with this attitude. So we'd like you to disable quads Charlie and Delta; and we'll wait about 5 to 10 minutes, and then we'll establish the PTC. Over.

01 10 42 10 LMP Roger. Disable Charlie and Delta, and we'll wait before starting PTC.

01 10 42 16 CC Roger.

01 10 53 17 CC Hello, Apollo 11, Houston. The rates are damped out well enough for you to initiate the PTC now. Over.

01 10 53 26 LMP Okay. We'll get it going.

01 10 59 58 CMP Houston, Apollo 11.

01 11 00 03 CC Roger. Go ahead.

01 11 00 09 CMP Roger. This time the DAP didn't like 0.3. It's - We followed the procedures; we got down to 70 000 ENTER. It took off at about 0.7.

01 11 00 21 CC Roger. We're copying that. Stand by.

01 11 00 39 LMP Houston, Apollo 11. Would you like high gain back?

01 11 00 43 CC Roger. And you - Would you select ATTITUDE HOLD? Over.

01 11 01 09 CDR Houston. Would you say again what your request is?

01 11 01 15 CC Roger, 11. We'd like you to go back to ATTITUDE HOLD. Over.

01 11 01 22 CDR Roger.

01 11 01 24 CC 11, Houston. Looks like we're going to have to reinitialate - reinitialize this PTC.

01 11 01 31 CDR All right.

01 11 01 41 CMP Okay. Do you have any roll angle that you'd like to stop it in, Charlie? I haven't stopped it yet.

01 11 01 48 CC Stand by.

01 11 01 55 CC 11, Houston. It's your preference. Right now if you want to. Over.

01 11 02 03 CMP Okay.

01 11 07 47 CC Apollo 11, Houston. Over.

01 11 07 52 LMP Houston, Apollo 11.

01 11 07 53 CC Roger, 11. The problem on that initially - starting up the PTC was we failed to do the VERB 49 which - and load the desired initial attitude; so the DAP tried to take it back to the old attitude that we had started up in number of hours to go. That's why we picked up the rates in the other axes. We're going to wait in this attitude for about 20 minutes to damp out the rates again, and then we'll proceed with the VERB 49 and load our attitude that we have at the time - at this time. Over.

01 11 08 37 CMP Okay. That sounds good, Charlie. When you get to the VERB 49, I'd like for you to give me the three gimbal angles that you want loaded.

01 11 08 44 CC Roger. We'll do. Over.

01 11 08 48 CMP Thank you.

01 11 08 50 CC And Apollo 11, Houston. We have your flyby PAD if you're ready to copy. Over.

01 11 08 56 CMP Stand by one.

01 11 09 31 LMP Houston, Apollo 11. Is that P30 PAD?

01 11 09 34 CC That's affirmative. Over.

01 11 09 41 LMP Okay. Ready to copy.

01 11 09 42 CC All right, Buzz. It's - flyby is the purpose. SPS/G&N: 62815, plus 097, minus 020 070 54 5944, minus 00028, plus 00023, plus 00069 029 149 312, apogee is NA, plus 00221 00078 001 00034, sextant star 01 2185 227, boresight star is NA NA NA. Latitude is minus 0265, minus 16500, 11899 36228, 144 56 47. In the comments: your set stars are Deneb and Vega, 007 144 068. No ullage. It's a docked burn using the PTC REFSMMAT. Stand by for your readback. Over.

01 11 12 41 LMP Okay. Would you give me GET of 0.05g again, please?

01 11 12 44 CC Roger. 144 56 47. Over.

01 11 12 58 LMP Roger. Flyby SPS/G&N: 62815, plus 097, minus 020 070 54 5944, minus 00028, plus 00023, plus 00069, 269 149 312 NA, plus 00221 00078 001 00034, 01 2185 227 NA, minus 0265, minus 16500 11899 36228 144 56 47, Deneb and Vega, 007 144 068. No ullage; docked, PTC REFSMMAT. Over.

01 11 14 12 CC Roger. Say again your roll angle, Buzz. I copy - I read 029. Over.

01 11 14 20 LMP Roger. 029.

01 11 14 22 CC Roger. Good readback.

01 11 14 38 CMP Houston, Apollo 11. On the 0.7 rate, the rate loaded into the DAP is 0.1 or 0.2.

01 11 14 48 CC 11, Roger.

01 11 17 46 CC Hello, Apollo 11. Houston. Over.

01 11 17 51 CMP Houston, Apollo 11. Go.

01 11 17 53 CC Roger, Mike. Would you please copy down your VERB 16 NOUN 20 ICDU angles now, then execute a VERB 49 and load that - those angles, the NOUN 20

that you see on the DSKY into the VERB - into the NOUN 22 slot; and PRO on that, and that will start our 20-minute rate period. Over.

01 11 18 18       CMP       Okay, Charlie. I'll do that right now in just a matter of inches. Those numbers are plus 04511, plus 09021, and plus 35984. Over.

01 11 18 31       CC       Roger.

01 11 20 13       CMP       Houston, Apollo 11. I've done that and, of course, I got an immediate 50 18. So I guess we're set up to proceed from here, and I'll start the 20-minute timer.

01 11 20 21       CC       That's affirmative.

01 11 20 44       CMP       Houston. I still question that 0.2 rate with 0.2 loaded into the DAP, though. Could you explain that one?

01 11 20 50       CC       Roger. We're working on it.

01 11 20 54       CMP       Okay.

01 11 25 42       CC       Apollo 11, Houston. Over.

01 11 25 48       CMP       Houston, Apollo 11.

01 11 25 49       CC       Roger. We got a little laser visual experiment we'd like to - for you to do for us. If - if you got the Earth through any of your windows or through the telescope, would you so advise? Over.

01 11 26 09       CMP       Stand by one, Charlie.

01 11 26 15       CMP       At this roll attitude, what should our high-gain angles be? Maybe that would help us locate you. We don't see you in the lens.

01 11 26 23       CC       Stand by.

01 11 27 27       CC       Hello, Apollo 11. Houston. Those high gain angles are pitch minus 70, yaw 90. We think the Earth is apparently pretty close to plus z-axis. Over.

01 11 27 40       CMP       Okay.

01 11 28 00       CMP       Okay, Charlie. I got you in the telescope.

01 11 28 08      CC      Roger, Apollo 11. We've got a laser that we're going to - It's a blue-green laser that we're going to flash on and off at a frequency of on for a second, off for a second. It's coming out of McDonald Observatory near El Paso, which is - should be right on the terminator -- or right inside the terminator. We are going to activate that momentarily. Would you please take a look through the telescope and see if you can see it. Over.

01 11 28 42      CMP      Telescope? Or sextant?

01 11 28 45      CC      Either one. Over.

01 11 28 49      CMP      Okay, I'll try it with the telescope; and if I don't see it there, then I'll try the sextant.

01 11 28 53      CC      Roger. We'll give you the word when they've got it turned on. Over.

01 11 28 58      CMP      Okay.

01 11 29 44      CMP      11, Houston. They don't have it turned on yet. We'll give you the word when they got it turned on. Over.

01 11 29 50      CMP      Okay.

01 11 30 42      CC      Hello, Apollo 11. Houston. We noticed the CRYO pressure dropped a moment ago. Did you stir up the CRYO's? Over.

01 11 30 50      CDR      Roger. We've finished our cycling operations.

01 11 30 53      CC      Roger. Copy. Out.

01 11 33 53      CC      Hello, Apollo 11. Houston. McDonald's got the laser turned on. Would you take a look? Over.

01 11 34 02      CMP      Okay, Charlie.

01 11 34 04      CC      It's bluish-green.

01 11 36 48      CC      11, Houston. We got some shaft and trunnion for you that might tweak it up a little bit. Shaft of 141.5, trunnion of 39.5. Over.

01 11 37 07      CDR      Okay. Stand by.

01 11 38 55      CC      Apollo 11, Houston. If you see it, it should be coming up - appear to be coming up through the clouds. McDonald reports that there's a break in

the clouds that they're beaming this thing through. Over.

01 11 39 09 CDR Roger.

01 11 39 54 CC Hello, Apollo 11. Houston. You can terminate the exercise on the laser. Our rates are steady enough now for - to commence the PTC. Over.

01 11 40 06 LMP Okay, Houston. Neither Neil nor Mike can see it. Incidentally, those shafts and trunnions just missed pointing at the world.

01 11 40 17 CC Roger. Thank you.

01 11 40 26 LMP As we are looking at it through the scanning telescope, it would be about a - oh, maybe a third of an Earth radii high and to the left.

01 11 40 37 CC Roger.

01 11 40 39 LMP But, we did - but we did identify the El Paso area and it appeared to us to be a break in the clouds there, and we looked in that break and saw nothing.

01 11 40 48 CC Roger. Thank you much. Out.

01 11 43 06 CMP Houston, Apollo 11. Over.

01 11 43 09 CC Roger. Go ahead. Over.

01 11 43 13 CMP Were you following that on the DSKY?

01 11 43 17 CC Roger. Stand by.

01 11 43 28 CC 11, Houston. What's your exact question? Over.

01 11 43 34 CMP I've followed the procedure through step 7 down to the point where I've got 27303 ENTER, and this resulted in an OPERATOR ERROR LIGHT.

01 11 43 48 CC Roger. Stand by.

01 11 45 04 CC Apollo 11, Houston. Stand by a moment. We'll have an answer for you momentarily. Over.

01 11 45 11 CMP Okay. Appreciate it, Charlie. Now the light's gone out without any further DSKY action.

01 11 45 16 CC Roger.

01 11 45 18 CMP Correction. Stand by; that's not so.

01 11 45 22 CC Roger.

01 11 57 06 CC Apollo 11, Houston.

01 11 57 11 CMP Houston, Apollo 11.

01 11 57 13 CC Roger. We've finally gotten concurrence on our problem here with 50 guys looking at it. When we were sitting in the 5018, we attempted to load the erasable before you terminated the VERB 49. So Mike, what we're going to have to do is call up the present CDU's, copy those down, and do a VERB 49, load the present, then do a PROCEED, then an ENTER, and then we can then set up ATTITUDE HOLD in step 6. Over.

01 11 58 03 CMP Okay. I think that's what we did last time.

01 11 58 10 CC It appeared to us that we attempted to load the erasable prior to entering on the VERB 49 which VERB 49 was still running, and it clobbered the CDU's. Over.

01 11 58 26 CMP Okay.

01 12 01 02 CMP Houston, Apollo 11. We're moving at the proper rate.

01 12 01 06 CC Hallelujah!

01 12 01 51 CC 11, Houston. It looks great to us now. Over.

01 12 01 59 CMP It looks fine here, Charlie. The 0.7 part is the only part I don't find explained yet.

01 12 02 05 CC Roger, Mike. We're working on that one right now. We're coming up with the story soon. Over.

01 12 02 14 CMP Thank you.

01 12 02 24 CC 11, Houston. We're handing over COMM to Goldstone. Over. Correction, from Goldstone to Honeysuckle. Over.

01 12 02 32 CMP Okay.

01 12 02 53 CMP Hello, Houston through Honeysuckle Ov - -

01 12 03 00 CC Apollo 11, Houston. Go ahead. Over.

01 12 03 05 CMP You sound good to us through Honeysuckle. How do we sound?

01 12 03 08        CC        Roger. You're five-by, Mike. We'd like the OMNI configuration as follows. OMNI Alfa place in Bravo, OMNI to OMNI, high-gain track to MANUAL, high-gain yaw 270, pitch - -

01 12 04 02        CC        Hello, Apollo 11. Houston. How do you read now? Over.

01 12 04 07        LMP       Roger. I'm reading you loud and clear. I'm not sure I got all those. I've got S-band OMNI B, OMNI, track to MANUAL, and beam wide, pitch - you'd better say that again, and yaw 270. Over.

01 12 04 26        CC        Roger, Buzz. I broke up at pitch minus 50 at beam wide. Over.

01 12 04 37        LMP       Roger. Copy.

01 12 05 24        LMP       Houston, Apollo 11. Are you ready to copy some numbers on status report, et cetera.

01 12 05 30        CC        Say again. Over.

01 12 05 38        LMP       Roger. Are you ready to copy some numbers on the status report, et cetera?

01 12 05 42        CC        Roger. Go ahead. Over.

01 12 05 49        LMP       Okay. Radiation CDR 11005, CMP 10006, LMP 09007; medication negative. And I got some battery and RCS numbers for you.

01 12 06 07        CC        Go ahead. Over.

01 12 06 10        LMP       Battery C 37.1, PYRO battery A and B both 37.1. RCS Alfa 82, Bravo 84, Cocoa 85, Delta 87. Over.

01 12 06 28        CC        Roger, we copy. Radiation 11005, 10066, 09007; no medication; 37.1, 37.1, 37.1, 82, 84, 85, 87. Over.

END OF TAPE



APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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01 12 06 51 LMP That's affirmative. And you want a LM/CM DELTA-V? It's 1.1.

01 12 06 56 CC Roger. Copy 1.1.

01 12 07 56 CC Hello, Apollo 11. Houston. Please verify that four CRYO heaters AUTO, the four fans off. Over.

01 12 08 07 LMP Okay. We have been holding the O<sub>2</sub> heater number 1 in the OFF position. I believe that was your last instruction. All the other heaters are AUTO and all fans are off. Over.

01 12 08 22 CC Roger. Stand by.

01 12 08 26 CC 11, Houston. We would like all heaters AUTO. Over.

01 12 08 32 LMP Roger. All four AUTO, all four fans off.

01 12 09 00 CC Hello, Apollo 11. Houston. As the Sun sinks slowly in the west, the White Team bids you good night. If we get a story on the seven-tenths, we can give it to you in about 15 minutes or so; if not, we'll give it to you in the morning. Over.

01 12 09 15 CMP Okay. That sounds fine, Charlie. Thanks.

01 12 09 32 LMP Hey, you earned your pay today, Charlie. Thank you.

01 12 09 39 CC Roger. Good night all.

01 12 20 05 CC Hello, Apollo 11. Houston. One request: the optics switch to zero. And we've got a lot of theories on why it maneuvered at seven-tenths a moment ago, Mike, but no real definite answer. We'll be back with you later. Over.

01 12 20 21 CMP Okay. No rush, Charlie. Thank you.

01 12 52 06 CC Hello, Apollo 11. Houston. Over.

01 12 52 10 CMP Houston, Apollo 11.

01 12 52 12 CC Roger. Mike, I think we can explain that seven-tenths rate. When we - the first time through, you know, we failed to go through the VERB 49, so we had a large error between our actual CDU and desired CDU in roll. And with that situation,

the DAP - the vehicle will roll - will maneuver, rather, at a rate that is loaded in, which was three-tenths plus four-tenths rate, and it will limit at four-tenths above the desired rate, so - that is if we have a large enough angle between the desired and the actual, which we did. So, therefore, the rate was four-tenths plus three-tenths to give you the seven-tenths. Over.

01 12 53 08       CMP       Okay. Thank you.

01 12 53 11       CC       Roger.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSC NET 1)

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REST PERIOD - NO COMMUNICATIONS

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

Tape 26/1  
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REST PERIOD - NO COMMUNICATIONS

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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REST PERIOD - NO COMMUNICATIONS

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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REST PERIOD - NO COMMUNICATIONS

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

Tape 29/1  
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REST PERIOD - NO COMMUNICATIONS

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

Tape 30/1  
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REST PERIOD - NO COMMUNICATIONS



(GOSS NET 1)

Tape 31-1

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02 00 09 00        CC        Apollo 11, Apollo 11, this is Houston. Over.

02 00 09 08        LMP        Good morning, Houston. Apollo 11.

02 00 09 10        CC        Good morning, Apollo 11.

02 00 09 19        LMP        ... nice sleep. Be getting around to the ...

02 00 09 34        LMP        How's everything look up here from the ground?

02 00 09 47        CC        Apollo 11, this is Houston. Roger. Say again, please.

02 00 09 54        LMP        Roger. How do all our systems look?

02 00 09 59        CC        Roger. They're looking great, and as far as we can tell everything is good from down here. Over.

02 00 10 08        LMP        Roger. Looks like the attitude held up real well during PTC last night.

02 00 10 13        CC        Yes, it did. We were showing you remaining well within a circle of 10 degrees radius throughout the night. Seems to be working beautifully.

02 00 10 37        CMP        How's the old Green Team this morning? Did you have a quiet night?

02 00 10 40        CC        Yes. It was a very quiet night. Down here the old Black Team is complaining they didn't get a chance to make any transmissions. Ron Evans is getting - -

02 00 10 53        CMP        Well, we'll be seeing them tomorrow, I guess.

02 00 10 56        CC        Yes. Ron's getting to be known as the silent CAP COMM.

02 00 11 03        CMP        That's the best kind, Bruce.

02 00 11 05        CC        (Laughter) Okay.

02 00 11 41        CC        When you feel up to copying, 11, I've got a couple of small items in the way of a flight plan update and your morning consumables update. Over.

02 00 12 14        LMP        Apollo 11.

02 00 12 17        CC        Roger, 11. We'd like to perform a waste-water dump at your convenience some time in the near future here. No particular time scheduled. Down air at the time for midcourse correction 3, which is about 53 55, we're deleting midcourse correction number 3 and all the items associated with it. For your information, the calculated value of the burn for midcourse number 3 was eight-tenths of a foot per second, that is 0.8 feet per second. Canceling this, if we decide to burn midcourse correction 4, this would then give you a burn for midcourse correction 4 of 2.0 feet per second. At 53 hours we have an IMU realign P52. We're requesting that you do this while in PTC, and we plan to continue PTC throughout the day. Over.

02 00 13 52        CMP        - then we'll get to the waste-water dump - -

02 00 13 57        CC        Say again, please. You're cutting out.

02 00 14 04        LMP        Roger. - -

02 00 14 26        CC        11, this is Houston. Stand by a minute, please. We're having difficulty receiving you.

02 00 15 12        CC        Apollo 11, this is Houston. Radio check. Over.

02 00 15 17        LMP        Roger, Houston. Read you loud and clear. How me? Over.

02 00 15 20        CC        Roger. Reading you the same. We did a minor reconfiguration down here. Stand by. Out.

02 00 16 37        CC        Okay, 11. This is Houston. We switched your OMNI antennas as you rolled through the appropriate position. Did you copy the flight plan update item?

02 00 17 08        CC        Apollo 11, this is Houston. Over

02 00 17 15        LMP        Apollo 11, go ahead.

02 00 17 17        CC        Roger, 11. Did you copy the flight plan update items? Over.

02 00 17 23        LMP        Roger. How do you read me now, Bruce?

02 00 17 29        LMP        Okay. The battery charge is in the process now and the waste-water dump is in work. MCC-3 has been canceled. It would have been 0.8 feet per second. MCC-4 now looks like about 2.4 feet per second. At around 53 hours we'll do a P52 in PTC. Over.

02 00 17 56        CC        Roger, 11. The magnitudes of the midcourse corrections were just for your information, but midcourse 4 was down around 2.0 feet per second. Again, for your information, on SPS chamber pressure, it looks like your onboard readout of 87 psi corresponds to 92 psi by our telemetry, and your value of 89 on board corresponds to 94. Over.

02 00 18 53        CC        Apollo 11, Houston. Radio check on a new power amplifier in our transmitter. Over.

02 00 19 02        LMP       Roger. Read you loud and clear. How me? Over.

02 00 19 04        CC        Roger. Loud and clear. Did you copy my notes on SPS chamber pressure?

02 00 19 12        LMP       Negative.

02 00 19 13        CC        Okay. Just for your information again, it appears that your readout of 87 psi corresponds to our corrected TM readout of 92 - that's 92 psi, and 89 on board is really 94 psi. Over.

02 00 19 48        LMP       Roger, I got that you were reading about 5 psi low.

02 00 19 53        CC        Roger. And are you ready for the consumables update?

02 00 20 00        LMP       Ready to copy.

02 00 20 02        CC        Okay. Consumables update for GET of 46 plus 00: minus 5.5 percent, minus 6.5 percent, minus 2.5 percent, minus 7.5 percent, minus 5.0 percent, minus 2 pounds hydrogen, plus 1 pound oxygen, and that minus 5.5 percent on the RCS total corresponds to minus 66 pounds. Over.

02 00 20 54        LMP       Okay. I copy those, and I'll give you our percentages now: Alpha 82, Bravo 84, Cocoa 85, Delta 87. Over.

02 00 21 07        CC        This is Houston. We copy your percentages, and do you have a crew status report on sleep for us?

02 00 21 24        LMP       Roger. And in descending order 8, 9, and 8. Over.

02 00 21 30        CC        Houston. Roger. Out.

02 00 22 54       CMP       Houston, we're getting CRYO pressure warning now in the middle of stirring up the ...

02 00 23 02       CC       Roger. We copy.

02 00 32 35       LMP       Houston, Apollo 11. We've got the continent of Africa ... facing toward us right now, and of course, everything's getting smaller and smaller as time goes on. The Mediterranean is completely clear. The Sun looks like it's about to set around Madagascar. The equatorial belt of Africa stands out quite clearly. We're seeing the dark green or a muddy colored green, compared to the sandier colors in the southern tip of Africa and, of course, the Sahara northern coast of Africa. There's a rather remarkable cloud that appears in the vicinity of the border between Afghanistan and Pakistan. It's just about to go into the sunset now. It is casting quite a large shadow. It's isolated. There don't seem to be any other clouds ... the band of clouds near the tropical conceptions clouds down around the equator clearly separate the clockwise and the counterclockwise cloud formations. Over.

02 00 33 57       CC       Roger, 11. We copy your word description on that. I understand you can see a shadow being cast by that cloud over between Afghanistan and Pakistan. Any estimate on how long that shadow would be? Over.

02 00 34 18       LMP       It looks like it's a shadow. Coming around to - back that way - -

02 00 34 33       CC       We're getting a lot of background noise now, also. If you will stand by a minute or so until we roll a little further in PTC, I think things will get better.

02 00 34 44       LMP       Okay. It's coming around to the number 1 window. We'll get you ...

02 00 34 49       CC       Roger, we're hearing you.

02 00 37 02       CC       11, this is Houston. The noise on the COMM seems to have quieted down now. I guess that we've rotated a new antenna into view and probably also the Earth out of view in your window. Over.

02 00 37 17       LMP       Okay. It looks as though the length of the shadow of that cloud is about the same as the width of the Persian Gulf.

02 00 37 26        CC        Okay. We copy the width of the Persian Gulf, and I guess that all I can give you firsthand is a single isolated data point, and that is that it was clear here in Houston this morning. That's a pretty localized observation. As a result of your waste-water dump, it looks like the PTC mode has been disturbed somewhat. We're showing you about 20 degrees out in pitch right now and about 6 degrees in yaw, which is significantly greater, about twice as much - a little more than twice as much as the deviation you had prior to the waste-water dump. We're watching it down here, though, and we'll let you know if we think any corrective action is required. Over.

02 00 38 14        LMP        Okay. Maybe we ought to - next time split that in half, and put half of it on one side and half on the other or something like that.

02 00 38 25        CC        Yes. We could do that. We were actually pretty interested in seeing what the effect on PTC would be of the waste-water dump. We don't recall ever having performed a waste-water dump during PTC on previous missions. Over.

02 00 38 44        LMP        Well, now we know.

02 00 38 46        CC        Roger.

02 00 42 54        LMP        Houston, Apollo 11. I am looking at that cloud now around Pakistan through the sextant, and it appears to be one single cell in the latter stages of development. There is a smaller, more isolated one - -

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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02 00 45 38        CC        Apollo 11, this is Houston. We lost you down in the noise on the COMM link here about the time you were describing the single-cell cloud formation over Afghanistan-Pakistan area through the sextant. Over.

02 00 45 55        LMP        Roger. It came through a lot clearer through the sextant than with the monocular, and you could definitely tell it was one single cell in the latter stages of development. It must have gone up to over 50 000 feet, though. The eastern Mediterranean is phenomenally clear. You can see all the lakes; the Dead Sea stood out quite well. Over.

02 00 46 24        CC        Roger. What appears to be the limit of resolution through that sextant from your current position? Over.

02 00 46 39        LMP        Well, I can't see it right now. It's outside the field of view.

02 00 46 43        CC        Roger.

02 00 46 44        LMP        And, I don't know how you'd really describe the limit of resolution. I will think about that a little.

02 00 46 50        CC        Okay. I guess the smallest object that you could pick out looking through it would give us a pretty good hack.

02 00 47 00        LMP        Well, you can see the Nile River going almost up to its source. The lake is obscured by clouds, but you can trace it all the way on up.

02 00 47 14        CC        Roger.

02 00 47 20        LMP        I guess that is down though, isn't it?

02 00 48 39        CC        Apollo 11, Houston.

02 00 48 46        CMP        Go ahead, Houston.

02 00 48 48        CC        Roger. We have been working under the assumption that it would take about an hour for the interference from a waste-water dump to dissipate to the point where you could reasonably take star sightings for platform alignment navigation or something of this sort. If you have a spare minute or two, could you comment on the observation condition, now? Over.

02 00 49 19      CMP      Yes. Stand by one, Bruce.

02 00 49 21      CC      Okay.

02 00 49 44      CMP      My guess would be the telescope's probably pretty useless, but you can differentiate in the sextant between water droplets and stars by the difference in their motions.

02 00 50 02      CC      Okay, Mike. I guess that we've still got - what you are saying is that we've still got a lot of water droplets visible, but you can pick them out and distinguish them in the sextant, then.

02 00 50 13      CMP      Right. I think so. Buzz is looking through it now. Just a second.

02 00 50 17      CC      Okay.

02 00 56 36      LMP      Houston, Apollo 11. It looks like at this time the sextant would be quite usable for any alignment. There's actually very few ... verticals.

02 00 56 50      CC      Roger, Buzz. How about the telescope? Is it useful now?

02 00 57 02      LMP      Well, it's not quite as useful; it never seems to be. Depending on the position of the Sun, it's got that band that seems to go across the center. I don't think it's because of the waste-water particles that it would lack its effectiveness. Over.

02 00 57 22      CC      Roger. What - Is this band something that's deposited on the outside of the optics? Over.

02 00 57 31      LMP      No. I see the reflection from the Sun.

02 00 57 35      CC      Roger.

02 00 57 41      CMP      The Sun bounces off the LM structure. With the LM attached, that telescope is just about useless. Those star charts that MPAD provided us, I think, would be most useful if we had to use the - if for some reason we had to mark through the telescope. We could use those as a guide for what we're looking at and say, "Well, that bright blob over there has got to be that star because that's the position we're in." But so far, we've not been able to pick out any decent star patterns while docked with the LM using the telescope.

02 00 58 12       CC       This is Houston. We copy.

02 01 40 38       LMP       Houston, Apollo 11.

02 01 41 07       LMP       Houston, Apollo 11. Over.

02 01 41 09       CC       Go ahead, Apollo 11.

02 01 41 18       CC       Apollo 11, this is Houston. Go ahead - -

02 01 41 20       LMP       - - How do your read? Over.

02 01 41 22       CC       Roger. We're reading you loud and clear.

02 01 41 24       LMP       Roger. You're coming back a little scratchy.  
It looks like our O<sub>2</sub> flow transducer's gotten  
a good bit worse. I just looked at it at the  
last water accumulator cycling, and it just  
barely registered - barely crept up above 0.2.  
Over.

02 01 41 45       CC       Roger.

02 01 42 40       CC       11, this is Houston. At the time of your cyclic  
accumulator stroking, we were on low-bit-rate  
data, and consequently not receiving the O<sub>2</sub> flow  
parameter. We expect that what you're seeing  
is probably nominal. That is, it's probably  
what we would expect from a transducer that's  
malfunctioning probably in this fashion, and  
it's just going to keep on getting worse like  
that. Nothing to worry about. We'll monitor  
things on the ground here. Over.

02 01 43 17       LMP       Okay. It does look like it's gradually degrad-  
ing to about zilch.

02 01 43 24       CC       Roger. We copy.

END OF TAPE



APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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02 02 40 59 CC Apollo 11 CDR, this is Houston. Radio check. Over.

02 02 41 07 CDR Roger, Houston. CDR. Loud and clear.

02 02 41 10 CC Roger. We're reading you the same. Out.

02 02 41 15 CDR And would you check with FAO and see where that errata sheet is? We haven't been able to locate that.

02 02 41 24 CC Roger. I understand it's supposed to be the back page in Buzz's operational checklist.

02 02 41 34 CDR Okay.

02 03 09 15 CC Apollo 11, this is Houston. Did you find it? Over.

02 03 09 22 LMP Roger. We found it.

02 03 09 24 CC Roger. And I see you're in P00. If you can give us ACCEPT, we'll uplink a new state vector to you and update the CMC clock. Over.

02 03 09 38 LMP Okay. You've got it.

02 03 09 41 CC Roger.

02 03 12 44 CC 11, this is Houston. We're through with the uplink. You can go back to BLOCK.

02 03 12 54 LMP Roger. Back to BLOCK.

02 03 16 30 CC Apollo 11, this is Houston. We would like to terminate the charge on battery B at GET of 51 30. Over.

02 03 18 06 CC Apollo 11, this is Houston. We would like to terminate charging battery Bravo at 51 30 GET. Over.

02 03 18 18 LMP Roger. Terminate charging battery Bravo 51 30.

02 03 18 23 CC Roger. Out.

02 03 36 35 CC 11, this is Houston. We show you terminating battery B charge. Over.

02 03 37 56 CC Apollo 11, this is Houston. Over

02 03 38 03 CDR Go ahead, Houston. Apollo 11.

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02 03 38 05           CC       Roger, 11. We show you terminating battery B  
charge at about 51 hours 30 minutes. Over.

02 03 38 17           CDR       Okay.

02 03 38 23           CC       Roger. Out.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(COSS NET 1)

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02 03 59 23 LMP Houston, Apollo 11. Would you like to have both oxygen and hydrogen purge on? Over.

02 03 59 32 CC 11, this is Houston. Say again. Both what on? Over.

02 03 59 41 LMP On the fuel cell purge: would you like to see both oxygen and hydrogen? Over.

02 04 00 02 CC Apollo 11, this is Houston. Affirmative. We request hydrogen and an oxygen fuel cell purge. Over.

02 04 00 17 LMP Okay. Any preference which first?

02 04 00 22 CC Negative. As long as you've got the H<sub>2</sub> purge line heaters on.

02 04 00 29 LMP Okay. I'll go get - Go ahead with the hydrogen then.

02 04 58 29 CMP Houston, Apollo 11. Over.

02 04 58 32 CC Apollo 11, this is Houston. Go ahead.

02 04 58 38 CMP Roger. You copy my NOUN 93?

02 04 58 43 CC That's affirmative. We've got it.

02 04 58 48 CMP Okay. I am going to go ahead and thrust then. Triangle difference is 0.01, but it's sort of difficult at three-tenths rate. I'm required to use medium speed unresolved, and it's difficult to hold the star centered long enough to get a decent mark on it.

02 04 59 15 CC Roger. We copy. It looks okay to us.

02 04 59 22 CMP Roger.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS-NET 1.)

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02 05 51 36       CC       Apollo 11, this is Houston. Over.

02 05 51 42       CMP       Go ahead, Houston.

02 05 51 45       CC       Roger. I've got the morning news here if you're interested. Over.

02 05 51 51       CMP       Yes, we sure are. We're ready to copy and comment. Isn't that 2:30 there?

02 05 51 57       CC       Roger.

02 05 52 02       CDR       Okay. Go.

02 05 52 03       CC       Okay. Here we go. The interest in the Flight of Apollo 11 continues at a high level but a competing interest in the Houston area is the easing of watering rules. Mayor Louie Welch promises a lifting of lawn-watering restrictions if the rains continue. Friday is partly cloudy, and there is a 30-percent chance of thunderstorms in the afternoon. In Washington, D.C., the Senate Finance Committee approved extension of the income tax surtax, but a Senate vote on the bill - -

02 05 52 35       CMP       You cut out, Houston. You cut out.

02 05 52 40       CC       Roger. Where do you hold me cutting out? Over.

02 05 52 46       CMP       Houston, Apollo 11.

02 05 52 48       CC       Apollo 11, Houston. Over.

02 05 54 51       CC       Apollo 11, this is Houston. How do you read now? Over.

02 05 54 57       CMP       Loud and clear, Houston. Go ahead.

02 05 54 59       CC       Roger.

02 05 55 00       CMP       Start after the rains in Houston.

02 05 55 03       CC       Roger. In Washington, the Senate Finance Committee has approved extension of the income tax surtax, but a Senate vote on the bill currently seemed remote. In Austin, State Representative Ray Lemmon of Houston has been nominated as the National Director of the American Society for Oceanography. Lemmon has proposed a study of the possibility of establishing an institute of oceanography in Texas. This would be the first such institute on the western Gulf of Mexico.

In Minneapolis, Minnesota, the weather bureau, after recapping today's weather showing a high of 88 and a low of 72, has noted "snowfall: none." From St. Petersburg, Florida, comes a radio report from the Norwegian explorer, Thor Heyerdahl, which said that the crew of his papyrus boat, the Ra, will sail into Bridgetown, Barbados, despite damage from heavy seas. The crew, however, will sleep on an escort vessel. Norman Baker, navigator of the expedition, said the crew was aboard the Ra today repairing damage from storms this past week, which split the footing of the mast. Part of the broken mast was jettisoned overboard, and the vessel was 725 miles east of the Barbados. "It is possible but uncomfortable to sleep aboard the Ra," Baker said in the radio report. "But the purpose of our voyage is not a test of strength or human endurance." That is the reason why the crew was spending nights aboard the escort vessel Shenandoah, which rendezvoused with the Ra on Tuesday.

- 02 05 56 39        CC        In sports, the Houston Oilers are showing plenty of enthusiasm in their early preseason workouts at Kerrville, and Coach Wally Lemm says he is impressed with the fine group of rookies. National League baseball yesterday, Thursday: St. Louis 11, Philadelphia 3; Montreal 5, over Pittsburg 4; Atlanta 12, Cincinnati 2; San Francisco 14, and Los Angeles 13. American League: we have Baltimore 3, over Cleveland 2; Detroit 4 to Washington's 3; Minnesota 8 to Chicago 5. Boston at New York was rained out. And in Corby, England, an Irishman, John Coyle has won the world's porridge eating championship by consuming 23 bowls of instant oatmeal in a 10-minute time limit from a field of 35 other competitors. Over.
- 02 05 57 48        CMP        Roger. I assume Houston didn't play yesterday.
- 02 05 57 51        CC        That's correct.
- 02 05 57 55        CMP        I'd like to enter Aldrin in the oatmeal eating contest next time.
- 02 05 58 00        CC        Is he pretty good at that?
- 02 05 58 04        CMP        He's doing his share up here.
- 02 05 58 13        CC        Let's see. You all just finished a meal not long ago, too, didn't you?
- 02 05 58 20        LMP        I'm still eating.
- 02 05 58 24        CC        Okay. Does that - that - -

02 05 58 27 . CMP He's on his - He's on his 19th bowl.

02 05 58 30 . CC Roger. Are you having any difficulties with gas in the food bags like the 10 crew reported?

02 05 58 40 CMP Well, that's intermittently affirmative, Bruce. We have these two hydrogen filters, which work fine as long as you don't hook them up to a food bag. But the entry way into the food bag has enough back pressure to cause the - the filters to start losing their efficiency. A couple of times, I've been tempted to go through that dry-out procedure, but we found that simply by leaving the filters alone for a couple of hours, their efficiency seems to be restored.

02 05 59 14 CC Roger. We copy.

02 05 59 23 CMP Their efficiency ranges anywhere from darn near perfect to terrible just depending on the individual characteristics of the food bags we're putting through them. Some of the food bags are so crimped near the entry-way that there's no way we can work them loose to prevent back pressure.

02 05 59 44 CC Roger.

02 06 32 12 CC Apollo 11, this is Houston. Over.

02 06 34 22 CC Apollo 11, this is Houston. Over.

02 06 34 32 CDR Hello, Houston. Go ahead.

02 06 34 33 CC Roger, 11. As you've probably noticed, your coning angle in PTC mode is increased substantially as a result of the waste water dump, the fuel cell purge, and a natural coupling, so it looks like we are going to have to terminate PTC here in a little while. And we'd like to get your feeling as to whether you're still anticipating trying to send back TV signals from inside the LM; and if so, we'll try to provide an attitude that you can hold that'll give us high gain antenna lock on the Earth during the TV and LM activation period. Over.

02 06 35 18 CDR Yes, we're still planning that activity if the cord lengths work out all right, and we'll accept those attitudes that you work up for us.

02 06 35 29 CC This is Houston. Roger. Out.

02 06 35 34 LMP When you work up an attitude to get high gain, is there any way that we could get partial Sun in one of the two LM front windows?

02 06 35 45 CC This is Houston. We'll have a look at it.

02 06 39 14 CC Apollo 11, this is Houston. Over.

02 06 39 20 CDR Go ahead, Houston.

02 06 39 21 CC Roger. We have a TV attitude for you if you're ready to copy.

02 06 39 32 CMP Go ahead. Ready to copy.

~~02 06 39 35~~ CC Okay. We recommend stopping PTC at GET of 54 45 00, and this should put you at just about the right roll angle. The attitude we recommend is roll 263, pitch 090, yaw 000. This gives you the Earth out of window number 1 in the command module and places the high gain antenna in the CSM window for TV at your convenience. You will also have the Sun shining in - or shining at the hatch on the LM, and if you take down the window shades you should get some sunlight in. We're recommending wide deadband. Over.

02 06 40 36 CMP Roger. Thank you, Houston. We'll look at that.

02 06 40 41 CC Roger. Out.

02 06 42 53 CMP Houston, Apollo 11. When we pass the proper roll angle, we're not going to be anywhere near zero degrees yaw. Do you want us to just stop and try until we find ourselves in and then VERB 49 the three angles you gave us?

02 06 43 06 CC Stand by.

02 06 43 20 CC Hello, Apollo 11. Houston. We'd like you to stop at the proper roll angle, then do a VERB 49 to the roll and pitch. Over. Correction, roll and yaw.

02 06 43 52 CMP Houston, Apollo 11. Over.

02 06 43 54 CC Go ahead, 11. Over.

02 06 44 12 CC Hello, Apollo 11. Houston. Do you read? Over.

02 06 44 21 CMP Houston, Apollo 11. Over.

02 06 44 23 CC Roger, 11. Do you read me? Over.

02 06 44 38 CC Hello, Apollo 11. Houston. Over.

02 06 44 46 CMP Stand by, Charlie. Yes, we're going to come out of PTC here at 263 roll and then do a VERB 49 to the recommended attitude.

02 06 44 58 CC That sounds fine to us. Over.

02 06 46 56 CC Hello, Apollo 11. Houston. Before you open the pressure equalization valve, we'd like the LM/CM DELTA-P. Over.

02 06 47 06 CMP Okay. Let me check it again. It was about 155.

02 06 47 12 CC Roger.

02 06 47 14 CMP I read it 158 right now, Charlie.

02 06 47 17 CC Roger. Thank you much.

02 06 49 51 CMP Houston, Apollo 11. We're stopping PTC at 263 ... 0.

02 06 49 59 CC 11, Houston. You're about one-by on this transmission. Say again. Over.

02 06 50 08 CMP Houston, Apollo 11. Do you read?

02 06 51 46 CMP Houston, Apollo 11. How do you read on the high gain?

02 06 51 50 CC 11, how do you read me? Over.

02 06 51 55 CMP Read you loud and clear, Charlie. We just switched to HIGH GAIN, and we stopped PTC at roll 263, pitch 90, yaw 0. How do you read?

02 06 52 03 CC Roger, Mike. You're five-by now on the high gain. We're right between the OMNI antennas and pretty horrible COMM on the OMNI's. We got you five-by on the high gain, and we copy the PTC stoppage. Over.

02 06 52 18 CMP Okay, fine.

02 06 52 35 CMP Houston, we're going to open the DIRECT O<sub>2</sub> valve and start pumping up the cabin.

02 06 52 40 CC Roger. Copy.

02 06 53 06 CC Apollo 11, Houston. We're going to hand over to Goldstone for uplink in about 2 minutes. We might have a momentary dropout of COMM. Over.



02 06 53 16       CMP       Alrighty. Can you hear our master alarm in the background? That's O<sub>2</sub> FLOW HIGH coming through this amplifier.

02 06 53 27       CC       Roger. Copy.

02 06 53 37       CMP       That photoelectric cell is a good device. It's worked very well.

02 06 53 46       CC       11, Houston. Say again. Over.

02 06 53 50       CMP       I say that photoelectric cell amplifier for the master alarm is a good device. It's working very well, and it's a nice pleasing tone.

02 06 54 00       CC       Roger. Copy. Thank you.

02 06 54 08       CMP       Makes you almost glad to get master alarms.

02 06 55 01       CMP       Houston, Apollo 11. As a matter of curiosity, our O<sub>2</sub> flow meter is pegged FULL-SCALE HIGH.

02 06 55 08       CC       Roger, 11. We copy that here. Over.

02 06 55 14       CMP       Okay.

02 06 55 26       CMP       Boy, that transducer's working somewhat.

02 06 55 32       CC       Roger.

02 06 55 51       CC       11, Houston. We'd like to try to attempt to correlate your O<sub>2</sub> flow in transducer with the flow valve that you've got open. How far - How far open would you say you have the REPRESS O<sub>2</sub>? Over. Correction, the DIRECT O<sub>2</sub>.

02 06 56 10       CMP       Stand by, Charlie.

02 06 56 19       CMP       Okay, Charlie. It's not open very far. It's hard to give you a good reading without shunting it again, but the arrow is at about the one o'clock position. Now I reduce the flow, and I'll let it stabilize here. Right now our onboard reading is about 0.4, and that's with the arrow in the O<sub>2</sub> valve at the two o'clock position. Would you rather have comparisons of O<sub>2</sub> flow readings or would you rather have valve position comparisons?

02 06 56 48       CC       Roger. Stand by.

02 06 56 52       CC       EECOMM's say they'd like to look at valve positions. Over.

02 06 57 01       CMP       Okay. Well, we're holding steady now at  
0.3 pound per hour, and our cabin pressure is  
about 54; and I'll close the valve momentarily  
and then open it again to this position and tell  
you how much travel is required.

02 06 57 18       CC       Roger.

02 06 57 29       CMP       It's about 30 degrees of travel, Charlie, from  
the closed position, which is with the arrow  
pointing at about three to three-thirty,  
four o'clock.

02 06 57 38       CC       Roger.

02 06 57 47       CMP       Our flow is stabilized now at 0.6.

02 06 57 55       CC       Roger. We copy. We're reading the same.

02 06 58 00       CMP       Okay.

02 06 58 06       CMP       Yes, open it back to the one o'clock position.

02 06 58 10       CC       Roger.

02 06 58 31       CMP       Is that enough different positions, or you want  
more, Charlie?

02 06 58 36       CC       Mike, that's good - good enough. We're satisfied  
now. Over.

02 06 58 42       CMP       Okay.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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02 07 02 02       CMP       Houston, Apollo 11. We've terminated direct O<sub>2</sub>, our cabin pressure is 57, and, as a matter of curiosity, when we turn the DIRECT O<sub>2</sub> valve OFF, we get a master alarm just like they did in the spacecraft testing.

02 07 02 17       CC       Roger.

02 07 02 20       CC       11, Houston, we have a little update for you. When you go into the LM, we'd like you to unstow and bring back to the command module the following items. Over.

02 07 02 35       CMP       Ready to copy.

02 07 02 36       CC       Roger. We'd like you to pick up the - out of the flight data file, the surface checklist, the mission rules NO-GO card, the DPS, APS, RCS limit cue card. Over.

02 07 04 34       CC       Apollo 11, Houston. The reason we wanted you to bring those three items back, we'll have some updates for you, for those three. Over.

02 07 04 45       CMP       Roger. We figured you would.

02 07 09 58       CC       Apollo 11, Houston. We're getting the TV at Goldstone. We're not quite configured here at Houston for the transmission. We'll be up in a couple of minutes. Over.

02 07 10 13       CMP       Roger. This is just for free. This isn't what we had in mind.

02 07 10 17       CC       Roger.

02 07 19 49       CC       Apollo 11, Houston. It's a pretty good show here. It looks like you almost got the probe out.

02 07 19 54       CMP       Yes, it's loose now.

02 07 19 55       CDR       Can you see that?

02 07 19 58       CC       Roger, Neil. It's really good.

02 07 20 03       CDR       Not much light up in that area, but apparently the TV set's able to pick it up.

02 07 20 10       CC       There are some bright spots shining on the probe. Apparently Sun shafting on it that just gets just about enough for us to make it out. Over.

02 07 20 21 CDR I think those are the tunnel lights.

02 07 20 22 SC ...

02 07 20 24 CC Oh, Okay. You're right.

02 07 20 32 CDR Okay. It's loose now. Coming down.

02 07 20 35 CC Roger.

02 07 20 57 CC Looks like it's a little bit easier than doing that in the chamber.

02 07 21 04 CDR You bet. This is the only way ...

02 07 21 05 CMP You have to take it easy.

02 07 21 06 CDR It's pretty massive, but it goes where you direct it.

02 07 21 11 CC ll, Houston. That's a beautiful picture now, we've got. We're looking at a 12-second delay. To us you are just bringing it down by the optics now.

02 07 21 27 CDR Mike must have done a smooth job in that docking. There isn't a dent or a mark on the probe.

02 07 21 33 CC Roger.

02 07 21 38 CC We're really getting a great picture here, ll. Over.

02 07 22 00 CC ll, Houston. With a 12-foot cable, we estimate you should have about 5 to 6 feet excess when you get the camera into the LM. Over.

02 07 22 11 CDR Roger.

02 07 22 14 CC We can see the probe now. Correction, the drogue.

02 07 22 22 CDR Roger.

02 07 23 04 CDR Okay. Drogue removal's coming next.

02 07 23 06 CC Roger. As we suspected.

02 07 24 07 CC ll, Houston. Now it's a good view of the storage area under the couch.

02 07 24 35 CC ll, Houston. Looks like you're pretty crowded in there with that drogue. Over.

02 07 24 43 CDR Oh, it's not really bad.

02 07 24 44 CMP This TV cable is getting in the way.

02 07 24 54 CC We see lots of arms.

02 07 25 20 LMP The only problem, Charlie, is these TV stage-hands don't know where they stand.

02 07 25 27 CC Well, you got to really have a union card, there. We can't really complain too much, I guess.

02 07 26 28 CC Apollo 11, Houston. Do you have a little white dot in the bottom of your monitor - TV monitor? Over.

02 07 26 39 LMP Roger. We do.

02 07 26 41 CC Roger. I guess part of the camera's been burnt out down there. These are really beautiful pictures now, Buzz. Over. Real clear.

02 07 26 56 LMP Okay. We might have got just a little bit of Sun in there. Is it just one small white dot?

02 07 27 01 CC That's affirmative.

02 07 27 42 CMP We went up in the tunnel checking the roll angle, Charlie, and it's 2.05 degrees.

02 07 27 48 CC Roger. Copy. 2.05 on the roll CAL.

02 07 27 55 CMP And that's a plus.

02 07 27 57 CC Roger. Plus.

02 07 28 45 CC 11, Houston. The tunnel looks pretty clear to us. Somebody going up there now. Over.

02 07 28 53 CDR It's Mike checking his connectors up there now.

02 07 29 00 CC Roger.

02 07 29 08 CC 11, Houston. The lighting up in there looks very good to us at this time. Over.

02 07 29 22 CDR I think that's mostly the camera. It - it's subdued to say the least.

02 07 29 30 CC Roger. It's pretty - It's gathering pretty well to us. We see everything quite clearly up in there.

02 07 30 05 CMP Well, the docking latches look good today just like they did yesterday. Everything up in there looks just fine.

02 07 30 12        CC        That sounds fine to us. Over.

02 07 30 45        CC        11, Houston. We can even read the decals up there on the LM hatch.

02 07 30 53        LMP       Well, let me zoom it up and see how much you can read.

02 07 30 57        CC        Okay.

02 07 31 11        CC        We can see the LM umbilical connection quite well there, Buzz. We see you zooming in on one of the decals now. It's, "To reset, unlatch handle; latch behind grip and pull back two full strokes." That's about all we can make out.

02 07 31 35        LMP       Hey, you get an A-plus.

02 07 31 37        CC        Thank you very much, sir. At least I passed my eye test.

02 07 31 46        LMP       I'm standing 6 feet from it, Charlie, and you can read it better than I can. There's something wrong with the system.

02 07 31 54        CC        Roger.

02 07 33 08        CC        That's a real good view of the LM hatch handle there, 11. Over.

02 07 33 16        CDR       Roger.

02 07 33 24        CDR       Looks like we'll be ready to go into the LM early if that's okay with you all down there.

02 07 33 34        CC        Roger. It's fine with us, Neil. Go ahead anytime you wish. Over.

02 07 33 57        CC        11, Houston. The white spot you see on your monitor, our TV people say it is a burn spot; but they expect it to dissipate after a couple of hours. Over.

02 07 34 14        LMP       Roger. Thank you.

02 07 35 23        CMP       Okay, the dump valve is actuated.

02 07 35 26        CC        Roger. Copy, 11. We see that very clearly. Is that you, Buzz, with your hand on it?

02 07 35 33        CMP       Yes.

02 07 35 34        LMP       Roger.

02 07 36 10      CC      11, Houston. We're really amazed at the quality of the picture up in the tunnel. It's really superb. Over.

02 07 36 18      LMP      It is, considering the amount of light up in there.

02 07 36 20      CMP      Roger. We're about to open our hatch now.

02 07 36 23      CC      Roger.

02 07 36 32      CMP      Roger. There's that same guy that, when you open up the door, why, he's waiting there for you, and he turns the lights on.

02 07 36 38      CC      How about that. Just like the refrigerator.

02 07 37 08      CC      Buzz, the view in through your - by your right - left shoulder there is so good we can see the ascent engine cover, the Velcro on it, and that's about all we can make out right now.

02 07 37 27      CC      Now we can see the helmet stowage bag - -

02 07 37 28      LMP      We don't see anything loose up there.

02 07 37 30      CC      Well, great. Looks good to us. We see the helmet storage bag.

02 07 37 53      CC      Hello, 11. Houston. We got a view of the PLSS there, off the right of our screen.

02 07 38 35      CC      11, Houston. Buzz, you already in? Over.

02 07 38 42      LMP      Roger. I'm halfway in, hanging out. Start turning around, I guess.

02 07 38 46      CC      Roger.

02 07 39 14      CC      Apollo 11, Houston. We'd like you to read out the LCG reservoir sight level. Over.

02 07 39 27      CMP      Okay. Stand by.

02 07 39 50      CC      11, we have a good view of the window there. It looks like the Sun's finally coming through the shade.

02 07 40 00      LMP      Yes, I'm afraid it's - We're just about plus Z toward the Sun.

02 07 40 05      CC      That's affirmative. This attitude put both windows right toward the Sun - or the LM. Over.

02 07 40 15 LMP Well, that may be good in some respects, but -

02 07 40 22 CC We had a view, Buzz, of the utility light cord. ...

02 07 40 31 LMP Now let me show you a view looking the other way.

02 07 40 33 CC Roger. And we see right now the utility light or either the floodlight up there.

02 07 40 45 CC I think now I see the utility light still in the stowage bag. Hey, that's a great shot right there. We see you in there. Guess that's Neil and Mike. Better be, anyway.

02 07 41 13 CC We see you waving.

02 07 41 33 CC ll, Houston. That's really a beautiful shot.

02 07 41 46 CC ll, Houston. We didn't quite decipher that signal that just came from the CMP.

02 07 41 55 LMP Just saying hello. On the LCG sight gage, you got about - oh, it looks like the white mark that's in the plunger is about a quarter to three-eighths inch out into the green away from the red. Is that what you'd like to see? Over.

02 07 42 18 CC Stand by. Roger, Buzz. That looks good to us. Thank you much.

02 07 42 28 LMP It is the white index, is it not, that you're interested in comparing whether it's in the red or green?

02 07 42 34 CC Stand by. That's affirmative, Buzz. It looks good. That's a good reading for us. Over.

02 07 42 42 LMP Okay.

02 07 42 46 CC We had a shot moment - a moment ago of the suit disconnect valve.

02 07 42 58 LMP I'll open up the windows and see what the lighting condition's going to be like.

02 07 43 24 CC ll, Houston. That's a real good view we have of the AOT. You're back now, Buzz, and notice you're taking down one of the window shades. Over.



02 07 43 36 CC The light is superb.

02 07 43 37 LMP How's the Sun coming in? How's the Sun coming in from this direction going to affect what you can see?

02 07 43 44 CC It made it really super. The lighting is excellent in the - in the LM right now. We can make out the AOT, the ISA, and the left-hand window - there's a little glare off of that, but the LMP side the - with the shade down it's really excellent. Over.

02 07 44 08 LMP Well, let's - I'm turned around, why I took the shade off my side first.

02 07 44 16 CC Roger. We copy. The light level for the TV is really excellent. Over.

02 07 44 29 CDR Yes, the lighting in the LM is very nice now, just like completely daylight; and everything is visible. A good bit lighter than the tunnel was earlier.

02 07 44 43 CC Roger. We got a good view now, Neil, of the DEDA; and also Buzz's ACA.

02 07 45 05 LMP Hey, I'm pointing it at the front hatch now. Everything seems to be in place down there.

02 07 45 11 CC Roger, we got the dump valves in view. Over.

02 07 45 13 LMP Roger.

02 07 45 44 CC 11, Houston. We see you removing the ISA now, folding it up, putting it up on the AOT. The instrument panels are coming into view behind.

02 07 45 58 LMP Yes, I think it'd probably be best, since we've done SPS burn, to put it back over the instrument panel instead of putting it up over the PLSS on the recharge station. Would you care to comment on that one? We could do either just as easily.

02 07 46 12 CC Stand by. We'll have an answer for you momentarily.

02 07 46 18 CC 11, Houston. That's really a super shot of the main display.

02 07 46 59 LMP The vehicle is surprisingly free of any debris floating around. It's very clean.

02 07 47 04 CC Roger.

02 07 47 17 CC 11, Houston. It's pretty hard to describe this view. It's really - really great.

02 07 47 23 LMP Now you know how we feel.

02 07 47 30 LMP Okay. Neil's OPS is about 57, 5800.

02 07 47 35 CC Copy.

02 07 47 36 LMP And mine's about 5800, also.

02 07 47 39 CC Copy.

02 07 48 04 CC 11, Houston. That's a good shot of Neil's PLSS, there. Over.

02 07 48 16 LMP No, that's mine.

02 07 48 40 CC 11, Houston. That moment - a moment ago, we had a good shot of your PLSS, Buzz, and the two helmet stowage bags. Down behind your left shoulder, Buzz, we have the - the DSKY and the ACA.

02 07 50 01 LMP We're going to go ahead and take all the Moon data on back into the command module, Charlie.

02 07 50 07 CC Roger.

02 07 50 58 CC Apollo 11, Houston. Buzz, it appears that you're intending to put on the Sun filter and view the Sun through the AOT. Over.

02 07 51 09 LMP Yes, unfortunately it looks like it's down a little bit more towards ... than I can be able to see in the AOT.

02 07 51 17 CC Roger.

02 07 52 15 LMP We got a beautiful view of the side of the command module out of the AOT looking in the left rear detent.

02 07 52 23 CC Roger.

02 07 52 24 LMP I can see the hatch and all the - all the EVA handrails. First time we've seen the silvery outside of the command module.

02 07 52 40 LMP I can read the letters on the hatch cover. It's a boost cover release; and the big yellow arrow that points toward the opening - place where the tool B goes.

02 07 52 55 CC Roger. Great shot now back down into the -

02 07 53 01 CMP And left on the - -

02 07 53 04 CC Go ahead, Buzz. Over.

02 07 53 07 LMP Say again.

02 07 53 08 CC I was just saying we got a great shot looking back into the command module.

02 07 53 09 LMP ...

02 07 53 14 LMP Okay. And the left detent, I can see the AO - or the rendezvous radar, and I move to the forward detent and that's about all I've got. I'm looking eyeball to eyeball.

02 07 53 25 CC Roger.

02 07 54 08 LMP Charlie, is there any concern about the duration that we ought to have the window shades open?

02 07 54 14 CC Stand by.

02 07 54 17 LMP We don't have - We don't have any circulation in here, and it might get a little on the warm side.

02 07 54 23 CC Roger.

02 07 54 30 CMP We'll - We'll put up a couple of hoses in the command module here and get a little circulation going.

02 07 54 36 CC Sounds like a good idea. Over.

02 07 55 04 CC Apollo 11, Houston. As far as the window shades go in this LM, there's nothing except for crew comfort. I don't think we've got any systems problem. Be sure to put them back up when you egress. Over.

02 07 55 17 LMP That we will do.

02 07 55 52 LMP Charlie, I'll give you a view out of the overhead window, back looking at the command module right-hand rendezvous window.

02 07 56 01      CC      Roger.

02 07 56 19      CC      Well, we see it now. Thanks a lot, Buzz. That's a good view through the overhead.

02 07 56 32      LMP      One washer on -

02 07 56 38      LMP      One washer's on by the overhead.

02 07 56 42      CC      Roger.

02 07 56 49      CC      There we go. We got it now.

02 07 56 58      LMP      There wasn't very much debris in the command module or the LM. We found very few loose particles of bolts, nuts, and screws and lint and things. Very few in each spacecraft. They were very clean.

02 07 57 14      CC      Roger. Sounds good.

02 07 57 45      CC      11, Houston. We have a good view out of the rendezvous - correction, the overhead window of the LM. We don't see anybody staring back at us, though. Over.

02 07 59 03      LMP      Charlie, can you see Mike's two eyeballs staring out through the rendezvous window?

02 07 59 11      CC      11, Houston. Stand by. We haven't picked him up yet.

02 07 59 22      LMP      You are looking through a lot of layers of glass.

02 07 59 38      CC      11, Houston. We had a - -

02 07 59 40      LMP      ... on my monitor.

02 07 59 41      CC      We had a slight glimpse of Mike in the rendezvous window at that time. It's pretty murky looking into there, though.

02 07 59 48      LMP      Okay. Here he is; I've got him. I've got him on the monitor now.

02 07 59 55      CC      Okay. We see him staring back at us now. Hello, in there.

02 08 00 28      CC      Apollo 11, Houston. Our recommendation for the ISA is to stow it back over the instrument panel. Over.

02 08 00 42      LMP      Roger. Will do.

02 08 01 56      CC      11, Houston. We can make out the markings on the panel. We read SYSTEM A ASCENT FUEL, ASCENT OXIDIZER. Quad 1, quad 4. The - It's really unbelievable, the definition we're getting down here off that little camera. Over.

02 08 02 14      CC      We can even see the barber pole on the talkbacks.

02 08 02 24      CC      We can read the markings on the instruments for the glycol pressure, quantity, PCC<sub>2</sub>. You can even read the scale on the eight ball. Over.

02 08 02 58      CC      11, Houston. We see the cross-feed barber pole, and we have the Velcro patches back up to the RCS systems now. We can see the markings on the meters, green and red bands, in limits.

02 08 03 27      CC      We see you raised the cover on the abort stage. We don't recommend that.

02 08 03 34      LMP      Yes. We're going to tape that one over.

02 08 03 35      CC      Roger.

02 08 03 36      LMP      We're going to tape that one over.

02 08 03 37      CC      We concur.

02 08 03 44      LMP      The restraints in here do a pretty good job of pulling my pants down.

02 08 03 53      CC      Roger. We haven't quite got that before the 50 000 000 TV audience, yet.

02 08 04 17      CC      11, Houston. That's a good view of the eight ball. We see - You can even read the OFF flag, there.

02 08 04 30      CC      You can see the signal strength meter for the radar, read the numbers on it.

02 08 04 54      LMP      Houston, did you want us to test the cameras in the LM and - I was wondering about that. I saw it in the flight plan, but I'm just wondering if you want to do that on CSM power, or do you want us to take both of the 16mm cameras back in the CSM and test them there? Over.

02 08 05 18      CC      Stand by, Buzz.

02 08 05 21      LMP      As an alternative to that, why, we could wait LOI day and do it then when we transfer over to LM power.

02 08 05 32 CC Roger. Stand by. We'll have an answer.

02 08 05 47 CC 11, Houston. On that TV, our commentary - The monitor I was looking at was delayed about 12 seconds, 12 to 15 seconds while it went through our color converter. It was probably - You thought I was crazy, but we were looking at it 15 seconds after you broadcast it. 11, Houston - -

02 08 06 06 LMP We understood that, Charlie.

02 08 06 08 CC Okay. On the LM cameras, we'd like you to do it on LOI day with the LM power. Over.

02 08 06 19 LMP Okay. That's what we'll do.

02 08 07 16 LMP Houston, we're showing you something that came out of the Commander's checklist stowage packet. It's got a 16-millimeter camera in it, and it's got this little cylinder; and I guess - I don't understand what it is. Maybe you can tell us.

02 08 07 35 CC Roger. Stand by. We can't figure it out either.

02 08 07 46 LMP It's got an arrow on the back, and it says "turn," but I'm afraid to turn it.

02 08 07 56 CC 11, your friendly geologist says it's the camera crank - crank, excuse me, for the 16-sequence camera if it jams. Over.

02 08 08 10 LMP All very well. Thank you.

02 08 08 28 LMP There's that word again. The ancillary stowage container.

02 08 08 35 CC Roger.

02 08 09 10 CC The shades couldn't quite hack it, there, Buzz. Over.

02 08 09 51 CMP Houston, 11. Are you still getting high bit rate off the OMNI's at this distance?

02 08 09 56 CC Stand by, Mike.

02 08 10 07 CC Apollo 11, Houston. About 50 percent of the time, we're getting high bit rate off the OMNI's when you're in PTC. Over.

02 08 10 17 CMP Okay. Thank you.

02 08 10 19 CC You're welcome.

02 08 11 24      CC      Apollo 11, Houston. Neil, at this attitude you look like you're about 12 feet long.

02 08 11 34      CDR      It seems like I always find myself upside-down in whatever I'm doing around here.

02 08 12 29      CC      Apollo 11, Houston. Could you give us a few comments on your crew comfort with the CSM hoses moving the air around? Over.

02 08 12 42      LMP      Well, it's picking up a little bit on circulation in here.

02 08 12 47      CC      What do you estimate the temperature is, Buzz? Over.

02 08 12 57      LMP      Oh, I'd say maybe 73, 75.

02 08 13 02      CC      Roger.

02 08 13 06      LMP      It's hard to tell at this density and pressure of gas, but comfort level is about the - about the same as the command module.

02 08 13 20      CC      You probably - -

02 08 13 21      LMP      It was a little warmer or stuffier when we first got in, but it seems to be improving.

02 08 13 27      CC      Houston copies. Out.

02 08 14 28      CC      11, Houston.

02 08 14 29      LMP      You may be able to see some - -

02 08 14 31      CC      Go ahead.

02 08 14 32      LMP      -- some particles jumping around on your screen. That's just dust particles that are being illuminated by Sun shafting in the window.

02 08 14 42      CC      Roger. They're very clear now. Over. And that's a good view of Neil's - correction, of Buzz's circuit breaker panel, there.

02 08 15 50      LMP      I can just barely see the handrail on the front porch from the position on the right-hand window.

02 08 15 59      CC      Roger.

02 08 16 15      CC      11, Houston. Our view of the Panel 11 is - gets brighter, then darker. Are you changing the f-stop at all? Over.

02 08 16 32 LMP No, what's happening is, we get pretty close to the window now and then, and it drives the automatic light control into the stop, I think.

02 08 16 42 CC I think that's right.

02 08 16 51 LMP Yes, I had the switch on OUTSIDE while I was going through the overhead window. That may be what's contributing to some of it.

02 08 16 58 CC Roger.

02 08 17 05 CC 11, Houston. We seem to be picking up a few more dust particles now. We see them quite clearly in the screen now. Over.

02 08 17 17 LMP Yes, I'm choking on one every so often.

02 08 17 41 CC 11, Houston. Your show is going out to the U.S. now. We're about to get the satellite up. It'll be transmitted to some other countries after that. Over.

02 08 17 58 LMP Roger. I'm checking out this window bracket where I'll be putting it for the EVA pictures of Neil going down the ladder.

02 08 18 08 CC Roger.

02 08 18 17 CC Apollo 11, Houston. We keep marveling about the color and the clarity of the picture. It's really difficult to describe. It's - It's just perfect. Over.

02 08 18 31 CC And, 11, it doesn't look like you're having too much trouble with that bracket up there, Buzz.

02 08 18 41 LMP I'll tell you, those new knobs really make it easy to twist the thing and get it cinched down quite tight.

02 08 18 50 CC Roger.

02 08 20 06 CC 11, Houston. Buzz, how does the alignment look, there?

02 08 20 13 LMP It looks pretty good, as well as I can tell without the gear extended. I can't get a real definitive answer, but you couldn't fix it any place to see much more out of the window without hand-holding it for the whole time.

02 08 20 29 CC Roger. Looks like to us it's going to work real well.



02 08 20 31 LMP Give it enough room to - Yes, I think so.

02 08 21 02 CC Buzz, we see you putting your window guard in place there, and back up to the ISA now.

02 08 21 59 LMP Houston, ask FA0 if the 90-degree bracket isn't stowed in the Commander's stowage assembly.

02 08 22 09 CC Stand by.

02 08 23 35 CC ll, Houston. Buzz, you still looking for that 90-degree bracket? Over.

02 08 23 45 CDR Yes, he is looking for it now.

02 08 23 47 CC Roger. We'll have a word for you in just a moment.

02 08 24 28 CDR Our monitor shows pretty good, clear pictures from this angle. I already found the 90-degree bracket.

02 08 24 37 CC Roger, Neil. It's really a super picture. We've got the ACA, your ACA, the picture of the throttle, the 90-degree bracket. We see your handles, and now over to the bracket.

02 08 25 25 LMP That's about the position we'll be putting the camera in after the initial descent on the ladder, and it'll be taken 1 frame a second for most of the EVA.

02 08 25 40 CC Houston copies. Out. That's a real good view of that camera.

02 08 26 03 LMP Our monitor is a little bit wavy, so it's hard for us to tell when we're - when we've got a steady picture for you.

02 08 26 11 CC ll, we have no complaints at all. We don't see that waviness on our picture. It's just really great. Over.

02 08 26 19 LMP Do the edges of the window look like straight lines to you?

02 08 26 22 CC That's affirmative.

02 08 26 26 LMP Okay. They don't in our monitor, and that leads us to make some corrections to the camera, which probably aren't required sometimes.

02 08 26 39 CC Buzz, we have no complaints at all. It's a magnificent picture.

02 08 27 49 CC What was that, Buzz, you're chasing now?

02 08 27 55 CDR That was - That was me picking up some particles of paint that were floating through the air in front of the camera, there.

02 08 28 02 CC Roger, Neil. We got it. It appears to us that Neil's about to check the Velcro mat, there.

02 08 28 17 CC Okay, Buzz. We see the card up now.

02 08 28 26 LMP Okay. For those of you that don't know, this is where we log most of our data for each of the LM maneuvers, and we have another card like this that the timeline book that is laid down on the table in front of the data display keyboard; and it's on this timeline that we have all our procedures. But we obviously have to hold these in place in zero g, so we make use of the Velcro patches on the back and on the table so we can attach these down here; and then we just turn the pages over when we go to new sequences in our timeline of procedures.

02 08 29 13 CC Roger.

02 08 29 18 LMP And we're ready to copy DOI PAD.

02 08 29 21 CC Roger. We'll have the FIDO's work that one up for you momentarily.

02 08 30 26 CC ll, Houston. That was a good shot of Panel 2. Now we got Panel 3 in view with the TEMP MONITOR switch. The stabilization - station and control panel, we see now, with the MODE CONTROL switches. Now over to the rendezvous radar. Real good.

02 08 30 48 CC ll, that's real good camera work.

02 08 31 06 LMP That'll be the most unusual position a cameraman's ever had, hanging by his toes from a tunnel and taking the picture upside-down.

02 08 31 17 CC Roger. Well you're doing a super job. We got a good view of the cross pointer, there. Had a good view of the tape meter.

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02 08 31 41 LMP We're giving you a picture now of the floor of the cabin. I think you can see the - one of the two portable life support system backpacks here in the center, and on each side, we have the two helmet visors. I'll remove one of them and show you a little closer view of what this looks like.

02 08 32 04 CC Roger.

02 08 32 10 LMP Inside the helmet visors are the EVA gloves with the blue tips. I'm about to take those out now.

02 08 32 27 CC Roger, Buzz. That's a great shot now that we're getting of the helmet, the EVA visor, and also the - the EVA gloves in the background.

02 08 32 41 LMP Okay. You did say this was going out now, didn't you?

02 08 32 45 CC Stand by. I think so.

02 08 32 58 CC ll, you got a pretty big audience. It's live in the U.S. It's going live to Japan, western Europe, and much of South America. Everybody reports very good color. Appreciate the great show.

02 08 33 15 LMP Roger. Understand. Thank you.

02 08 33 48 CC Buzz, that was a good demonstration of your EVA visor assembly. Appreciate it.

END OF TAPE

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02 08 34 39 CC Hey, I like the good view of Mr. Collins down there. We finally see him again.

02 08 34 46 CMP Hello there, earthling.

02 08 34 54 CC Hello there.

02 08 35 24 CC 11, Houston. We noticed when you were scanning over Panel 2 a moment ago, 1 and 2, the two eight balls were slightly in disagreement. Control said he'd like a AGS align, there.

02 08 35 39 LMP Yes. One of them's AGS, one of them's PNGCS. The problem is, we don't know whether to align AGS to PNGCS or PNGCS to AGS.

02 08 35 51 CC Stand by.

02 08 35 58 CC 11, Chris said he can tell you.

02 08 36 05 LMP We'll cage them both.

02 08 36 08 CC Roger.

02 08 37 01 LMP Like old home week, Charlie, to get back in the LM again.

02 08 37 04 CC Roger. I can imagine.

02 08 37 24 CDR The traverse from the bottom of the LM to the aft bulkhead of the command module must be about 16, 20 feet. It's not a disorienting one at all, but it's most interesting to contemplate just pushing off from one and bounding on into the other vehicle all the way through the tunnel.

02 08 37 44 CC Roger. Must be some experience. Is Collins going to go in and look around?

02 08 37 56 CDR We're willing to let him go but he hasn't come up with the price of the ticket yet.

02 08 38 01 CC Roger. I'd advise him to keep his hands off the switches.

02 08 38 08 CDR If I can get him to keep his hands off my DSKY, it'd be a fair swap.

02 08 38 13 CC Roger.

02 08 38 18 CMP That's why I've been eating so much today. I haven't had anything to do. He won't let me touch it any more.

02 08 38 23 CC Roger.

02 08 38 55 CC ll, Houston. If that's not the Earth, we're in trouble.

02 08 39 00 CDR That's the Earth, and we have a very good view of it today. There are a few more cloud bands on than yesterday when we beamed down to you, but it's a beautiful sight.

02 08 39 34 CDR We have some horizontal banding in our TV monitor. Are we transmitting that to you, or do you have a clear picture?

02 08 39 41 CC Neil, we have a very clear picture. The only thing that we see is a little white dot in the bottom of our screen, which is - our TV guys say is an - apparently a burned out spot in the camera, but it should come back. Over.

02 08 39 59 CDR Roger. We have that in our monitor also.

02 08 40 20 CC ll, Houston. We do have three lines across our TV. I thought it was just a transmission problem, but everybody's telling me now that it's probably - it's on the downlink. Over.

02 08 40 35 CDR No, those are the same three ones that we have.

02 08 40 37 CC Okay.

02 08 40 47 LMP How far are - out are we now, Charlie?

02 08 40 51 CC Stand by. Give you exact figure.

02 08 41 00 CDR Did you notice the difference between yesterday and today? This is as large an image we can - we can give you.

02 08 41 05 CC Roger. If you think we're smaller, you're now 177 000 miles out. Over.

02 08 41 13 LMP Thank you.

02 08 41 14 CDR That's nautical miles?

02 08 41 17 CC That's affirmative, ll. We -

02 08 41 23 LMP ... Hold on.

02 08 41 24 CC Go ahead. Over.

02 08 41 34 CC 11, Houston. We see the - still see the banding along the intratropical convergence. I guess the most predominate one now is around the - up in the - around the equator or slightly north of the equator.

02 08 41 51 LMP Yes, that's the way it looks, Charlie. Same as yesterday.

02 08 41 54 CC Roger.

02 08 42 05 LMP Just keep the Pacific Ocean nice and clear and calm on splash day, is all we ask.

02 08 42 31 CDR And Charlie, I'd like to say hello to all my fellow scouts and scouters at Farragut State Park in Idaho having a National Jamboree there this week; and Apollo 11 would like to send them best wishes.

02 08 42 47 CC Thank you, Apollo 11. I'm sure that, if they didn't hear that, they'll get the word through the news, surely appreciate that.

02 08 43 32 CC 11, Houston. We have you - your subspacecraft point is just off the western coast of South America directly south of about Mexico City. Over.

02 08 43 46 CDR That - That looks like what we observe from here.

02 08 44 02 CDR And we're going to turn our TV monitor off now for a short bit while we have some other work to do. Apollo 11 signing off.

02 08 44 12 CC Roger, 11. Thank you very much. That was one of the greatest shows we've ever seen. We sure appreciate it. Over.

02 08 44 20 CDR It was a pleasure.

02 08 45 50 CC Hello, Apollo 11. Houston. Could you give us an idea of about how long it will be before you start close - closing the LM back up? Over.

02 08 46 00 CDR We've got a little more work to do up here, Charlie. We're going to make sure that we have everything transferred around and stowed the way we want it and try to get a little bit ahead on tomorrow's timeline. I suppose that we could be out of there in another half hour or so if it was necessary.

02 08 46 23        CC        Roger, Neil. We're not trying to push you. We're just trying to get an idea of - about water dumps and starting up the PTC again. Take your sweet time. Over.

02 08 46 34        CDR        Okay. We'd like to get a flight plan update from you for the next couple of hours, here. When you think what the various constraints might be and what - what order you might like us to do things.

02 08 46 53        CC        Roger. Stand by. We'll have that to you in a moment.

02 08 56 08        CC        Hello, Apollo 11. Houston. Mike, we'd like to go ahead and do a waste-water dump. We'd like you to dump it all the way down to zero. Over.

02 08 56 21        CMP        Roger. We copy that, Charlie.

02 08 56 31        CMP        How does that work, Charlie?

02 08 57 26        CDR        Houston, 11.

02 08 58 04        CC        11, Houston. Did you call? Over.

02 08 58 09        CDR        Roger. Just noticed that the mast that the EVA light is on is charred brown. It looks as though it took quite a beating during launch.

02 08 58 23        CC        Roger.

02 08 58 24        CDR        The EVA light still does work.

02 08 58 27        CC        Roger. We'll let this - the SPAN guys look at this, and we'll be back with you with what we think. Over.

02 08 58 37        CDR        Okay.

02 09 00 21        CC        11, Houston. We were wondering, Neil, with your closing comment on the TV, if you were going to turn it off. It indicated that you might be considering turning it back on. We were wondering whether we want to keep the lines up. Over.

02 09 00 35        CDR        Well, we want your recommendation on that, but I think we would just as soon, ourselves, terminate the TV. But if you have a commitment to keep, we'd be more than willing to turn it back on.

02 09 00 52        CC        Roger. Stand by.

02 09 01 25      CC      Apollo 11, Houston. We'd like to terminate the TV. We don't - We think we got a really - a good tape. That hour and a half show was superb. And we'd like to pick up TV - correction - PTC at about 58 hours. Over.

02 09 01 44      CDR      Roger. PTC at 58 hours.

02 09 01 48      CC      And we'll have the remaining functions in the flight plan soon. Over.

02 09 01 56      CDR      Okay. Fine.

02 09 04 05      CC      Apollo 11, Houston. Our recommendations on the activities for the next hour or so, as far as flight plan goes, are: Continue your LM familiarization as desired until about 58 hours, then ingress to the CSM, close the hatch, and establish PTC shortly thereafter. Over.

02 09 04 27      CC      And, Apollo 11, Houston. Terminate the - -

02 09 04 29      LMP      Okay.

02 09 04 30      CC      - - the water dump. Over.

02 09 04 31      LMP      Okay, Charlie. Thank you.

02 09 04 34      LMP      Okay. Water dump being terminated now.

02 09 17 48      CMP      Houston, Apollo 11.

02 09 17 51      CC      11, Houston. Go ahead.

02 09 17 55      CMP      Roger, Houston. I'd like to do a P52 option 3 and tweak the platform up prior to starting the PTC. Over.

02 09 18 03      CC      Roger, 11. Stand by.

02 09 18 14      CC      11, Houston. That sounds like a good idea to us. Go ahead.

02 09 18 20      CMP      Okay. And the platform's looking pretty good to me. It looks like the worst axis drift is 0.01 something degrees per hour. Is that about what you figure?

02 09 18 27      CC      11, Roger. We've had reports all the marks have been good all the - the last couple of times you've run them. Just a moment; I'll get you some



information on the apparent drift rate.

02 09 18 41      CMP      Okay, Owen. Thank you. You got the maroons on?

02 09 18 47      CC      Say again, 11.

02 09 18 51      CMP      I say you got the maroons on now?

02 09 18 54      CC      Not permanently, Mike. Just have a stand-by here while Charlie's out checking how to use that special tool on the camera. The maroon team will be on tomorrow.

02 09 19 06      CMP      Okay. Nice to hear your voice. How's everything going?

02 09 19 09      CC      Everything's going smoothly here. We sure enjoyed the show this afternoon, Mike.

02 09 19 15      CMP      Okay.

02 09 19 27      CC      11, Houston. We suggest you go ahead and do the P52 first, and we'll take a look at the angles and give you some new drift rates after taking a look at them. Over.

02 09 19 37      CMP      All right. Fair enough.

02 09 25 00      CC      Apollo 11, Houston. Over.

02 09 25 05      CDR      Go ahead. 11, here.

02 09 25 07      CC      11, Houston. A little information to you there, CDR. We've all taken a momentary brief respite from our work here to have some special - to have a bite of special moon cheese that is - I understand it's been sent to us directly from Wapakoneta, your own hometown. Over.

02 09 25 29      CDR      No, we can't - we can't pronounce it either. I think you'll enjoy that. They make a fine brand of cheese.

02 09 25 37      CC      Roger, there, and I'll polish up the grammar for the next trip.

02 09 25 50      CMP      Houston, 11. You are looking at the NOUN 93, and I'll proceed when you copy them

02 09 26 00      CC      11, Houston. We've got them.

02 09 26 08      CMP      Okay.

02 09 28 15      CC      Hello, Apollo 11, Houston. We'd like POO and ACCEPT. We have a DELTA-H update for you. Over.

02 09 28 23      CMP      All right, Charlie. Stand by one.

02 09 29 31      CMP      Houston, Apollo 11. POO and ACCEPT.

02 09 29 33      CC      Roger.

02 09 31 48      CC      Apollo 11, Houston. We got the load in. The computer's yours. Over.

02 09 31 56      CMP      Houston, 11. Roger.

02 09 36 04      CC      Hello, Apollo 11. Houston. We'd like for you to stir up the CRYO's now. Over.

02 09 36 14      CMP      Houston, Apollo 11. Roger.

02 09 44 33      CDR      Houston, Apollo 11. We're completed in the LM. We're closing up the hatches and the probe and drogue back in.

02 09 44 42      CC      Roger. We copy. Out.

02 09 59 38      CC      Hello, Apollo 11. Houston. We're standing by to watch your startup on the PTC at any time. You can start off at the VERB 49. Over.

02 09 59 48      CDR      Wilco. We're just finishing up the probe and about to close up the hatch here. We're going to be a couple of minutes late, probably, getting started in the PTC.

02 09 59 59      CC      Roger. No sweat, 11. We're standing by. Over.

02 10 06 08      CC      Hello, Apollo 11. Houston. Mike, there's no wait required. Where rates are steady, you can proceed on. Over.

02 10 06 17      CMP      I'm doing it, Charlie.

02 10 06 18      CC      Roger.

02 10 06 24      CMP      The tunnel's all taken care of, the drogue, probe, and hatch all back.

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02 10 06 28

CC

Roger. Copy. Out.

END OF TAPE

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(GOSS NET 1)

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02 10 10 01        CC        Hello, Apollo 11. Houston. We have some new additions to your alternate contingency checklist, if you would break that out. Over.

02 10 10 15        CDR        Stand by.

02 10 11 46        CDR        Okay, Houston. 11's ready to copy.

02 10 11 48        CC        Roger, 11. If you'll turn to page F2-22. Over.

02 10 12 27        CDR        Okay. I have F2-22.

02 10 12 31        CC        Roger, Neil. Under column L - that's column Lima, line 06. The new data is 00001. Line 07, the new data is 02134. Over.

02 10 13 01        CDR        Okay. I have in F2-22, column Lima, item 6, 00001; item 7, 02134.

02 10 13 20        CC        Roger. That's correct. Thank you much. Out.

02 10 13 37        CC        11, Houston. For your information, those two entries are an update to your DELTA-H that we have already uplinked into the CMC. Over.

02 10 13 47        CDR        Roger. Thank you.

02 10 14 04        CMP        What was I marking on, Charlie? About an 18-kilometer line, or what?

02 10 14 09        CC        We - Our update puts you to - the DELTA-H to 35 kilometers, Mike. Over.

02 10 14 17        CMP        Okay.

02 10 19 24        CC        Hello, Apollo 11. Houston. We've got some switch positions for you for the high gain. Over.

02 10 19 33        LMP        Okay. Go ahead.

02 10 19 35        CC        Roger, Buzz. Select Bravo, OMNI, HIGH-GAIN TRACK to MANUAL; BEAM, WIDE. Over.

02 10 19 48        LMP        Okay. Bravo, OMNI; TRACK, MANUAL; and BEAM, WIDE.

02 10 19 53        CC        Roger. And your high-gain angles are minus 50 on the pitch, 270 on the yaw. Over.

02 10 20 03 LMP Okay. Going there now.

02 10 41 22 CC Hello, Apollo 11. Houston. We have some updates and some things we'd like to talk to you about, if you aren't in the middle of your meal. If it's convenient anytime for you, we're ready with some updates. Over.

02 10 41 46 CDR What - What are the updates going to apply to?

02 10 41 51 CC Roger. We have a couple of changes on the LM mission rules NO-GO for your NO-GO card, Neil. One slight change on the APS/DPS fuel and TEMP pressure card, and we have a change to the procedure for the secondary radiator leak check, which is to be formed at - performed at 71 hours tomorrow, and also some indications that we have a couple of landing site obliques stowed in the wrong place. Over.

02 10 42 36 CDR Okay. Is any of those in the flight plan? The secondary radiator, for example?

02 10 42 43 CC That's affirmative. The secondary radiator leak check is called out in the flight plan at 71 20. That procedure is listed in your launch operations book on page 2-9, L2-9. We'd like to change that procedure. Over.

02 10 43 08 CDR Okay. Stand by.

02 10 43 25 CMP Charlie, on the secondary leak check, just read it verbatim like you want, and I'll copy directly into the flight plan and not fool around with the checklist.

02 10 43 32 CC Roger. That's fine. If you're ready to copy, stand by.

02 10 43 37 CMP Ready to copy on the leak check.

02 10 43 40 CC Roger. It's monitor secondary accumulator quantity. Step 2 is secondary glycol to radiator valve, NORMAL for 30 seconds, then BYPASS. If no decrease in secondary accumulator quantity - Are you with me?

02 10 44 21 CMP Yes, I'm with you.

02 10 44 22 CC Okay. If no decrease in secondary accumulator quantity, secondary glycol to radiator valve to NORMAL. Next step, secondary coolant loop pump,

AC-1 or AC-2. After 3 minutes, verify glycol discharge secondary pressure 39 to 51 psig. Also verify secondary EVAP out TEMP has changed. Next step, secondary coolant loop pump, OFF. Secondary glycol to radiator valve, BYPASS. That ends the procedure. Over.

02 10 45 52       CMP       Okay. I read back: monitor secondary accumulator quantity; secondary glycol radiator valve, NORMAL for 30 seconds, then to BYPASS. If no decrease in secondary accumulator quantity, secondary glycol to radiator valve to NORMAL. Secondary coolant loop pump, AC-1 or 2. After 3 minutes, verify glycol secondary discharge pressure 39 to 51 psig. Verify secondary evaporator outlet TEMP has changed. Secondary coolant loop pump, OFF. Secondary glycol radiator valve to BYPASS. And what's the reason for the change, Charlie?

02 10 46 27       CC       Roger. Stan is concerned that our present procedure as shown in the checklist does not really flow glycol through the radiator, and it - They want to verify that we do not have a plugged secondary radiator. Over.

02 10 46 48       CMP       Okay. They have any abnormal indications in that system, so far?

02 10 46 52       CC       Negative. This is the procedure that they came up with. It's just a check, Mike. Everything's looking great to us. Over.

02 10 47 02       CMP       Okay. Fine.

02 10 47 31       CDR       Charlie, we'll get back with you on these other changes in a few minutes. Okay?

02 10 47 38       CC       Roger, Neil. No hurry. Over.

02 11 10 57       CC       11, Houston. We're wondering who's on horn.

02 11 11 09       CMP       Say again, Houston?

02 11 11 12       CC       We just had a little music there.

02 11 11 21       CMP       We'll keep you entertained.

02 11 11 28       CC       Roger. That was good. You can keep it coming down, 11.

02 11 11 36       CMP       Okay.

02 11 12 34       CMP       Because it's a special occasion today, Houston. This is the third anniversary of Gemini 10.

02 11 12 42       CC       Roger. Happy anniversary.

02 11 12 51       CMP       Thank you, sir.

02 11 19 32       LMP       Houston, Apollo 11. Ready to copy your update.

02 11 19 35       CC       Roger. Stand by.

02 11 19 50       CC       Okay, Buzz. The first item is that we have indications that your landing site obliques are not in the proper position. If you'll check, we think that the intermediate-scale landing site oblique is stowed in the CSM lunar landmark book. We think that the large-scale landing site oblique is stowed in the back of the LM lunar surface map book. Over.

02 11 20 38       LMP       I think I heard you Charlie, but I'm not sure that I understand.

02 11 20 45       CC       Roger. According to our stowage list the - the landing site oblique should be in the transfer bag. In - But in the backup set of data, the intermediate-scale oblique is in the CSM lunar landmark book, and the large-scale oblique is in the back of the LM lunar surface map book; and that's the reason we think that they might be not where you think they are. Over.

02 11 21 15       LMP       Okay. We've got three obliques. The last one is one I asked for recently. It's just a blow-up of the second one. The first one is one that's got dotted lines on it, indicating horizon view and 50-degree LPD; and all three of those are in the transfer book. Over.

02 11 21 34       CC       Roger. Fine. We were wrong in our - in our backup set. We had those out of place. Looks like the onboard data's good. We just wanted to let you check on that one. We have an update on the APS/DPS fuel card that you place on the panel. It's a typo error. If you'll break out that little card, we've got the - correct that typo error. Over.

02 11 22 10       LMP       Stand by.

02 11 23 05       LMP       Okay. I got it.

02 11 23 07      CC      Roger, Buzz. Under the DPS column on the pressure side, you go down to the fourth item, says pressure greater than 150 PTCA should be greater than 65 percent. Over.

02 11 23 28      LMP      Okay. That's greater than 1.8 but less than 65 and greater than 150 for greater than 65.

02 11 23 35      CC      That's affirmative. Out.

02 11 23 46      CC      And we have three items on the mission rules NO-GO card, if you're ready to copy those. Over.

02 11 24 32      LMP      Okay. I've got the mission rules NO-GO.

02 11 24 34      CC      Roger, Buzz. First entry's on the EPS under AC bus A. The line extends all the way to high gate. Actually, the line should read - at DOI it would be NO-GO AC bus A. After that the NO-GO would be both buses. So if you will just pencil in both buses from PDI through high gate, it'll be correct for that line. Over.

02 11 25 20      LMP      Okay. I've got that: AC bus A for DOI and both buses NO-GO for PDI on.

02 11 25 28      CC      That's affirmative up until high gate. You can stop at the line in front of the column "5 minutes to low gate." Now the next line is under the G&C PGNS, pitch and roll GDA's. You can scratch that line completely. Over.

02 11 25 56      LMP      Roger. Got it.

02 11 25 57      CC      Okay, Buzz. Last entry is down under RCS, and it's a typo error under the three - in the line "three-axis attitude control." If you proceed to the right at PDI plus 05, you'll see one axis. The line goes all the way to low gate to touchdown. That's incorrect. The line should stop under "5 minutes to low gate." Over.

02 11 26 38      LMP      Okay. We're stopping that at "5 minutes to low gate."

02 11 26 41      CC      That's affirmative. That completes that card. The rest of the updates are just really for your information based on our 58-hour platform - look at the platform. We are really good shape. Your GYRO's have almost no drift in them since - plotted update we were looking at X of a minus 2.24 ...



Y of point plus 0.87, Z of minus 0.11. Since the update, which was based on the 52-hour P52, I believe, we gave you an X drift of plus 0.79, yaw of plus 1.06, Z of plus 0.02 ... I can see the difference between the 52-hour and the 57-hour alignments were - did not really give us enough time to get a real good or completely valid update on the drift check. So we're real satisfied with the way the GYRO's are looking. The PIPA's are looking great also. We are in real good shape with those, too. Over.

02 11 32 21 CDR This is Apollo 11. Radio check.

02 11 32 23 CC Roger. Reading you five-by. How me? Over.

02 11 32 28 CDR Okay. Loud and clear. You cut out when you were talking about the platform - something about 52 hours and after that, we never heard you again.

02 11 32 37 CC Roger. Guess we were changing antennas. Stand by. That's affirmative, 11. We were swapping antennas on you down here. Basically the word is that we have a real good platform, very small drift on the GYRO's, and very small drift in the PIPA's. Over.

02 11 33 00 CDR Roger. Thank you. And I would like to have a few words of clarification if you will give them to me on the RCS ... what that change of pitch may mean.

02 11 33 14 CC Copy. A few words of clarification on the RCS? Oh. Roger. The update there, Neil, you are speaking of about the one axis down to 5 minutes of low gate?

02 11 33 31 CDR Yes. That's right. I'm not quite sure what that ... means beyond 5 minutes.

02 11 33 38 CC Stand by. I'll make sure I got my story straight with Control. Stand by.

02 11 33 44 CDR Okay.

02 11 34 33 CC 11, Houston. On the RCS, what we are saying is that if we lose control about one axis prior to low gate, we would recommend an abort. This would require a - a loss of - of two distinct jets which is not very probable, but that is what we are recommending. After low gate we would continue on. We would recommend that we continue on to attempt a landing. Over.

02 11 35 13 CDR Roger. I think I ...

02 11 35 17 CC Roger.

02 11 35 45 CMP Charlie, did you say you had some updates for me from the lunar surface book?

02 11 35 49 CC Apollo 11, say again. You were cut out. Over.

02 11 35 55 CMP Roger. Did you say you had some updates for us in the lunar surface book. Over.

02 11 36 00 CC Negative. At this time, we do not have any updates for the lunar surface book. We wanted you to have it just in case. Over.

02 11 36 12 CMP Roger. You were cut out that time.

02 11 36 15 CC Roger. At the present time, we do not have any updates for you on the lunar surface book. We are thinking about some and kicking them around, but they're very minor changes. Over.

02 11 36 37 CC 11, Houston. Did you copy that transmission?

02 11 37 09 CC Apollo 11, Houston. We swapped antennas on you again. I say again that we do not have any lunar surface update - book updates at this time. We're considering a few minor ones, but we're still kicking them around the MOCR. Over.

02 11 37 27 CMP Apollo 11. I understand.

END OF TAPE

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02 11 45 31 CDR Houston, 11. We have a crew status report for you.

02 11 45 34 CC Roger. Go ahead, 11.

02 11 45 39 CDR Okay. Radiation: CDR 11009, CMP 10010, LMP 09011. No medication.

02 11 45 55 CC Roger, 11. We copy for the radiations. And, We're considering - This PTC looks sort of weird to us, so we're considering stopping and starting over again, and we'll be with you in a couple of minutes. Over.

02 11 46 15 CDR Okay.

02 11 47 46 CC Apollo 11, Houston. Would you give us the LM/CM DELTA-P reading? Over.

02 11 48 45 CC Hello, Apollo 11. Houston. We switched the antennas on you again. Would you please give us the LM/CM DELTA-P reading? Over.

02 11 49 43 CC Hello, Apollo 11. Houston. Over.

02 11 49 48 CDR Go ahead. 11 here.

02 11 49 50 CC Roger. We switched antennas on you, there, moments ago, Neil. Could you please give us the LM/CM DELTA-P reading? Over.

02 11 50 00 CDR It's less than 0.1.

02 11 50 02 CC Roger.

02 11 50 13 CMP 0.15, now, Neil says, Charlie.

02 11 50 16 CC Roger. Thank you, Mike. Could you give us some help? This PTC is strange: it's not like anything we've seen before. We were wondering if you have had any events or any odd data that could help us out. Over.

02 11 50 35 CMP I didn't understand that. Say again.

02 11 50 38 CC Roger. We're looking at a - sort of a funny looking PTC. We've already drifted out to 70 degrees in pitch and we're wondering if you all have had any vents or any such thing as that, that could have caused us to pick up these rates to drive us off. Over.

02 11 51 09       CMP       Negative, Charlie. We don't know of anything.

02 11 51 11       CC       Roger.

02 11 51 13       CMP       Unless it's got something to do with that entry  
from the position that we want to be in. I don't  
know.

02 11 51 21       CC       Roger. When we started off, it looked real fine  
to us. Now it's drifting off with a funny pattern  
that we haven't seen previously on a flight. And  
we're just trying to figure out - I think we'll  
probably start it over again. We'll be with you  
momentarily. Over.

02 11 51 39       CMP       Okay.

02 11 55 12       CC       Apollo 11, Houston. We hate to say it, but we'd  
like to terminate this PTC and start over again.  
We have no assurance that we're going to get it  
through the sleep period with this funny config-  
uration, or funny pattern. We'd like you to stop  
it now and go back to pitch 090, yaw 0, and  
roll - whatever you stop on. Over.

02 11 55 42       CMP       Roger.

02 11 58 37       CC       11, Houston. We recommend you disable Bravo and  
Charlie; select quads Alfa and Delta. Over.

02 11 59 25       CC       Apollo 11, Houston. Over.

02 12 02 30       CC       Apollo 11, Houston. Over.

02 12 03 07       CC       Apollo 11, Houston. Over.

02 12 03 40       CC       Apollo 11, Houston. Over.

02 12 05 55       CC       Apollo 11, Houston. Do you read? Over.

02 12 11 09       CC       Hello, Apollo 11. Hello, Apollo 11. Over.

02 12 11 32       CDR       ... Apollo 11. Go ahead.

02 12 11 35       CC       Roger. Reading you about one-by. Looks like we  
picked a super attitude here for PTC stabilization.  
We're reading you in BACKUP VOICE now. Over.

02 12 11 51       CDR       Roger. We read you loud and clear.

02 12 11 53       CC       Roger.

02 12 12 03 CDR Would you like us to pick another antenna?

02 12 12 06 CC I think we've got about the best configuration. We've been doing it all from the ground here, 11. We'll just keep it as it is. Over.

02 12 12 16 CDR Roger.

02 12 14 32 CC Apollo 11, Houston. Would you select COMMAND RESET and OMNI Alfa? Over.

02 12 15 03 CDR Houston, 11 on OMNI Alfa.

02 12 15 06 CC Roger. We read you about three-by now. Over.

02 12 15 12 CDR Roger.

02 12 17 19 CC Apollo 11, Houston. We is stable; you can start the PTC. Over.

02 12 17 29 SC ...

02 12 20 59 CMP Houston, Apollo 11. Checklist page F9-7; I've completed step 8, and I'd like to know what you think is ideal timing between step 8, step 9, and step 10 on that page? Over.

02 12 21 15 CC Roger. Stand by.

02 12 22 46 CC Apollo 11, Houston. We don't see any time constraint. We'd like you to go ahead and set up the wide deadband and then go through step 10 and 11. Over.

02 12 22 57 CMP Okay. Will do. I don't see any constraint here, Charlie. I was just checking to make sure, because last time, I went from 8 to 9 to 10 to 11 a little bit more swiftly than I'd been doing in the past.

02 12 23 09 CC Roger.

02 12 23 58 CMP Step 11 complete.

02 12 24 02 CC Roger. We copy.

02 12 24 22 CC Apollo 11, Houston. Would you please select OMNI Bravo? Over.

02 12 24 30 CMP Roger. Bravo.

02 12 24 43       CMP       Houston, Apollo 11. How do you read on Bravo?

02 12 24 46       CC       Roger. Reading you five-by.

02 12 24 50       CMP       Same here.

02 12 25 07       CC       Apollo 11, Houston. Looks like we've got a good PTC going. It's good night from the White Team. Over.

02 12 25 17       CMP       Okay. See you tomorrow. Thank you for everything.

02 12 45 38       CDR       Houston, Apollo 11.

02 12 45 41       CC       Go ahead, 11. Over.

02 12 45 46       CDR       Do you have any idea where the S-IVB is with respect to us?

02 12 45 50       CC       Stand by.

02 12 49 02       CC       Apollo 11, Houston. The S-IVB is about 6000 nautical miles from you now. Over.

02 12 49 14       CDR       Okay. Thank you.

02 12 50 07       CMP       Houston, Apollo 11. How's the PTC looking?

02 12 50 11       CC       Stand by.

02 12 50 32       CC       11, Houston. The PTC looks great to us. Over.

02 12 50 38       CMP       Hey, do you have any idea what happened to the previous one?

02 12 50 42       CC       We have absolutely no idea. Over.

02 12 50 49       CMP       Okay. Did, it look like it was all right, then just all of a sudden start diverging?

02 12 50 57       CC       That's negative, Mike. If you'll look at the plot, which we'll save for you and let you see it postflight, it started off immediately on the first REV and just spiraled out to about - oh 20 to - 20 degrees in pitch, and then it seemed to be setting up a spiral around an offset pitch point of about 20 degrees off from 90 degrees; but we didn't want to take a chance that it would become stable at that point. We thought it might diverge, and so we called you and started over again. Over.

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02 12 51 39

CMP

Okay, no complaints. I was just curious as to what had happened.

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REST PERIOD - NO COMMUNICATIONS



APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

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REST PERIOD - NO COMMUNICATIONS

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REST PERIOD - NO COMMUNICATIONS

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

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REST PERIOD - NO COMMUNICATIONS

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REST PERIOD - NO COMMUNICATIONS

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02 21 10 24 LMP Houston, Apollo 11.

02 21 11 01 LMP Houston, Apollo 11.

02 21 13 14 CT Goddard voice, Houston COMM TECH. Goss conference.

02 21 13 17 MSFN You're loud and clear. How me?

02 21 13 19 CT Roger. Read you the same.

02 21 13 21 MSFN Roger.

02 21 17 37 CT Madrid, Houston COMM TECH. Net 1, voice check.

02 21 17 41 CT Houston COMM TECH, Madrid. I read you loud and clear.

02 21 17 44 CT Roger. Read you loud and clear also.

02 21 18 07 LMP Hello, Houston. Apollo 11.

02 21 18 16 CC Apollo 11, Houston. Good morning.

02 21 18 21 LMP Good morning. Are you planning a midcourse correction 4 this morning?

02 21 18 26 CC That's negative. Midcourse number 4 is not required. We were going to let you sleep in until about 71 hours if you'd like to turn over.

02 21 18 38 LMP Okay. That'll be fine.

02 21 18 48 CC Say again, Buzz. You were cut off there.

02 21 18 52 LMP Okay. I'll see you at 71 hours.

02 21 18 55 CC Roger.

END OF TAPE

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02 23 03 30        CC        Apollo 11, Apollo 11, this is Houston. Over.

02 23 03 38        LMP        Good morning again, Houston. Apollo 11.

02 23 03 41        CC        Roger 11. Good morning. When you - -

02 23 03 48        LMP        Would you like the O<sub>2</sub> purge this morning?

02 23 03 52        CC        Yes indeed. O<sub>2</sub> fuel cell purge at 71 hours, and when you feel like copying, I've got a flight plan update containing - I guess that and some other items for you.

02 23 04 08        CDR        Okay. Stand by.

02 23 06 59        LMP        Houston, Apollo 11. Go ahead with the flight plan update.

02 23 07 05        CC        Roger, 11. This is Houston. At approximately 71 hours to 72 hours, we have you down for an eat period which I imagine is probably in progress already. 71 hours: O<sub>2</sub> fuel cell purge; 72 hours GET: CO<sub>2</sub> filter change number 6, secondary radiator flow check. And we'll send you up a P37 block data on a 2 hour pass, pericynthion pass, return mode abort. At 73 hours 00 minutes: stop PTC at approximately 0 degrees roll. That is, when you're coming up on 0 degrees roll angle around 73 hours, we'd like you to stop PTC. And perform a P52 option 3 remaining in the PTC REFSMMAT for a drift check. 73 hours, 20 minutes: we'll give you a P27 update to the landing site REFSMMAT, LOI-1 state vector, and target load. 73 hours 30 minutes: maneuver to 000 roll, pitch, and yaw; high gain antenna angles will be pitch 0, yaw 335; and perform a P52 option 1 using the new landing site REFSMMAT. Resume the nominal flight plan at 74 hours GET. Over.

02 23 09 08        LMP        Okay. We'll get started on the fuel cell purge while we're eating. CO<sub>2</sub> canister change number 6; secondary radiator flow check; copy some pads. Also at 72 hours, stop PTC 0 roll at 73; do a P52 option 3; we'll get your uplink REFSMMAT for the landing site; and at 000 - let's see, now was this with the old REFSMMAT or the new REFSMMAT?

02 23 09 45 CC This is with the - -

02 23 09 46 LMP - - ... antenna and, pitch - -

02 23 09 50 CC - - This is with the new REFSMMAT, Buzz.

02 23 09 58 LMP You said you want the P52 done at that attitude with the new REFSMMAT?

02 23 10 05 CC Roger.

02 23 12 01 CC Apollo 11, this is Houston. Over.

02 23 12 17 CC Apollo 11, this is Houston. Over.

02 23 12 35 CC Apollo 11, this is Houston. Over.

02 23 12 41 CMP Houston, go ahead.

02 23 12 42 CC Roger, 11. Correction on my last. At 73 20, we uplink you the new REFSMMAT. And at 73 30, we'd like you to maneuver to 0 roll, 0 pitch, 0 yaw in the old REFSMMAT. And then torque around to the new REFSMMAT and run your P52 option 1 in that same inertial attitude. Over.

02 23 13 12 CMP Roger. Understand.

02 23 13 15 CC I've got consumables update, when you're ready to copy.

02 23 13 22 CMP I just got up, but you didn't catch me on that one.

02 23 13 26 CC I say I have one for you.

02 23 13 55 CMP Okay. We're ready to copy that consumable update.

02 23 13 59 CC Roger. As of GET 68 00, RCS total minus 4.5 percent, corresponding to approximately minus 53 pounds. Alfa minus 6.0 percent, minus 1.0 percent, minus 7.0 percent, minus 3.0 percent; H<sub>2</sub> total, minus 1.2 pounds; O<sub>2</sub> total, plus 10 pounds. Over.

02 23 14 49 CMP Roger. And our readouts on board are. Alfa is 82, Bravo is 84, Cocoa is 84, and Delta is 87.

02 23 15 09 CC Houston. Roger. Out.

02 23 15 14      CMP      And you want us to cycle the O<sub>2</sub> and H<sub>2</sub> fans, I imagine?

02 23 15 24      CC      11, this is Houston. Affirmative. Over.

02 23 15 31      CMP      Okay.

02 23 23 26      LMP      Houston, Apollo 11. I have a status report for you.

02 23 23 34      CC      Go ahead, 11.

02 23 23 38      LMP      Roger. On sleep; CDR, CMP, 7.5; LMP, 6.5. Over.

02 23 23 46      CC      Roger. 7.5 for each. Over.

02 23 23 54      LMP      Negative. LMP 6.5.

02 23 23 59      CC      Roger. 7.5, 7.5 and 6.5. And I got a few words for you here on the SPS engine performance. Over.

02 23 24 14      LMP      Okay. We're ready to listen.

02 23 24 18      CC      Okay, 11. It turns out that the engine performance during both of your burns so far this mission has been the same as it was on engine acceptance tests. The onboard PC reading is due to a known gage calibration factor between what you've actually got in the chamber and what you're reading out on the gage. We expect single-bank operation to be 90 - that is, 90 psi on the gage with an actual chamber pressure of 95 psi. In dual-bank operation, the chamber pressure is 94 psi on the gage with an actual of 99 psi. 80 psi on the gage on board correlates to 83 psi actual. And we recommend that you stick to an LOI termination cue of 80 psi on the gage. That is, no change to the mission rules. Over.

02 23 25 37      CDR      Apollo 11. Roger. We got all that.

02 23 25 40      CC      Houston. Out.

02 23 33 08      LMP      Houston. Apollo 11.

02 23 33 12      CC      Apollo 11, this is Houston. Go ahead. Over.

02 23 33 25      CC      Apollo 11, this is Houston. Go ahead. Over.

02 23 33 40      CC      Apollo 11, this is Houston. Go ahead. Over.



02 23 33 47 CDR Houston, do you read Apollo 11?

02 23 33 49 CC Roger, 11. We're reading you loud and clear now. We were down in the noise as we switched antennas a minute or so ago. Over.

02 23 34 00 CMP Roger. What sort of settings could you recommend for the solar corona? We've got the Sun right behind the edge of the Moon now.

02 23 34 12 CC Roger.

02 23 34 16 LMP It's quite an erie sight. There is a very marked three-dimensional aspect of having the Sun's corona coming from behind the Moon the way it is.

02 23 34 27 CC Roger.

02 23 34 31 LMP And it looks as though - I guess what's giving it that three-dimensional effect is the earthshine. I can see Tycho fairly clearly - at least if I'm right side-up, I believe it's Tycho, in moonshine - I mean, in earthshine. And, of course, I can see the sky is lit all the way around the Moon, even on the limb of it where there's no earthshine or sunshine.

02 23 35 40 CC Apollo 11, this is Houston. Over.

02 23 35 45 LMP Go ahead.

02 23 35 47 CC Roger. If you'd like to take some pictures, we recommend using magazine Uniform which is loaded with high speed black and white film, interior lights off, electric Hasselblad with the 80-millimeter lens. And you're going to have to hand-hold us, I guess. We're recommending an f-stop of 2.8, and we'd like to get a sequence of time exposures. Over.

02 23 36 24 LMP Okay. You want magazine Uniform instead of magazine Tango? Over.

02 23 36 30 CC Roger. We're not trying to get you all wrapped up in a procedure here. This is on a not-to-interfere basis, of course. Over.

02 23 36 43 LMP Okay.

02 23 36 46 CC And on the exposures we're looking for an eighth of a second, a half a second. And, if you think you can steady the camera against anything to get longer exposures, 2 seconds, 4 seconds, and 8 seconds. Over.

02 23 37 11 LMP Roger. We copy.

02 23 37 13 CC Roger. Out.

02 23 39 15 CC Apollo 11, Houston. Over.

02 23 39 23 CMP Go ahead, Houston.

02 23 39 25 CC Roger. We'd like to do a little CRYO tank balancing. So, if you could position the oxygen tank number 1 heater switch to OFF and hydrogen tank 2 heater switch to OFF leaving all the rest of the CRYO switches the same, we'll let it run that way for a few hours. Over.

02 23 39 48 CMP Okay. Stand by one on those switches. We'll get them in a minute.

02 23 39 51 CC Roger. And how far out can you see the corona extending? Over.

02 23 40 13 CDR ... bit like zodiacal light. It keeps going out farther and farther. We'll talk about it a little more later.

02 23 40 31 CC Roger. Out.

02 23 43 11 CDR ... We've got quite a few pictures ...

02 23 44 06 CC Apollo 11, this is Houston. I think we have COMM again. We heard you calling. Over.

02 23 44 27 CC Apollo 11, this is Houston. Were you calling? Over.

02 23 44 48 CMP Houston, Apollo 11. Understand you want the heaters OFF for hydrogen tank 1 and oxygen tank 1. Is that affirmative?

02 23 44 56 CC That's negative, Mike. Hydrogen tank number 2 heaters OFF and oxygen tank number 1 heaters OFF.

02 23 45 05 CMP Okay.

02 23 45 07 CC Roger. Out.

02 23 45 12 CMP I have hydrogen tank number 2 heaters OFF; I have oxygen tank number 1 heaters OFF.

02 23 45 18 CC Roger. Out.

02 23 52 15 CMP Houston. Apollo 11. The earthshine coming through the window is so bright you can read a book by it.

02 23 52 24        CC        Oh, very good.

02 23 56 00        CDR        And, Houston, I'd suggest that along the ecliptic line we can see the corona light out to two lunar diameters from this location. The bright light only extends out about an eighth to a quarter of the lunar radius.

02 23 56 35        CC        Roger. Understand that you can see the corona approximately 200 solar diameters out along the ecliptic, and the bright light extends out approximately one-eighth to one-quarter lunar radius. Over.

02 23 56 52        CDR        That's two lunar - two lunar diameters along the ecliptic in the bright part, right; a quarter to an eighth of a lunar radius out, and that's perpendicular to the ecliptic line on the South Pole.

02 23 57 07        CC        Roger.

02 23 59 20        CDR        Houston, it's been a real change for us. Now we are able to see stars again and recognize constellations for the first time on the trip. It's - the sky is full of stars. Just like the night side of Earth. But all the way here, we have only been able to see stars occasionally and perhaps through the monocular, but not recognize any star patterns.

02 23 59 52        CC        I guess it has turned into night up there really, hasn't it?

02 23 59 58        CDR        Really has.

03 00 04 57        CC        11, this is Houston. Go ahead. Over.

03 00 13 48        CC        Apollo 11, this is Houston. Do you read? Over.

03 00 14 38        CC        Apollo 11, this is Houston. How do you read? Over.

03 00 14 43        CDR        Okay. We went to HIGH GAIN. Looks like you had a little trouble getting signal strength there.

03 00 14 49        CC        Roger. We missed an OMNI switch there. Over.

03 00 14 55        CDR        All right. On the secondary loop check when we went to FLOW on the secondary radiators, the quantity dropped from 40 percent down to 36 in the first 10 seconds and then stabilized at 36 for the remainder of the 30 seconds.

03 00 15 30      CC      Apollo 11, this is Houston. We believe that is normal system operation. The radiators are expected to be very cold right now and apparently the decrease you saw was due to contraction in the fluid. Over.

03 00 15 49      CDR      Okay. We will go ahead with the procedure just as if there were no decrease in accumulator quantity. Right?

03 00 15 55      CC      Roger. Press on.

END OF TAPE

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03 00 17 25 CDR And, Houston, the secondary radiator flow check is complete and satisfactory.

03 00 17 31 CC Houston. Roger. Out.

03 00 17 40 CMP And that's a good deal because we don't have to have any meetings about whether we're going to do it or don't do it any more.

03 00 17 47 CC That's for sure.

03 00 18 00 CC The Flight Director says "ouch."

03 00 18 12 CMP No. No "ouch" intended. I enjoyed every one of those meetings.

03 00 19 10 CC 11, this is Houston. I have your pericynthion plus 2 PAD, P30 format, when you're ready to copy.

03 00 19 24 CDR Roger. Stand by.

03 00 20 17 LMP Houston, Apollo 11. Ready to copy pericynthion plus 2.

03 00 20 24 CC Apollo 11, this is Houston. Pericynthion plus 2 hours PAD. SPS G&N: 62710, plus 098, minus 019, GET ignition 077 46 2248, DELTA-VX NOUN 81, plus 32148, minus 00455, minus 10377, roll NA, pitch 307, and the remainder of the PAD is NA. GDC align stars Vega and Deneb. Roll 243 183 012, no ullage. Remarks: Assumes landing site REFSMMAT and docked. Over.

03 00 21 48 LMP Roger. SPS G&N: 62710, plus 098, minus 019, 077 46 2248, plus 32148, minus 00455, minus 10377, NA, 307, Vega and Deneb, 243 183 012, no ullage, landing site REFSMMAT, docked. And I need a change on the LM weight. Over.

03 00 22 30 CC No change in the LM's weight - in the LM weight, and the readback is correct. Out.

03 00 25 06 CC Apollo 11, this is Houston. Over.

03 00 25 13 CDR Roger. Go ahead.

03 00 25 14        CC        Roger. We're having difficulty getting commands into the spacecraft. We'd like you to cycle your UP TELEMETRY switch to COMMAND RESET and OFF and then back to NORMAL. Over.

03 00 25 32        CDR        Okay. We'll do it.

03 00 25 50        CDR        We have you on high gain right now. You want us to switch over to OMNI?

03 00 26 02        CC        Negative. We would like to stay on the high gain if we can. Over.

03 00 26 11        CDR        Okay.

03 00 27 16        CC        Apollo 11, this is Houston. Over.

03 00 27 24        CDR        Go ahead.

03 00 27 25        CC        Roger. We'd like you to switch to OMNI Delta as we show you approximately at the scan limit of the high gain antenna. Now we will then command OMNI Delta down here after you advise us you've switched, and then you can select Bravo on board and we will be back in the OMNI antenna commanding business. Over.

03 00 27 46        CDR        Okay. We're going to Delta now.

03 00 28 16        CC        11, Houston. You can go ahead and select OMNI Bravo on board now.

03 00 28 24        CDR        ...

03 00 28 27        CC        Roger. Out.

03 00 29 24        CC        Apollo 11, this is Houston. If you have a minute or so free, we can read you up the morning news here.

03 00 29 35        CDR        Go right ahead; let's hear it.

03 00 29 37        CC        Roger. Hot from the wires of the MSC Public Affairs Office, especially prepared for the crew of Apollo 11.

03 00 29 46        CC        Okay. First off, it looks like it's going to be impossible to get away from the fact that you guys are dominating all the news back here on Earth. Even Pravda in Russia is headlining the

mission and calls Neil, "The Czar of the Ship."  
I think maybe they got the wrong mission.

- 03 00 30 06      CC      West Germany has declared Monday to be "Apollo Day." School children in Bavaria have been given the day off. Post Office clerks have been encouraged to bring radios to work and Frankfurt is installing TV sets in public places.
- 03 00 30 24      CC      BBC in London is considering a special radio alarm system to call people to their TV sets in case there is a change in the EVA time on the Moon.
- 03 00 30 35      CC      And in Italy, Pope Paul VI has arranged for a special color TV circuit at his summer residence in order to watch you, even though Italian television is still black and white.
- 03 00 30 48      CC      Back here in Houston, your three wives and children got together for lunch yesterday at Buzz's house. And according to Pat, it turned out to be a gabfest. The children swam and did some high jumping over at Buzz's bamboo pole.
- 03 00 31 11      CC      In Moscow, space engineer Anatol Koritsky was quoted by TASS as saying that Luna 15 could accomplish everything that has been done by earlier Luna spacecraft. This was taken by the press to mean Luna 15 could investigate the gravitational fields, photograph the Moon, and go down to the surface to scoop up a bit for analysis.
- 03 00 31 35      CC      Even the kids at camp got into the news when Mike Jr. was quoted as replying "yeah" when somebody asked him if his daddy was going to be in history. Then after a short pause he asked, "What is history?" In Washington, President Nixon is planning to use his executive power to streamline the Interstate Commerce Commission. According to industry sources, it was reported Nixon would trim the commission from 11 to 7 members by not making new appointments.
- 03 00 32 12      CC      And the big news around Houston today concerns the Astros. In the sports world, the Houston Astros rallied in the ninth inning at Cincinnati to dump the Reds 7 to 4. Going into the ninth however, things looked pretty bleak. The Astros were trailing 4 to 3. Then with one out, Jesus Alou stroked a single to right field. John

Edwards hit another single to right, and Sandy Valdespino hit a double to bring in the tying run. Julio Gotay was walked and Joe Morgan dropped a bunt for the game-winning play. A wild throw to the plate allowed another run to score, then a sacrifice fly by Dennis Menke brought in the final run. They really came through in the ninth.

- 03 00 32 56 CC And other games in the National League - -
- 03 00 32 57 CMP Yes. Those Astros have really been catching those flies since they put a roof on the stadium.
- 03 00 33 05 CC Good work.
- 03 00 33 19 CC In other games in the National League, New York beat Montreal 5 to 2; Pittsburgh beat St. Louis 4 to 1; and Atlanta over San Diego in the first game of a double header 6 to 2.
- 03 00 33 32 CC In the American League, Detroit beat Cleveland 4 to nothing; New York trounced Washington 5 to nothing; Baltimore outhit - Boston outhit Baltimore to score 6 runs to the Orioles' 2; and Chicago beat Kansas City 6 to 1.
- 03 00 33 50 CC Okay. In golf world, Tommy Jacobs, an infrequent competitor in recent years, took the lead in the Philadelphia Golf Classic yesterday. His second round score was 139.
- 03 00 34 02 CC You might be interested in knowing, since you are already on the way, that a Houston astrologer, Ruby Graham, says that all the signs are right for your trip to the Moon. She says that Neil is clever, Mike has good judgment, and Buzz can work out intricate problems. She also says Neil tends to see the world through rose-colored glasses, but he is always ready to help the afflicted or distressed. Neil, you are also suppose to have "intuition that enables you to interpret life with feeling." Buzz is to be very sociable and cannot bear to be alone in addition to having excellent critical ability. Since she didn't know at what hour Mike was born, she has decided that he either has the same attributes as Neil or he is inventive with an unconventional attitude that might seem eccentric to the unimaginative.



03 00 34 56 CC And last but not - -

03 00 34 58 CMP Who said all that?

03 00 35 00 CC (Laughter) Ruby Graham, an astrologer here in Houston. Now we check with Flight Operations for all the signs for the mission, and then we, of course, had to make sure that everything was really all set.

03 00 35 49 CDR Houston, 11. You're cutting out ...

03 00 35 56 CC Apollo 11, Apollo 11, this is Houston. We're switching OMNI's. Can you stand by for about 2 minutes?

03 00 37 30 CDR Houston, 11. Radio check.

03 00 37 35 CC 11, Houston. Go ahead.

03 00 37 41 CDR Roger. You cut out after Tommy Jacobs. I guess we got into antenna switching problems.

03 00 37 49 CC Okay. Following Tommy Jacobs, we have the hot smoking word from a local Houston astrologer by the name of Ruby Graham. She says that all the signs are right for your trip to the Moon. Neil is clever, Mike has good judgment, and Buzz can work out intricate problems. She also says Neil tends to see the world through rose-colored glasses but is always ready to help the afflicted or distressed. Neil, you are also supposed to have "intuition that enables you to interpret life with feeling," Buzz is supposed to be very sociable and cannot bear to be alone in addition to having excellent critical ability. Since she didn't know at what hour Mike was born, she decided he either has the same attributes as Neil or that he is inventive with an unconventional attitude that might seem eccentric to the unimaginative. And that's 30 for today. Over.

03 00 38 51 CDR Thank you much there, Bruce and Fred Show, we appreciate that.

03 00 38 58 CC Roger.

03 00 39 13 CMP Did you hear our comment about the Astros?

03 00 39 17 CC The one about the roof?

03 00 39 23       CMP       Yes.

03 00 39 44       CC       Hey, Mike, the game was at Cincinnati there,  
and we think that they're still using Crosby  
Field up there. I don't believe it has a roof  
on it.

03 00 40 00       CDR       You got him on that one.

03 00 40 02       CC       Right - -

03 00 40 03       CDR       I think they're just getting to be a good team  
in the clinch.

03 00 40 05       CC       They certainly seem to be.

03 00 40 11       CMP       Well, if they can do that well without a roof,  
think of what they're going to do with a roof.

03 00 40 16       CC       Roger. Out.

03 00 40 21       CMP       We're trying.

03 00 40 41       CDR       An old Oiler fan is trying to comment on an  
alien game.

03 00 41 23       CMP       You tell Michael Jr., history or no history, he'd  
better behave himself.

03 00 41 29       CC       Roger. We'll pass that along, Mike.

03 00 48 58       CC       Apollo 11, Houston. If it's convenient with you,  
we have an LOI-1 PAD that we can pass up to you  
now. Over.

03 00 49 10       CDR       Stand by.

03 00 49 17       CMP       Houston, Apollo 11. The next time we pass  
through roll 0, we're going to stop PTC and that  
will give us 90 degrees pitch. Now, I understand  
you want us to move from 90 degrees pitch to  
0 degrees pitch for the platform align, option 1.  
Is that affirmative?

03 00 49 42       CC       Stand by, please.

03 00 49 47       CDR       And we are ready to copy on the LOI-1.

03 00 50 37       CC       Apollo 11, this is Houston. When you stop at  
0 roll, you will be in approximately 90 pitch,  
0 yaw, and 0 roll. We'd like you to run the

first P52, that is, the P52 option 3, from that attitude. Then we'll uplink you a new REFSMMAT, either before or while you are maneuvering to 000, and then you can torque the platform around and run the second REFSMMAT. Over. Run the second P52. Over.

03 00 51 13       CMP       Okay.

03 00 51 15       CC        And I copied you are ready for the LOI-1 pad.  
Over.

03 00 51 22       CDR       Go ahead.

03 00 51 24       CC        LOI-1, SPS G&N: 62710, plus 098, minus 019, GET  
ignition 075 49 4965, minus 28897, minus 03944,  
minus 00686. Roll 358, pitch 226, 347; 01692,  
plus 00610; 29173 602 29108; sextant  
star 31 1066 358. Remainder of the PAD is NA.  
GDC align Vega and Deneb 243 183 012. No ullage.  
The horizon will be visible just below the upper  
edge of the hatch window 2 minutes prior to the  
LOI burn. It will not be visible in the rendez-  
vous window on the left-hand side. LOS at  
75 hours 41 minutes 23 seconds. AOS at 76 15 29.  
AOS without the LOI burn 76 05 30. The values  
which you would see on NOUN 42 prior to LOI burn  
are HA plus 431.3, HP minus 128.2. Readback.  
Over.

03 00 53 54       CDR       Roger. LOI-1, SPS G&N: 62710, plus 098,  
minus 019, 075 49 4965, minus 28897, minus 03944,  
minus 00686; 358 226 347; 01692, plus 00610;  
29173 602 29108; 31 106.6 358. GDC align Vega  
and Deneb 243 183 012. No ullage. Horizon in  
the hatch window 2 minutes before TIG. AOS with  
an LOI 76 15 29. AOS without an LOI 76 05 30.  
HA before the burn 431.3, HP minus 128.2. Say  
again LOS time.

03 00 55 47       CC        Roger. LOS time 75 41 23. Over.

03 00 55 58       CDR       Understand 75 41 23.

03 00 56 03       CC        11, this is Houston. Readback correct. Out.

03 01 04 38       CC        Apollo 11, this is Houston. Over.

03 01 04 43       LMP       Go ahead.

03 01 04 44 CC Roger. Apparently we missed getting your onboard readouts on battery Charlie and PYRO batteries Alfa and Bravo last night. I wonder if you could give us some fresh numbers. Over.

03 01 04 59 LMP You want the readings now?

03 01 05 01 CC Yes, please. If it's convenient for you.

03 01 05 16 LMP Okay. All three of them are still 37.1.

03 01 05 20 CC Roger. 37.1 cubed. Out.

03 01 09 14 CMP Houston, Apollo 11. The P52 option 3 is complete. We're maneuvering to 000.

03 01 09 20 CC Roger. We observe your maneuvering, and we'll have some uplinks for you in a couple of minutes here.

03 01 09 27 CMP Okay.

03 01 13 13 CC Apollo 11, this is Houston. We observe you're in POO. If you'll give us ACCEPT, we'll start our uplinks.

03 01 13 24 CMP You've got it, Houston.

03 01 13 25 CC Roger. Out.

03 01 16 51 CC Apollo 11, this is Houston. Over.

03 01 16 58 CDR Go ahead, Houston.

03 01 16 59 CC Roger. We're on low bit rate at the present time so it's going to take us a little bit longer than normal to get this stuff up to you. Over.

03 01 17 12 CDR I guess we're in no rush.

03 01 17 15 CC Okay. We're here if you're there.

03 01 17 24 CDR The view of the Moon that we've been having recently is really spectacular. It fills about three-quarters of the hatch window, and of course, we can see the entire circumference, even though part of it is in complete shadow and part of it's in earthshine. It's a view worth the price of the trip.

03 01 17 45 CC Well, there are a lot of us down here that would be willing to come along.

03 01 17 58 CMP I hope you get your turn, and soon.

03 01 18 11 CDR One of these days, we'll be able to bring the whole MOCR along, I hope. Save a lot of antenna switching.

03 01 18 21 CC Say again, 11.

03 01 18 26 CDR One of these days, we could bring the whole MOCR along, and then that'll save a lot of antenna switching.

03 01 18 34 CC That's jolly.

03 01 20 21 CC Apollo 11, this is Houston. Over.

03 01 20 28 CMP Go ahead, Houston.

03 01 20 30 CC 11, this is Houston. We're showing you - -

03 01 20 32 CMP The Czar is brushing his teeth, so I'm filling in for him.

03 01 20 36 CC Say again, please.

03 01 20 42 CMP I said the Czar is brushing his teeth, so I'm filling in for him. What can we do for you?

03 01 20 47 CC Roger. If you don't get in the way of the Czar while he's brushing his teeth, we'd like you to bring up the primary accumulator quantity a little bit. We're showing the quantity now at 20.6 percent on TM. Seems to have gone down a bit since you've gone into the shadow. We'd like it serviced to bring the quantity up to between 30 and 40 percent, preferable 35 percent. Over.

03 01 21 19 CMP Okay.

03 01 21 23 CC The computer is yours, 11. The loads are in and verified. You can go back to BLOCK.

03 01 21 31 CMP We're in BLOCK.

03 01 23 52 CC 11, this is Houston. On the basis of your last P52 alignment, the platform looks like it's indeed performing very well. No problems there,

no updates required, and no PIPA bias update is required either. Over.

03 01 24 12       CMP       Sounds good.

03 01 40 51       CMP       Houston, Apollo 11. Radio check.

03 01 40 54       CC        11, this is Houston. Loud and clear. Over.

03 01 41 00       CMP       Okay. Just checking. Do you want high gain?

03 01 41 06       CC        Roger. If you can give it to us.

03 01 41 11       CMP       Okay.

03 01 42 19       CMP       Houston, Apollo 11. How do you read on the high gain?

03 01 42 23       CC        Loud and clear on the high gain.

03 01 42 29       CMP       Same here. We've completed the P52 option 1.

03 01 42 36       CC        Roger. We've been looking over your shoulder by TM.

03 01 42 48       CMP       Glad to have you.

END OF TAPE

03 01 58 37 LMP Houston, Apollo 11. Standing by to copy TEI 1 and TEI 4. Over.

03 01 58 43 CC Roger. I've got the 1 and 4 PAD's here, right now. I'll be ready to read them up to you in just a second.

03 01 59 31 CC 11, this is Houston. I'm ready with the TEI 1 and 4 PAD's. Over.

03 01 59 44 LMP Ready to copy.

03 01 59 46 CC Roger. TEI 1, SPS G&N: 38658, minus 054, plus 065, TIG 078 02 0345, plus 29180, plus 03779, minus 01325; roll NA, pitch 041. The balance of the PAD is NA. Ullage two jets, 19 seconds. TEI 4 PAD, SPS G&N: 38658, minus 054, plus 065, TIG 084 29 5059, plus 31373, plus 03760, minus 00968; roll NA, pitch 034. The rest of the PAD is NA. Ullage two jets, 19 seconds. Both of these PAD's are for an undocked maneuver. TEI plus 4 PAD assumes no LOI-2. Over. Make that TEI 4 PAD assumes no LOI-2.

03 02 01 53 LMP Roger. TEI 1, SPS G&N: 38658, minus 054, plus 065, 078 02 0345, plus 29180, plus 03779, minus 01325; roll NA, pitch 041; two jets, 19 seconds, undocked. TEI 4: 38658, minus 054, plus 065, 084 29 5059, plus 31373, plus 03760, minus 00968; roll NA, pitch 034; two jets, 19 seconds, undocked; assumes no LOI-2.

03 02 02 59 CC 11, this is Houston - -

03 02 03 00 LMP - - Apollo 11. Over.

03 02 03 01 CC - - 11, this is Houston. Readback correct. Out.

03 02 04 24 CC 11, this is Houston. Over.

03 02 04 30 LMP Roger. Go ahead, Houston.

03 02 04 32 CC Roger. At GET of 74 30, we'd like you to cycle the fans in all four CRYO tanks and position the heaters in all four CRYO tanks to the AUTO position. We're doing this in advance of LOI in order to insure that you don't have any destratification as a result of the burn, which might result in giving you a master caution and warning during the burn. Over.

03 02 05 08 LMP Okay. Was that 74 30? You want us to cycle the heaters and turn - cycle the fans and turn all the heaters on.

03 02 05 16 CC All the heaters to AUTO; cycle the fans at 74 30, about 25 minutes from now. Over.

03 02 05 23 LMP Okay.

03 02 34 44 CC 11, this is Houston. Radio check. Over.

03 02 34 49 CDR Houston, 11.

03 02 34 51 CC Roger. Loud and clear now.

03 02 35 10 CDR Houston, Apollo 11.

03 02 35 12 CC Go ahead, 11.

03 02 35 20 CDR Apparently this is not a very good OMNI attitude for you. We're ready to start our PTC check.

03 02 35 52 CC 11, this is Houston. We're ready, except that we'd like to get the high gain antenna prior to this test. Over.

03 02 36 06 CDR Can you give us a couple of pointing angles?

03 02 36 09 CC Roger. From an attitude with 60 degrees roll, around to an attitude of roll 058 inertial. It would be pitch plus 30 and yaw 270 on the high gain antenna.

03 02 36 27 CDR Thank you.

03 02 51 01 CC Apollo 11, Apollo 11, this is Houston. Radio check. Over.

03 02 51 13 CC Apollo 11, Apollo 11, this is Houston. Radio check. Over.

03 02 51 36 CC Apollo 11, this is Houston. Do you read? Over.

03 02 51 43 CDR Roger. Loud and clear.

03 02 51 45 CC Roger. We're reading you weak but clear.

03 02 51 52 CDR Roger. We put our - our roll for MSFN track in on the wrong side. Going to continue rolling around until we get high gain here. And, we'll



delete the - the pitch that was scheduled after the TVC check.

03 02 52 15        CC        Say again please, 11.

03 02 52 20        CDR        Roger. We put the wrong sign in - -

03 02 52 24        CC        Roger.

03 02 52 25        CDR        - - for the roll correction to get MSFN high gain, and we're continuing rolling around to get the proper attitude for high gain at this time. We will delete the pitch maneuver that was scheduled subsequent to - subsequent to the TV check since we already have those pictures.

03 02 52 46        CC        Roger. We copy. And we recommend that you go ahead and complete your TVC test on board. If you have problems, we'll talk to you when you get around further into the high gain antenna attitude. Over.

03 02 53 12        CDR        Roger.

03 02 58 59        CDR        Houston, how do you read on high gain?

03 02 59 02        CC        Oh, loud and clear on high gain, 11.

03 02 59 07        CDR        Roger. We're proceeding.

03 02 59 09        CC        Roger.

03 03 03 22        CC        Apollo 11, this is Houston. We observed your gimbal test down here, and it looked good to us. Over.

03 03 03 32        CDR        Roger. It looked good here.

03 03 18 49        CC        Apollo 11, this is Houston. Radio check. Over.

03 03 18 55        CMP        Loud and clear.

03 03 18 56        CC        Roger. And your systems are looking good from down here.

03 03 19 02        CMP        Yes. Looks good up here too, Bruce.

END OF TAPE

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(GOSS NET 1)

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03 03 30 38      CC      Apollo 11, this is Houston. Over.

03 03 30 44      LMP      Roger. Go ahead Houston, Apollo 11.

03 03 30 46      CC      11, this is Houston. You are GO for LOI. Over.

03 03 30 53      LMP      Roger. GO for LOI.

03 03 30 55      CC      And we're showing about 10 minutes and 30 seconds to LOS. I would like to remind you to enable the BD roll on the AUTO RCS switches. Over.

03 03 31 09      LMP      Roger. And confirm you want PCM low going over the hill. Over.

03 03 31 18      CC      That's affirmative, 11.

03 03 31 24      LMP      Roger.

03 03 31 43      LMP      If you want to, I'll put it back to high until just before LOS. Over.

03 03 31 51      CC      Negative, 11. Low is okay for now. Over.

03 03 31 57      LMP      Roger.

03 03 35 55      CDR      Houston, do you want to give me a time check, please?

03 03 35 58      CC      Roger. I'll give you a Mark at 13 minutes and 30 seconds to ignition.

03 03 36 11      CDR      Okay. And then a GET, please.

03 03 36 16      CC      Stand by a minute.

03 03 36 18      CDR      Okay.

03 03 36 41      CC      I'll give you a time hack on the GET at 75 hours 37 minutes and I'll try that bias at about a second and a half to allow for the time of flight.

03 03 36 55      CDR      Okay.

03 03 36 57      CC      Stand by.

03 03 37 01      CC      MARK.

03 03 37 02 CC 75 hours 37 minutes GET.

03 03 37 07 CDR Thank you.

03 03 37 12 CC And I'll give you a time hack on time to ignition at 12 minutes to ignition. Over.

03 03 37 22 CDR Okay.

03 03 37 44 CC Stand by for a Mark at TIG minus 12.

03 03 37 51 CC MARK.

03 03 37 52 CC TIG minus 12.

03 03 37 56 CDR You were right on, Bruce. Thank you.

03 03 37 58 CC Roger. Out.

03 03 39 29 CC Two minutes to LOS.

03 03 40 33 CC Apollo 11, this is Houston. All your systems are looking good going around the corner, and we'll see you on the other side. Over.

03 03 40 42 CDR Roger.

03 03 40 49 CDR Everything looks okay up here.

03 03 40 51 CC Roger. Out.

03 04 02 -- BEGIN LUNAR REV 1

03 04 15 47 CC Apollo 11, Apollo 11, this is Houston. Do you read? Over.

03 04 15 59 CC Apollo 11, Apollo 11, this is Houston. Do you read? Over.

03 04 16 11 SC ...

03 04 16 59 SC Houston, Apollo 11. Over.

03 04 17 00 CC Apollo 11, Apollo 11, this is Houston. We are reading you weakly. Go ahead. Over.

03 04 17 08 CDR Roger. Burn status report follows. DELTA-TIG zero, burn time 557, ...  $V_{gx}$  minus 0.1,  $V_{gy}$

minus 0.1,  $V_{gz}$  plus 0.1, DELTA- $V_C$  minus 0.390, fuel, plus 3 ... 42. Over.

03 04 17 44 CC 11, this is Houston. These residuals, do you have minus 0.1?

03 04 17 50 SC ...  $V_{gx}$  minus 0.1,  $V_{gy}$  minus 0.1,  $V_{gz}$  1.1, and a burn time of 5 plus 57. Stand by, maybe the COMM will improve a little bit. Over.

03 04 19 32 CC Apollo 11, this is Houston. Are you in the process of acquiring data on the burn? Over.

03 04 21 37 CC Apollo 11, Apollo 11, this is Houston. How do you read?

03 04 21 43 CDR Reading you loud and clear, Houston. How us?

03 04 21 46 CC Roger. Reading you the same, now. Could you repeat your burn status report? We copied the residuals and burn time, and that was about it. Send the whole thing again, please.

03 04 21 56 CDR It was like - like perfect! DELTA-TIG zero, burn time 557, shaft value on the angles,  $V_{gx}$  minus 0.1,  $V_{gy}$  minus 0.1,  $V_{gz}$  plus 0.1, no trim, minus 6.8 on DELTA- $V_C$ , fuel was 38.8, LOX 39.0, plus 50 on balance, and we ran an increase on the PUGS, NOUN 44 showed us in a 60.9 by 169.9.

03 04 22 35 CC Roger. We copy your burn status report. And the spacecraft is looking good to us on telemetry.

03 04 22 47 CDR Everything looks good up here.

03 04 34 34 CDR Apollo 11 is getting its first view of the landing approach. This time we are going over the Taruntius crater, and the pictures and maps brought back by Apollo 8 and 10 have given us a very good preview of what to look at here. It looks very much like the pictures, but like the difference between watching a real football game and watching it on TV. There's no substitute for actually being here.

03 04 35 11 CC Roger. We concur, and we surely wish we could see it firsthand, also.

03 04 35 32 LMP We're going over the Messier series of craters right at the time, looking vertically down on them, and Messier A we can see good sized blocks in the bottom of the crater. I don't know what our altitude is now, but in any case, those are pretty good size blocks.

03 04 35 56 CC Okay. Just roughly, it looks like you are about 120 miles or 130 miles right now - make that 127 miles.

03 04 37 12 CDR We're approaching PDI point now. Over.

03 04 37 24 CDR There's Secchi in sight.

03 04 37 48 LMP We're going over Mount Marilyn at the present time, and it's ignition point.

03 04 37 55 CC Roger. Thank you. And our preliminary tracking data for the first few minutes shows you in a 61.6 by 169.5 orbit. Over.

03 04 38 10 LMP Roger.

03 04 38 13 CC And Jim is smiling.

03 04 41 29 CC Apollo 11, this is Houston. Over.

03 04 41 35 CDR Go ahead.

03 04 41 37 CC 11, Houston. During your SPS burn as played back on tape down here, we've observed the nitrogen tank Bravo pressure in the SPS system dropping a little bit more than we anticipated. It's holding steady right now. We'll continue to watch it and keep you posted if anything comes up. Over.

03 04 42 03 CDR Roger. Thank you.

03 04 42 04 CC Right. And it has held steady - -

03 04 42 05 CDR Currently going over Maskelyne Mas - ,

03 04 42 10 CDR Okay.

03 04 42 11 CDR And Boothill, Duke Island, Sidewinder, looking at Maskelyne W, that's the yaw round checkpoint, and just coming into the terminator. At the terminator it's ashen and gray. As you get further away from the terminator, it gets to be

a lighter gray, and as you get closer to the sub-solar point, you can definitely see browns and tans on the ground, according to the last Apollo 11 observation anyway.

03 04 42 49      CC      Roger, 11. We're recording your comments for posterity.

03 04 42 57      CDR      (Laughter) Okay.

03 04 43 04      CMP      Did somebody in the background - do they accuse us of being compromisers? Huh!

03 04 43 19      CDR      And landing site is well into the dark here. I don't think we're going to be able to see anything of the landing site this early.

03 04 43 42      CC      Apollo 11, this is Houston. When you have a free minute, could you give us your onboard readout of N<sub>2</sub> tank Bravo, please. And we'd like to make sure you understand that ever since you stopped thrusting with the SPS, the temperature in this tank has remained steady. Over. Make that the pressure has remained steady.

03 04 44 07      CMP      Roger. We understand tank pressure has stayed steady. Thank you.

03 04 44 12      LMP      Roger. We're showing the N<sub>2</sub> tank pressure and the tank Bravo to be 1960, something like that, and Alfa is, oh, about 2250. Over.

03 04 44 34      CC      Roger. We show 2249 in Alfa and 1946 down here.

03 04 44 44      LMP      All right.

03 04 53 19      CMP      Houston, Apollo 11. How about coming up with some roll, pitch, and yaw angles in which to stop this so-called ORB RATE that I'm doing.

03 04 53 28      CC      Roger. Stand by.

03 04 53 45      CC      We'll have them for you in a minute, 11.

03 04 53 51      CMP      Okay. And time to stop also, please.

03 04 53 55      CC      Yes, indeed.

03 04 56 35      CC      Apollo 11, this is Houston. Over.

03 04 56 41 CDR Go ahead, Houston.

03 04 56 42 CC Roger. We show you, in the flight plan, staying in orbital rate until about 79 hours 10 minutes. Do you have some particular attitude or reason for wanting to go inertial? Over.

END OF TAPE

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(GOSS NET 1)

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03 04 57 00 LMP No, that's fine. I just wanted to confirm that. Until 79 10, then we'll breeze around here in orbit.

03 04 57 07 CC Roger. And we've got an observation you can make if you have some time up there. There's been some lunar transient events reported in the vicinity of Aristarchus. Over.

03 04 57 28 LMP Roger. We just went into spacecraft darkness. Until then, why, we couldn't see a thing down below us. But now, with earthshine, the visibility is pretty fair. Looking back behind me, now, I can see the corona from where the Sun has just set. And we'll get out the map and see what we can find around Aristarchus.

03 04 57 54 CDR We're coming upon Aristarchus right now - -

03 04 57 55 CC - - Okay. Aristarchus is at angle Echo 9 on your ATO chart. It's about 39<sup>4</sup> miles north of track. However, at your present altitude, which is about 167 nautical miles, it ought to be over - that is within view of your horizon: 23 degrees north, 47 west. Take a look and see if you see anything worth noting up there. Over.

03 04 58 34 CDR Both looking.

03 04 58 36 CC Roger. Out.

03 05 03 01 LMP Houston, 11. It might help us a little bit if you could give us a time of crossing of 45 west.

03 05 03 09 CC Say again, please, 11.

03 05 03 23 LMP You might give us a time of crossing of 45 west, and then we'll know when to start searching for Aristarchus.

03 05 03 32 CC Roger. You'll be crossing 45 west at 77 04 10 or about 40 seconds from now. Over. Thirty seconds from now.

03 05 03 45 LMP Okay.

03 05 04 50 CC Apollo 11, when we lose the S-band, we'd like to get OMNI Charlie from you. And update my last, that 77 04 was the time when Aristarchus should



become visible over your horizon. 77 12 is point of closest approach south of it. Over.

03 05 05 14 LMP Okay. That sounds better because we just went by Copernicus a little bit ago.

03 05 05 18 CC Roger. We show you at about 27 degrees longitude right now.

03 05 05 25 LMP Righto.

03 05 07 07 LMP Houston, when a star sets up here, there's no doubt about it. One instant it's there, and the next instant it's just completely gone.

03 05 07 16 CC Roger. We copy.

03 05 09 21 CC Apollo 11, this is Houston. We request you use OMNI Charlie at this time. Over.

03 05 09 29 LMF Okay. Going to OMNI Charlie.

03 05 09 32 CC Roger. Out.

03 05 11 57 LMF Houston, Apollo 11.

03 05 12 01 CC Apollo 11, this is Houston. Go ahead.

03 05 12 06 LMF Roger. Seems to me since we know orbits so precisely, and know where the stars are so precisely, and the time of setting of a star or a planet to so very fine a degree, that this might be a pretty good means of measuring the altitude of the horizon ...

03 05 12 32 CC Roger.

03 05 12 51 CME Hey, Houston. I'm looking north up toward Aristarchus now, and I can't really tell at that distance whether I am really looking at Aristarchus, but there's an area that is considerably more illuminated than the surrounding area. It just has - seems to have a slight amount of fluorescence to it. A crater can be seen, and the area around the crater is quite bright.

03 05 13 30 CC Roger, 11. We copy.

03 05 14 23 LMF Houston, Apollo 11. Looking up at the same area now and it does seem to be reflecting some of the earthshine. I'm not sure whether it was worked

out to be about zero phase to - Well, at least there is one wall of the crater that seems to be more illuminated than the others, and that one - if we are lining up with the Earth correctly, does seem to put it about at zero phase. That area is definitely lighter than anything else that I could see out this window. I am not sure that I am really identifying any phosphorescence, but that definitely is lighter than anything else in the neighborhood.

03 05 15 15        CC        ll, this is Houston. Can you discern any difference in color of the illumination, and is that an inner or an outer wall from the crater? Over.

03 05 15 34        CMP        Roger. That's an inner wall of the crater.

03 05 15 43        LMP        No, there doesn't appear to be any color involved in it, Bruce.

03 05 15 47        CC        Roger. You said inner wall. Would that be the inner edge of the northern surface?

03 05 16 00        CMP        I guess it would be the inner edge of the west-northwest part, the part that would be more nearly normal if you were looking at it from the Earth.

03 05 16 20        CC        ll, Houston. Have you used the monocular on this? Over.

03 05 16 28        LMP        Stand by one.

03 05 17 59        LMP        Roger. Like you to know this quest for science has caused me to lose my E-memory program, it's in here somewhere, but I can't find it.

03 05 18 08        CC        ll, this is Houston. We're - we're hearing only a partial COMM. Say again please.

03 05 18 20        CDR        I think ...

03 05 18 41        CDR        Houston, we will give it a try if we have the opportunity on next - when we are not in the middle of lunch, and trying to find the monocular.

03 05 18 51        CC        Roger. Copied you that time. Expect in the next REV you will probably be getting ready for LOI-2.

03 05 19 09        CC        So, let's wind this up, and since we've got some other things to talk to you about in a few minutes. Over.

03 05 19 19 LMP Okay.

03 05 22 44 CC Apollo 11, this is Houston. Over.

03 05 22 49 CMP Go ahead, Houston.

03 05 22 53 CC 11, this is Houston. We're targeting - planning to make the LOI-2 burn now using bank A only. We'll have the PAD and everything for you next time around. Just trying to economize a little on bank B. Bank B is holding, though.

03 05 23 15 CMP Roger. Understand.

03 05 31 53 CC Apollo 11, this is Houston. Over.

03 05 32 02 CDR Go ahead.

03 05 32 04 CC 11, Houston. In order to improve the communications a little bit here, we'd like to try to get you on the high-gain antenna. We're recommending a pitch angle of 0, yaw 355 - I say again 355, the track switch to MANUAL, and wide beamwidth. Over.

03 05 32 42 CDR Okay. You ready to switch to high gain now?

03 05 32 45 CC That's affirmative.

03 05 33 09 CC 11, Houston. Do you read?

03 05 33 19 CDR Roger. We read you. It seems to be rather marginal on the high gain.

03 05 33 24 CC Roger. We concur.

03 05 33 42 LMP Houston, Apollo 11. Could you give us a time of crossing the prime meridian 150 west? Over.

03 05 33 47 CC Roger. Stand by about a half a second, here. Okay. Your time of crossing the 150 west meridian will be 77 50 05. Over.

03 05 34 10 LMP Thank you.

03 05 34 24        CC        11, this is Houston. We have about 6 minutes remaining until LOS, and in order that we may configure our ground lines, we'd like to know if you're still planning to have the TV up with the beginning of the next pass. Over.

03 05 34 48        CDF        Roger, Houston. We'll try to have it ready.

03 05 34 50        CC        This is Houston. We are inquiring if it is your plan to. Over.

03 05 35 00        CDF        It never was our plan to; but it's in the flight plan, so I guess we'll do it.

03 05 35 07        CC        Houston. Roger. Out.

03 05 35 47        CC        11, Houston.

03 05 35 53        CME        Roger. Go ahead.

03 05 35 54        CC        For use in connection with the prime meridian crossing, you have an orbital period now of 2 hours 8 minutes and 37 seconds. Over.

03 05 36 10        CME        Thank you.

03 05 36 11        CC        Roger. Out.

03 05 38 16        CC        Apollo 11, this is Houston. A little over 2 minutes to LOS. All your systems parameters and orbit are looking good from the ground. We have AOS on the other side at 78 23 31. Over.

03 05 38 40        CDR        Roger. 78 23 21.

03 05 38 43        CC        Roger. That was 31 on the end.

03 05 38 50        CMP        Okay.

03 06 03 --               BEGIN LUNAR REV 2

03 06 23 55        CC        Apollo 11, this is Houston. Over.

03 06 24 09 LMP This is Apollo 11. Are you picking up our signals okay?

03 06 24 13 CC Apollo 11, this is Houston. Affirmative. We are reading you loud and clear on voice and we have a good clear TV picture, a little bright crater in the - -

03 06 24 23 LMF - - No, no, no - -

03 06 24 24 CC - - the bottom of the picture. I guess that's the spot on the tube.

03 06 24 30 LMF I'm sorry about that one.

03 06 24 33 CC And if you give us POO and ACCEPT, we will uplink our new state vector and target load to you.

03 06 24 45 CMP Okay.

03 06 25 30 LMF Houston, Apollo 11. One of the larger craters on the back side - I noticed a small, dark speck on the outer wall and I put the monocular on it. I was able to see - oh, an area maybe a quarter of a mile in diameter. It was really a fresh-looking dark-colored pit, and that seems to be in contrast with all the other fresh little craters or holes that you can perceive on the walls of any of these craters. Around this particular one there seems to be two or three of these - especially the one that caught my attention. Quite remarkable. Over.

03 06 26 24 CC Roger. Do you have a location on that one?

03 06 26 34 LMF No, not a precise one. I've got several pictures of it, though.

03 06 26 38 CC Roger. We copy.

03 06 26 47 CC We're getting a beautiful picture in down there now, 11. The color's coming in quite clearly, and we can see the horizon and the relative blackness of space, and without getting into the question of grays and browns, it looks, at least on our monitor, sort of a brownish-gray.

03 06 27 10 LMF That's a good, reasonable way of describing it. It appears to me as though it made a difference just sitting back in the tunnel and gazing at all windows; it makes a difference which one you're looking out of. For example, the camera

right now is looking out the number 5 window, and it definitely gives a rosier or tanner tinge, especially when you look straight through it and not at an angle. Over.

03 06 27 45        CC        Roger.

03 06 27 53        LMF        And if you rear back 95 or 100 degrees ...

03 06 27 54        MS        ... Still holding ... Okay.

03 06 28 02        CC        Say again, 11?

03 06 28 07        LMF        I'd say we're about 95 degrees east, coming up on Smyth's Sea.

03 06 28 11        CC        Roger. And for your information, we show you at an altitude of about 92 miles above the surface right now.

03 06 28 21        LMF        Okay.

03 06 28 22        CMP        Houston, Apollo 11. Could you observe a difference in the  $N_2$  pressures before LOI? It seems to me as though the two were not equal on the ... B tank was a little low on pressure. Over.

03 06 28 57        CMP        I'm flying it in SPS minimum impulse, Houston, and it's rather difficult to keep it on a constant data. The LM wants to wander up and down. I'm not sure if it's in response to MASCONN's or what, but I can get it completely stabilized in DATA and let it alone, and in another couple of minutes it will have developed its own rate.

03 06 29 22        CC        This is Houston. Roger.

03 06 29 30        CMP        Houston, we'll be moving shortly from the side window to the hatch window, and we'll try and pick up some of the landmarks that we'll be looking at as we approach the powered descent. Over.

03 06 29 47        CC        11, this is Houston. Roger. And we're through with the uplinks; the computer is yours. You can go to BLOCK and we'll have the information on nitrogen for you shortly. Over.

03 06 30 01        CMP        Roger. Copy.

03 06 30 08        LMF        Okay, Houston. Several minutes ago I was exactly steady on data, and since then I have been moving

toward the LM, pointed straight down toward the radius vector, and that's been despite a number of down minimum-pitch impulses.

03 06 30 30        CC        Roger.

03 06 30 49        LMP        We're over Smyth's Sea right now.

03 06 30 51        CC        Roger.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

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03 06 30 56       CMP       We're about 88 degrees east, I would estimate.

03 06 31 04       CC       We show you about south of the - southwest of the crater Jansky right now.

03 06 31 28       CMP       Smyth Sea doesn't look much like a sea. It - The area which is devoid of craters, of which there's not very much, is sort of a hilly looking area. It's not like the maria at all.

03 06 31 41       CC       Roger. We copy that about the sea, and it looks like you were just giving us a view of the crater Neper, the large crater on the left, and Jansky on the right.

03 06 32 06       CMP       We think you're close, but no cigar.

03 06 33 20       CC       11, this is Houston. Would you care to comment on some of these craters as we go by?

03 06 33 29       CDR       Roger. We're approaching the approach path to ignition. This is equivalent to 13 minutes before ignition, and we're at about 83 degrees, I guess - 83 degrees east. That correspond to location you're holding there presently?

03 06 33 59       CC       Roger. We're showing your present position as about 77 - 76 degrees east looking back towards the east.

03 06 34 16       CMP       Hey, you should be looking back at Smyth Sea now.

03 06 34 19       CC       Roger.

03 06 34 23       CDR       Okay.

03 06 34 25       CMP       Houston, what you're seeing in the middle of the screen now is the crater Schubert and Gilbert U is in the center right now; and this comes up at about - a little over 12 minutes before power decent. Instead of me looking - Instead of looking back at it, we'd be looking straight down at it in descent.

03 06 34 50       CC       Roger.

03 06 34 55       CC       And we show you at an altitude now of about 110 miles; and, of course, you'll be considerably lower at the initiation of powered descent.



03 06 35 18      CMP      Okay, Houston. Look at register 3 on the DSKY data. This data is increasing toward my desired of 315; and I'll let the hand controller alone here, and I'll bet you it reverses itself.

03 06 35 46      CC        Roger, ll. We're watching the DSKY now, and it's still coming in beautifully on the TV.

03 06 35 59      LMP      Okay. There's - on the right side of the screen at the present time, there's a triple crater with - with a small crater between the first and second; and the one at the bottom of the screen is Schubert Y. Zoom in; it does have a central peak in Schubert Y. Actually, several of them, and you can observe those plus the rim craters at the bottom of your screen.

03 06 36 36      CC        Roger. We're seeing the central peak quite clearly now.

03 06 36 53      LMP      Okay. We're zooming in now on a crater called Schubert N. Schubert N, very conical inside walls and the bottom appears to be nearly flat.

03 06 37 11      CMP      Look at data on the DSKY. It's stabilized and is holding steady now.

03 06 37 19      CC        Roger.

03 06 37 20      LMP      Looking out the window I can see a number of small craters on the bottom of Schubert N.

03 06 37 32      CMP      We're coming up on the Foaming Sea where I'll be doing some P22 marking on a crater of my choice, name of crater, Camp.

03 06 37 41      CC        Okay. We'll be watching for Neper.

03 06 37 49      CMP      And notice register 3 has reversed itself, and it's heading back the other way now without any pitch thruster firing.

03 06 37 56      CC        Roger, Mike. We confirm that you've changed the direction of your pitch rate.

03 06 38 28      CMP      Generally speaking - -

03 06 38 30      LMP      The crater - -

03 06 38 31      CMP      - - The tendency seems to be to pull the LM down toward the center of the Moon there as in a gravity gradient experiment.

03 06 38 40      CC      Roger, ll. We copy - -

03 06 38 43      CMP      It may have something to do with MASSCON's or  
it may - -

03 06 38 46      CC      Roger. We copy ...

03 06 38 47      LMP      ...

03 06 38 48      CMP      It may have something to do with MASSCON's or it  
may just be the peculiarity of the DSKY display.

03 06 38 51      CC      Okay. We've observed the behavior of your DSKY,  
and I think we've got the data here to work on it.  
Let us grind around a little while on it, and  
we'll report back to you, probably in a REV or  
two.

03 06 39 08      CMP      Okay. Well, in the meantime, I'm going to pitch  
down toward 315.

03 06 39 14      CC      Roger.

03 06 39 25      LMP      Three craters - three horizontal craters that you  
now have in the field of view are immediately  
underneath the ground track. The right-hand is  
the largest crater that you see, Dubiago P.

03 06 39 49      CC      Roger. We concur on the identification of that  
crater.

03 06 40 01      CC      And we show you coming up on landmark Alfa 1  
here shortly.

03 06 40 11      LMP      Roger. Mike's having his first look at Alfa 1  
at the present time.

03 06 40 22      CMP      Yes. It's a very bright crater. It's not a large  
one but an extremely bright one. It looks like a  
very recent and, I would guess, impact crater with  
rays streaming out in all directions which should  
make my - Correction - the Foaming Sea easy to  
see coming up on it now. Crater Camp is one of  
the smaller ones out on the - on the floor of the  
Foaming Sea.

03 06 41 34      CC      Here we show you over the Sea of Fertility now, and  
we ought to have Langrenus down south of track a  
few degrees, about 9 degrees south of track.

03 06 41 48 LMP Now the crater that's in the center of the screen now is Webb. We'd be looking straight down on it at about 6 minutes before power descent. It has a relatively flat bottom to the crater, and you can see maybe two or three craters that are in the bottom of it on the western wall, the wall that's now nearest the - the camera. Near the bottom of the screen, we can see a dimple crater, just on the outside. And then coming back toward the bottom of the screen and to the left, you can see a series of depressions. It's this type of connected craters that give us most interest to discover why they're in the particular pattern that they're in. I'll zoom the camera in now and try and give you a closer look at it.

03 06 42 48 CC Roger. We're observing the dimple crater now. The central peak we can see on the Orbiter photos doesn't seem to stand out very well here.

03 06 43 02 LMP Well, they're not central peaks. They're depressions in the center.

03 06 43 05 CC Roger.

03 06 43 08 CMP And you'll notice on the pitch thruster activity, I've still - I've put in a dozen minimum impulses in pitchdown, and I'm still far from correcting back to 315.

03 06 43 20 LMP We're moving the camera over to the right window now to give you Langrenus, its - its several central peaks and -

03 06 43 29 CC Roger. We got Langrenus in our screen now.

03 06 43 54 CC Okay, ll. This is Houston. We're getting a beautiful picture of Langrenus now with its rather conspicuous central peak.

03 06 44 07 CMP The Sea of Fertility doesn't look very fertile to me. I don't know who named it.

03 06 44 12 CDR Well, it may have been named by a gentleman whom this crater was named after, Langrenus. Langrenus was a cartographer to the King of Spain and made one of the - one of the early reasonably accurate maps of the Moon.

03 06 44 39 CC Roger. That's very interesting - -

03 06 44 41 CDR ... at least it sounds better for our purposes than the Sea of Crises.

03 06 44 46 CC Amen to that.

03 06 44 52 CC Okay. It looks like you're coming inside now on the camera.

03 06 44 59 LMP Well, I can't get behind to see the monitor. I'll bring the focus in, but we're going to be looking down past one of the LM quads and one of the antennas almost straight down at the ground track that we'll be seeing coming in now. I guess there's maybe 2 or 3 minutes before power descent.

03 06 45 37 LMP All right, that should put the LM structure about in focus, and I'm going to move it out to infinity and then expand the field of view.

03 06 46 00 LMP Crater Secchi is out my window now, window number 2.

03 06 46 09 CC Hello, Apollo 11. This is Houston. We show you coming up on the terminator at 78 53, about 7 minutes from now, and we've also got the LOI-2 and TEI-5 PAD's ready for you after the TV whenever you want to terminate. Over.

03 06 46 31 LMP Roger.

03 06 46 33 CC And we're getting a good view of the track leading into the landing site now and -

03 06 46 58 CC Okay. And it looks like we got Secchi K, went by about 10 seconds ago; coming up on Apollo Ridge.

03 06 47 36 CC And in the right-hand portion of our screen right now, we can see Messier Alfa and Bravo with the light-colored rays streaming off in one direction.

03 06 48 00 LMP I don't know if you can make out, but in the Sea of Fertility there are a number of craters that are just barely discernible, old, old craters whose outlines are just barely able to be seen.

03 06 48 14        CC        Roger. I think we can make them out. The color really enhances our ability to discern features and craters over what we see in real time on our black and white monitor.

03 06 48 31        LMP        Right. The - At these low Sun angles, there's no trace of brown. It's now returned to a very gray appearance and, like the 8 crew says, it has a look of plaster of paris to it at this Sun angle, which is completely lacking in ...

03 06 48 49        CC        Roger.

03 06 49 06        LMP        Okay. This is very close to ignition point for power descent. Just passing Mount Marilyn that - that triangular-shaped mountain that you see in the center of the screen at the present time with crater Secchi Theta on top of the far northern edge of the mountain.

03 06 49 32        CC        Roger. We're getting a good view of Mount Marilyn and the Secchi Theta.

03 06 49 45        LMP        And now we're looking at what we call Boot Hill; occurs 20 seconds into the descent.

03 06 50 08        LMP        The bright, sharp-rimmed crater at the very right edge of the screen, Censorinus T. Now passing the - the 1-minute point in power descent.

03 06 50 30        CC        Roger. And for your information, your current altitude is 148 nautical miles above the surface.

03 06 50 39        LMP        Don't you think?

03 06 50 43        CMP        I'm unable to determine altitude at all looking out the window. I couldn't tell whether we were down at 60 or up at 170.

03 06 50 50        CC        I bet you could tell if you were down at 50 000 feet.

03 06 50 57        CMP        I wouldn't be surprised.

03 06 51 11        LMP        We're passing some steep ridges here. The edge of some old craters that were photographed by Apollo 10; and those - the crew of Apollo 10 was very impressed with the steepness of these ridges when they came over them at about 50 000 feet.

03 06 51 36        CC        Roger. We can observe they're also steep even from this altitude. You got quite a shadow being cast by the Sun at these low angles.

03 06 51 47        LMP        The entire surface is getting considerably darker than the surface that we looked at previously when the Sun was quite high above us. The crater in the - bright crater in the center of the screen, - well, the smaller one is Censorinus.

03 06 52 09        CC        Roger. And we show you low over 1 minute from the terminator at the present time.

03 06 52 24        LMP        How's the brightness of the picture you're receiving? You think we ought to open f-stop some as we approach the terminator?

03 06 52 34        CC        Yes. The brightness is still doing quite well. You can go ahead and open it up a stop or two. The automatic light level compensation seems to be working beautifully.

03 06 52 58        LMP        There's a good picture of Boot Hill.

03 06 53 02        CC        Roger. We're - -

03 06 53 03        LMP        Three minutes and 15 seconds into the descent.

03 06 53 08        CC        Roger. We're seeing Boot Hill now.

03 06 53 10        LMP        The next crater coming into the bottom, that's Duke Island right there, and to the left, the crater - the largest of the craters near the center of the picture right now is Maskelyne W. This is a position check during descent at about 3 minutes and 39 seconds, and it's our down-range position check and cross-range position check prior to yawing over face up to acquire the landing radar. Past this point, we would be unable to see the surface below us until getting very near the landing area.

03 06 53 57        CC        Roger. I imagine you'll get a - you'll get a real good look at that tomorrow afternoon.

03 06 54 14        LMP        Sinuous Rille is the one that was referred to in Apollo 10 as Sidewinder.

03 06 54 21        CMP        That's a good name, too: Sidewinder and Diamondback. It looks like a couple of snakes down there in a lake bed.

03 06 54 42 LMP And we're approaching the terminator now.  
See the - -

03 06 54 48 CC Roger.

03 06 54 49 LMP Contrast has increased and only the sunlit  
side of these ridges remain illuminated, while  
the dark sides and the shadow will become com-  
pletely black.

03 06 54 59 CC ll, this is Houston. The picture's getting a  
little grainy now. You might go ahead and  
open up the f-stop.

03 06 55 19 LMP Landing point is just barely in the darkness.  
That one crater, the upper part of which you  
see, lower part completely in darkness. The  
small, well-defined crater is Moltke, which is  
about abeam of the landing sight.

03 06 55 32 CC Roger. We can just see; it looks like a little  
less than half of its rim right now.

03 06 55 45 CC And we can make out just barely some features  
on the surface, maybe from earthshine.

03 06 55 58 CC Are you wide open on the f-stop at this time?

03 06 56 03 CMP Yes, we are.

03 06 56 06 LMP Yes. And it looks like we're just about to get  
the Sun coming into the lens, so we'll have to  
move the camera away.

03 06 56 12 CC Roger.

03 06 56 14 CMP We can't see any earthshine or any surface features  
at all in earthshine now due to the fact that the  
LM is very bright and is causing our pupils to  
contract. It's a very fantastic view to see the  
terminator as you look along the edge of it. I  
think you'll agree that some of these craters  
that you're seeing in the picture now are really  
accentuated by the lengthening of the shadows  
as they come close to the terminator.

03 06 56 42 CC Yes. It's a very beautiful and a rugged sight  
that we've got on the screen now.

03 06 56 52 CMP And I think you've got some interesting data on  
thruster firing versus pitch angle. It looks

like that LM just wants to head down towards the surface, is all.

03 06 57 01      CC      Roger. I have a comment here that says that's what the LM was built for.

03 06 57 12      CMP      I believe!

03 06 57 45      CMP      And as the Moon sinks slowly in the west, Apollo 11 bids good day to you.

03 06 57 50      CC      Roger. We sort of thought it was the Sun setting in the east.

03 06 58 00      CMP      Well, it depends on your point of view.

03 06 58 04      CC      Roger. Out.

03 06 58 20      CC      Apollo 11, Houston. When you're ready to copy, I have an LOI-2 PAD and a TEI-5 PAD. Over.

03 06 58 30      CMP      Okay. Stand by.

03 06 58 46      CMP      I'm passing 182 inertial. I'm going inertial now.

03 06 58 54      LMP      Ready to copy LOI-2 PAD.

03 06 58 58      CC      Roger on the inertial. And here we go on the LOI-2 PAD. LOI-2, SPS/G&N: 38320, plus 166, minus 081; TIG 080 11 3603. NOUN 81: minus 01408, minus all balls, minus 00743. Roll all balls, 196 359 00657, plus 00537. DELTA-V<sub>T</sub> 01592 017 01531. Sextant star 23 1160 138. The rest of the PAD is NA. GDC align, Vega and Deneb 243 183 012. Ullage, two jets 19 seconds. Remarks: On your DAP load, we would like an R1 20101 vice the value which appears in the flight plan. In making the sextant star check this must be done between GET of 79 30 10, at which time the star comes above the horizon, and 79 52 10, which is your local sunrise due to the fact that this star's relatively close to the Sun. Your burn orientation is heads down, retrograde pitched up 28 degrees with respect to local horizontal. The calculated values for NOUN 42 are H<sub>A</sub> 65.6 and H<sub>P</sub> 54.6. Both of those being plus. Read back. Over.



03 07 01 55 LMP Roger. LOI-2: SPS/G&N: 38320, plus 166, minus 081 080 11 3603, minus 01408, minus all balls, minus 00743, all zeros, 196 359 00657, plus 00537, 01592 017 01531 23 1160 138. Vega, Deneb 243 183 012, two jet 19 seconds, DAP, R1 20101. Sextant star between 79 30 10 and 79 52 10. Attitude is heads down, retrograde pitched up 28 degrees.  $H_A$  after the burn - Was that NOUN 42 for  $H_A$  and 64.6 and  $H_P$  54.6? Over.

03 07 03 19 CC Roger. On the NOUN 42 value, the last stuff you gave,  $H_A$  is 65.6,  $H_P$  is 54.6. Otherwise, I readback correct. I'm standing by with your TEI-5 PAD. Over.

03 07 03 37 LMP Roger.  $H_A$  65.6 for NOUN 42. And ready to copy.

03 07 03 44 CC 11, this is Houston. TEI-5 SPS/G&N: 37201, minus 060, plus 047; TIG 086 09 3666. NOUN 81: plus 33521, plus 03441, minus 01458; roll NA, pitch 032. The rest of the PAD is NA. Ullage two jet, 16 seconds undocked. Over.

03 07 04 44 LMP Roger. TEI-5 SPS/G&N: 37201, minus 060, plus 047 086 09 3666, plus 33521, plus 03441, minus 0145-458, NA, 032. The rest is NA. Two jet, 16 seconds, undocked. Over.

03 07 05 16 CC Apollo 11, this is Houston. Readback is correct. Out.

03 07 05 42 CC Apollo 11, this is Houston.

03 07 05 44 CMP Houston, you want us back on downvoice backup? Over.

03 07 05 49 CC Apollo 11, this is Houston. That's affirmative on the downvoice backup. We'd like you to confirm your UPTELEMETRY switch in the NORMAL position. Over.

03 07 06 04 CMP Roger. It's in BLOCK. Did you get us the - You got us a new CSM state vector and an LOI-2 target load in between all that television, didn't you?

03 07 06 13 CC That's affirmative.

03 07 06 17 CMP Thank you.

03 07 06 18 CC And what I'm asking for is the switchover to - -

03 07 06 20       CMP       The UPTELEMETRY switch is in NORMAL. Over.

03 07 06 22       CC       Roger. Out.

03 07 21 51       CC       Apollo 11, this is Houston. Over.

03 07 21 57       LMP       Go ahead, Houston.

03 07 21 58       CC       Roger. During the LOI-1 burn, your engine  
burned a little bit more propellant than we  
predicted, and consequently, we'd like to  
update - or send you a new TEI-4 PAD. Over.

03 07 22 19       LMP       Okay.

03 07 22 23       CMP       Our chamber pressure onboard was higher that  
time, too. It's all on the onboard tape, the  
time entry, and the chamber pressure; but to  
make a long story short, it worked its way up  
to 100.

03 07 22 34       CC       Roger.

03 07 22 39       CC       And down here, we showed a chamber pressure of  
on the order of 103 to 104 psi during your burn  
on playback.

03 07 22 50       CMP       Okay.

03 07 22 52       LMP       Go ahead with the TEI-4.

03 07 22 54       CC       Roger. TEI-4 revised: SPS/G&N: 38320,  
minus 055, plus 060 084 30 2749, plus 31380,  
plus 03475, minus 01032; roll NA, pitch 034.  
Rest of the PAD is NA. Ullage two jets 16 sec-  
onds, undocked. No LOI-2. Over.

03 07 23 52       LMP       Just in TEI-4 SPS/G&N: 38320, minus 055,  
plus 060 084 30 2749, plus 31380, plus 03475,  
minus 01032, NA, 034. All the rest of the PAD's  
NA. Two jets, 16 seconds, undocked. No LOI-2.

03 07 24 29       CC       11, this is Houston. Readback correct. Out.

03 07 32 19       CC       Apollo 11, this is Houston.

03 07 32 24       LMP       Roger. Go ahead, Houston.

03 07 32 26       CC       Roger. We've been looking at your systems data  
on playback, and everything is looking good. In  
particular, the SPS looks good. I would like to

remind you, though, of a request to perform this burn on the bank A ball valves only, and you are GO for LOI-2. Also, we have currently in the flight plan, you scheduled tomorrow to start entering the LM at about 96 hours GET, and we'd like to know if you have any plans to initiate this ingress into the LM earlier. If so, we can call the people in ahead of time. Over.

03 07 33 15 LMP Well, we didn't have any plans to. No. We just wanted to be ready at that time.

03 07 33 20 CC Roger. We just wanted to make sure that we were ready when you were ready. Over.

03 07 33 27 LMP Okay. And to get the sextant star in LOI-2, that's roll zero. Is that affirmative?

03 07 33 38 CC That's affirmative. Roll zero.

03 07 33 43 LMP Okay.

03 07 43 30 CC Apollo 11, Houston. Five minutes until LOS. And with respect to your request for the nitrogen bottle pressures preburn, just before the burn, we were showing 2270 pounds per square inch on bottle Alfa and 2350 on bottle Bravo. Over.

03 07 43 58 CMP Apollo 11. Roger. Thank you.

03 07 44 00 CC Roger. Out.

03 07 46 23 CC Apollo 11, this is Houston. Two minutes to LOS. Your AOS on the other side is 80 33 21, and the friendly White Team will see you when you come out from behind the Moon.

03 07 46 41 CMP Apollo 11. Roger.

03 07 46 43 LMP Thank you, Bruce.

03 07 46 44 CC Make that your friendly "Greens." Your friendly White Team CAP COMM will see you when you come out from behind the Moon. I think it's basically the Maroon Team here, and we "Greenies" are leaving.

03 07 46 56 CMP Okay. I don't blame you, Hank.

03 07 47 06 CC Roger. I'd rather be up there.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

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03 08 12 -- BEGIN LUNAR REV 3

03 08 35 30 CC Hello, Apollo 11. Houston. We're standing by. Over.

03 08 35 58 CDR  $V_{gy}$  minus 0.0,  $V_{gz}$  minus 0.1, DELTA- $V_C$  minus 5.2, fuel 362, OX 364, unbalance plus 50, and our postburn now 94's, 66.1 by 54.4. Go ahead.

03 08 36 25 CC Roger. We copy, Neil. Would you say again the DELTA- $V_z$ ? We missed that. Over.

03 08 36 32 CDR Roger. That was minus 0.1.

03 08 36 35 CC Roger. Copy the burn report. Sounds good.

03 08 36 43 CDR And all looked good up here.

03 08 37 07 CC Apollo 11, Houston. We missed your DELTA-TIG and also your DELTA burn time. Over.

03 08 37 15 CDR DELTA-TIG was zero and the burn time was 17 seconds.

03 08 37 20 CC Copy 17.

03 08 38 05 CC Apollo 11, Houston. We'll be satisfied if you pump up the cabin to 5.4. Over.

03 08 38 14 CDR Okay. We're showing about 5.2 right now.

03 08 38 18 CC Roger.

03 08 38 40 CDR And, Charlie, the LM/CM DELTA-P is just over 1 pound right now.

03 08 38 44 CC Copy. Out.

03 08 43 48 CC Apollo 11, Houston. Over.

03 08 44 32 CC Hello, Apollo 11. Houston. Over.

03 08 45 28 CC Apollo 11, Houston. If you read, please attempt to acquire on the high gain. We're having trouble locking up on the TM and we have no voice. Over.

03 08 47 23 CC Hello, Apollo 11, Apollo 11.

03 08 47 24 CDR Roger.

03 08 47 26 CC Roger. We're reading you five-by. Go ahead. Over.

03 08 47 27 CDR Roger. We have you on high gain now.

03 08 47 34 CC Roger. We lost the TM and the voice for about 5 minutes here. We attempted a handover and fouled it up in some manner, but we got you back now. Thank you much.

03 08 47 47 CDR Okay. We're pressurizing the LM at this time.

03 08 47 50 CC Copy.

03 08 50 51 CC Hello, Apollo 11. Houston. We have a P22 AUTO optics update for you if you're ready to copy. Over.

03 08 51 22 CMP Ready to copy.

03 08 51 23 CC Roger, Mike. It's landmark Alfa 1: T1, 82 37 35; T2, 82 42 50. We're 7 miles north. Over.

03 08 51 59 CMP Copy. P22: T1, time 82 37 35; T2, 82 42 50. And the target is 7 miles north. Thank you.

03 08 52 21 CC Roger.

03 08 55 32 CDR I get the distinct impression, Charlie, that mare there laps up over the edge of the mountains at the shorelines.

03 08 55 42 CC Roger. We copy.

03 08 56 40 CC Houston. On your comment about the mare lapping up to the terrain - mountainous terrain, is that an impression like a lava flow coming in around a prominence, Neil, or is it more - looks like it's sloping up at that point? Over.

03 08 57 06 CDR It isn't true everywhere, but there's certainly places where there seems to be a slope downward towards the shoreline on the mare. In other words, from the mare down to the shoreline is a downward slope indicating that it might be a lava flow.

03 08 57 23       CC       Roger.

03 08 58 41       CDR       Crossing Duke Island and Maskelyne W.

03 08 58 47       CC       Say again, Neil. Over.

03 08 58 50       CDR       We just crossed Duke Island and Maskelyne W.

03 08 58 52       CC       Roger.

03 09 22 57       CC       Hello, Apollo 11. Houston. We're wondering if  
you've started into the LM yet. Over.

03 09 23 06       CDR       We have the CSM hatch out, the drogue and probe  
removed and stowed, and we're just about ready  
to open the LM hatch now.

03 09 23 16       CC       Roger. Thank you much, Neil. We'll be standing  
by.

03 09 25 53       CDR       Okay, Charlie. We're in the LM. The docking  
index mark is the same.

03 09 26 00       CC       Roger. We copy.

03 09 26 53       LMP       Charlie, apparently there just doesn't seem to  
be any slow way to get that REPRESS to AUTO  
without making a big bang.

03 09 27 01       CC       Apollo 11, Houston. Say again. Over.

03 09 27 08       LMP       Roger. There just doesn't seem to be any slow  
way to get the REPRESS closed to AUTO and avoid  
a big bang. Over.

03 09 27 16       CC       We copy, Buzz. Thank you much. Out.

03 09 27 23       CC       We concur with that, Buzz.

03 09 27 35       CC       Apollo 11, Houston. We'll have LOS 81 45, next  
AOS - Stand by.

03 09 27 47       CC       Next AOS 82 32. Over.

03 09 27 55       CDR       Okay. 82 32.

03 09 29 30       CMP       Houston, Apollo 11. I am going to start a ma-  
neuver to P22 attitude at this time.

03 09 29 35       CC       11. Roger. We copy. Over.

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03 09 29 41       CMP       Okay. We're noticing some water inside the  
command module for the first time. There's a  
little puddle of it on the aft bulkhead sort of  
like 101 had.

03 09 29 49       CC       Roger.

03 09 29 54       CMP       I'd like to know how EECOMM wants to get rid of  
it. There are a number of different ways and  
what does he think is the best one?

03 09 30 00       CC       We'll be with you in a moment, Mike. Stand by.

03 09 30 05       CMP       No big rush. It will wait until the next REV  
or two.

03 09 30 08       CC       All right.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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03 09 41 21        CC        Hello, Apollo 11. Houston. We've played back the LOI-2 burn. It looks really good to us. The systems were all good. We got an orbit on the limited amount of tracking at 65.4 by a 53.9. Over.

03 09 41 40        CDR        Sounds good, Houston.

03 10 10 --                    BEGIN LUNAR REV 4

03 10 32 35        CC        Hello, Apollo 11. Houston. We're standing by. Out.

03 10 32 43        CMP        Okay, Houston. We'll be done with P22 in just a couple of minutes.

03 10 32 46        CC        Roger. We copy all that. You're looking good.

03 10 47 01        CMP        Houston, Apollo 11.

03 10 47 03        CC        Go ahead.

03 10 47 07        CMP        Roger. You copy that NOUN 49 on your downlink? If you've had enough time, I'll proceed.

03 10 47 21        CC        We got it. Go ahead, Mike.

03 10 50 27        CC        Apollo 11, Houston. We see a NOUN 89. You can do the VERB 34 now. Over. Beat me to it.

03 10 50 35        CMP        Yes. I've done it, Charlie.

03 10 50 37        CC        Roger.

03 10 52 19        CMP        Houston, Apollo 11.

03 10 52 22        CC        Go ahead, 11. Over.

03 10 52 26        CMP        All that procedure for P22 seemed to work very well. The only thing that was a little odd, is that there was some DAP thruster activity. I had pitch in ACCEL COMMAND, and roll and yaw in RATE COMMAND, and somehow, roll and yaw got excited and the DAP went into a flurry of thruster firing. We've noticed the same thing in the CMS, and just written it off as a CMS peculiarity.



03 10 52 55        CC        Roger. We saw that activity, Mike. We'll see if we can track it down and let you know. Over.

03 10 53 03        CMP        Okay.

03 10 53 46        CC        Apollo 11, Houston. You can proceed to sleep attitude now. Over.

03 10 53 54        CMP        That's in work, Houston.

03 10 53 56        CC        Okay.

03 10 54 23        CMP        Houston, we're holding inertial a little while to study the approach to the landing zone.

03 10 54 27        CC        Roger.

03 10 56 50        LMP        Houston, this is Apollo ... in the Eagle - Apollo 11 in the Eagle. I've got ... for our landing area.

03 10 57 01        CC        Apollo 11, Houston. You are breaking up badly. Say again. Over.

03 10 57 09        LMP        Roger. I can see the entire landing area from the position I'm in looking out the left window in the LM.

03 10 57 20        CC        Roger, Buzz. Understand you can see the entire landing area looking out the LM windows. Over.

03 10 57 28        LMP        That's right.

03 10 59 07        SC        ...

03 10 59 12        CC        Apollo 11, Houston. Say again. Over.

03 10 59 56        CC        Apollo 11, Houston. We got a lot of noise on the downlink. Would you please try your high gain in wide beamwidth, and the angles are 180 the yaw and pitch zero. Over.

03 11 00 30        CMP        Houston, Apollo 11. How do you read us on the high gain? Over.

03 11 00 34        CC        Roger, Mike. You're a lot better now. Over.

03 11 00 38        CMP        Okay. You want a wide beam for some reason?

03 11 00 43        CC        That's affirmative. We got you in the shadows, though. You are looking right down along the engine bell towards the Earth so we need you in wide beam. Over.

03 11 00 53       CMP       Okay. Fine. We're starting our maneuvers to sleep attitude. Roll 82, pitch 229, yaw zero.

03 11 01 02       CC       Roger. The angles you got in the flight plan will be good when you get there.

03 11 03 43       CDR       Houston, 11.

03 11 03 45       CC       Go ahead, 11. Over.

03 11 03 49       CDR       Okay. We are on page activation 12 and 13, step 4, and verify descent talkbacks gray, and they're barberpole.

03 11 04 04       CC       Roger. Stand by.

03 11 04 13       CC       Apollo 11, Houston. We would like you to take the low voltage taps OFF; RESET, then ON. Over.

03 11 04 22       CDR       Stand by. We got it. We just had one circuit breaker out of position.

03 11 04 26       CC       Okay.

03 11 04 28       CDR       We have them gray now.

03 11 04 29       CC       Roger.

03 11 09 14       LMP       ... should have warmed up by now.

03 11 09 53       LMP       Oh, he's transmitting on B.

03 11 09 54       CDR       Hey, Mike, you transmitting on B?

03 11 10 22       LMP       Houston, Apollo 11 - Apollo 11/Eagle. Over.

03 11 10 29       CC       Roger, Eagle. This is Houston. We read you. Over.

03 11 10 35       LMP       Roger. I read you about four-by-four. Could you give me a short count, please?

03 11 10 40       CC       Roger, Eagle. Coming in with the short count - 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. Houston out. Over.

03 11 10 55       LMP       Roger. Are you copying my low bit rate? Over.

03 11 10 58       CC       Roger. We got some beautiful data here, Eagle. We're - All those guys are looking at it - systems guys. We'll have some word for you in a minute how everything looks.

03 11 11 09 LMP Roger. I'm all ready to switch to high bit rate if that's okay with you.

03 11 11 13 CC Would you please stand by, Eagle. We want to get to the proper sleep attitude before we proceed on with the COMM check. Over.

03 11 11 23 LMP Standing by.

03 11 11 33 LMP Houston, Eagle. We'll go ahead with the camera checkout. I'm still on low taps, and I assume there's no problem doing that. Over.

03 11 11 42 CC Stand by.

03 11 11 46 CC That's affirmative. No problem on that, Eagle. You can go ahead and power up the sequence camera. Over.

03 11 12 00 LMP Should have done that before.

03 11 12 03 CC Eagle, be advised - sounds like a hot mike. Over.

03 11 12 04 LMP Right. Yes.

03 11 12 16 LMP Roger. If you're reading me now, I am in hot mike because I'm in ICS push to talk, and DOWN-VOICE BACKUP. Over.

03 11 12 24 CC Roger. We just wanted to remind you. Over.

03 11 12 30 LMP Thank you.

03 11 12 50 CC Columbia, this is Houston. Are you maneuvering to sleep attitude? Over.

03 11 13 03 CC Eagle, this is Houston. We have lost all the voice and data with Columbia. Would you see if he is maneuvering to sleep attitude? Over.

03 11 13 17 LMP Hey, Mike. You maneuvering to sleep attitude?

03 11 13 20 CMP ...

03 11 13 24 LMP I don't believe they can hear you, Mike. Are you maneuvering now to sleep attitude?

03 11 13 28 CMP ...

03 11 13 40 LMP Houston, Eagle. The Columbia has maneuvered to sleep attitude. He's got the high gain antennas - antenna angles set in, and he should be communicating with you. Over.

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03 11 13 55      CC      Roger. We don't have him. Stand by.

03 11 14 02      CC      Eagle, Houston. Would you please have Columbia  
put in COMMAND RESET? Over.

03 11 14 12      CMP      Wilco. COMMAND RESET.

03 11 14 22      CC      Eagle, Houston. Since we're in sleep attitude,  
I'll give you another long count. If you're  
reading in this mode, we'd like you to switch  
to high bit rate. Over.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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03 11 14 38 LMP Roger. Go ahead with your short count.

03 11 14 40 CC Roger. 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. We're reading you five-by. You can go to high bit rate now. Over.

03 11 14 53 LMP Roger. Going to high bit rate now.

03 11 15 34 CC Eagle, this is Houston. Do you read? Over.

03 11 15 40 LMP Houston, this is Eagle. Roger. Read you loud and clear. How me? Over.

03 11 15 45 CC Roger. Reading you five-by also, Buzz, and we got the high bit rate. It's looking beautiful through Goldstone. Giving you a count: 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. Please give us a count. Over.

03 11 16 04 LMP Roger, Houston. Eagle with a count. 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. Over.

03 11 16 15 CC Roger. Stand by. We're reading you five-by. Over.

03 11 16 23 LMP Okay. I'm ready to go S-band voice. Over.

03 11 16 27 CC Stand by, Eagle. Stand by on step 4.

03 11 16 55 CC Columbia, this is Houston. Would you please give us POO in ACCEPT. We've got a load for you. Break. Eagle, we're ready to go to step 4. Please select S-band voice to VOICE. Over.

03 11 17 53 CC Hello, Eagle. This is Houston. How do you read - normal voice? Over.

03 11 18 00 LMP Eagle - Houston, this is Eagle. Read you loud and clear on S-band, normal voice. How me? Over.

03 11 18 05 CC Roger. You're beautiful in this mode, Buzz. We're reading you five-by. Coming with a short count and we'd like one back from you. 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. Houston out.

03 11 18 28 LMP Roger. Houston, Eagle. You're gorgeous also. 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. Eagle, over.

03 11 18 39 CC Roger, Eagle. This is better than the downvoice backup. Stand by 1.

03 11 18 55      CC      Eagle, Houston. Everybody's happy as a clam with this mode. We'd like to stay here for a little bit. Telemetry looks great, and the voice is great. Over.

03 11 19 09      LMP      Roger. Understand. I'm checking out camera number 4 now.

03 11 19 26      CC      Eagle, Houston. Say again what you're checking out? Over.

03 11 19 35      LMP      Roger, Houston. Eagle has checked out both 70-millimeter cameras and both 16-millimeter cameras, and all work fine. Over.

03 11 19 46      CC      Sounds great. Stand by.

03 11 19 57      CC      Eagle, Houston. We've looked over your systems on the high bit rate. Everything looks super; we're ready to go. Over.

03 11 20 10      LMP      Roger. Stand by. You want to go back to low bit rate now?

03 11 20 13      CC      Stand by on that. Over.

03 11 20 28      CC      Eagle, Houston. We look good through the 210 on this mode. We're going to shift data select to an 85-foot dish to see what we've got, and then we'll be back to you on the 210. If you'll stand by a couple of minutes in this mode, we'll be back with you. Over.

03 11 20 48      LMP      Roger. Eagle standing by.

03 11 21 36      CC      Eagle, Houston. How do you read? Over.

03 11 21 52      LMP      Houston, Eagle. Read you loud and clear. Over.

03 11 21 55      CC      Roger. We're reading you five-by. We've got the voice good through the 85; the telemetry is in and out through the 85. Stand by. We'll be back with you through the 210. Over.

03 11 22 28      CC      Eagle, Houston. You can go step 5 now. We'd like low bit rate. Over.

03 11 22 39      LMP      Houston, Eagle. You have low bit rate.

03 11 22 44      CC      Roger. Copy, Eagle.

03 11 22 59 CC Eagle, Houston. Could you give me a short count - this mode? Over.

03 11 23 07 LMP Houston, this is Eagle with a short count. 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. Eagle. Over.

03 11 23 15 CC Roger, Eagle. You're five-by. This S-band voice is really beautiful. Over.

03 11 23 26 CC And, Eagle, Houston. We'll be standing by in this mode for a minute or so. We'll be back with you if you'll just stand by. Over.

03 11 23 41 LMP Roger.

03 11 25 26 CC Eagle, this is Houston coming through the 210. How do you read? Over.

03 11 25 35 LMP Roger. Read you loud and clear.

03 11 26 16 CC Eagle, this is Houston. We're happy with all our data in all modes. You can power down the COMM now. Over.

03 11 26 26 LMP Roger. I understand. Eagle will power down the COMM, and we are just approaching 27 volts now. It looks like we won't have to bother with the high taps.

03 11 26 39 CC Right.

03 11 26 40 LMP We're powering down. Out.

02 11 26 41 CC Roger. Copy. Out.

03 11 26 44 CC Columbia, this is Houston. We got a TEI 11 PAD for you and an update on the water dump. Over.

03 11 26 54 CMF Stand by one, Houston. Are you through with the DSKY?

03 11 26 56 CC That's affirmative. Over.

03 11 26 59 CMP Okay.

03 11 29 25 CMP Houston, Columbia. Ready to copy TEI 11. Over.

03 11 29 29 CC Roger, Columbia. Here we come with the TEI 11. SPS G&N: 37200, minus 060, plus 047. NOUN 33, 098 05 2422, plus 41448, plus 03719, minus 02422. Roll is NA, pitch 020, the rest of the PAD is NA. Set stars are NA. The ullage is two quads -

correction, two jets for 16 seconds; use Bravo and Delta. In the comments, the undocked present CSM - correction, this is for - TEI 11 is undocked. Present onboard weight of the CSM is 37200 pounds, about 50 Alfa on your DAP. Over.

03 11 31 17       CMP       All right. I read back: TEI 11, SPS G&N: 37200, minus 060, plus 047, plus 098, 05 2422, plus 41448, plus 03719, minus 02422; NA, 020; the rest of the PAD NA. Ullage, two jets for 16 seconds, quads B and D. Undocked present CSM weight is okay in the DAP.

03 11 31 50       CC       Roger, 11. And we'd like you to do a waste-water dump at 84 hours down to 25 percent. Over.

03 11 32 06       CMP       Roger. I understand. Waste-water dump to 25 percent at 84 hours.

03 11 32 10       CC       Roger. And, Mike, we'll have LOS in about 11 minutes at 83 44. AOS is 84 30, and prior to - or at LOS, we would like you to go - Configure the S-band for high gain track to REACQ, high gain beam to NARROW, and let's try that to see if we can get an automatic REACQ at the next AOS. Over.

03 11 32 43       CMP       Good idea.

03 11 32 51       CMP       I'm in REACQ and NARROW now.

03 11 32 54       CC       Roger.

03 11 33 31       CC       Apollo 11, Houston. Also, that water that you got on the aft bulkhead, we - If it's not too much, we just recommend sopping it up and then throwing the sponges away in the waste stowage area. If it's too much, then we recommend using the procedure in the checklist on page F10-14. Over.

03 11 33 58       CMP       All right. Thank you.

03 11 37 25       CC       Apollo 11, Houston. Would you have Buzz make sure he gives us the OPS pressure readings before you close up? Over.

03 11 37 35       CMP       Will do.

03 11 38 01       CDR       Houston, 11. The OPS read 5750, both bottles.

03 11 38 05       CC       Roger.



03 12 08 -- BEGIN LUNAR REV 5

03 12 31 12 CC Apollo 11, Houston. Over.

03 12 31 20 CMP Houston, Apollo 11.

03 12 31 21 CC 11, Houston. Roger. Reading you fine, and it looks like the automatic REACQ went very well just as soon as you came around the limb. We have several small items to discuss with you here just before you go to sleep. Over.

03 12 31 29 CMP Go ahead. Over.

03 12 31 40 CC Okay, 11. First of all, on our LM systems checks, everything went fine. I would like to remind you, though, tomorrow you may see an ascent pressure light when you activate the MC&W. There should be no problem, however. You did note that the APS AUX tank pressure was only reading 111 psi, which is normal at this point, but below the level which will trigger your light due to the helium which has been dissolved into the propellant. Over.

03 12 32 18 CMP Roger. Understand that. Thank you.

03 12 32 20 CC Roger. And next item, the supercritical helium rise rate is nominal, and you also had that question for us about your thruster activity during the P22 on the last REV. Believe we understand that now, as you reported that your pitch was in ACCEL COMMAND and your yaw and roll were in RATE COMMAND. You were firing your pitch thrusters. This will couple rates into your yaw and roll axes, and the - You were at that time holding only half a degree dead-band and coupling rates into yaw and roll produced the extra firings about the yaw and roll axes. Over.

03 12 33 07 CMP Yes. That may be true. It's very peculiar coupling, in that it waits longer than you would think and its reaction is greater than you would think. We were getting yaw rates of around four-tenths of a degree per second, for example.

03 12 33 23 CC Roger, Mike. We did play the data back, and that's the way it looked upon analysis of the chart recordings back here. Over.

03 12 33 35 CMP Okay. Fine.

03 12 33 36 CC They've also looked at the results of your landmark tracking. The marks all apparently were very good, and we've got a full page of data here relative to the altitudes of the various site locations, which I won't read up to you, but I did want to let you know that the marks apparently went very well. I also have your consumable budgets, particularly your RCS propellant quantities. They're Deltas from nominal if you should want them. Your worst quad is quad Charlie, which is 9 percent low. I'll not read up the others unless you want them. Over.

03 12 34 17 CMP Okay. How about the O<sub>2</sub> fuel cell purge? You want that now?

03 12 34 22 CC I'll have to stand by just a moment.

03 12 34 26 LMP Okay. And then the other one is, we're still charging battery A.

03 12 35 28 CC ll, Houston. We would like to delay the fuel cell purge until the backside of the Moon, and you go ahead and - should terminate your battery charge at this time. Over.

03 12 35 43 LMP Okay. Understand. I knew we had another O<sub>2</sub> and H<sub>2</sub> purge coming up in the morning; I wasn't sure whether you wanted to go through with this one or not. I'll wait until the next side and then do it.

03 12 35 53 CC That's fine, Buzz.

03 12 35 54 LMP Terminate battery charging now.

03 12 35 56 CC That's right, and one other systems item here - in order to balance your CRYO tanks, would you get your O<sub>2</sub> tank 1 and your H<sub>2</sub> tank 2 heaters off? Over.

03 12 36 16 CMP Okay. I have O<sub>2</sub> tank heater 1 off, and H<sub>2</sub> tank heater 2 off.

03 12 36 25 CC That's right, Mike, and we believe you have your quad Bravo and quad Charlie turned off in your DAP at this time, and a 5-degree deadband. We'd prefer a 10-degree deadband for your sleep period overnight here. Over.

03 12 36 43 CMP Okay.

03 12 36 47 CC One other item relative to a malfunction procedure. It's unlikely that you'll have to worry about this

tomorrow, but in your malfunction list under docking on page F11-9, there is a malfunction procedure for a high O<sub>2</sub> flow rate at the top of - under tunnel at the top of page 11-9. We would like to have you not use that malfunction procedure should you encounter the high O<sub>2</sub> flow rate, and instead, check back with Houston for a revised procedure should you find that situation. Over.

03 12 37 38       CMP       Understand, and note has been made in my checklist.

03 12 37 45       CC        11, Houston. Roger. That just about takes care of all the items we have here on the ground before time to hit the sack, and I guess you will have a presleep check for us before you go to bed.

03 12 38 06       LMP       Roger. We're in the midst of cycling the O<sub>2</sub> and H<sub>2</sub> fans now.

03 12 38 11       CC        Roger.

03 12 38 21       LMP       And the radiation is as follows: CDR 11012, CMP 10013, LMP 09015. Negative medication. Over.

03 12 38 36       CC        Roger. Copy, 11.

03 12 41 54       LMP       Houston, Apollo 11.

03 12 41 56       CC        11, Houston. Go ahead.

03 12 42 01       LMP       Roger. We're thinking about taking the monocular with us on into the LM. We think it might prove to be of some use. Over.

03 12 42 10       CC        Roger, Buzz. It sounds like a good idea for some of your surveying work there inside the cockpit. Over.

03 12 42 21       LMP       Okay. You want to run that by with whoever might be concerned?

03 12 42 24       CC        I sure will.

03 12 47 47       CC        Apollo 11, Houston. We have apparently lost the high gain lock. We would appreciate it if you would give us a help manually to try to relock up on the high gain. Over.

03 12 48 07       LMP       Houston, Apollo 11. ...

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03 12 48 12

CC

11, Houston. Reading you very weak, still too far down in the noise to complete the full transmission. If you'd give us a hand on a manual relock, we'd appreciate it.

END OF TAPE

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03 12 52 02 CC Apollo 11, Houston. We're still unable to pick you up on the high gain antenna. Request you go to MANUAL, and wide beamwidth. The pitch and yaw angles in your checklist are good ones. You should be able to find us there. Over.

03 12 53 08 LMP Houston, Apollo 11. How do you read now?

03 12 53 10 CC 11, Houston. Loud and clear this time. How me?

03 12 53 16 LMP Loud and clear. You faded out on your last transmission. Over.

03 12 53 21 CC Roger. Are you in wide beam now?

03 12 53 29 LMP Negative. I got you locked back on again REACQ and narrow.

03 12 53 33 CC Roger. That's all we want. We want to stay in narrow, and we're a little puzzled about why we lost you here a few minutes ago. Do you have any ideas?

03 12 53 48 LMP No, we sure don't (cough) - sure don't. We're showing - we're showing about 15 degrees plus pitch and about 270. That ought to be good and clear.

03 12 54 00 CC We concur there. We still don't have any good ideas on why we were lost then.

03 12 54 38 CC 11, Houston. Would you confirm that we did acquire automatically when you came around the limb for this passage. Over.

03 12 54 51 LMP That's confirmed.

03 12 54 54 CC Thank you.

03 13 04 38 CC Apollo 11, Houston. Over.

03 13 04 44 LMP Houston, Apollo 11.

03 13 04 46 CC 11, Houston. On your AUTO RCS SELECT switches, we show quad Bravo disabled but quad Charlie only partially disabled. Charlie 3, I believe, is the only one you have selected off. Is that correct?

03 13 05 05 CMP Yes. Roger. That's correct.

03 13 05 06        CC        Roger.

03 13 05 59        CMP        How do they look to you now, Houston?

03 13 06 06        CC        11, Houston. We see them all disabled at this time. Thank you.

03 13 06 15        CMP        Thank you.

03 13 09 22        CC        Apollo 11, Houston. Over.

03 13 09 30        LMP        Go ahead, Houston.

03 13 09 31        CC        11, Houston. We're going to try to check out this ability to automatically reacquire on the S-band, and what we want to do is to secure our uplink carrier for about 30 seconds. Then we will turn it back on and see if the spacecraft equipment will automatically reacquire. So if you do not get a call from us within about 3 minutes, that means we have not been able to reacquire and request your assistance on a manual acquisition. Over.

03 13 10 04        LMP        Okay. We understand.

03 13 10 11        CC        11, Houston. We also would appreciate - if you will note the angles that the antenna tracks through in its attempt to reacquire. Over.

03 13 10 26        LMP        Roger. We'll do that.

03 13 13 28        CC        11, Houston. It looks like we're locked back up again with no delay. How does it look on board? Over.

03 13 13 37        LMP        Roger. The signal strength dropped very rapidly to zero; and the pitch and yaw, in about 3 seconds, moved toward 40 degrees pitch and 240 degrees yaw. Right now, they're sitting on about 15 degrees pitch and about 265 degrees yaw. So they didn't move very far, about 50 degrees apiece; and then they picked right back on up again. Over.

03 13 14 19        CC        Roger. Some of "The Luckiest People" in the background there. We copied your pitch and yaw angles.

03 13 15 27        CC        11, Houston. Could you give us the location of your - pitch and yaw location of your position indicators? Over.

03 13 15 39 LMP Roger. They're in the same position as the antenna right now; plus 15 degrees pitch and - no, now wait a minute. I got them - got it at about 275 instead of 265.

03 13 15 57 CC Okay. Thank you.

03 13 16 23 CC 11, Houston. We'd like to try the same procedure once more. We'll leave the carrier a little longer and be back up for a call within 4 minutes. Over.

03 13 16 35 LMP Okay.

03 13 20 07 CC 11, Houston. We're locked back up again. Can you give us a report on how the antenna behaved?

03 13 20 24 LMP Roger. It was essentially identical as before. The pitch went to 45, 40 to 45 and the yaw went to about - to about 255, 245 to 255; and then it rather quickly locked up at 15 degrees pitch and 270 yaw. Over.

03 13 20 49 CC 11, Houston. Roger. Your angles are 45 and 255. Do I understand that as soon as the carrier dropped, it went to these angles; or did it only go to these angles after the uplink carrier was reenabled and the antenna began to reacquire? Over.

03 13 21 12 LMP No. As soon as the carrier dropped off, why, it drifted over into those angles and stayed there. Then when it came back up again, why, it hunted around for a while, but it didn't get any further off. Gradually brought it on in to the angles where it is right now; and then the signal strength would take several jumps as evidently it goes from wide to medium to narrow. Over.

03 13 21 38 CC 11, Houston. Understand. And on another subject, request you zero your optics for the night. Over.

03 13 21 58 LMP Roger. Zeroed.

03 13 27 46 CC Apollo 11, Houston. Can you confirm that you have changed the CO<sub>2</sub> filter as per flight plan in the last hour? Over?

03 13 28 01 CMP No. We're still eating. We're about to do it. We'll let you know.

03 13 28 04        CC        Roger, 11. And we've got about 14 minutes until LOS. AOS is 86 30, an hour away. We're wondering whether or not you plan to have one man up at that time or would you all like to be asleep inside the next hour? Over.

03 13 28 25        CMP        Somebody will be up.

03 13 28 27        CC        Roger. The thing that we're still puzzling on is the antenna, and if - as long as there will be somebody up, why, we would like to have somebody check the automatic REACQ on the next AOS.

03 13 28 42        CMP        Okay. We'll do that. We haven't chlorinated the water yet, and we haven't changed the lithium hydroxide. We're just still finishing up dinner.

03 13 28 49        CC        Roger, Mike. Thank you.

03 13 40 07        CC        Apollo 11, Houston. We have LOS coming up in 2 minutes now, and AOS will be at 86 plus 28 plus 15. Over.

03 13 40 20        CDR        We'll see you on the other side, Houston.

03 13 40 21        CC        Roger.

END OF TAPE



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03 14 06 -- BEGIN LUNAR REV 6

03 14 30 37 CMP Houston, Apollo 11. Over.

03 14 30 39 CC 11, Houston. Loud and clear here. Over.

03 14 30 44 CMP Okay. We just appeared to get a solid lock for the last - oh, about a minute. The ... needle's been wandering up and down, and the pitch and yaw needles have been wandering around, but it appears to have reacquired by itself solidly now. We're just finishing up our fuel cell purge. Hydrogen on number 3 is the last to go off. It'll be coming off in just a second.

03 14 31 09 CC Roger, 11.

03 14 32 17 CC Apollo 11, Houston. We believe we've tracked down the reacquisition problem we had on the previous REV. It looks like it was a receiver power supply here on the ground and no problems in the spacecraft at all. Over.

03 14 32 35 CMP Okay. Glad to hear it.

03 14 32 37 CC 11, that really winds things up as far as we're concerned on the ground, for the evening. We're ready to go to bed and get a little sleep. Over.

03 14 32 49 CMP Yes. We're about to join you.

03 14 32 51 CC Roger.

END OF TAPE

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03 16 05 --

BEGIN LUNAR REV 7

REST PERIOD - NO COMMUNICATIONS

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03 18 02 --

BEGIN LUNAR REV 8

REST PERIOD - NO COMMUNICATIONS

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03 20 01 --

BEGIN LUNAR REV 9

REST PERIOD - NO COMMUNICATIONS

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03 21 32 39        CC        Apollo 11, Apollo 11. Good morning from the Black Team.

03 21 33 01        CMP        Good morning, Houston.

03 21 33 04        CC        Good morning. We got about 2 minutes to LOS here, Mike.

03 21 33 12        CMP        ... You guys wake up early.

03 21 33 15        CC        (Laughing) Yes, you're about 2 minutes early on the wakeup. Looks like you were really sawing them away.

03 21 33 23        CMP        You're right.

03 21 33 44        CC        11, Houston. For planning purposes, you can go ahead and take the monocular into the LM with you.

03 21 33 56        CMP        Okay. I'll tell them. How are all the CSM systems looking?

03 21 34 06        CC        11, Houston. Looks like the command module's in good shape. Black Team has been watching it real closely for you.

03 21 34 17        CMP        We sure appreciate that. Because I sure haven't.

03 21 34 27        CC        Say again.

03 21 34 34        CMP        I say because I sure have not.

03 21 34 37        CC        Roger.

03 21 35 01        CC        Apollo 11. Thirty seconds. AOS will be 94 plus 21.

03 21 35 11        CMP        94 21.

END OF TAPE

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03 21 59 -- BEGIN LUNAR REV 10

03 22 22 17 CC Apollo 11, Houston. Standing by.

03 22 23 04 LMP Houston, Apollo 11.

03 22 23 06 CC Apollo 11, Houston. Go.

03 22 23 11 LMP Roger. How do you read the BIOMED in the LMP with the LCG on? Over.

03 22 23 17 CC Roger. Stand by, 11.

03 22 23 47 CC Apollo 11, Houston. We have good data on all 3 crewmen. No. Belay that. The Commander we do not have yet.

03 22 24 00 LMP Okay. He's not up yet.

03 22 50 00 LMP Houston, Apollo 11. We just had a very good view of the landing site. We can pick out almost all of the features we've identified previously.

03 22 50 10 CC 11, Houston. Roger. Sounds real fine. And, 11, I have your maneuver PAD and consumables update whenever you want them.

03 22 50 30 SC Stand by.

03 22 50 34 LMP Stand by a little, please.

03 22 50 37 CC Roger. We're standing by. And that's the block data on the maneuver PAD, by the way.

03 22 52 39 CMP Houston, Apollo 11 is a couple of minutes away from this rolling right 40 degrees to roll 122, pitch 229, yaw 0. Over.

03 22 52 48 CC Apollo 11, Houston. Roger. We're standing by.

03 22 54 04 CMP Houston, Apollo 11. Ready to copy.

03 22 54 08 CC Roger. Apollo 11, Houston. Here's your block data, TEI 30. Over.

03 22 54 20       CMP       Ready to copy.

03 22 54 22       CC       SPS/G&N: 36639; your NOUN 48, minus 072, plus 051; your NOUN 33, 135 24 4000; NOUN 81, plus 32178, plus 06036, minus 01304, your pitch 064. The rest is NA. Ullage: two jet, 16 seconds; and it's based on LOI REFSMMAT. Over.

03 22 55 49       CMP       Roger. TEI 30 SPS/G&N: 36639 minus 072, plus 051, 135 24 4000, plus 32178, plus 06036, minus 01304, pitch 064, two jets 16 second, LOI REFSMMAT. Over.

03 22 56 15       CC       Apollo 11, Houston. Readback correct. Your consumables update?

03 22 56 36       CMP       Yes. Go ahead.

03 22 56 37       CC       Roger. GET 91 plus 30, minus 7 percent; Alfa minus 8, Bravo minus 2.5, Charlie minus 10, Delta minus 6.5. H<sub>2</sub> total, minus 2 pounds; oxygen total, plus 9 pounds. Over.

03 22 57 18       CMP       Okay. Thank you. And on board, we're reading for quad Alfa 75 percent, Bravo 78, Charlie 78, and Delta 77 percent.

03 22 57 37       CC       11, Houston. We copy.

03 22 57 49       CC       Apollo 11, Houston. I have your base-line altitude update now, if Buzz is ready to copy.

03 22 58 00       SC       ...

03 22 58 02       CMP       Go ahead.

03 22 58 04       CC       Roger. Alfa 1 is 500, that's 500 feet above the landing site. Over.

03 22 58 23       CMP       Okay. Alfa 1 is 500 feet above the landing site. Thank you.

03 22 58 51       CMP       Houston, Apollo 11. Our crew status report for sleep: CDR 5.5, CMP 6.0, LMP 5.0. Over.

03 22 59 02       CC       Apollo 11, Houston. Roger. We have that now.

03 23 16 09       CC       Apollo 11, Houston. Over.

03 23 16 16       LMP       Houston, Apollo 11. Go ahead.

03 23 16 18        CC        Roger. The "Black Bugle" just arrived with some morning news briefs if you're ready.

03 23 16 28        CDR        Go ahead.

03 23 16 30        CC        Roger.

03 23 16 31        CMP        ...

03 23 16 32        CC        Okay. Church services around the world today are mentioning Apollo 11 in their prayers. President Nixon's worship service at the White House is also dedicated to the mission, and our fellow astronaut, Frank Borman, is still in there pitching and will read the passage from Genesis which was read on Apollo 8 last Christmas. The Cabinet and members of Congress, with emphasis on the Senate and House space committees, have been invited, along with a number of other guests. Buzz, your son, Andy, got a tour of MSC yesterday. Your Uncle Bob Moon accompanied him on the visit which included the LRL. Among the - -

03 23 17 27        LMP        - - Thank you.

03 23 17 28        CC        Roger. Among the large headlines concerning Apollo this morning, there's one asking that you watch for a lovely girl with a big rabbit. An ancient legend says a beautiful Chinese girl called Chang-o has been living there for 4000 years. It seems she was banished to the Moon because she stole the pill of immortality from her husband. You might also look for her companion, a large Chinese rabbit, who is easy to spot since he is always standing on his hind feet in the shade of a cinnamon tree. The name of the rabbit is not reported.

03 23 18 15        LMP        Okay. We'll keep a close eye out for the bunny girl.

03 23 18 19        CC        Roger. You residents of the spacecraft Columbia may be interested in knowing that today is Independence Day in the country of Colombia. Gloria Diaz of the Philippines was crowned Miss Universe last night. She defeated 60 other girls for the global beauty title. Miss Diaz is 18, with black hair and eyes, and measures 34-1/2, 23, 34-1/2. First runner-up was Miss Australia, followed by Miss Israel, and Miss Japan. While you're on your way back Tuesday night, the American and



National League Allstars will be playing ball in Washington. Mel Stottlemyre of the Yankees is expected to be the American League's first pitcher. No one is predicting who will be first pitcher for the National League yet. They have nine on the roster. Even though research has certainly paid off in the space program, research doesn't always pay off, it seems. The Woodstream Corporation, parent company of the Animal Trap Company of America which has made more than a billion wooden spring mousetraps, reports that it built a better mousetrap but the world didn't beat a door to its path - didn't beat a path to its door. As a matter of fact, the company had to go back to the old-fashioned kind. They said, "We should have spent more time researching housewives and less time researching mice". And the "Black Beag - Bugle" is all completed for the morning.

03 23 20 47        CDR        Thank you very much. We appreciate the news.

03 23 21 21        LMP        Black Team, we'll be looking for an interesting day with you all tomorrow.

03 23 21 27        CC        Roger. We'll be going off here shortly, and we'll pick you up in the morning for sure.

03 23 30 15        CC        Apollo 11, Houston. Three minutes to LOS; AOS at 96 plus 20.

03 23 30 27        CDR        Apollo 11. 96 20. Thank you.

END OF TAPE

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03 23 54 -- BEGIN LUNAR REV 11

04 00 21 24 CC Hello, Columbia. Houston. Do you read? Over.

04 00 21 58 LMP Hello, Houston, this is Eagle. How do you read? Over.

04 00 22 03 CC Eagle, this is Houston. Are you calling? Over.

04 00 22 08 LMP Roger. How do you read? Over.

04 00 22 11 CC Roger. Reading you about three-by, Buzz; a lot of noise on the loop. We think it's coming from Columbia, but we can't tell. We're unable to raise voice with him. Would he please go to high gain. Over.

04 00 22 26 LMP Okay. I'll have him go to high gain. It's probably the glycol pump you hear in the background, and I'm up to the point where I turn on the IMU. Would you recommend I hold off here for a few minutes or go ahead and power up the IMU? Over.

04 00 22 41 CC Roger. Stand by.

04 00 22 42 LMP Hey, get your high gain to working.

04 00 22 46 CMP Houston.

04 00 23 06 CC Eagle, this is Houston. You can turn on the IMU. Over.

04 00 23 14 SC ...

04 00 23 21 CMP Houston, this is Columbia.

04 00 23 31 CC Columbia, this is Houston. Do you read? Over.

04 00 23 37 CMP Houston ...

04 00 24 44 CC Hello, Eagle. This is Houston. We've got a noisy downlink on the downvoice backup. Would you please select S-band voice to VOICE? Over.

04 00 25 50 CC Columbia, this is Houston. Do you read? Over.

04 00 25 57 CMP Houston, Columbia. Reading you loud and clear. How me?

04 00 26 00 CC Roger. About three-by, Mike. We've got a lot of noise in the background. It's clearing up now. Break. Eagle, Houston. Do you read? Over.

04 00 26 12 LMP Houston, Eagle. About four-by-four. Go ahead.

04 00 26 15 CC Roger. Just getting a voice check. Say the page you're on in the activation checklist. Over.

04 00 26 24 LMP Roger. I'm on page 27. Over.

04 00 26 27 CC Roger. Understand 27. We copy. Out.

04 00 27 07 CC Columbia, this is Houston. Would you please give us POO in ACCEPT. We have a state vector for you. Over.

04 00 27 15 CMP Stand by one.

04 00 28 21 CMP Houston, Columbia. You have POO in ACCEPT, and how are you reading me now?

04 00 28 26 CC Roger. Understand, we have POO in ACCEPT. You're about three-by in - on the voice, Mike. Over.

04 00 28 35 CMP Okay. You're coming in loud and clear, and I'm configured for normal voice. If you've got any switch changes, let me know.

04 00 28 42 CC Roger. We've got some noise somewhere in the system down here, I think. We're working on it. And I've got a 130 landmark update for you, and also a DAP load whenever you're ready to copy. Over.

04 00 28 59 CMP Stand by one.

04 00 29 20 CMP Go ahead with the 130 update.

04 00 29 22 CC Roger, Mike. Coming at you with the 130, P1 is 98 37 35, P2 98 42 44, 4 miles north. Over.

04 00 29 52 CMP Okay. P1 98 37 35, P2 98 42 44, 4 miles north of track; and go ahead with your DAP load.

04 00 30 04 CC Roger. CSM weight 36651, LM weight 33627, pitch trim minus 0.72, yaw trim plus 0.51. Over.

04 00 30 32       CMP       36651, 33627, minus 0.72, plus 0.51. Over.

04 00 30 40       CC       Both are good readbacks. Out.

04 00 30 46       LMP       Houston, Eagle. Are you satisfied with the LGC self test? Over.

04 00 30 52       CC       Roger. Understand. You passed the LGC self test. Over.

04 00 30 59       LMP       Negative. I was asking you if you were satisfied with it. As far as I can tell, it's satisfactory. And also the primary EVAP flow is actuated to number 1 at 96 05. Over.

04 00 31 11       CC       Roger. Copy on the primary EVAP. We've got the low bit rate, Buzz. We couldn't see that LGC self test. Over.

04 00 31 20       LMP       Okay.

04 00 31 27       CMP       Houston, Columbia. The docking tunnel index angle remains unchanged.

04 00 31 32       CC       Roger. Copy. Out.

04 00 32 07       LMP       Houston, Eagle is going to secondary transmitter/receiver and secondary power amplifier, and I'll check with you in 60 seconds. Over.

04 00 32 16       CC       Roger. Stand by. We're standing by. Over.

04 00 32 23       LMP       Okay.

04 00 32 29       CC       Columbia, Houston. We are through with the computer. You can go back to BLOCK. Over.

04 00 33 14       LMP       Houston, Eagle. On secondary transmitter/receiver and power amplifier, how do you read? Over. 1, 2, 3, 4, 5. Over.

04 00 33 21       CC       Roger. Reading you five-by, Buzz. How me? 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. Out.

04 00 33 30       LMP       Roger. That's about the same as before. Switching back to PRIMARY.

04 00 33 34       CC       Roger.

04 00 34 27       LMP       Houston, Eagle. Back on PRIMARY, and I'm ready to proceed with the steerable antenna activation.

04 00 34 34 CC Roger. We're standing by, Buzz. Go ahead. Over.

04 00 34 45 LMP And I'll go to BIOMED left - right momentarily.

04 00 34 49 CC Roger.

04 00 36 40 LMP Houston, Eagle. Got a real nice lock on - lockon on the steerable antenna, and you should be receiving BIOMED right and PCM high. Over.

04 00 36 53 CC Roger, Eagle. We got you five-by. It's really beautiful. We've got the high bit rate and the BIOMED. Out.

04 00 37 07 CC Eagle, Houston. Do you copy? Over.

04 00 37 13 LMP Roger. Copy.

04 00 39 26 LMP Houston, Eagle. For your information, we're doing the glycol pump check now.

04 00 39 30 CC Roger. Copy.

04 00 39 44 LMP And there's the secondary glycol pump.

04 00 39 47 CC Roger.

04 00 40 26 LMP And I'm on secondary, or number 2 pump right now, and I'll hold here for a couple of seconds and then switch back to number 1.

04 00 40 35 CC Roger.

04 00 42 47 CC Columbia, Houston. Over.

04 00 42 51 LMP Houston.

04 00 42 54 CMP/LMP Go ahead, Houston.

04 00 42 56 CC Roger, Columbia. We noticed your DAF configuration. We'd like you to turn off B3 and C4, Mike, and for register 2 in the DAP, we'd like all ones. Over.

04 00 43 21 CMP B3 and C4 are both off on panel 8 and I understand you want - Say again what you want on register 2.

04 00 43 29 CC Roger. In the DAP, we'd like you load all ones. Over.

04 00 43 36 CMP All right.

04 00 44 08 CC Columbia, Houston. Did you hit the COMMAND RESET around - after LOS on the last pass? Over.

04 00 44 19 CMP That's affirmative. When we were having difficulty getting you, Charlie, I pushed the COMMAND RESET to make sure I had control of high gain.

04 00 44 26 CC Roger. Thank you much. We're in good shape now. Over.

04 00 44 31 CMP Okay.

04 00 46 19 LMP Houston, Eagle. Can you tell me if you're picking up BIOMED on the CDR now? Over.

04 00 46 26 CC Stand by.

04 00 46 44 CC Eagle, Houston. We're not getting any BIOMED from the CDR now. Over.

04 00 46 53 LMP Roger. Understand.

04 00 47 58 CC Eagle, Houston. We got the BIOMED on the commander now. Over.

04 00 48 06 LMP Very good. Thank you.

04 00 49 19 LMP Houston, Eagle. We're ready for an E-memory dump if you are. Over.

04 00 49 23 CC Roger. We're ready. Go.

04 00 49 58 CC Eagle, this is Houston. We see the optics zero switch on. Before you take some marks, don't forget to cycle it back off and on, and then on. Over.

04 00 50 12 LMP Roger. Houston, Eagle here. I wish we had one of those optics. I'll tell Mike about it.

04 00 50 18 CC Roger, Columbia. Excuse me. Sorry about that.

04 00 57 04 CC Eagle, Houston. Could you give us a hack on the time that you switched to LM power and also verify that we're on glycol pump 1. Over.

04 00 57 20 CDR This is Eagle. We're on pump 1, stand by for the switchover time.

04 00 57 26       CC       Roger.

04 00 57 57       CDR       The switch time to LM power is 95 54 00. Over.

04 00 58 03       CC       Roger. Copy, Neil. Is Buzz back in the Columbia now? Over.

04 00 58 10       CDR       Yes. He is.

04 00 58 12       CC       Roger. Thank you.

04 01 00 04       CDR       Hello, Columbia, this is Eagle on Simplex B. How do you read?

04 01 00 10       CMP       You are loud and clear in Simplex B, Neil.

04 01 00 13       CDR       Roger. Read you loud and clear.

04 01 00 24       CDR       Okay. Would you configure for Simplex A, please?

04 01 00 30       CMP       Roger. Going to Simplex A.

04 01 01 05       CDR       Columbia, Eagle. How do you read on VHF-A?

04 01 01 09       CMP       Reading you loud and clear on A.

04 01 01 11       CDR       Roger. Read you loud and clear.

04 01 01 22       CDR       And I'm ready to get a time hack from you. Load the CSM time.

04 01 01 29       CMP       Okay.

04 01 01 42       CMP       Do you want the T-EPHEM first?

04 01 01 46       CDR       Let's get your clock first and then we'll get T-EPHEM.

04 01 01 50       CMP       Okay.

04 01 01 53       CDR       Give me a time for load.

04 01 01 59       CMP       97 01 30. Correction on that, Neil. 97 - make that 97 03 30.

04 01 02 23       CDR       Okay. I have 97 03 30 set in.

04 01 02 27       CMP       Okay. And you've got about a minute to go.

04 01 02 29       CDR       Okay.

04 01 03 17 CMP 15 seconds to go. 10. 5, 4, 3, 2, 1.

04 01 03 32 CMP 1.

04 01 03 33 CMP MARK it.

04 01 03 34 CMP 97 03 30.

04 01 03 35 CDR Got it.

04 01 03 46 CDR Okay. Let's do a 0665 on my Mark.

04 01 03 59 CDR Did you get that, Mike?

04 01 04 01 CMP Standing by for your Mark.

04 01 04 03 CDR Okay, 3, 2, 1.

04 01 04 06 CDR MARK.

04 01 04 08 CMP Okay. 97 04 03.86.

04 01 04 20 CDR Okay. I'm within three-hundredths. That's within our ability to keep together, I think.

04 01 04 26 CMP Roger.

04 01 04 46 CDR Okay. Now you want to give me T-EPHEM VERB 05, NOUN 01 ENTER?

04 01 04 56 CMP Okay. I've got VERB 05, NOUN 01, ENTER. Going to 17 06 ENTER.

04 01 05 00 CDR Roger.

04 01 05 04 CMP Are you ready to copy?

04 01 05 06 CDR Go ahead.

04 01 05 07 CMP Roger. Register 1, 5 balls; register 2, 20017; register 3, 20616. Over.

04 01 05 20 CDR Understand R1, 5 zeros; R2, 20017; R3, 20616.

04 01 05 28 CMP That's correct.

04 01 05 43 CMP And I'm standing by configured to record your PCM data.

04 01 06 37 CDR And I'm ready to start on a docked IMU coarse align when you are; and when you're ready, go MIN deadband ATT hold.



04 01 06 50       CMP       Okay. Stand by.

04 01 08 13       CMP       We're minimum deadband, attitude hold.

04 01 08 21       CDR       Okay. Now I need your NOUN 20.

04 01 08 31       CMP       Okay. I got VERB 06, NOUN 20. Give me a Mark  
on it.

04 01 08 37       CDR       Okay.

04 01 08 38       CDR       MARK.

04 01 08 42       CMP       Register 1, plus 11202, plus 20741, plus 00211.  
Over.

04 01 08 57       CDR       Copy. 11202, 20741, 00211.

04 01 09 05       CMP       That's correct.

04 01 11 34       CC       Eagle, Houston. That coarse align looked good  
to us. Over.

04 01 11 40       CDR       Roger.

04 01 11 52       CDR       Okay, Mike. Your attitude hold's no longer  
required.

04 01 11 58       CMP       Thank you.

04 01 13 55       CDR       Okay, Mike. I'd like to copy a NOUN 20 again,  
06 NOUN 20. Be on my Mark.

04 01 14 07       CMP       Standing by for your Mark.

04 01 14 09       CDR       3, 2, 1; stand by. Take it again.

04 01 14 18       CMP       Okay.

04 01 14 19       CDR       3, 2, 1.

04 01 14 22       CDR       MARK.

04 01 14 24       CMP       Okay, I read plus 11154, plus 20792, plus 00230.  
Over.

04 01 14 38       CDR       I get - You get 11154, 20792, 00230.

04 01 14 48       CMP       That's correct.

04 01 15 06       CC       Eagle, Houston. I -

04 01 15 07 CDR Okay, Houston. Did you copy -

04 01 15 10 CC Eagle, Houston. We have the angles. I'll read them back. Over. For the command module, 11154, 20792, 00230. For the LM, 18995, 02852, 35863. Over.

04 01 15 34 CDR That's correct for Eagle and command module.

04 01 15 36 CC Roger.

04 01 15 42 CDR Did you get the time? Was 97 14 20.

04 01 15 45 CC Roger. Copy, Eagle. Out.

04 01 17 08 CC Columbia and Eagle: LOS for both spacecrafts 97 32, AOS 98 18. Houston, out.

END OF TAPE

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04 01 21 35        CC        Eagle, Houston. We have your gyro torquing angles if you're ready to copy. Over.

04 01 21 47        CDR        Roger. We're ready to copy.

04 01 21 59        CC        Roger. Eagle. For X minus 00060, Y plus 00620, Z plus 01080. Over.

04 01 22 34        CDR        Understand. X minus 00060, Y plus 00620, Z plus 01080.

04 01 22 50        CC        Roger, Eagle. Good readback. Out.

04 01 24 18        CDR        Houston, this is Eagle. Do you want us to go ahead and do a VERB 42 at this time?

04 01 24 28        CC        Stand by. That's affirmative, Eagle. We'd like you to go ahead and fine align. Over.

04 01 24 37        CDR        Okay.

04 01 24 48        LMP        Houston, Eagle, LMP. How do you read? Over.

04 01 24 49        CC        Roger. Five-by, Buzz. How me? Over.

04 01 24 54        LMP        Loud and clear. I'm going to be going through an ascent battery check. You want to check my BIOMED's briefly? Over.

04 01 25 01        CC        Roger. Go ahead.

04 01 25 17        CC        Eagle, Houston. We got a good BIOMED on you, Buzz. Over.

04 01 25 26        LMP        Okay. Let me know where it ought to be at this point.

04 01 25 29        CC        Roger. You can stay there at that point. When we go LOS, we'd like you to go off on the BIOMED. Over.

04 01 25 39        LMP        Roger.

04 01 25 53        CDR        Do you copy those angles, Houston - torquing angles?

04 01 25 57        CC        Roger. They're correct. You can torque. Over.

04 01 27 43       CC       Apollo 11, Houston. We have about 4 minutes LOS.  
That makes AOS 98 18. Over.

04 01 27 54       CDR       Eagle. Roger.

04 01 27 58       CMP       Columbia. Roger.

04 01 28 31       CMP       Eagle, Columbia.

04 01 28 39       CDR       Columbia, Eagle. Go ahead.

04 01 28 41       CMP       Roger. The capture latch is in the probe or  
engaged in the drogue. Would you like to set  
them from your side?

04 01 28 51       CDR       Roger. Stand by.

04 01 28 57       LMP       Houston, Eagle. ED battery A is 37.0 and  
battery B is 36.9. Over.

04 01 29 04       CC       Roger. Copy both of those, Buzz. Out.

04 01 29 20       CC       Eagle, Houston. We looked at the E-memory.  
It's GO. Over.

04 01 29 26       LMP       Roger. E-memory GO.

04 01 29 41       CDR       Mike, the capture latches look good.

04 01 29 44       CMP       Thank you.

04 01 29 54       CC       Eagle, Houston. We'd like you to go to the OMNI  
antenna, and next AOS, we'd like you to be in  
forward. Over.

04 01 30 06       LMP       Roger. Going to - Which OMNI do you want now,  
aft?

04 01 30 20       CC       Eagle, Houston. We'd like aft now and forward  
at AOS. Over.

04 01 30 27       LMP       Roger.

04 01 31 05       CC       Apollo 11, Houston. Thirty seconds to LOS.  
Both spacecraft looking good going over the  
hill. Out.

04 01 55 -- BEGIN LUNAR REV 1?

04 02 18 21 CC Apollo 11, Houston. We're standing by. Over.

04 02 19 10 CC Columbia, Houston. Do you read? Over.

04 02 19 30 CC Eagle, Houston. Do you read? Over.

04 02 20 19 CC Columbia, Houston. Over.

04 02 20 53 CC Eagle, Houston. No voice. Will you verify forward OMNI? Over.

04 02 21 58 CC Columbia, Houston. We have no voice with Eagle. Would you please verify that Eagle is on forward OMNI. Over.

04 02 22 36 CC Columbia, Houston. Over.

04 02 23 10 CC Eagle, Houston. Over.

04 02 23 16 LMP Houston, Eagle. Go ahead.

04 02 23 17 CC Roger. Are you reading me, Buzz? Over.

04 02 23 22 LMP Roger. I've got you now. I fed in those angles for the S-band but I couldn't get a lockon because the antenna would be looking through the LM in order to reach the Earth. Over.

04 02 23 41 CC Roger. We copied in the P22 attitude that you will not be able to get a high-gain lockon. We have a DAP data load, if you're ready to copy. Over.

04 02 24 05 LMP Roger. Ready to copy.

04 02 24 07 CC Okay. LM weight 33627, CSM weight 36651, pitch trim 00470, roll trim 00589. Over.

04 02 24 34 LMP Roger. LM weight 33627, CSM weight 36651, pitch trim 00470, roll trim 00589. Over.

04 02 24 49 CC Roger, Buzz. That's a good readback. You're about two-by with these OMNI's in this configuration; we won't have very good COMM until we get through with the P22. Over.

04 02 25 02 LMP Roger. Understand.

04 02 25 13        CC        Eagle, Houston. Would you select S-band voice to VOICE. Over.

04 02 25 57        CMP        Houston, Columbia. Downvoice backup. Do you read?

04 02 25 59        CC        Roger. We read you. Columbia, did you call? Over.

04 02 26 06        CMP        Affirmative. Downvoice backup. How do you read me?

04 02 26 08        CC        Roger. Better, Mike. We're reading you now about four-by. No voice at all with you earlier. Let's stay in this configuration. Eagle, are you in VOICE mode? Over.

04 02 26 22        LMP        Roger. Eagle is in VOICE mode. How do you read? Over.

04 02 26 25        CC        Roger. You're about three-by now, Buzz. We're satisfied with this COMM configuration. Let's stay with where we are. Over.

04 02 26 36        CMP        Houston, Columbia is in OMNI Charlie downvoice backup, and if you get a chance, would you look up the coordinates of 130 for me, please? I have been - conflicting information between my cue card and my flight plan. I'd like to know which coordinate values you want me to use.

04 02 26 51        CC        Roger. Stand by.

04 02 27 07        LMP        Houston, Eagle. Completed gear extension okay.

04 02 27 46        CC        Columbia, Houston. We're satisfied with what you already have loaded in P22 for these coordinates. Over.

04 02 27 56        CMP        Thank you, Houston.

04 02 29 00        CC        Columbia, Houston. The coordinates you have loaded in P22 are - we have - are Site 130 prime. Do you concur? Over.

04 02 29 17        CMP        I have the coordinates loaded on the cue card which are for crater 130.

04 02 30 03        CC        Columbia, Houston. We made an error on those coordinates. We'd like you to load for latitude

in a NOUN 89 plus 01 243, longitude over 2 plus 11 844, altitude minus 001 46 as shown in the flight plan. Over.

04 02 31 30      CMP      Okay, Houston.

04 02 33 06      CC      Eagle, Houston. Could you give us an idea where you are in the activation? Over.

04 02 33 13      LMP      Roger. We're just sitting around waiting for something to do. We need a state vector, a REFSMMAT, a reading on the AGS. And we need you to watch our DAP load, give a voice check, and throttle check. Over.

04 02 33 34      CC      Roger. Eagle, we'll have the state vectors and the REFSMMAT as soon as we get the high gain. Over. It will be about another 10 minutes or so before we get through the P22, and when we maneuver to attitude and get the high gain, we'll have the updates for you. Over.

04 02 33 56      LMP      Roger. We'll go ahead with the DAP and throttle ... check if you don't have the gimble drive check, okay?

04 02 34 04      CC      Roger. Understand you're going to the DAP throttle check. That's affirmative.

04 02 35 32      CMP      Houston, Columbia. These T1 and T2 times are still good, aren't they?

04 02 35 37      CC      Say again. Over.

04 02 35 42      CMP      I say the T1 and T2 times remain unchanged, don't they?

04 02 35 51      CC      That's affirmative. Over.

04 02 35 55      CMP      Thank you.

04 02 37 58      LMP      Houston, Eagle.

04 02 38 01      CC      Go ahead, Eagle. Over.

04 02 38 05      LMP      Roger. In the first of - on page 47, step 1, we had the guidance control in PGNS and mode control PGNS AUTO and, of course, the circuit breakers are not in on the thrusters yet. So when we started through the DAP and proceeded on NOUN 46 - and we're looking at NOUN 47 now,

so we've got an RCS TTA light and we've got four out of the eight other bright colored red flags. I think that this is explained by the fact that we are in PGNS and AUTO and unable to fire the thrusters.

04 02 38 51      CC      Roger. Stand by.

04 02 39 13      CC      Eagle, Houston. You are correct. The lights are there and the flags because we haven't closed the breakers yet. Over.

04 02 39 23      LMP      Roger.

04 02 40 02      CDR      And Houston, Eagle. Are you going to use the high gain before you can look at our GDA position indicator?

04 02 40 12      CC      Stand by.

04 02 40 35      CC      Eagle, Houston. We can see all the throttle data - -

04 02 40 37      MS      I can give high ...

04 02 40 40      CC      Go ahead. Over.

04 02 40 43      CDR      I could give you high bit rate on the OMNI if that would help any.

04 02 40 47      CC      Negative. We have all the throttle data we need. You can stay low bit rate. You can proceed through the throttle test, but do not do the gimbal trim. Over. Repeat, do not do the gimbal trim.

04 02 41 01      CDR      Roger. Understand.

04 02 41 41      CMP      Boy, you just can't miss those check points, Diamondback and Sidewinder.

04 02 42 23      CMP      AUTO optics are pointed just a little bit north of crater 130.

04 02 42 29      CC      Roger. Copy, Columbia. Out.

04 02 42 33      CMP      ...

04 02 44 15      LMP      Houston, Eagle. We are ready to pressurize the RCS. Over.



04 02 44 21       CC       Stand by.

04 02 44 40       CC       Eagle, Houston. You can go ahead with your RCS pressurization, but we would like to hold off on RCS checkout until we get the high bit rate. Over.

04 02 44 52       LMP       Roger.

04 02 44 54       CC       And Eagle, Houston. Have you deployed the landing gear yet? Over.

04 02 44 59       LMP       That's affirmative. The landing gear is out and ...

04 02 45 04       CC       Roger.

04 02 45 55       CMP       Houston, Columbia. I've completed my marks. I've gone ACCEL COMMAND in all three axes to prevent that thruster firing that last time.

04 02 46 03       CC       Roger.

04 02 46 49       CMP       Houston, Columbia. Say again on the necessary data on the downlink. Let me know and I'll proceed.

04 02 46 55       CC       Columbia, stand by on the NOUN 49. Over.

04 02 47 00       CMP       Standing by, Houston.

04 02 47 18       CC       Columbia, Houston. We got your NOUN 49; you can proceed. Over.

04 02 47 23       CMP       Roger.

04 02 47 38       CC       Colum - correction, Eagle, Houston. We see the MASTER ARM, you can go ahead and press. We see the press now. Over.

04 02 47 49       LMP       Roger. Looks good.

04 02 47 51       CC       Roger, Buzz. If you've got - would like, I've got your AGS abort constants. Over.

04 02 48 01       LMP       Ready to copy.

04 02 48 03       CC       Roger. For your AGS address 224, plus 60267; 225, plus 58148; 226, plus 70312; 227, minus 50031. Over.

04 02 48 35 LMP Roger. 224, plus 60267, 225, plus 58148; 226, plus 70312; 227, minus 50031. Over.

04 02 48 52 CC Roger. Good readback. Out.

04 02 49 19 CMP Eagle, Columbia. My P22 is complete. I'm continuing this maneuver to AGS CAL attitude.

04 02 49 25 CC Roger. Fine. We copy.

04 02 49 28 LMP Roger.

04 02 49 30 CC Eagle, Columbia. Your high-gain angles are - Corrected - Eagle, Houston. Your high-gain angles are 165 pitch, yaw 66. Over.

04 02 49 47 LMP Roger. ...

04 02 50 16 LMP Stand by about another ...

04 02 51 13 LMP Houston, Eagle. I think I've got you on the high-gain antenna now. AGS are go.

04 02 51 36 CC Columbia, Houston. If you go to REACQ on the high gain, we can acquire you now. Over.

04 02 52 24 CC Eagle, Houston. We got some loads for you if you'll give us P00 and DATA. Over.

04 02 52 32 LMP You've got P00 and DATA.

04 02 52 35 CC Roger. We've got both of you on the high gains now. It sounds great now. Over.

04 02 52 43 CMP Copy. Roger.

04 02 52 46 CC Columbia, Houston. I have a SEP PAD if you're ready to copy. Over.

04 02 52 54 CMP Stand by one.

04 02 53 18 CMP Ready to copy.

04 02 53 19 CC Roger, Mike. SEP PAD, RCS/G&N: NOUN 47 and NOUN 48 are NA, NOUN 33, 100 395 000, NOUN 81 is NA, roll 000 007 000. Rest of PAD is NA.

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04 02 53 58

CMP

SEP, RCS/G&N at a TIG of 100 39 50: roll 0,  
pitch 007, yaw 0. Over.

04 02 54 08

CC

Roger. Good readback.

END OF TAPE

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04 02 54 49 CDR Houston, Eagle. Are you ready for us to start the RCS checkout now?

04 02 55 03 CC As soon as we finish the uplink. Stand by one. Over.

04 02 55 11 CDR Okay.

04 02 55 45 CMP Houston, Columbia. Comment on P22. Worked just fine. The crater I marked on is a small crater down inside crater 130 as described by John Young.

04 02 55 57 CC Roger. We copy.

04 02 56 06 CC Eagle, Houston. On our load - during our load, we had to do a VERB 96 to stop integration. We're going to start over again on this load. Over.

04 02 56 19 CDR Eagle. Roger.

04 02 56 22 LMP And, Eagle, here. I have read out address in the AGS 404, 405 and 406, and I had believed that 405 and 406 would both be all zeros, and I would propose maybe that I reset them to zero. I realize that 404 should be a negative number, and it is minus 13495. Over.

04 02 56 51 CC Roger. Copy.

04 02 57 23 CC Eagle, Houston. Over.

04 02 57 28 LMP Go ahead.

04 02 57 31 CC Buzz, we've got - The only thing we're missing here is the drift check. After we finish our load, we'd like you to do the drift check with Columbia. Over.

04 02 57 44 CDR GO.

04 02 58 05 CC Eagle, Houston. The 404, 405, 406 look fine to us. Over.

04 02 58 18 LMP Roger. I am going to be setting them up to zero for the undocking. The question is do you want me to reset 404, 405, 406 back to the numbers that they are now, or can I leave them zero? I intend to set 404 to a minus 13495. Over.

04 02 58 38 CC Stand by.

04 02 59 33 CC Eagle, Houston. We would like you to zero, as called out in the timeline, all three addresses, 404, 405, 406, before undocking. After docking you can load them back to the values that you have right now. Over.

04 02 59 54 LMP Eagle. Roger.

04 03 00 13 LMP And, Houston, Eagle here. Both RCS helium pressures are reading 2900. Over.

04 03 00 23 CC Copy. Out.

04 03 01 30 CC Eagle, Houston. Over.

04 03 01 35 LMP Go ahead.

04 03 01 36 CC Roger, Buzz. There seems to be some confusion here on 405 and 406. We'd like you to zero them out prior to undocking, and after undocking you can - we'd like them still zeroed. Over.

04 03 01 52 LMP Roger. I agree with that. Thank you.

04 03 01 55 CC Yes.

04 03 03 25 CC Eagle, Houston. We've got the load in the - We have reselected P00; your integration is going again for you; the computer is yours. We'd like to do the drift check now. Over.

04 03 03 37 CDR Roger. In work.

04 03 03 39 CDR Columbia, let's flick it in 0620 when you are ready.

04 03 03 48 CMP Standing by until your Mark, Neil.

04 03 03 57 CDR Okay. 3, 2, 1.

04 03 04 01 CDR MARK.

04 03 04 05 CMP 358.1.64, 020.73, 359.54. Over.

04 03 04 20 CDR Copy. 358.64 020.73 and 359.54.

04 03 04 27 CMP That's correct.

04 03 04 38 CC Eagle, Houston. We've copied the angles and will read back if you are ready. Over.

04 03 04 47 CDR Go ahead.

04 03 04 48 CC Roger, Neil.

04 03 04 49 CC For the CM - for Columbia: 35864, 02073, 35954.

04 03 04 58 CC For Eagle: 30374, 20078, 00053. Over.

04 03 05 09 CDR That's correct, and GET was 99 hours and 4 minutes even.

04 03 05 13 CC Roger. Copy. Out.

04 03 06 08 CC Eagle, Houston. Have you initialized the AGS yet? Over.

04 03 06 17 LMP Negative. I haven't had a state vector yet.

04 03 06 21 CC Roger, Buzz. Have you done the 377 yet?

04 03 06 27 LMP Roger. Standing by for your K-factor.

04 03 06 30 CC Roger. Stand by.

04 03 06 37 CC Columbia, Houston. We have got a load for you. Could we have POO and ACCEPT? Over.

04 03 06 45 CMP You got it.

04 03 06 47 CC Roger. Thank you, Mike. And break. Eagle, we've got a K-factor for you. Over.

04 03 07 00 LMP Roger. Ready to copy.

04 03 07 02 CC Roger, Buzz. K-factor coming at you: 90 00 00 15. Over.

04 03 07 18 LMP Roger. 90 00 00 15.

04 03 07 24 CC Roger. That's good. That's a good ENTER there.

04 03 09 13 CC Eagle, Houston. We recommend the AGS initial - Well, we see it coming up now on the AGS initialization. Over.

04 03 09 22 LMP Roger.

04 03 09 28 CC Eagle, Houston. After the AGS initialization, we'll be ready for the RCS checkout.

04 03 09 36 LMP Roger.

04 03 09 42 CC Columbia, Houston. We got the load in. You can go back to BLOCK.

04 03 09 48 CMP Thank you.

04 03 11 29 CC Columbia, Houston. Did you get a - copy any LM data, low bit rate, behind the Moon? Over.

04 03 11 39 CMP That's affirmative.

04 03 11 42 CC Roger. Stand by.

04 03 11 48 CMP Or at least I've configured for it. I'm not sure Eagle sent it or not.

04 03 11 51 LMP No, we did not send V-data. Eagle. Over.

04 03 11 55 CC Roger. Copy.

04 03 13 58 CC Eagle, Houston. The alignment and the initialization looked good to us. Over.

04 03 14 11 LMP Roger. Thank you.

04 03 15 27 CC Apollo 11, Houston. LOS is 99 30; next AOS 100 16. Over.

04 03 15 43 LMP 100 16. Roger.

04 03 16 31 CMP Eagle, Columbia. Let me know when you come to your RCS hot-fire checks so I can disable my roll.

04 03 16 37 CDR Wilco.

04 03 16 38 LMP Roger. We're right there now. And we'd like you - CSM in MID deadband ATT hold. Over.

04 03 16 44 CMP That's where I am.

04 03 16 46 LMP And, Houston, you have high bit rate with us now, I believe? We're ready to proceed with the RCS checks.

04 03 16 54 CC Roger, Eagle. We're standing by. We're ready. Over.

04 03 18 57 LMP Columbia, we'd like wide deadband ATT hold. Over.

04 03 19 02 CMP Okay. Going wide deadband ATT hold.

04 03 19 12 CMP You got it.

04 03 19 17 CMP Are you going to do your hot-fire now?

04 03 19 20 LMP Roger.

04 03 19 21 CMP Okay. I'm disabling my roll.

04 03 19 31 CMP Roll is disabled.

04 03 19 34 LMP Roger.

04 03 21 07 CMP Roger. Would you believe you've got thrusters on board that vehicle.

04 03 22 04 CMP Give me a call just as soon as your hot-fire is complete, please.

04 03 22 09 CDR Wilco.

04 03 24 13 LMP Houston, Eagle. The RCS hot-fire is complete. How did you observe it? Over.

04 03 24 18 CC Stand by. Eagle, Houston. The RCS hot-fire looks super to us. We're all GO.

04 03 24 32 LMP Roger. Mike, would you confirm that thrusters B3 and C4 are off? Over. And your radar transponder off.

04 03 24 42 CMP C4 is off; B3 is off. Transponder is to HEATER which is the same as being off, and I've got my roll jets back on now.

04 03 24 50 CDR And you're maneuvering. Right?

04 03 24 53 CMP Will be shortly, Neil.

04 03 25 00 CC Apollo 11, Houston. We're GO for undocking. Over.

04 03 25 08 LMP Roger. Understand.

04 03 26 39 CMP Starting a trim maneuver to AGS CAL attitude.

04 03 28 05 CMP Houston, Columbia.

04 03 28 07 CC Go ahead, Columbia. Over.

04 03 28 12 CMP Roger. There will be no television of the undocking. I have all available windows either full of heads or cameras, and I'm busy with other things.

04 03 28 19 CC We concur. Over.



04 03 28 23      CMP      Okay.

04 03 28 24      CC      And, Eagle, Houston. We'd like you to select aft OMNI now. It will be good for both LOS and AOS. Over.

04 03 28 33      IMP      Roger. Going to aft OMNI.

04 03 29 07      CC      Apollo 11, Houston. One minute to LOS.

04 03 29 13      CMP      Columbia. Roger.

04 03 29 18      CDR      ... Columbia. Systems looking good.

04 03 51 --           BEGIN LUNAR REV 13

04 04 17 06      CC      Hello, Eagle. Houston. We're standing by. Over.

04 04 17 51      CC      Eagle, Houston. We see you on the steerable. Over.

04 04 18 01      CDR  
(EAGLE)      Roger. Eagle is undocked.

04 04 18 03      CC      Roger. How does it look, Neil?

04 04 18 04      CDR  
(EAGLE)      The Eagle has wings.

04 04 18 06      CC      Roger.

04 04 18 08      CDR  
(EAGLE)      Looking good.

04 04 18 09      CC      Roger, Neil. We got a - If you will give us POO and DATA, we've got the loads for you.

04 04 18 20      IMP  
(EAGLE)      Okay. You've got it. POO and DATA.

04 04 18 24      CC      Roger. Let us know when you are ready to copy. We have a DOI PAD, and a PDI PAD. Over.

04 04 18 41      CDR  
(EAGLE)      You check our tracking light, Mike?

04 04 19 02      CDR  
(EAGLE)      Back off? Okay. I'm ready to start my yaw maneuver if it suits you, Mike.

04 04 20 06      CDR  
(EAGLE)      Does it look like you are going to be able to do this without burning thrusters, Mike?

04 04 20 28 LMP (EAGLE) Go ahead, Houston. Eagle is ready to copy.

04 04 20 32 CC Roger, Eagle. Coming at you with a DOI PAD: 101 36 14.07. NOUN 81, minus 00758, plus all balls, plus 00098 plus - correction, 00572, perigee plus 00085 00764 030 000 293. NOUN 86, minus 00759, plus all balls, plus 00090. Rest of the PAD is NA. Stand by on your readback. If you are ready to copy the PDI data, I have it for you. Over.

04 04 20 51 LMP (EAGLE) Go ahead.

04 04 21 55 CC Understand you are ready to copy the PDI data, Eagle. Over

04 04 22 01 LMP (EAGLE) That's affirmative. Go ahead with the PDI.

04 04 22 05 CC Roger. PDI PAD: TIG 102 33 04.36 09 50, minus 00021, 182 287 000, plus 56919. PDI abort, less than 10 minutes, 105 12 30.00. PDI abort, greater than 10 minutes, 103 40 00.00 107 11 30.00. No PDI plus 12: 102 44 27.00. NOUN 81 plus 01223, minus all balls, plus 01889 01520 plus 00110 02250, burn time 046 000 190, plus 01187, plus all balls, plus 01911. NOUN 11 103 31 07.00. NOUN 37 105 12 30.00. Ready for your readbacks. Over.

04 04 24 39 CC Eagle, Houston. We are through with the computer. You can go back to BLOCK. Over.

04 04 24 49 LMP (EAGLE) Roger. Back to BLOCK; and REALIGN: 101 36 14.07 minus 00758, plus all zeros, plus 00098 00572, plus 00085 00764 030 000 293, minus 000759, plus all zeros, plus 00090. NA. Over.

04 04 25 33 CC That was a good readback, Buzz. Go ahead. Over.

04 04 25 42 LMP (EAGLE) Okay. PDI PAD: 102 33 04.36, 09 50, minus 00021 182 287 000, plus 56919. PDI less than 10: 105 12 30.00. PDI greater than 10: 103 40 00.00 107 11 30.00. No PDI plus 12 abort: 102 44 27.00, plus 01223, minus all zeros, plus 01889 01520, plus 00110 02250 046 000 190, plus 01187, plus 00000, plus 019011 103 31 07.00 105 12 30.00. Over.

04 04 27 24 CC Roger. Good readback, Buzz. Out.

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(GOSS NET 1)

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04 04 29 02	CMF (COLUMBIA)	Neil, I'm maneuvering in roll.
04 04 29 04	CDR (EAGLE)	Roger. I see you.
04 04 29 10	IMP (EAGLE)	Houston, Eagle. Are you copying the very large numbers for range and range rate in VERB 83? And did you just give us a state vector that changed one of the two vehicles? Over.
04 04 29 28	CC	Roger, Eagle. We gave you a LM state vector. We have not changed the CSM state vector, however. Over.
04 04 29 40	IMP (EAGLE)	Okay. That explains it. Over.
04 04 30 16	CC	Columbia, Houston. On my Mark 9 30 to ignition.
04 04 30 19	CC	MARK.
04 04 30 20	CC	9 30.
04 04 30 53	CC	Eagle, Houston. Would you have Columbia go to the high gain, yaw 0, pitch minus 20. Over.
04 04 31 05	CDR (EAGLE)	You want him to go to high gain yaw 0? Say again the numbers.
04 04 31 13	CC	Roger, Neil. Yaw 0, pitch minus 20, high-gain angles. Over.
04 04 31 20	CDR (EAGLE)	Okay. Yaw 0, pitch minus 20 on the high gain.
04 04 31 23	CC	That's affirmative. We've lost all data with him.
04 04 31 25	CDR (EAGLE)	To Columbia?
04 04 31 29	CDR (EAGLE)	He says he'll do that as soon as he gets around there.
04 04 31 32	CC	Roger.
04 04 31 45	CDR (EAGLE)	Okay.

04 04 32 36 CC Columbia, Houston. How do you read?

04 04 32 40 CMP I read you loud and clear, Houston. How me?  
(COLUMBIA)

04 04 32 43 CC Roger, Mike. Five-by. On my Mark 7 minutes to ignition.

04 04 32 49 CC MARK.

04 04 32 50 CC Seven minutes.

04 04 32 55 IMP I agree. Everything's looking real good.  
(COLUMBIA)

04 04 33 47 CC Apollo 11, Houston. You are looking good for separation. You are GO for separation, Columbia. Over.

04 04 33 55 CMP Columbia understands.  
(COLUMBIA)

04 04 34 38 CMP We're really stabilized, Neil. I haven't burned a thruster in 5 minutes.  
(COLUMBIA)

04 04 35 26 CMP I'll make a small trim maneuver.  
(COLUMBIA)

04 04 36 21 -CDR Mike, what's going to be your pitch angle at SEP?  
(EAGLE)

04 04 36 27 CMP 007 degrees.  
(COLUMBIA)

04 04 36 28 CDR Okay.  
(EAGLE)

04 04 36 44 CMP Is that close enough for you or do you want it to a couple of decimal places?  
(COLUMBIA)

04 04 36 46 CDR No. That's good.  
(EAGLE)

04 04 37 31 CMP I think you've got a fine looking flying machine there, Eagle, despite the fact you're upside-down.  
(COLUMBIA)

04 04 37 36 CDR Somebody's upside-down.  
(EAGLE)

04 04 38 53       CMP  
                  (COLUMBIA)     Okay, Eagle. One minute until TIG. You guys  
                                  take care.

04 04 38 56       CDR  
                  (EAGLE)       See you later.

04 04 40 19       CMP  
                  (COLUMBIA)     Houston, Columbia. My DSKY is reading 4.9, in  
                                  X, 5.0 ..., make it and EMS 105.4. Over.

04 04 40 32       CC                   Roger. Copy. Columbia, it looks good to us.  
                                  Over.

04 04 40 36       CMP  
                  (COLUMBIA)     Thanks.

04 04 41 07       CC                   Columbia, Houston. We'd like you to terminate  
                                  average G. Over.

04 04 41 16       CMP  
                  (COLUMBIA)     Roger. In POO.

04 04 43 00       CDR  
                  (EAGLE)       You're going right down U.S. 1, Mike.

04 04 47 20       CMP  
                  (COLUMBIA)     Eagle, Columbia. At your convenience, I would  
                                  like to switch over to VHF ranging modes.

04 04 47 29       LMP  
                  (EAGLE)       Roger. Let's go to VHF ranging now.

04 04 47 31       CMP  
                  (COLUMBIA)     Okay.

04 04 47 32       CMP  
                  (COLUMBIA)     MARK.

04 04 47 58       CMP  
                  (COLUMBIA)     Eagle, Columbia. I am reading you loud and  
                                  scratchy. Neil is not coming through too well  
                                  on his VOX. Could you be quiet for 15 seconds  
                                  while I get this locked on.

04 04 48 13       LMP  
                  (EAGLE)       Okay.

04 04 48 33       CMP  
                  (COLUMBIA)     I've got a solid lock on. I have you at 0.27  
                                  miles.

04 04 49 07       CC                   Eagle, Houston. We've got a state vector for you.  
                                  We'd like POO and DATA. Over.

04 04 49 15       LMP  
                  (EAGLE)       You have it.

04 04 49 16        CC        Thank you, sir.

04 04 49 29        CC        Columbia, Houston. We have a CSM rescue PAD if  
you are ready to copy. Over.

04 04 49 37        CMP  
(COLUMBIA)      Ready to copy.

04 04 49 39        CC        Roger, Mike. Phasing TIG 103 40 0000, TPI for  
PDI less than 10, 105 12 3000, TPI for PDI  
greater than 10, 107 11 3000. Over.

04 04 50 14        CMP  
(COLUMBIA)      Roger. TIG's follow: phasing 103 40, PDI less  
than 10, 105 12 30 more than 10, 107 11 30.  
Over.

04 04 50 25        CC        Good readback. Out.

04 04 50 57        CC        Eagle, Houston. When you are ready to copy,  
I have a lunar surface data PAD for you. Over.

04 04 51 08        LMP  
(EAGLE)        Roger. Stand by.

04 04 51 10        CC        We've got the load in, Eagle. You can go back  
update link OFF. Over.

04 04 51 21        LMP  
(EAGLE)        Roger.

04 04 52 16        CC        Columbia, Houston. At your convenience we'd  
like POO and ACCEPT. We have a couple of  
state vectors for you. Over.

04 04 52 24        CMP  
(COLUMBIA)      Okay. Going to POO and ACCEPT, and I just got  
some unexplained roll thruster activity. I  
might have bumped the hand controller.

04 04 52 32        CC        Roger. We will look at it. Out

04 04 52 38        LMP  
(EAGLE)        And Eagle is ready to copy lunar surface data  
PAD.

04 04 52 43        CC        Roger, Buzz. Starting with the T2, T2 TIG:  
102 54 2900 103 51 5600 106 37 3500 109 10 0000.  
In the remarks: T2 occurs at PDI plus 2126.  
T3 time - correction T3, T3 TIG: 104 39 4100  
001 58 1500 001 58 5400. NOUN 11: 105 36 2300  
107 11 3000. Ready for your readback. Over.

04 04 54 20        LMP  
(EAGLE)        Roger. T2: 102 54 2900 103 51 5600 106 37 3500

109 10 0000, T2 is PDI plus 2126. T3: 104 39 4100  
001 58 1500 001 58 5400 105 36 2300 107 11 3000.  
Over.

04 04 55 10 CC Roger. Good readback, Eagle. Out.

04 04 55 50 CMP  
(COLUMBIA) Would you put your tracking light on, please?

04 04 55 53 LMP  
(EAGLE) It's on, Mike.

04 04 55 54 CMP  
(COLUMBIA) Thank you.

04 04 56 20 CC Columbia, Houston. We've got the load in. You  
can go back to BLOCK. Over.

04 04 56 30 CMP  
(COLUMBIA) Is that for Columbia?

04 04 56 32 CC That's affirmative, Columbia.

04 04 56 37 CMP  
(COLUMBIA) Okay. Thank you, Houston.

04 04 58 31 LMP  
(EAGLE) Mike, you want to give us a Mark when you're  
right at 7 miles - I mean seven-tenths of a  
mile?

04 04 58 36 CMP  
(COLUMBIA) Will do.

04 04 58 57 LMP  
(EAGLE) Okay. We just got seven-tenths on the radar.

04 04 58 59 CMP  
(COLUMBIA) MARK.

04 04 59 00 CMP  
(COLUMBIA) Yes. I'm oscillating between 0.69 and seven-  
tenths.

04 04 59 05 LMP  
(EAGLE) Very good. We've got 4200 on the ... meter.

04 04 59 11 CMP  
(COLUMBIA) I'm steady on 70 now. Yes. I read you sort of  
scratchy, but I read you.

04 05 00 01 CMP  
(COLUMBIA) Houston, Apollo - or Houston, Columbia. Over.

04 05 00 04        CC        Roger. Go, Columbia. Over.

04 05 00 08        CMP  
(COLUMBIA)       Roger. I still need a DOI P76 PAD, and a PDI-1  
plus 12 P76 PAD sometime at your convenience.

04 05 00 16        CC        Roger. Stand by.

04 05 01 05        CC        Columbia, Houston. DOI P76 PAD, if you're ready  
to copy. Over.

04 05 01 13        CMP  
(COLUMBIA)       Ready to copy.

04 05 01 14        CC        Roger, Mike. NOUN 80 - correction, NOUN 84:  
minus 00758, plus all zeros, plus 00098;  
NOUN 33: 101 36 1400, and stand by for the  
PDI plus 12.

04 05 01 43        CMP  
(COLUMBIA)       Roger.

04 05 01 47        CC        Columbia, Houston, with the PDI plus 12 NOUN 84,  
if you're ready to copy.

04 05 01 54        CMP  
(COLUMBIA)       Ready to copy.

04 05 01 56        CC        Roger. NOUN 84: plus 01223, minus all zeros,  
plus 01889; NOUN 33: 102 44 2700, PDI plus 12  
burn time is 046, burn time for DOI is 030.  
Ready for your readback. Over.

04 05 02 40        CMP  
(COLUMBIA)       Roger. DOI P76: 84 is minus 00758, all balls,  
plus 00098, at 101 36 1400; plus 01223, minus  
all balls, plus 01889, 102 44 2700; burn time  
46 and 30 seconds.

04 05 03 09        CC        Roger. One error, Columbia, on the TIG for DOI;  
seconds was 1407. Over.

04 05 03 21        CMP  
(COLUMBIA)       Roger. 1407.

04 05 03 23        CC        Roger.

04 05 03 37        CC        Columbia, Houston. We'd like you to turn off  
your rotational direct - rotational control  
power direct number 2 off. Over.

04 05 03 49        CMP  
(COLUMBIA)       It's off. Thank you.



04 05 06 58           CC           Columbia, Houston. On those P76's, a friendly reminder from your FIDO: add half the burn time to the TIG. Over.

04 05 07 10           CMP  
(COLUMBIA)           Roger.

04 05 14 09           CC           Columbia, Houston. We've lost data with Eagle. Will you please have him select aft OMNI? Over.

04 05 14 22           CMP  
(COLUMBIA)           Eagle, this is Columbia. Houston would like you to select aft OMNI.

04 05 14 37           LMP  
(EAGLE)           Roger. I got it now. Houston, you reading Eagle now on aft OMNI?

04 05 14 41           CC           That's affirmative, Eagle. Reading you five-by.

04 05 14 58           CMP  
(COLUMBIA)           Roger.

04 05 16 17           CC           Columbia, Houston. We'll have LOS at 101 28. AOS for you 102 15. Over.

04 05 16 30           CMP  
(COLUMBIA)           Thank you.

04 05 17 07           CC           Eagle, Houston. It appeared to us when you were doing the P52, maneuvering the S-band, the high gain went into the stop. Verify that both S-band breakers are in. Over.

04 05 17 23           LMP  
(EAGLE)           Roger. I think I'd gone up to 90.0 before it went there. The one on this side is in and I'll check the other later.

04 05 17 29           CC           Okay. Thank you, Buzz.

04 05 17 53           CC           Eagle, Houston. You are GO for DOI. Over.

04 05 18 00           LMP  
(EAGLE)           Roger. GO for DOI. Do you have LOS and AOS times?

05 04 18 03           CC           Roger. For you LOS at 101 28. AOS 102 16. Over.

04 05 18 16           LMP  
(EAGLE)           Roger. Copy.

04 05 18 18           CC           And, Buzz, S-band steerable update for you on the angles at AOS: 219 and yaw 30. Over.

04 05 18 31           LMP  
(EAGLE)           Roger. That's in the flight plan. Thank you.

04 05 19 08           CMP  
(COLUMBIA)       Houston, Columbia. How are all the systems looking?

04 05 19 13           CC           Say again. Over.

05 04 19 19           CMP  
(COLUMBIA)       Just wanted to get a systems check from you sometime prior to LOS.

04 05 19 23           CC           Roger.

04 05 19 46           CDR  
(EAGLE)           Houston, Eagle. You can - Torquing angles NOUN 93 on four zeros and a 3 are minus 00292, plus 00289, minus 00094.

04 05 20 04           CC           Roger. Copy. Stand by. Roger, Eagle. You can torque it. Over.

04 05 20 18           CDR  
(EAGLE)           Roger. Copy.

04 05 20 44           CC           Columbia, Houston. Your systems are looking good going over the hill. Approximately 7 minutes to LOS.

04 05 20 53           CMP  
(COLUMBIA)       Thank you.

04 05 22 37           CC           Eagle, Houston. Place the BIOMED to Commander. Over.

04 05 22 48           LMP  
(EAGLE)           Roger. You got him.

04 05 22 51           CC           Thank you, sir.

04 05 23 43           CC           Eagle, Houston. We've lost the high bit rate. Would you please select low bit rate? Over.

04 05 23 52           LMP  
(EAGLE)           You got it.

04 05 23 54           CC           And, Eagle, on my Mark we'll have 12 minutes to ignition. Over.

04 05 24 06           LMP  
(EAGLE)           Roger.

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04 05 24 08      CC      Eagle, Houston. Stand by for my Mark.  
04 05 24 13      CC      MARK.  
04 05 24 14      CC      Twelve minutes to ignition.  
04 05 24 18      LMP      We copy.  
                  (EAGLE)  
04 05 25 27      CC      Columbia/Eagle, Houston. Three minutes to LOS.  
  Both looking good going over the hill.  
04 05 25 34      CMP      Columbia. Roger.  
                  (COLUMBIA)  
04 05 25 38      LMP      Eagle. Roger.  
                  (EAGLE)

END OF TAPE

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04 05 51 -- BEGIN LUNAR REV 14

04 06 15 02 CC Columbia, Houston: We're standing by. Over.

04 06 15 36 CC Columbia, Houston. Over.

04 06 15 41 CMP Houston, Columbia. Reading you loud and clear.  
(COLUMBIA) How me?

04 06 15 43 CC Roger. Five-by, Mike. How did it go? Over.

04 06 15 49 CMP Listen, babe. Everything's going just swimmingly.  
(COLUMBIA) Beautiful.

04 06 15 52 CC Great. We're standing by for Eagle.

04 06 15 57 CMP Okay. He's coming along.  
(COLUMBIA)

04 06 16 00 CC We copy. Out.

04 06 16 09 CC And, Columbia, Houston. We expect to lose your  
high gain sometime during the powered descent.  
Over.

04 06 16 19 CMP Columbia. Roger. You don't much care do you?  
(COLUMBIA)

04 06 16 22 CC No, sir.

04 06 17 27 LMP Houston, Eagle. How do you read?  
(EAGLE)

04 06 17 29 CC Five-by, Eagle. We're standing by for your burn  
report. Over.

04 06 17 36 LMP Roger. The burn was on time. The residuals be-  
(EAGLE) fore nulling: minus 0.1, minus 0.4, minus 0.1,  
X and Z nulled to zero ... nulling ...

04 06 18 25 CC Columbia, Houston. We've lost all data with Eagle.  
Please have him reacquire on the high gain. Over.

04 06 18 37 CMP Eagle, this is Columbia. Houston would like you  
(COLUMBIA) to reacquire on the high gain. They've lost your  
data. Over.

04 06 18 50 CMP Eagle, did you copy Columbia?  
(COLUMBIA)

04 06 18 54 CC Eagle, Houston. Did you call?

04 06 19 05 LMP (EAGLE) Eagle, Houston - Houston, Eagle. How do you read now?

04 06 19 08 CC Roger. Five-by, Neil. We copied up to the AGS residuals. Would you please repeat the AGS residuals in the trim - correction - the Sun check? Over.

04 06 19 19 LMP (EAGLE) Roger. AGS residuals: minus 0.1, minus 0.2, minus 0.7. And we used the PGNS NOUN 86 for DELTA-V<sub>Z</sub> which was 9.5, versus yours which was 9.1, and I believe that may explain the difference. Apogee 57.2, perilune 9.1, Sun check to three marks, NOUN 20, minus NOUN 22, plus 0.19, plus 0.16, plus 0.11. Over.

04 06 19 54 CC Roger. Copy. Looks great.

04 06 22 37 CC Columbia, Houston. We've lost Eagle again. Have him try the high gain. Over.

04 06 22 46 CMP (COLUMBIA) Eagle, this is Columbia. Houston lost you again. They're requesting another try at the high gain.

04 06 23 57 CC Eagle, Houston. We have you now. Do you read? Over.

04 06 24 02 LMP (EAGLE) Loud and clear.

04 06 24 04 CC Roger. We see your VERB 47.

04 06 24 12 LMP (EAGLE) Yes. I don't know what the problem was there. It just started oscillating around in yaw. According to the needle, we're picking up a little oscillation right now, as a matter of fact.

04 06 24 23 CC Roger. We'll work on it.

04 06 24 38 CDR (EAGLE) Horizon checklist right on time.

04 06 24 41 CC Roger.

04 06 24 45 LMP (EAGLE) Did you copy the star - I mean the Sun check, Charlie?

04 06 24 48 CC That's affirmative. We did, Buzz. Out.

04 06 25 35 CC Eagle, Houston. The AGS initialization looked good to us. Over.

04 06 25 43 LMP (EAGLE) Roger.

04 06 26 28 CDR (EAGLE) Our radar checks indicate 50 000-foot perilune. Our visual altitude checks steadying out at about 53 000.

04 06 26 37 CC Roger. Copy. *not EAGLE 234*

04 06 26 55 LMP (EAGLE) And, Houston, we got a 500 alarm early in the program. Went to DESCENT 1, proceeded on it, and we're back at AUTO again. Over.

04 06 27 06 CC Roger. We saw that, Buzz. Thank you much. Out.

04 06 27 09 LMP (EAGLE) All right. I say again - Okay. That wasn't an alarm; that was a code. Okay.

04 06 27 14 CC Roger. We saw that.

04 06 27 22 CC Eagle, Houston. We recommend you yaw 10 right. It will help us on the high-gain signal strength. Over.

04 06 28 08 CC Eagle, Houston. If you read, you're GO for powered descent. Over.

04 06 28 18 CMP (COLUMBIA) Eagle, this is Columbia. They just gave you a GO for powered descent.

04 06 28 22 CC Columbia, Houston. We've lost them on the high gain again. Would you please - We recommend they yaw right 10 degrees and reacquire.

04 06 28 34 CMP (COLUMBIA) Eagle, this is Columbia. You're GO for PDI and they recommend you yaw right 10 degrees and try the high gain again.

04 06 28 46 CMP (COLUMBIA) Eagle, you read Columbia?

04 06 28 48 LMP (EAGLE) Roger. We read you.

04 06 28 49 CMP (COLUMBIA) Okay.

04 06 28 51 CC Eagle, Houston. We read you now. You're GO for PDI. Over.

04 06 28 57 LMP (EAGLE) Roger. Understand. AELD control circuit breakers. DECA GIMBAL AC - closed?

04 06 29 07 CDR (EAGLE) What?

04 06 29 08 LMP DECA GIMBAL AC - closed? Circuit breaker? COMMAND  
(EAGLE) OVERRIDE - off? GIMBAL-ENABLE? RATE SCALE - 25.

04 06 29 23 CC Eagle, Houston. Your alignment is GO on the AGS.  
On my Mark, 3 30 until ignition.

04 06 29 29 LMP Roger.  
(EAGLE)

04 06 29 33 CC Mark.

04 06 29 34 CC 3 30 until ignition.

04 06 29 38 LMP Roger. Copy. Thrust translation - four jets -  
(EAGLE) Balance couple - ON. TTCA throttle - MINIMUM.  
Throttle - AUTO CDR. Prop button - RESET. Prop  
button. Okay. ABORT/ABORT STAGE - RESET. ATT  
CONTROL - three of them to MODE CONTROL. Okay,  
MODE CONTROL is set. AGS is reading 400 plus 1.  
Standing by for ...

04 06 30 45 LMP Hit VERB 77?  
(EAGLE)

04 06 31 04 LMP Okay. Sequence camera coming on.  
(EAGLE)

04 06 31 32 CC Eagle, Houston. If you'd like to try high gain,  
pitch 212, yaw 37. Over.

04 06 31 45 LMP Roger. I think I've got you on high gain now.  
(EAGLE)

04 06 31 49 CC Roger.

04 06 32 03 LMP Say again the angles, though.  
(EAGLE)

04 06 32 05 CC Roger.

04 06 32 06 LMP I'll set them in to use them before we yaw around.  
(EAGLE)

04 06 32 08 CC Roger. Pitch 212, yaw plus 37.

04 06 32 24 LMP OMNI's in.  
(EAGLE)

04 06 33 09 LMP ... 10 ... 10 percent ...  
(EAGLE)

04 06 33 41 . CC Columbia, Houston. We've lost them. Tell them to go aft OMNI. Over.

04 06 33 51 CMP  
(COLUMBIA) They've lost you. Use the OMNI's again.

04 06 34 01 LMP  
(EAGLE) ...

04 06 34 05 CMP  
(COLUMBIA) Say again, Neil?

04 06 34 07 LMP  
(EAGLE) I'll leave it in SLEW. Relay to us. See if they have got me now. I've got good signal strength in SLEW.

04 06 34 13 CMP  
(COLUMBIA) Okay. You should have him now, Houston.

04 06 34 16 CC Eagle, we've got you now. It's looking good. Over.

04 06 34 23 CC Eagle - -

04 06 34 24 LMP  
(EAGLE) - - descent looks good.

04 06 34 25 CC Eagle, Houston. Everything is looking good here. Over.

04 06 34 29 LMP  
(EAGLE) Roger. Copy.

04 06 34 34 CC Eagle, Houston. After yaw around, angles: S-band pitch, minus 9, yaw plus 18.

04 06 34 46 LMP  
(EAGLE) Copy.

04 06 34 59 LMP  
(EAGLE) AGS and PNGS agree very closely.

04 06 35 01 CC Roger.

04 06 35 14 LMP  
(EAGLE) Beta ARM. Altitudes are a little high.

04 06 35 45 LMP  
(EAGLE) Houston. I'm getting a little fluctuation in the AC voltage now.

04 06 35 51 CC Roger.

04 06 35 52 LMP  
(EAGLE) Could be our meter, maybe, huh?



04 06 35 54           CC           Stand by. Looking good to us. You're still looking good at 3, coming up 3 minutes.

04 06 36 13           LMP  
(EAGLE)           ... real good. ... about on.

04 06 36 18           CDR  
(EAGLE)           Our position checks downrange show us to be a little long.

04 06 36 21           CC           Roger. Copy.

04 06 36 24           LMP  
(EAGLE)           AGS has gone about 2 feet per second greater ...

04 06 36 36           CDR  
(EAGLE)           ... ought to be ... Stand by.

04 06 36 43           LMP  
(EAGLE)           Altitude ...

04 06 37 00           LMP  
(EAGLE)           ... it's going to stop.

04 06 37 18           CC           Eagle, Houston. You are GO to continue - -

04 06 37 19           LMP  
(EAGLE)           ... closed ... GO ... at 4 minutes.

04 06 37 22           CC           Roger. You are GO - You are GO to continue powered descent. You are GO to continue powered descent.

04 06 37 30           LMP  
(EAGLE)           Roger.

04 06 37 35           CC           And, Eagle, Houston. We've got data dropout. You're still looking good.

04 06 38 04           LMP  
(EAGLE)           ... PGNS. We got good lock-on. Altitude lights OUT. DELTA-H is minus 2 900.

04 06 38 18           CC           Roger. We copy.

04 06 38 20           LMP  
(EAGLE)           Got the Earth right out our front window.

04 06 38 23           CDR  
(EAGLE)           Houston, you're looking at our DELTA-H?

04 06 38 25           CC           That's affirmative.

04 06 38 26           CDR  
(EAGLE)           PROGRAM ALARM.

04 06 38 28 CC It's looking good to us. Over.

04 06 38 30 CDR  
(EAGLE) It's a 1202.

04 06 38 32 LMP  
(EAGLE) 1202.

04 06 38 48 CDR  
(EAGLE) Give us a reading on the 1202 PROGRAM ALARM.

04 06 38 53 CC Roger. We got - We're GO on that alarm.

04 06 38 59 CDR  
(EAGLE) Roger. P30.

04 06 39 01 CC 6 plus 25, throttle down - -

04 06 39 02 LMP  
(EAGLE) Looks like about 820 -

04 06 39 03 CC - - 6 plus 25, throttle down.

04 06 39 06 CDR  
(EAGLE) Roger. Copy. 6 plus 25.

04 06 39 14 LMP  
(EAGLE) Same alarm, and it appears to come up when we have a 1668 up.

04 06 39 17 CC Roger. Copy.

04 06 39 23 CC Eagle, Houston. We'll monitor your DELTA-H.

04 06 39 24 LMP  
(EAGLE) ... worked out beautifully.

04 06 39 28 CC DELTA-H - -

04 06 39 29 LMP  
(EAGLE) ... looks good now.

04 06 39 30 CC Roger. DELTA-H is looking good to us.

04 06 39 34 LMP  
(EAGLE) Ah! Throttle down - -

04 06 39 35 CDR  
(EAGLE) Throttle down on time!

04 06 39 36 CC Roger. We copy throttle down - -

04 06 39 37 LMP - - ... throttles down. Better than the simulator.  
(EAGLE)

04 06 39 42 CC Roger.

04 06 39 48 LMP AGS and PGNS look real close.  
(EAGLE)

04 06 40 08 CC At 7 minutes, you're looking great to u.,  
Eagle.

04 06 40 13 LMP Okay. I'm still on SLEW so we may tend to lose  
(EAGLE) as we gradually pitch over. Let me try AUTO  
again now and see what happens.

04 06 40 21 CC Roger.

04 06 40 23 LMP Okay. Looks like it's holding.  
(EAGLE)

04 06 40 24 CC Roger. We got good data.

04 06 40 49 CC Eagle, Houston. It's descent 2 fuel to MONITOR.  
Over.

04 06 40 55 CDR Going to 2.  
(EAGLE)

04 06 41 01 LMP Give us an estimated switchover time please,  
(EAGLE) Houston.

04 06 41 05 CC Roger. Stand by. You're looking great at  
8 minutes.

04 06 41 10 LMP At 7000 -  
(EAGLE)

04 06 41 12 CC Eagle, you've got 30 seconds to P64.

04 06 41 15 LMP ... Roger.  
(EAGLE)

04 06 41 27 CC Eagle, Houston. Coming up 8 30; you're looking  
great.

04 06 41 35 LMP P64.  
(EAGLE)

04 06 41 37 CC We copy.

04 06 41 51 CC Eagle, you're looking great. Coming up 9 minutes.

04 06 42 05 BR Manual attitude control is good.  
(EAGLE)

04 06 42 08 CC Roger. Copy.

04 06 42 10 CC Eagle, Houston. You're GO for landing. Over.

04 06 42 17 LMP Roger. Understand. GO for landing. 3000 feet.  
(EAGLE) PROGRAM ALARM.

04 06 42 19 CC Copy.

04 06 42 20 LMP 1201  
(EAGLE)

04 06 42 24 CDR 1201.  
(EAGLE)

04 06 42 25 CC Roger. 1201 alarm. We're GO. Same type. We're GO.

04 06 42 31 LMP 2000 feet. 2000 feet. Into the AGS, 47 degrees.  
(EAGLE)

04 06 42 35 CC Roger.

04 06 42 36 LMP 47 degrees.  
(EAGLE)

04 06 42 41 CC Eagle, looking great. You're GO.

04 06 42 58 CC Roger. 1202. We copy it.

04 06 43 01 LMP 35 degrees. 35 degrees. 750. Coming down to  
(EAGLE) 23.

04 06 43 07 LMP 700 feet, 21 down, 33 degrees.  
(EAGLE)

04 06 43 11 LMP 600 feet, down at 19.  
(EAGLE)

04 06 43 15 LMP 540 feet, down at - 30. Down at 15.  
(EAGLE)

04 06 43 26 LMP At 400 feet, down at 9.  
(EAGLE)

04 06 43 29 LMP ... forward.  
(EAGLE)

04 06 43 30 LMP 350 feet, down at 4.  
(EAGLE)

04 06 43 35 LMP 30, ... one-half down.  
(EAGLE)

04 06 43 42 LMP We're pegged on horizontal velocity.  
(EAGLE)

04 06 43 46 LMP 300 feet, down 3 1/2, 47 forward.  
(EAGLE)

04 06 43 51 LMP ... up.  
(EAGLE)

04 06 43 52 LMP On 1 a minute, 1 1/2 down.  
(EAGLE)

04 06 43 57 CDR 70.  
(EAGLE)

04 06 44 04 LMP Watch your shadow out there.  
(EAGLE)

04 06 44 07 LMP 50, down at 2 1/2, 19 forward.  
(EAGLE)

04 06 44 13 LMP Altitude-velocity light.  
(EAGLE)

04 06 44 16 LMP 3 1/2 down, 220 feet, 13 forward.  
(EAGLE)

04 06 44 23 LMP 11 forward. Coming down nicely.  
(EAGLE)

04 06 44 24 LMP 200 feet, 4 1/2 down.  
(EAGLE)

04 06 44 26 LMP 5 1/2 down.  
(EAGLE)

04 06 44 31 LMP 160, 6 - 6 1/2 down.  
(EAGLE)

04 06 44 33 LMP 5 1/2 down, 9 forward. That's good.  
(EAGLE)

04 06 44 40 LMP 120 feet.  
(EAGLE)

04 06 44 4 LMP 100 feet, 3 1/2 down, 9 forward. Five percent.  
(EAGLE)

04 06 44 51 LMP ...  
(EAGLE)

04 06 44 54 LMP Okay. 75 feet. There's looking good. Down a  
(EAGLE) half, 6 forward.

04 06 45 02 CC 60 seconds.

04 06 45 04 LMP Lights on. ...  
(EAGLE)

04 06 45 08 LMP Down 2 1/2. Forward. Forward. Good.  
(EAGLE)

04 06 45 17 LMP 40 feet, down 2 1/2. Kicking up some dust.  
(EAGLE)

04 06 45 21 LMP 30 feet, 2 1/2 down. Faint shadow.  
(EAGLE)

04 06 45 25 LMP 4 forward. 4 forward. Drifting to the right  
(EAGLE) a little. Okay. Down a half.

04 06 45 31 CC 30 seconds.

04 06 45 32 CDR Forward drift?  
(EAGLE)

04 06 45 33 LMP Yes.  
(EAGLE)

04 06 45 34 LMP Okay.  
(EAGLE)

04 06 45 40 LMP CONTACT LIGHT.  
(EAGLE)

04 06 45 43 LMP Okay. ENGINE STOP.  
(EAGLE)

04 06 45 45 LMP ACA - out of DETENT.  
(EAGLE)

04 06 45 46 CDR Out of DETENT.  
(EAGLE)

04 06 45 47 LMP MODE CONTROL - both AUTO. PERCENT ENGINE COMMAND  
(EAGLE) OVERRIDE - OFF. ENGINE ARM - OFF.

4:18 pm  
EXT →

04 06 45 52 LMP (EAGLE) 413 is in.

04 06 45 57 CC We copy you down, Eagle.

04 06 45 59 CDR (TRANQ) Houston, Tranquility Base here.

04 06 46 04 CDR (TRANQ) THE EAGLE HAS LANDED.

04 06 46 06 CC Roger, Tranquility. We copy you on the ground. You got a bunch of guys about to turn blue. We're breathing again. Thanks a lot.

04 06 46 16 CDR (TRANQ) Thank you.

04 06 46 18 CC You're looking good here.

04 06 46 23 CDR (TRANQ) Okay. We're going to be busy for a minute.

04 06 46 25 LMP (TRANQ) MASTER ARM, ON. Take care of the ... I'll get this ...

04 06 46 38 LMP (TRANQ) Very smooth touchdown.

04 06 46 52 LMP (TRANQ) ...

04 06 47 03 LMP (TRANQ) Okay. It looks like we're venting the oxidizer now.

04 06 47 06 CC Roger, Eagle. And you are STAY for - -

04 06 47 08 LMP (TRANQ) ...

04 06 47 09 CC - - T1. Over. Eagle, you are STAY for T1.

04 06 47 12 CDR (TRANQ) Roger. Understand, STAY for T1.

04 06 47 15 CC Roger. And we see you venting the OX.

04 06 47 20 LMP (TRANQ) Roger.

04 06 47 36 LMP ... circuit breaker.  
(TRANQ)

04 06 48 10 LMP ... copy NOUN 60, NOUN 43. Over.  
(TRANQ)

04 06 48 13 CC Roger. We have it.

04 06 48 14 CMP Houston, how do you read Columbia on the high  
(COLUMBIA) gain?

04 06 48 17 CC Roger - -

04 06 48 18 LMP ...  
(TRANQ)

04 06 48 19 CC - - We read you five-by, Columbia. He has  
landed, Tranquility Base. Eagle is at Tranquil-  
ity. Over.

04 06 48 26 CMP Yes. I heard the whole thing.  
(COLUMBIA)

04 06 48 27 CC ... good show.

04 06 48 31 CMP Fantastic.  
(COLUMBIA)

04 06 48 32 LMP Engine STOP-RESET.  
(TRANQ)

04 06 48 58 CMP Houston, Columbia went UPTHEMETRY COMMAND,  
(COLUMBIA) RESET, to reacquire on the high gain.

04 06 49 02 CC Copy. Out.

04 06 49 39 CC Eagle, Houston. You loaded R2 wrong. We  
want 10254.

04 06 49 50 LMP Roger.  
(TRANQ)

04 06 50 28 LMP And do you want V horizontal 5515.2?  
(TRANQ)

04 06 50 32 CC That's affirmative.

04 06 50 59 LMP Like - AGS to PGNS align. Over.  
(TRANQ)

04 06 51 04 CC Say again?



04 06 51 08 LMP Like an AGS to PGNS align. Over.  
(TRANQ)

04 06 51 11 CC Roger. We're standing by for it.

04 06 51 41 LMP ... quantity ...  
(TRANQ)

04 06 51 45 CC Eagle, Houston. You are STAY for T2. Over.

04 06 51 50 CC Correction, you're - -

04 06 51 52 CDR Roger. STAY for T2. We thank you.  
(TRANQ)

04 06 51 54 CC Roger, sir.

04 06 53 37 CC Tranquility Base, Houston. We recommend you  
exit P12. Over.

04 06 55 16 CDR Hey, Houston, that may have seemed like a very  
(TRANQ) long final phase. The AUTO targeting was  
taking us right into a football-field size -  
football-field sized crater, with a large num-  
ber of big boulders and rocks for about ...  
one or two crater diameters around it, and it  
required a ... in P66 and flying manually over  
the rock field to find a reasonably good area.

04 06 55 49 CC Roger. We copy. It was beautiful from here,  
Tranquility. Over.

04 06 56 02 LMP We'll get to the details of what's around here,  
(TRANQ) but it looks like a collection of just about  
every variety of shape, angularity, granularity,  
about every variety of rock you could find.  
The colors - Well, it varies pretty much depend-  
ing on how you're looking relative to the zero-  
phase point. There doesn't appear to be too  
much of a general color at all. However, it  
looks as though some of the rocks and boulders,  
of which there are quite a few in the near area,  
it looks as though they're going to have some  
interesting colors to them. Over.

04 06 56 47 CC Roger. Copy. Sounds good to us, Tranquility.  
We'll let you press on through the simulated  
countdown, and we'll talk to you later. Over.

04 06 57 00 CDR Roger.  
(TRANQ)

04 06 57 01 LMP (TRANQ) Okay. This one-sixth g is just like the airplane.

04 06 57 04 CC Roger. Tranquility. Be advised there's lots of smiling faces in this room and all over the world. Over.

04 06 57 15 CDR (TRANQ) Well, there are two of them up here. )

04 06 57 17 CC Roger. That was a beautiful job, you guys. *John*

04 06 57 19 CMP (COLUMBIA) And don't forget one in the command module. *John*

04 06 57 22 CC Roger.

04 06 57 48 CC Tranquility, Houston. We have you pitched up about 4-1/2 degrees. Over.

04 06 57 55 CDR (TRANQ) That's confirmed by our local observation.

04 06 58 00 CC Roger.

04 06 58 12 CMP (COLUMBIA) And thanks for putting me on relay, Houston. I was missing all the action.

04 06 58 16 CC Roger. We'll enable MSFN relay.

04 06 58 27 CMP (COLUMBIA) I just got it, I think.

04 06 58 28 CC Roger, Columbia. This is Houston. Say something. They ought to be able to hear you. Over.

04 06 58 40 CMP (COLUMBIA) Roger, Tranquility Base. It sure sounded great from up here. You guys did a fantastic job.

04 06 58 48 CDR (TRANQ) Thank you. Just keep that orbiting base ready for us up there now.

04 06 58 55 CMP (COLUMBIA) Will do.

04 06 59 19 CC Columbia, Houston. LOS 103 27, AOS 104 13. Over.

04 06 59 32 CMP (COLUMBIA) Thank you.

04 07 00 44        CC        Tranquility Base, Houston. All your consumables are solid. You're looking good in every respect. We copy the DPS are venting. Everything is copasetic. Over.

04 07 00 58        CDR  
(TRANQ)        Thank you, Houston.

04 07 02 03        CDR  
(TRANQ)        Houston, the guys that said that we wouldn't be able to tell precisely where we are the winners today. We were a little busy worrying about program alarms and things like that in the part of the descent where we would normally be picking out our landing spot; and aside from a good look at several of the craters we came over in the final descent, I haven't been able to pick out the things on the horizon as a reference as yet.

04 07 02 41        CC        Roger, Tranquility. No sweat. We'll figure out - We'll figure it out. Over.

04 07 03 32        CDR  
(TRANQ)        You might be interested to know that I don't think we notice any difficulty at all in adapting to one-sixth g. It seems immediately natural to move in this environment.

04 07 03 47        CC        Roger, Tranquility. We copy. Over.

04 07 03 55        CDR  
(TRANQ)        The area out the left-hand window is a relatively level plain cratered with a fairly large number of craters of the 5- to 50-foot variety, and some ridges - small, 20, 30 feet high, I would guess, and literally thousands of little 1- and 2-foot craters around the area. We see some angular blocks out several hundred feet in front of us that are probably 2 feet in size and have angular edges. There is a hill in view, just about on the ground track ahead of us. Difficult to estimate, but might be a half a mile or a mile.

04 07 04 54        CC        Roger, Tranquility. We copy. Over.

04 07 05 01        CMP  
(COLUMBIA)        Sounds like it looks a lot better than it did yesterday - -

04 07 05 02        CDR  
(TRANQ)        ...

04 07 05 03           CMP  
(COLUMBIA)           -- at that very low Sun angle. It looked rough  
as a cob then.

04 07 05 11           CDR  
(TRANQ)           It really was rough, Mike. Over the targeted  
landing area, it was extremely rough, cratered,  
and large numbers of rocks that were probably  
some, many larger than 5 or 10 feet in size.

04 07 05 32           CMP  
(COLUMBIA)           When in doubt, land long.

04 07 05 38           CDR  
(TRANQ)           So we did.

04 07 05 57           CC           Tranquility, Houston. After you get through  
this P57, we'd like an E-memory dump. Over.

04 07 06 07           LMP  
(TRANQ)           Roger. After this first P57, you want an  
E-memory dump.

04 07 06 11           CC           That's affirmative.

04 07 06 16           CC           Columbia, Houston. We have a P22 update for  
you, if you're ready to copy. Over.

04 07 06 27           CMP  
(COLUMBIA)           At your service, sir.

04 07 06 29           CC           Roger, Mike. T1, 104 32 18; T2, 104 37 28.  
And that is 4 miles south. This is based on  
a targeted landing site. Over.

04 07 06 58           CMP  
(COLUMBIA)           Okay. Roger. Understand based on a targeted  
landing site; T1, 104 32 18; T2, 104 37 28,  
and 4 miles south.

04 07 07 10           CC           Roger.

04 07 07 13           CMP  
(COLUMBIA)           Do you have any idea whether they landed left  
or right of center line? Just a little bit  
long, is that all we know?

04 07 07 19           CC           Apparently that's about all we can tell. Over.

04 07 07 24           CMP  
(COLUMBIA)           Okay. Thank you.

04 07 08 06           CC           Tranquility, Houston --

04 07 08 07           CDR  
(TRANQ)           And, Houston, our mission timer is now reading  
902 34 47 and static.

04 07 08 17 CC Roger. Copy your mission timer's now static.  
It - Say again the time?

04 07 08 24 CDR  
(TRANQ) 902 34 47.

04 07 08 35 CC Roger. Copy, Tranquility. That gravity align  
looked good to us. We see you recycling.

04 07 08 47 LMP  
(TRANQ) Well, no. I was trying to get time, 16 65 out,  
and somehow it proceeded on to the 622 before  
I could do a VERB 32 ENTER. I want to log a  
time here, and then I'd like to know whether  
you want me to proceed on the torquing angles  
or to go back and reenter again before torquing.  
Over.

04 07 09 08 CC Roger, Buzz. Stand by.

04 07 10 15 CC Tranquility, Houston. We'd like you to recall  
P57 and run through the gravity align one more  
time. Over.

04 07 10 24 LMP  
(TRANQ) Roger. I concur with that.

04 07 10 26 CC Roger, Tranquility. For the mission timer, two  
suggestions. Set the circuit breaker, panel 11;  
also reset and attempt to start. That nine in  
the first digit might have something to do with  
it. Over.

04 07 10 45 CDR  
(TRANQ) Okay. We've tried both of those. If the cir-  
cuit breaker is in when I reset the - put it in  
RESET, I get 902 04 40. When I release it now,  
I get 902 04 49. I'm going to cycle the cir-  
cuit breaker.

04 07 11 08 CC Roger.

04 07 11 12 CDR  
(TRANQ) I cycled the circuit breaker and got all nines.  
And we'll not now reset from all nines.

04 07 11 22 CC Roger.

04 07 11 37 CC Tranquility, Houston. We'll research this prob-  
lem and be back with you momentarily on the  
mission event time - correction, the mission  
timer.

04 07 11 47 CDR (TRANQ) Okay.

04 07 12 44 CDR (TRANQ) I'd say the color of the - The local surface is very comparable to that we observed from orbit at this Sun angle, about 10 degrees Sun angle, or that nature. It's pretty much without color. It's gray, and it's a very white, chalky gray, as you look into the zero-phase line; and it's considerably darker gray, more like a ash - ashen gray as you look out 90 degrees to the Sun. The - Some of the surface rocks in close here that have been fractured or disturbed by the rocket engine plume are coated with this light gray on the outside; but where they've been broken, they display a dark - very dark gray interior; and it looks like it could be country basalt.

04 07 14 02 CC Roger, Tranquility. We see the NOUN 93, VERB 34.

04 07 14 10 LMP (TRANQ) Roger. I assume you wanted it. Roger.

04 07 14 32 CC Tranquility, Houston. Please vent fuel and OX again. Over. It's building back up.

04 07 14 42 CDR (TRANQ) Okay. OX going now.

04 07 14 52 CC Tranquility, Houston. You can open both fuel and OX vent now. Over.

04 07 14 59 CDR (TRANQ) Okay.

04 07 15 01 LMP (TRANQ) Houston, Tranquility standing by for GO on a AGS to PGNS align and a lunar align. Over.

04 07 15 09 CC Stand by.

04 07 15 17 CC Tranquility, Houston. You are GO for the AGS to PGNS align and a lunar align. Over.

04 07 15 26 LMP (TRANQ) Roger.

04 07 15 44 CC Tranquility, Houston. Please vent the fuel. It's increasing rapidly. Over.

04 07 16 09 CDR We show 30 psi in the fuel and 30 in the  
(TRANQ) oxidizer.

04 07 16 05 CC Roger. We're reading somewhat different than  
that. Stand by.

04 07 16 14 CDR The fuel temperature is reading 64 in the  
(TRANQ) descent, and the oxidizer - that's descent 2 -  
and the oxidizer is off-scale low. Descent 1 is  
showing 61 in the fuel and 65 in the oxidizer.

04 07 16 41 CC Roger. Stand by. Tranquility, Houston. Please  
take the fuel vent switch and hold it open. Over.

04 07 17 01 CDR Okay. We're holding it open. Indicating about  
(TRANQ) 24 psi on board.

04 07 17 09 CC Roger.

04 07 17 34 CDR Now indicating 20 psi in the fuel side.  
(TRANQ)

04 07 17 37 CC Roger.

04 07 17 38 CDR And 22 in the OX.  
(TRANQ)

04 07 17 41 CC Roger.

04 07 18 47 LMP Now indicating 15 psi in both tanks.  
(TRANQ)

04 07 18 51 CC Roger.

04 07 19 17 CC Tranquility, Houston. If you haven't done so,  
you can release the fuel vent switch now.  
Over.

04 07 19 25 CDR Roger.  
(TRANQ)

04 07 20 52 CC Tranquility, Houston. We have indication that  
we've frozen up the descent-fuel helium heat  
exchanger, and there's some fuel trapped in the  
line between there and the valves; and the  
pressure we're looking at is increasing there.  
Over.

04 07 21 10 CDR Roger. Understand.  
(TRANQ)

04 07 22 0           CC           Tranquility Base, Houston. If you have not done so, please close both fuel and OX vents now. Over.

04 07 22 17           CDR  
(TRANQ)           They're closed.

04 07 22 18           CC           Thank you, sir.

04 07 22 30           CDR  
(TRANQ)           From the surface, we could not see any stars out the window; but out my overhead hatch, I'm looking at the Earth. It's big and bright and beautiful. Buzz is going to give a try at seeing some stars through the optics.

04 07 22 54           CC           Roger, Tranquility. We understand. Must be a beautiful sight. Over.

04 07 24 52           CC           Columbia, Houston. Two minutes to LOS. You're looking great going over the hill. Over.

04 07 25 08           CMP  
(COLUMBIA)        Okay. Thank you. Glad to hear the system's looking good. You have a suggested attitude for me? This one here seems all right.

04 07 25 15           CC           Stand by.

04 07 25 21           CMP  
(COLUMBIA)        Let me know when it's lunch time, will you?

04 07 25 24           CC           Say again.

04 07 25 29           CMP  
(COLUMBIA)        Oh, disregard.

04 07 25 31           CC           Columbia, Houston. You got a good attitude right there.

04 07 25 37           CMP  
(COLUMBIA)        Okay. Thank you.

END OF TAPE.



(GOSS NET 1)

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04 07 33 16           CC           Tranquility Base, Houston. If you want me to, I can give you a hack on the mission time, every 30 minutes. Over.

04 07 34 07           CC           Tranquility, Houston. I'm counting down to T3 time. If you'd like to give me a hack, we can set up an event timer. Over.

04 07 34 22           LMP  
(TRANQ)       Okay. How about counting up?

04 07 34 23           CC           Roger. You want it counting up? Stand by.

04 07 35 30           CC           Tranquility, Houston. On my Mark, 62 30.

04 07 35 34           CC           MARK.

04 07 35 35           CC           62 30 from - past PDI.

04 07 35 46           LMP  
(TRANQ)       What we're looking for, Charlie, is the time counting up to T2 that'll be equal to 60 minutes - or T3, be equal to 60 minutes on T3.

04 07 35 56           CC           Roger. We'll have it for you.

04 07 36 28           CC           Tranquility Base, Houston. Reset the event timer to zero and on my Mark at 103 39 41. We'll give you a hack, and it'll be 1 hour. Over.

04 07 36 44           CDR  
(TRANQ)       Roger.

04 07 36 45           CC           And we've got about - almost 3 minutes to go, Neil. Over.

04 07 36 51           CDR  
(TRANQ)       Okay.

04 07 39 16           CC           Tranquility Base, stand by on the event timer.

04 07 39 25           CC           Tranquility Base, Houston. On my Mark start your event timer.

04 07 39 36           CC           5, 4, 3, 2, 1.

04 07 39 41           CC           MARK.

04 07 39 46           CDR  
(TRANQ)       Roger. We got it; thank you.

04 07 39 47        CC        Roger, Neil.

04 07 47 19        CC        Tranquility, Houston. We see the star angle difference. Looks good.

04 07 47 29        LMP  
(TRANQ)        Okay. That last star was Navi, and it wasn't too well distinguishable. I can see where that error could come in. I think for the gravity alignment with one star, Rigel will be quite good.

04 07 47 42        CC        Roger. Stand by on the NOUN 93.

04 07 48 04        CC        Hello, Tranquility Base. Houston. We'd like you to torque that. Over.

04 07 49 --               BEGIN LUNAR REV 15

04 07 49 19        CDR  
(TRANQ)        Houston, this is Tranquility. Do you want us to accept this position? Over.

04 07 49 24        CC        Tranquility, Houston. We're looking at it. Stand by. We'd like you to pull the circuit breaker on panel 11 for the mission timer. Over.

04 07 49 35        CDR  
(TRANQ)        Roger. I've already done that, Charlie.

04 07 49 37        CC        Okay.

04 07 50 20        CC        Tranquility, Houston. We'd like you to reject that RLS. Over.

04 07 50 29        LMP  
(TRANQ)        Roger.

04 07 50 32        CC        And, Tranquility Base, Houston. We'd like you to call - after this, call POO, and give us a E-memory dump.

04 07 51 24        LMP  
(TRANQ)        Okay. Here comes the E-memory dump.

04 07 51 28        CC        Roger.

04 07 51 41        LMP  
(TRANQ)        And we got 1106.

04 07 51 43        CC        Roger.

04 07 52 09 CC Hello, Tranquility Base. Houston. Did I copy PROGRAM ALARM 1106 from you? Over.

04 07 52 16 LMP Roger. That's affirmative.  
(TRANQ)

04 07 52 18 CC Okay. Stand by.

04 07 52 19 LMP Could that, by any chance, be due to the fact that  
(TRANQ) I flashed the updata link switch to DATA while that was going on? Over.

04 07 52 29 CC Stand by.

04 07 52 38 CC Hello, Tranquility Base. Houston. The SPAN guys think that's conceivable. Stand by. I think we want another VERB 74.

04 07 52 51 LMP Okay. Standing by.  
(TRANQ)

04 07 53 02 CC Hello, Tranquility Base. Houston. We'd like another VERB 74. Over.

04 07 53 13 LMP Roger. Here it comes.  
(TRANQ)

04 07 53 54 CC Tranquility Base, Houston. On my Mark it will be GET 103 53

04 07 54 00 CC MARK.

04 07 54 01 CC 103 53 - correction, 54.

04 07 54 09 CDR Roger.  
(TRANQ)

04 07 54 14 CC Hello, Tranquility. Houston. We have the LM ascent PAD. If you're ready to go. Over.

04 07 54 28 LMP Stand by.  
(TRANQ)

04 07 54 38 LMP Roger. Ready to copy the LM ascent PAD.  
(TRANQ)

04 07 54 42 CC Roger, Tranquility. TIG, 104 39 47 00, 55358 00322, plus 0022. DEDA 47, plus 37130, minus 70615, plus 58620, plus 56936. Over.

04 07 55 28 LMP Roger. LM ascent PAD: 104 39 47 00,  
(TRANQ) 55358 00322, plus 0022, plus 37130, minus 70615, plus 58620, plus 56936. Over.

04 07 55 53        CC        Roger, Tranquility. Good readback. We also have a CSI PAD if you are ready to copy.

04 07 56 10        LMP  
(TRANQ)        Okay. We are ready to go.

04 07 56 12        CC        Roger. Coming at you with a CSI: NOUN 11, 105 35 3700, 107 11 3000, 0538, minus all zeros. FDAI is NA, 0937 - correction, 09356, 10315, plus 0538, minus all zeros, plus 0012. Over.

04 07 57 08        LMP  
(TRANQ)        Roger. Say again R1 and NOUN 86.

04 07 57 12        CC        Roger. R1 is plus 0538, and we have a load for you. Will you please give us P00 and DATA? Over.

04 07 57 25        LMP  
(TRANQ)        Roger. Before I do that I would like to designate the rendezvous radar up to plus-X.

04 07 57 30        CC        Roger.

04 07 57 44        LMP  
(TRANQ)        Okay. CSI readback: NOUN 11, 105 35 3700, 107 11 3000, 0538, minus all zeros, NA, 09356, 10315. NOUN 86, plus 0538, plus all zeros, and the last one was 0012. And what's the sign of that, please?

04 07 58 55        CC        Tranquility, Houston. The DELTA-V<sub>Y</sub> is minus all zeros. The DELTA-V<sub>Z</sub> is plus 0012. Over.

04 07 59 08        LMP  
(TRANQ)        Roger. Plus 0012.

04 07 59 10        CC        Roger. Good readback.

04 07 59 41        CDR  
(TRANQ)        Houston, Tranquility Base. The DSKY's yours, and updata link to DATA.

04 07 59 47        CC        Roger. Thank you, Tranquility.

04 08 02 26        CC        Hello, Tranquility Base. Houston. Or my Mark it will be 37 minutes to T3. Over.

04 08 02 35        CDR  
(TRANQ)        Okay.

04 08 02 42        CC        Stand by.

04 08 02 46        CC        MARK.

04 08 02 47 CC Thirty-seven minutes till T3.

04 08 02 51 CDR  
(TRANQ) Okay. Thank you.

04 08 03 10 CC Tranquility, this is Houston. It's your computer. We got the load in. You can start your P57.

04 08 03 18 CDR  
(TRANQ) Roger. Thank you.

04 08 05 19 LMP  
(TRANQ) Houston, Tranquility Base. Does somebody down there have a mike button keyed? Over.

04 08 05 26 CC Stand by, and we'll check.

04 08 05 42 CC Tranquility, Houston. Do you still hear it now? Over.

04 08 05 59 LMP  
(TRANQ) I still hear it. It sounds like somebody banging some chairs around in the back room.

04 08 06 05 CC Roger. That's a VOGAA that you hear for the CSM to keep the noise down on the loop. Maybe we got a MSFN relay or something. Stand by.

04 08 06 17 LMP  
(TRANQ) Okay.

04 08 06 43 CC Tranquility, Houston. We got the MSFN relay in. You're hearing the VOGAA, which is a noise suppression device. We'll try to take it out. Over.

04 08 06 55 LMP  
(TRANQ) All right. Thank you.

04 08 08 00 CC Tranquility, Houston. It ought to be a little quieter up there now. We disabled the MSFN relay.

04 08 08 11 LMP  
(TRANQ) Okay. I think the noise has stopped now. Thank you, Charlie. *Duke*

04 08 08 13 CC Roger.

04 08 14 32 CC Tranquility Base, Houston. On my Mark, 25 minutes till T3. Stand by.

04 08 14 46 CC MARK.

04 08 14 47 CC Twenty-five minutes until T3.

04 08 14 52 CDR  
(TRANQ) Roger. Thank you, Charlie.

04 08 15 00       CMP  
                  (COLUMBIA)     Houston, Columbia. How's it going?

04 08 15 02       CC           Columbia, Houston. We're reading you about  
                                  three-by. Over.

04 08 15 10       CMP  
                  (COLUMBIA)     Roger. I'm on OMNI Charlie. How's it going?

04 08 15 13       CC           Roger. Understand. OMNI Charlie. Mike, be  
                                  advised we have an update for you on the P22 for  
                                  the LM. We estimate he landed about 4 miles  
                                  downrange. Your T1 times are updated and your  
                                  T2, if you're ready to copy. Over.

04 08 15 33       CMP  
                  (COLUMBIA)     Ready to copy.

04 08 15 36       CMP  
                  (COLUMBIA)     Ready to copy.

04 08 15 37       CC           Okay. Roger, Columbia. T1 104 32 24, 104 37 33,  
                                  2 miles south. Time of closest approach is  
                                  104 39 08.

04 08 16 08       CC           Hello, Tranquility Base. Houston. We copy the  
                                  NOUN 93. You can torque them. Over.

04 08 17 30       CMP  
                  (COLUMBIA)     You said 4 miles long, is that correct, Houston?

04 08 17 34       CC           That's affirmative, Columbia. It's about 4 miles  
                                  long. Stand by. We'll have you a map location  
                                  momentarily. Over.

04 08 18 38       CDR  
                  (TRANQ)       Houston, Tranquility Base. Do you have an up-  
                                  dated LM weight for us? Over.

04 08 18 42       CC           That's affirmative. Stand by on the DAP. Our  
                                  DAP PAD for you is LM weight 10906. Over.

04 08 18 59       CDR  
                  (TRANQ)       Roger. 10906.

04 08 19 02       CC           Roger.

04 08 19 57       CC           Columbia, Houston. With a latitude/longitude  
                                  over two update for LM position. Over.

04 08 20 21       CC           Columbia, Houston. Over.

04 08 20 26       CMP           Go ahead, Houston.

04 08 20 28        CC        Roger, Mike. We got an update on the LAT longitude for the LM, if you're ready to copy. Over.

04 08 20 36        CMP  
(COLUMBIA)        Go ahead.

04 08 20 41        CMP  
(COLUMBIA)        Go ahead.

04 08 20 42        CC        Roger. Columbia, it's plus 7 - correction, plus 0.799 for the LAT, plus 11.730 for the longitude over two. Over.

04 08 21 02        CMP  
(COLUMBIA)        Thank you. The altitude remain unchanged?

04 08 21 08        CC        Say again. Over.

04 08 21 12        CMP  
(COLUMBIA)        Does the altitude remain unchanged? ...

04 08 21 16        CC        That's affirmative.

04 08 21 31        CC        Hello, Tranquility Base. Houston. You are stay for a T3. We have some surface block data if you're ready to copy. Over.

04 08 21 40        CDR  
(TRANQ)        Roger. Understand we're stay for T3. Stand by.

04 08 22 27        CDR  
(TRANQ)        Okay, Houston. Go ahead with your block data.

04 08 22 30        CC        Roger, Tranquility. T4, 106 38 02; T5, 108 36 15; T6, 110 34 30; T7, 112 32 45. Over.

04 08 23 05        LMP  
(TRANQ)        Copy. T4, 106 38 07; T5, 108 36 15; T6 110 34 30; T7, 112 32 45.

04 08 23 20        CC        Roger, Tranquility. Stand by one.

04 08 23 26        CC        Tranquility, Houston. Say again your T4 copy. Over.

04 08 23 33        CDR  
(TRANQ)        T4, 106 38 07.

04 08 23 37        CC        Roger. Correction on T4: 106 38 02. Over.

04 08 23 49        CDR  
(TRANQ)        Got T4, 106 38 02.





04 08 35 23 CC Hello, Tranquility Base. Houston. You can start your powerdown now. Over.

04 08 35 31 CDR (TRANQ) Roger. It's in progress.

04 08 35 37 CC And, Tranquility Base, the White Team is going off now and letting the Maroon Team take over. We appreciate the great show. It was a beautiful job, you guys.

04 08 35 47 LMP (TRANQ) Roger. Couldn't of had better agreement from all of you back there.

04 08 39 07 LMP (TRANQ) Houston, Tranquility.

04 08 39 09 CC Go, Tranquility. Over.

04 08 39 14 LMP (TRANQ) Roger. Our recommendation at this point is planning an EVA with your concurrence starting about eight o'clock this evening, Houston time. That is about 3 hours from now.

04 08 39 31 CC Stand by.

04 08 39 35 LMP (TRANQ) Well, we will give you some time to think about that.

04 08 39 40 CC Tranquility Base, Houston. We thought about it; we will support it. You're GO at that time. Over.

04 08 39 48 LMP (TRANQ) Roger.

04 08 39 56 CC You guys are getting prime time TV there.

04 08 40 08 CDR (TRANQ) Hope that little TV set works, but we'll see.

04 08 40 11 CC Roger.

04 08 40 33 CC Hello, Tranquility Base. Houston. Was your eight o'clock Houston time a reference to opening the hatch or starting the PREP for EVA at that time? Over.

04 08 40 46 CDR (TRANQ) That would be hatch opening.

6:41 PM  
EDT

04 08 40 48           CC           That's what we thought. Thank you much.

04 08 40 52           CDR  
(TRANQ)       That might be a little later than that, but in other words, start the PREP in about an hour or so.

04 08 40 57           CMP  
(COLUMBIA)   Houston, Columbia. Copy NOUN 49?

04 08 41 00           CC           Stand by, Columbia.

04 08 41 01           CC           Tranquility Base, Houston. That's fine. We are ready to support you any time, Neil. Over.

04 08 41 04           CMP          Roger.

04 08 41 09           CDR  
(TRANQ)       Roger.

04 08 41 10           CC           Break. Columbia, we see the NOUN 49. Stand by.

04 08 41 36           CC           Columbia, Houston. We got the data. We would like a VERB 34. Over.

04 08 41 46           CMP  
(COLUMBIA)   All right. Stand by one, Charlie, for the next one.

04 08 41 50           CC           Roger, Columbia. Did - How did Tranquility look to you down there? Over.

04 08 41 58           CMP  
(COLUMBIA)   Well, the area looks smooth, but I was unable to see him. I just picked out a distinguishable crater nearby and marked on it.

04 08 42 08           CC           Roger.

04 08 42 14           CMP  
(COLUMBIA)   It looks like a nice area, though.

04 08 42 29           CC           Hello, Columbia. Houston. I understand you could not see Tranquility. What were you marking on? Over.

04 08 42 48           CMP  
(COLUMBIA)   Houston, Columbia. I say again, I could not see him. AUTO optics pointed at a spot very close to the coordinates which you gave me, so I picked a tiny crater in that area and marked on it so I will be able to have repeatable data, but I was unable to see him.

04 08 42 05           CC           Roger. Copy.

04 08 46 11 CC Hello, Tranquility Base. Houston. On our DPS venting and that fuel problem, our heat exchanger is cleared up. We heard that the ice is melted, and we are in good shape now. Out.

04 08 49 39 CDR  
(TRANQ) Houston. Tranquility is going to put the track modes in P00 now.

04 08 59 27 CC Columbia, Houston. Over.

04 08 59 34 CMP  
(COLUMBIA) Columbia. Go.

04 08 59 35 CC Columbia, Houston. We noticed you are maneuvering very close to gimbal lock. I suggest you move back away. Over.

04 08 59 43 CMP  
(COLUMBIA) Yes. I am going around it, doing this CMC AUTO maneuvers to the PAD values of roll 270, pitch 101, yaw 45.

04 08 59 52 CC Roger, Columbia.

04 09 00 30 CMP  
(COLUMBIA) How about sending me a fourth gimbal for Christmas.

04 09 00 40 CC Columbia, Houston. You were unreadable. Say again please.

04 09 00 46 CMP  
(COLUMBIA) Disregard.

04 09 01 21 CC Columbia, Houston. Several items for you. Over.

04 09 01 28 CMP  
(COLUMBIA) Ready to copy.

04 09 01 30 CC Columbia, Houston. First of all, we'd like a waste-water dump to 10 percent on the backside. Secondly, it does not look like we are going to need any plane change at this time, so we will not be uplinking a new REFSMMAT. Third item, I would like all of your CRYO heaters to AUTO, and we are ready for a battery charge, battery BRAVO; it will last about 7 hours. If you should go to sleep, we will be terminating that BATT charge, but at the moment, we can go ahead and start the BATT charge on BATT Bravo. And a final item, for your SM RCS configuration for your rest period, register 1 for the DAP is lllll; DAP register 2, 01100. And your AUTO RCS select

switches, quad Alfa, pitch jets on only, quad Bravo all on, quad Charlie and quad Delta all off. Over.

04 09 02 57           CMP  
                  (COLUMBIA)     Roger. Dump waste water to 10 percent on the backside. Use prior REFSMMAT, CRYO heaters on to AUTO, battery B charge until I go to sleep. DAP is lllll, 01100. Select quads A pitch only on, C and D all up. Over.

04 09 03 22           CC           Columbia, Houston. Roger.

04 09 04 25           CC           Columbia, Houston. We will have a state vector update for you a little later. We are not prepared with it right now; and on another subject, from Tranquility Base, they are prepared to begin their EVA early. They expect to begin DEPRESS operations in about 3 hours at 108, approximately 108 GET. Over.

04 09 04 58           CMP  
                  (COLUMBIA)     Sounds good to me. Tell them to eat some lunch before they go.

END OF TAPE.

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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04 09 06 07 CC Columbia, Houston. We'd like your PRD readouts when possible, and we've checked over your EM dump. It all looks okay.

04 09 06 48 CC Tranquility Base, Houston. Over.

04 09 06 54 LMP Go ahead, Houston.  
(TRANQ)

04 09 06 56 CC Tranquility, Houston. We'd like your PRD readout, and we have double-checked your EM dump. It all looks okay. Over.

04 09 07 26 CDR Roger. Understand our E-memory dump was good.  
(TRANQ) CDR's dosimeter is 11014.

04 09 07 37 LMP And LMP is 09011.  
(TRANQ)

04 09 07 44 CC Roger, Tranquility. Break. Columbia, we would like for you to REACQ with your high gain; attempt a manual lock-on. Over.

04 09 08 01 CMP ...  
(COLUMBIA)

04 09 08 11 LMP Houston, Tranquility here. The LMP's readout may possibly be 09017. Over.  
(TRANQ)

04 09 08 21 CC Tranquility, Houston. Roger. 09017 is an update on your readout.

04 09 08 31 CMP Columbia's in high gain.  
(COLUMBIA)

04 09 08 32 LMP I'll let you know for sure when it goes to either 12 or 18.  
(TRANQ)

04 09 08 41 CC Tranquility, Houston. Roger. The medics report your latter reading, 17, appears to be the correct one. Over.

04 09 08 54 LMP Roger.  
(TRANQ)

04 09 09 11 CMP Columbia's in the high gain.  
(COLUMBIA)

04 09 09 13 CC Roger, Columbia. You're sounding much better now.

04 09 09 57       CC       Columbia, Houston. Request POO in ACCEPT, and we'll uplink another state vector. Over.

04 09 10 08       CMP  
(COLUMBIA)       Roger. Going POO in ACCEPT.

04 09 12 02       CC       Columbia, Houston. Suggest you put BATT A on your BATT relay bus. Over.

04 09 12 12       CMP  
(COLUMBIA)       Okay.

04 09 12 46       CC       Columbia, Houston. We're through with your computer. You can go to BLOCK.

04 09 12 53       CMP  
(COLUMBIA)       Roger. BLOCK.

04 09 14 43       CC       Tranquility Base, Houston. Over.

04 09 14 53       LMP  
(TRANQ)       Go ahead, Houston. Tranquility Base.

04 09 14 55       CC       Tranquility Base, Houston. We've reviewed the checklist, and about the only change in order to advance the EVA that we've found is that you'll want to delay your lithium hydroxide change until after the EVA rather than before. Over.

04 09 15 19       LMP  
(TRANQ)       Roger. We'd just as soon make a change and jettison the old one. Over.

04 09 16 21       CC       Tranquility Base, Houston. We would like to delay that LOIO - LiOH change until after the EVA. There is a possibility you could jettison the canister when you jettison your PLSS. Over.

04 09 16 39       LMP  
(TRANQ)       All right. We'll plan it that way. Over.

04 09 16 42       CC       Roger, Tranquility.

04 09 17 52       CC       Columbia, Houston. Over.

04 09 17 58       CMP  
(COLUMBIA)       Houston, Columbia.

04 09 17 59       CC       Columbia, Houston. We show your EVAP OUT temperature running low. Request you go to manual temperature control and bring it up. You can check the procedures in ECS MAL 17. Over.

04 09 18 20           CMP  
(COLUMBIA)           Roger, Houston.

04 09 19 49           CC                   Columbia, Houston. I have a P22 update for you.

04 09 19 57           CMP  
(COLUMBIA)           Columbia. Go ahead.

04 09 19 59           CC                   Columbia, Houston. Your P22 AUTO - AUTO optics landmark ID on LM. T1, 106 plus 30 plus 31; T2, 106 plus 35 plus 41, 2 nautical miles south. Your TCA, 106 plus 37 plus 16. Shaft angle 357.9 and trunnion angle 44.3. Over.

04 09 20 46           CMP  
(COLUMBIA)           Roger. Thank you.

04 09 21 35           CC                   Columbia, Houston. We have your LOS in 3 minutes. AOS will be 106 plus 11. Over.

04 09 21 47           CMP  
(COLUMBIA)           Roger.

04 09 25 29           LMP  
(TRANQ)              Houston, Tranquility. Over.

04 09 25 31           CC                   Tranquility, Houston. Go ahead.

04 09 25 38           LMP  
(TRANQ)              Roger. This is the LM pilot. I'd like to take this opportunity to ask every person listening in, whoever and wherever they may be, to pause for a moment and contemplate the events of the past few hours and to give thanks in his or her own way. Over.

04 09 26 08           CC                   Roger, Tranquility Base.

04 09 35 03           LMP  
(TRANQ)              That's about ready to fall off.

04 09 35 07           CDR  
(TRANQ)              As a matter of fact, it just doesn't look like it sunk in at all.

04 09 46 --                                   BEGIN LUNAR REV 16

04 09 47 17           CC                   Tranquility Base, Houston. We'd like some estimate of how far along you are with your eating and when you may be ready to start you EVA PREP. Over.

04 09 47 43           CDR  
(TRANQ)              I think that we'll be ready to start EVA PREP in about a half an hour or so.

04 09 47 50 CC Roger, Tranquility.

04 10 11 07 CMP Houston, Columbia. How do you read?  
(COLUMBIA)

04 10 11 12 CC Columbia, Columbia. This is Houston.

04 10 11 14 CDR Houston, this is Tranquility Base. We are begin-  
(TRANQ) ning our EVA PREP.

04 10 11 23 CC Tranquility Base, this is Houston, Roger. Copy.  
You're beginning EVA PREP. Break. Break. Colum-  
bia, Columbia, this is Houston. Reading you loud  
and clear. Over

04 10 11 35 CMP You're loud and clear. The waste-water dump is  
(COLUMBIA) down to 10 percent. I have a question on the  
P22. Do you want me to do another P22, or is  
all that information just for my own use in track-  
ing the LM for photographic purposes?

04 10 11 49 CC Columbia, this is Houston. We request that you  
perform another P22. We'd like you to let the  
AUTO optics take care of the tracking and devote  
your energies to trying to pick out the LM on  
the lunar surface. If you can find the LM, of  
course. We're looking for marks on it; but track-  
ing of geographical features doesn't do us all  
that much good. Over.

04 10 12 18 CMP Okay. Fine. I'll do it. And on the ECS system,  
(COLUMBIA) the - Whatever the problem was, it seems to have  
gone away without any changing of J52 sensors or  
anything like that. My glycol evaporator outlet  
TEMP is up above 50 now, and it's quite comfort-  
able in the cockpit; so we'll talk more about  
that one later.

04 10 12 43 CC Roger, Columbia. Did you shift into manual con-  
trol, or did the problem resolve itself under  
AUTO control? Over.

04 10 12 52 CMP The problem went away under AUTO.  
(COLUMBIA)

04 10 12 55 CC Roger. That's the best type. Out.

04 10 12 56 CMP I did cycle out of AUTO into - I did cycle out  
(COLUMBIA) of AUTO into MANUAL, back into AUTO.

1:44 PM  
EOT



04 10 13 05        CC        Houston. Roger. Out.

04 10 22 56        CC        Tranquility Base, Tranquility Base, this is  
Houston. Over.

04 10 23 05        CDR  
(TRANQ)      Go ahead, Houston.

04 10 23 07        CC        Tranquility, this is Houston. We need a second  
set of PRD readings so that we may establish a  
rate. Over.

04 10 23 19        CDR  
(TRANQ)      Okay. Stand by.

04 10 23 30        CDR  
(TRANQ)      CDR is reading 11014.

04 10 23 44        LMP  
(TRANQ)      LMP is reading 09017 and three-quarters.

04 10 23 52        CC        Tranquility, this is Houston. We copy your read-  
ings. Out.

04 10 29 26        CMP  
(COLUMBIA)    Houston, Columbia. How do you read on OMNI D,  
Dog?

04 10 29 30        CC        Columbia, this is Houston. We're reading you  
loud with background noise on OMNI D. Over.

04 10 29 41        CMP  
(COLUMBIA)    Okay. I'll stay on D here for awhile. I'm about  
to go into ...

04 10 29 45        CC        Roger. Out.

04 10 36 16        CMP  
(COLUMBIA)    Houston, Columbia. I'm coming up on my time for  
the first pass when I may - -

04 10 36 19        CC        Now while we've got time, you can.

04 10 36 20        CMP  
(COLUMBIA)    - - be able to see the LM. Do you have any topo-  
graphical cue that might help me out here? AUTO  
optics is tracking between two craters. One of  
them, as the LM sees it, would be long at  
11 o'clock. The other would be short and be-  
hind him at 5 o'clock. They're great big old  
craters - depressions.

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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04 10 36 44       CC       Stand by.

04 10 37 34       CC       Columbia, this is Houston. The best we can do on topo features is to advise you to look to the west of the irregularly shaped crater, and then work on down to the southwest of it. Over.

04 10 38 05       CC       Columbia, Houston. Another possibility is the southern rim of the southern of the two old-looking craters. Over.

04 10 38 42       CMP  
(COLUMBIA)       Roger, Houston. Columbia ... I kept my eyes glued to the sextant that time hoping I'd get a flash of reflected light off the LM, but I wasn't able to see any of my scan areas that you suggested.

04 10 38 56       CC       Roger. On that southern of the old craters, there's a small bright crater on the southern rim. One plot would put him slightly to the west of that small bright crater, about 500 to 1000 feet. Do you see anything down there? Over.

04 10 39 19       CMP  
(COLUMBIA)       Its going past now, Bruce, but I scanned that area that you are talking about very closely, and no, I did not see anything.

04 10 39 26       CC       Roger. Out.

04 10 40 21       CC       Columbia, this is Houston. Over.

04 10 40 28       CMP  
(COLUMBIA)       Go ahead.

04 10 40 33       CC       Columbia, this is Houston. On your LAM-2 map, we'd like to confirm the topographical area in which you were looking on this last period of sightings. As we understand you, you were looking in the vicinity of Papa 7 to November 8. Is that correct? Over.

04 10 40 59       CMP  
(COLUMBIA)       Stand by one.

04 10 41 01       CC       Roger.

04 10 43 00           CMP           Houston, Columbia.  
                  (COLUMBIA)

04 10 43 02           CC           Go ahead, Columbia.

04 10 43 08           CMP           One of the craters I was talking about is lo-  
                  (COLUMBIA)           cated exactly at Mike 6.7.

04 10 43 19           CC           Roger. We found that one.

04 10 43 21           CMP           The other one is located at 7 - The other one  
                  (COLUMBIA)           is located at 7.2, two-thirds of the way from  
                                  Mike to Nan.

04 10 43 36           CC           Roger. We believe you were looking a little  
                                  too far to the west and south. Over.

04 10 44 03           CMP           Roger. Understand. I was looking where auto  
                  (COLUMBIA)           optics was tracking, on the average, and under-  
                                  stand that it should have been more to the north  
                                  and more to the west; actually a tiny bit out-  
                                  side the circle, huh?

04 10 44 17           CC           More to the north and a little more to the east.  
                                  The feature that I was describing to you, the  
                                  small bright crater on the rim of the large,  
                                  fairly old crater, would be about Mike 0.8  
                                  and 8.2. Over.

04 10 44 40           CMP           Well, just give me your best estimate as to  
                  (COLUMBIA)           his location and his coordinate system, and  
                                  I'll plot it on my map and go from there.

04 10 44 48           CC           Roger.

04 10 48 54           CC           Tranquility Base, this is Houston. Can you  
                                  give us some idea of where you are in the sur-  
                                  face checklist at the present time? Over.

04 10 49 07           LMP           Okay. We're at the top of page 27.  
                  (TRANQ)

04 10 49 11           CC           Roger. Out.

04 10 50 29           CMP           Houston, Columbia. Over.  
                  (COLUMBIA)

04 10 50 31           CC           Go ahead, Columbia.

04 10 50 38           CMP  
                  (COLUMBIA)       Roger. I finally got you back on OMNI D. I've  
                                  been unsuccessfully trying to get you on the  
                                  high gain, and I've gone COMMAND RESET to  
                                  PROCESS. How do you read me now?

04 10 50 46           CC                   Roger. Reading you loud with background noise.  
                                  Understand that's OMNI Delta or OMNI Bravo?  
                                  Over.

04 10 50 56           CMP  
                  (COLUMBIA)       OMNI Delta and you were cut out. I never got  
                                  your coordinates on estimated LM position.  
                                  Over.

04 10 51 04           CC                   Columbia, this is Houston. Estimated LM posi-  
                                  tion is latitude plus 0.799, longitude over 2  
                                  plus 11.730. On your chart we would place it -  
                                  Stand by on the charts and readback on the  
                                  latitude and longitude.

04 10 51 46           CMP  
                  (COLUMBIA)       Yes. The latitude and longitude over 2, 799  
                                  and 11730 are the ones that I been using in  
                                  P22. But what I'm interested in is - is grid  
                                  coordinates on that map we're using.

04 10 52 01           CC                   Roger. We'll have them for you in a second.

04 10 52 08           CMP  
                  (COLUMBIA)       Thank you.

04 10 53 04           CMP  
                  (COLUMBIA)       Houston, Columbia. Could you enable the S-band  
                                  relay at least one-way from Eagle to Columbia  
                                  so I can hear what's going on?

04 10 53 12           CC                   Roger. There's not much going on at the pres-  
                                  ent time, Columbia. I'll see what I can do  
                                  about the relay.

04 10 53 23           CC                   Columbia, this is Houston. Are you aware that  
                                  Eagle plans the EVA about 4 hours early? Over.

04 10 53 33           CMP  
                  (COLUMBIA)       Affirmative. When's hatch open time in GET  
                                  estimated?

04 10 53 39           CC                   Roger. Somewhere around 108 hours. We'll have  
                                  an update for you on that a little later.

04 10 53 52           CMP  
                  (COLUMBIA)       Okay. I haven't heard a word from those guys,  
                                  and I thought I'd be hearing them through your  
                                  S-band relay.

04 10 53 57           CC           Roger. They're on about page Surface 27 in the checklist, proceeding in good time.

04 10 54 09           CMP  
(COLUMBIA)           Glad to hear it.

04 10 54 13           CMP  
(COLUMBIA)           You got a crowd there in MCC?

04 10 54 40           CC           Roger. You're last, Columbia.

04 10 54 46           CMP  
(COLUMBIA)           Roger. I expect you probably have about nine CAP COMMS and 11 Flight Directors with no place to plug in.

04 10 54 53           CC           Roger. Out.

04 10 55 00           CMP  
(COLUMBIA)           That ratio might even be reversed.

04 10 55 37           CMP  
(COLUMBIA)           Glycol evaporator outlet temperature is 50 degrees and the comfort in here is just fine.

04 10 55 43           CC           Roger. We copy 50 degrees on the glycol, and comfort index fine.

04 10 56 25           CMP  
(COLUMBIA)           If you'll excuse me a minute, I'm going to have a cup of coffee.

04 10 56 28           CC           Roger.

04 10 56 37           CC           Apollo - Columbia, this is Houston. Your map coordinates are Papa decimal 2 and 6 decimal 3 on the LAM-2 chart. Over.

04 10 57 10           CC           Columbia, this is Houston. Did you copy the coordinates for the LM? Over.

04 10 58 49           CC           Columbia, Columbia, this is Houston. If you read we request high-gain antenna, yaw 180, pitch 0. I say again, yaw 180, pitch 0 on the high gain. Over.

04 11 02 15           CC           Columbia, Columbia, this is Houston. Do you read? Over.

04 11 05 15           CMP  
(COLUMBIA)           Houston, Columbia on the high gain.

04 11 05 18           CC           Columbia, this is Houston reading you loud and clear. Over.

04 11 05 25           CMP           Read you loud and clear, Bruce.  
                  (COLUMBIA)

04 11 05 26           CC           Roger, Mike. I have the coordinates - -

04 11 05 29           CMP           What's new?  
                  (COLUMBIA)

04 11 05 31           CC           Well, what's new is I think we have some more  
  coordinates for you on the LM location. Over.

04 11 05 41           CMP           Ready to copy.  
                  (COLUMBIA)

04 11 05 43           CC           Roger, Mike. Papa 0.2 and 6.3 on your LAM-2  
  chart. Over.

04 11 06 02           CMP           Roger. Papa 0.2 and who 0.3?  
                  (COLUMBIA)

04 11 06 05           CC           6.3, I say again, 6.3.

04 11 06 17           CMP           Thank you. Papa 0.2 and 6.3. I'll try them.  
                  (COLUMBIA)

04 11 06 21           CC           Roger.

04 11 06 57           CMP           Okay. What you are saying is, if you look at  
                  (COLUMBIA)           the cat's paw, then that's just about, oh - his  
  middle finger, a little bit - one to two o'clock  
  from his middle finger. Is that right?

04 11 07 16           CC           Roger. About one to two o'clock from the middle  
  finger if you are using 12 o'clock being to the  
  west. Over.

04 11 07 29           CMP           That must be the way the cat's faced. Okay. I'm  
                  (COLUMBIA)           with you.

04 11 07 33           CC           Okay. And I got LOS and AOS times for you.

04 11 07 40           CMP           Go ahead.  
                  (COLUMBIA)

04 11 07 48           CMP           Go ahead, Houston.  
                  (COLUMBIA)

04 11 07 50           CC           Roger. Your LOS at 107 plus 23 plus 03. AOS  
  at 108 plus 09 plus 06. The next pass for

COAS tracking: your time of closest approach is 108 35 28. That's 3 miles south of track. Over.

04 11 08 28 CMP (COLUMBIA) I understand all that, but with this new information would you like me to try P22 and look for him in a different spot?

04 11 08 40 CC Stand by a minute, please.

04 11 08 44 CMP (COLUMBIA) Okay. Because I was looking in the wrong place last time. AUTO optics was not pointing me at the coordinates you gave me.

04 11 08 53 CC Roger.

04 11 10 06 CC Columbia, this is Houston. Over.

04 11 10 13 CMP (COLUMBIA) Go ahead.

04 11 10 15 CC On your next pass, Columbia, rather than performing a P22 as such, we would like you to look in the vicinity of the coordinates that we gave you, which is our best analysis based on map physics and the trajectory, and we also have another set of coordinates that we would like you to search in the vicinity of. This last one being based on an interpretation of the geological features that were seen by the crew on their way down. The coordinates of this second site are Mike 0.7 and 8.0. I say again, Mike 0.7 and 8.0. I say again, Mike 0.7 and 8.0. Over.

257  
1st on  
Moon

04 11 11 08 CMP (COLUMBIA) Roger. Copy. Mike 0.7 and 8.0. The only thing is, my best tool for looking is the sextant and if I'm going to crank the sextant up, I might as well let P22 go at the same time, or don't you think so?

04 11 11 24 CC Roger. If you want to go that way, crank it up and then you can drive it around and look where you want. Over.

04 11 11 33 CMP (COLUMBIA) Okay.

04 11 11 35 CC And if you can find the LM, then by all means, track it or make a note of where it was, and we

can track it on the next REV. If you are ready, we have a REFSMMAT update that we can pass up to you at this time, if you will give us POO in ACCEPT. Over.

04 11 12 06           CMP  
                  (COLUMBIA)

Okay. POO in ACCEPT you got. And this is an updated landing site RESFMMAT. We still believe that a plane change is not required. Is that affirmative?

04 11 12 15           CC

That's affirmative, Columbia.

04 11 12 20           CMP  
                  (COLUMBIA)

Good show.

04 11 15 34           CC

Columbia, this is Houston. We are through with the uplink. It's your computer.

04 11 15 43           CMP  
                  (COLUMBIA)

Roger. Thank you.

04 11 19 27           CMP  
                  (COLUMBIA)

Houston, Columbia.

04 11 19 30           CC

Go ahead, Columbia.

04 11 19 34           CMP  
                  (COLUMBIA)

On our next pass, I'd appreciate the S-band relay mode. Over.

04 11 19 40           CC

Roger. We're working on that. There haven't been any transmissions from Tranquility Base since we last talked to you. We cannot give you a full S-band relay without being assured of high-gain antenna. We're working on the partial relay for you. Over.

04 11 20 00           CMP  
                  (COLUMBIA)

Okay. Understand, Bruce. Thank you very much.

04 11 20 57           CC

Columbia, this is Houston. Approximately 2 minutes to LOS. All your systems are looking good from down here. Over.

04 11 21 09           CMP  
                  (COLUMBIA)

Does it look to you like the 240 controller is properly controlling the glycol evaporator outlet TEMP? It locks all right up here.

04 11 21 19           CC

Roger, Columbia. During this pass on the front side, it looked okay to us.



04 11 21 26           CMP           Okay. Thank you.  
                  (COLUMBIA)

04 11 31 00           CDR           Houston, Tranquility Base.  
                  (TRANQ)

04 11 31 03           CC           Go ahead Tranquility Base.

04 11 31 09           CDR           Okay. We are on about the middle of page 28,  
                  (TRANQ)           Surface - 28.

04 11 31 20           CC           Roger, Tranquility. We copy

04 11 38 16           CDR           All right -  
                  (TRANQ)

04 11 40 10           CDR           ... minimum.  
                  (TRANQ)

04 11 44 35           CDR           I think we'd ... to put ...  
                  (TRANQ)

04 11 45 --                           BEGIN LUNAR REV 17

04 11 54 00           CC           Tranquility Base, this is Houston. Over.

04 11 54 09           LMP           Roger. Go ahead, Houston.  
                  (TRANQ)

04 11 54 11           CC           Roger, Tranquility. We're coming up in about  
                                  6 minutes on GET of 108. If you'd like to  
                                  start your event timer, we can give you a hack  
                                  at 108 00. Over.

04 11 54 27           CDR           Wilco.  
                  (TRANQ)

04 12 01 03           LMP           Houston, Tranquility. We're ready to start with  
                  (TRANQ)           the electrical checkout. We're going to S-band  
                                  modulate FM. Over.

04 12 01 14           CC           Roger. Tranquility, this is Houston. We copy.  
                                  Go ahead with the FM. And we missed the mark at  
                                  108. Do you want us to try and give you one  
                                  at 108 05? Over.

04 12 01 27           CDR           I think we've got the timer going. We've got  
                  (TRANQ)           1 minute and 30 seconds.

04 12 01 33        CDR        MARK.  
                  (TRANQ)

04 12 01 34        CC         Roger. We copy, and you're in SYNC with us.

04 12 02 55        CDR        It's increase.  
                  (TRANQ)

04 12 02 58        CDR        T/R.  
                  (TRANQ)

04 12 03 01        CDR        In.  
                  (TRANQ)

04 12 04 42        CDR        Help you on that?  
                  (TRANQ)

04 12 04 49        CDR        Feed it, or disconnect, or what?  
                  (TRANQ)

04 12 04 57        LMP        Say again.  
                  (TRANQ)

04 12 05 00        CDR        Connect PLSS electrical umbilical to PGA.  
                  (TRANQ)

04 12 05 16        LMP        Let me \*\*\* up tight \*\*\* have to \*\*\* up straight  
                  (TRANQ)        \*\*\* up. Got her about \*\*\*

04 12 06 49        LMP        That's got it.  
                  (TRANQ)

04 12 07 21        CDR        \*\*\* Right.  
                  (TRANQ)

04 12 07 30        CDR        Fastest VOX in the west.  
                  (TRANQ)

04 12 07 37        LMP        Mark. All right. Okay.  
                  (TRANQ)

04 12 07 43        LMP        Aren't they?  
                  (TRANQ)

04 12 07 44        CDR        Well, we've got antennas down and \*\*\* not real  
                  (TRANQ)        good, is it? Okay. Yours is up. We'll put  
                                  my antenna up.

\*\*\* Three asterisks denote clipping of words and phrases.

(GOSS NET 1)

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04 12 08 11

LM'  
(TRANQ)

Okay.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

Tape 70/1  
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04 12 08 13	CDR (TRANQ)	Okay.
04 12 08 14	LMP (TRANQ)	How do you read now?
04 12 08 15	CDR (TRANQ)	Okay.
04 12 08 18	LMP (TRANQ)	Okay. I think that's going to be better.
04 12 08 26	CDR (TRANQ)	You read me all right now?
04 12 08 28	LMP (TRANQ)	Yes.
04 12 08 30	CDR (TRANQ)	Okay. That sounds pretty good.
04 12 08 32	LMP (TRANQ)	I guess it's a combination of the volume and the antenna. May have been just the volume that was way up too high. Why don't you try stowing it again; see if that makes any difference.
04 12 08 52	CDR (TRANQ)	Okay.
04 12 08 53	LMP (TRANQ)	All right. 1, 2, 3, 4, 5, 5, 4, 3, 2, 1. That - That sounds pretty good.
04 12 08 58	CDR (TRANQ)	... Okay?
04 02 08 59	LMP (TRANQ)	Better keep it pretty close to your mouth, though.
04 12 09 05	CDR (TRANQ)	Okay. Open up your audio circuit breaker, and disconnect the LM COMM cable.
04 12 09 44	CC	Columbia, Columbia, this is Houston. Over.
04 12 09 53	CMP (COLUMBIA)	Houston, Columbia on the high gain. How do you read?
04 12 09 55	CC	Roger, Columbia. Reading you loud and clear on the high gain. We have enabled the one-way MSFN

relay that you requested. The crew of Tranquility Base is currently donning PLSS's. The LMP has his PLSS on, COMM checks out, and the CDR is checking his COMM out now. Over.

04 12 10 23       CMP  
                  (COLUMBIA)       Sounds good. Thank you kindly.

04 12 10 50       CMP  
                  (COLUMBIA)       Houston, Columbia. I tweaked the platform up on the back side. I have a P52 option 3 when you're ready to copy the data.

04 12 10 58       CC                       Go ahead, Columbia.

04 12 11 03       CMP  
                  (COLUMBIA)       Roger. Stars 43 and 44: star angle difference 4 balls 1, NOUN 93 plus 000 - -

04 12 11 14       LMP  
                  (TRANQ)       Audio circuit breaker CLOSED.

04 12 11 16       CMP  
                  (COLUMBIA)       - - 57, plus - -

04 12 11 17       LMP  
                  (TRANQ)       All right, on your panel, VHF A, OFF; VHF B, OFF.

04 12 11 22       CMP  
                  (COLUMBIA)       - - 00166, minus 00022, and the - -

04 12 11 26       LMP  
                  (TRANQ)       All right, RCU PTT to MAIN.

04 12 11 27       CMP  
                  (COLUMBIA)       - - time is 107 30 38. Over.

04 12 11 32       CC                       Columbia, this is Houston. Copy star angle difference of 4 balls 1; NOUN 93, plus 00057 - -

04 12 11 42       LMP  
                  (TRANQ)       PLSS mode switch to B.

04 12 11 43       CC                       - - plus 00166, minus 00022 - -

04 12 11 50       LMP  
                  (TRANQ)       Warning tone?

04 12 11 51       CC                       - - time of 107 30 38. Over.

04 12 11 59       LMP  
                  (TRANQ)       ...

04 12 12 00           CMP           You got it.  
                  (COLUMBIA)

04 12 12 02           CC           Roger. Are you reading Tranquility Base now?

04 12 12 05           CDR           Okay. You've got an O and a P.  
                  (TRANQ)

04 12 12 06           LMP           What is your O<sub>2</sub> quantity, by the way?  
                  (TRANQ)

04 12 12 11           CDF           O<sub>2</sub> quantity is about 91.  
                  (TRANQ)

04 12 12 15           LMP           I've got 92.  
                  (TRANQ)

04 12 12 21           CDR           Okay, now. I'm going to mode select B.  
                  (TRANQ)

04 12 12 33           LMP           Warning tone.  
                  (TRANQ)

04 12 12 41           CDF           That where you were? B?  
                  (TRANQ)

04 12 12 44           LMP           I'm in B.  
                  (TRANQ)

04 12 12 45           CDR           \*\*\* A.  
                  (TRANQ)

04 12 12 46           LMP           Okay.  
                  (TRANQ)

04 12 12 49           CDR           I'm in A.  
                  (TRANQ)

04 12 12 51           LMP           Okay. How do you read me?  
                  (TRANQ)

04 12 12 53           CDR           I read you.  
                  (TRANQ)

04 12 12 55           LMP           You're loud and clear.  
                  (TRANQ)

04 12 12 58           LMP           I got another warning tone. Go.  
                  (TRANQ)

\*\*\* Three asterisks denote clipping of words and phrases.

04 12 13 04 CDR \*\*\* about now? Okay?  
(TRANQ)

04 12 13 06 LMP Both. That's mode select AR.  
(TRANQ)

04 12 13 11 CDR AR.  
(TRANQ)

04 12 13 15 LMP How do you read?  
(TRANQ)

04 12 13 16 CDR Didn't get a warning tone.  
(TRANQ)

04 12 13 17 LMP I got one.  
(TRANQ)

04 12 13 18 CDR Got it?  
(TRANQ)

04 12 13 28 CDR Okay. One antenna is out. Verify PLES O<sub>2</sub>  
(TRANQ) bottle pressure greater than 85. \*\*\*

04 12 13 33 LMF It is.  
(TRANQ)

04 12 13 35 CDR Do you have voice with \*\*\*  
(TRANQ)

04 12 13 38 LMP Got her.  
(TRANQ)

04 12 13 39 CDR Houston, Tranquility. How do you read? Over.  
(TRANQ)

04 12 13 43 CC Neil, Neil, this is Houston through Tranquility.  
Radio check. Over.

04 12 13 53 CDR Roger. Houston, this is Neil. How do you read?  
(TRANQ)

94 12 13 57 CC Neil, this is Houston. We're reading you loud  
and clear. Break, break. Buzz, this is Houston  
through Tranquility. Over.

04 12 14 06 LMP Roger, Houston. This is Buzz through Tranquil-  
(TRANQ) ity. How do you read? Over.

04 12 14 10 CC We're reading you loud and clear, Buzz. Out.

\*\*\* Three asterisks denote clipping of words and phrases.





04 12 20 43        CC        Neil, Neil, this is Houston. I can hear you trying to transmit; however, your transmission is breaking up. Over.

04 12 20 55        CDR  
(TRANQ)        Roger. \*\*\*

04 12 21 01        CC        Buzz, Buzz, this is Houston. Do you read? Over.

04 12 21 08        LMP  
(TRANQ)        Roger, Houston. This is Buzz. How do you read? Over.

04 12 21 11        CC        Roger. You're coming through loud and clear, Buzz. It's a beautiful signal.

04 12 21 19        LMP  
(TRANQ)        Neil's got his antenna up now. Let's see if he comes through any better now.

04 12 21 23        CDR  
(TRANQ)        Okay. Houston, this is Neil. How do you read?

04 12 21 26        CC        Neil, this is Houston. Reading you beautifully.

04 12 21 41        CDR  
(TRANQ)        (Static) My antenna's scratching the roof.

04 12 21 44        CC        We copy, your antenna scratching the roof. Roger.

04 12 21 59        LMP  
(TRANQ)        They hear everything but that.

04 12 22 01        CDR  
(TRANQ)        Houston, this is Tranquility. We're standing by for a GO for cabin DEPRESS. Over.

04 12 22 06        CC        Tranquility Base, this is Houston. You are GO for cabin depressurization. GO for cabin depressurization.

04 12 22 15        CDR  
(TRANQ)        Roger. Thank you.

04 12 22 18        LMP  
(TRANQ)        And the descent water valve is closed.

04 12 22 21        CDR  
(TRANQ)        Okay.

04 12 22 23        LMP  
(TRANQ)        Verify cabin fan number 1 circuit breaker open.

\*\*\* Three asterisks denote clipping of words and phrases.

04 12 22 27 CDR (TRANQ) \*\*\* Over. PLSS fan number 1 breaker.

04 12 22 30 LMP (TRANQ) We'll have to pull that one out. \*\*\*

04 12 22 48 LMP (TRANQ) Now wait a minute.

04 12 22 54 CC Columbia, this is Houston. Your LM line-of-sight COMM acquisition with the Tranquility Base is 108 plus 29. LOS is 108 plus 42. Over.

04 12 23 11 LMP (TRANQ) Suit circuits relief valve to AUTO.

04 12 23 14 CDR (TRANQ) In AUTO.

04 12 23 15 LMP (TRANQ) Suit gas diverter valve to EGRESS.

04 12 23 16 CDR (COLUMBIA) I'm going over to ... I'll pick you up on OMNI C or D.

04 12 23 18 CDR (TRANQ) GO.

04 12 23 21 CC Stand by please.

04 12 23 22 LMP (TRANQ) Verify MASTER ALARM.

04 12 23 26 CDR (TRANQ) Pushbutton light RESET.

04 12 23 31 CDR (TRANQ) \*\*\* ECS caution light and water separation light ON. Takes a while for the water separator. Maybe.

04 12 23 45 LMP (TRANQ) I don't understand ... Suit fan number 1 circuit breaker opened.

04 12 24 09 CC Buzz, this is Houston. We would like you to pull the suit fan DELTA-P circuit breaker on panel 16. Over.

04 12 24 28 LMP (TRANQ) Roger, I have it.

\*\*\* Three asterisks denote clipping of words and phrases.

04 12 24 30 CDR \*\*\* that \*\*\* if, if it's in.  
(TRANQ)

04 12 24 41 LMP \*\*\*  
(TRANQ)

04 12 24 50 LMP \*\*\* in EGRESS \*\*\*  
(TRANQ)

04 12 25 15 CDR Okay. There it is. ECS MASTER ALARM, water  
(TRANQ) separator.

04 12 25 20 LMP Okay.  
(TRANQ)

04 12 25 25 CDR \*\*\* both suit isolation valves to SUIT DISCON-  
(TRANQ) NECT.

04 12 25 26 LMP I'll get them.  
(TRANQ)

04 12 25 28 LMP Got it.  
(TRANQ)

04 12 25 30 CDR Okay. Disconnect LM hoses.  
(TRANQ)

04 12 25 46 LMP Okay.  
(TRANQ)

04 12 25 50 CDR Connect OPS O<sub>2</sub> hose to right-hand PGA blue  
(TRANQ) connector and lock.

04 12 25 54 LMP Let me do that for you.  
(TRANQ)

04 12 26 04 CDR Okay. Locked and lock locked.  
(TRANQ)

04 12 26 06 LMP Raise your arm up.  
(TRANQ)

04 12 26 36 CDR Locked, lock locked.  
(TRANQ)

04 12 26 41 CDR Okay. Retrieve purge valves from pocket.  
(TRANQ)

04 12 26 48 LMP Okay.  
(TRANQ)

\*\*\* Three asterisks denote clipping of words and phrases.

04 12 26 49        CDR        Verify closed; locked pin installed.  
                  (TRANQ)

04 12 26 51        LMP        Okay.  
                  (TRANQ)

04 12 26 52        CDR        Install in RH PGA red \*\*\*  
                  (TRANQ)

04 12 27 09        LMP        Okay. It's installed, locked and lock locked.  
                  (TRANQ)

04 12 27 14        CDR        Did you put it - -  
                  (TRANQ)

04 12 27 16        LMP        Oh, wait a minute. Should be - , Stand by.  
                  (TRANQ)

04 12 27 26        CDR        Roger. ...  
                  (TRANQ)

04 12 27 42        LMP        It's right out in the middle.  
                  (TRANQ)

04 12 27 44        CDR        All right. Check my diverter valves, VERTICAL.  
                  (TRANQ)

04 12 27 50        LMP        Both VERTICAL.  
                  (TRANQ)

04 12 27 55        CDR        That's two vertical.  
                  (TRANQ)

04 12 27 57        LMP        Okay.  
                  (TRANQ)

04 12 27 58        CDR        Hold this ... in your purge valve.  
                  (TRANQ)

04 12 28 22        LMP        Locked and double locked.  
                  (TRANQ)

04 12 28 25        CDR        Okay.  
                  (TRANQ)

04 12 28 42        CDR        Position mike.  
                  (TRANQ)

04 12 29 00        LMP        Sure wished I had shaved last night.  
                  (TRANQ)

\*\*\* Three asterisks denote clipping of word and phrases.

04 12 29 31 LMP \*\*\* Got your mikes where you want them?  
(TRANQ)

04 12 29 42 CDR Roger.  
(TRANQ)

04 12 30 07 CDR Verify PLSS mode select in AR.  
(TRANQ)

04 12 30 11 LMP Verified.  
(TRANQ)

04 12 30 19 CMP I don't know if you guys can read me on VHF,  
(COLUMBIA) but you sure sound good down there.

04 12 30 46 LMP And locked.  
(TRANQ)

04 12 30 48 CDR Okay.  
(TRANQ)

04 12 30 53 LMP All right. The vent window is clear. And re-  
(TRANQ) move LEVA from the engine cover. Verify EV visor  
is attached.

04 12 31 13 LMP How's the COMM now, Houston? Over.  
(TRANQ)

04 12 31 16 CC Buzz, this is Houston. The COMM is very good.  
You are coming in loud and clear, and Mike  
passes on the word that he is receiving you and  
following your progress with interest.

04 12 31 27 LMP Very well, thank you.  
(TRANQ)

04 12 31 58 CDR Got all the material up in the back?  
(TRANQ)

04 12 32 40 LMP Complete.  
(TRANQ)

04 12 33 43 CDR Helmet locked?  
(TRANQ)

04 12 33 46 LMP Yes. Locked and aligned.  
(TRANQ)

04 12 34 47 LMP Now, if you'll pull the RCU down.  
(TRANQ)

\*\*\* Three asterisks denote clipping of word and phrases.

04 12 35 38 LMP Wonder if we're triggering all the time.  
(TRANQ)

04 12 35 42 CDR I don't think so.  
(TRANQ)

04 12 35 45 CDR Houston, Neil. How do you read?  
(TRANQ)

04 12 35 48 CC Neil, this is Houston. Read you loud and clear and I read both the comments that said: "I wonder if we're triggering all the time" and "I don't think so." Prior to that it was relatively quiet. Over.

04 12 36 01 CDR Okay. We're hearing a little bit of background  
(TRANQ) noise, and I just wanted to make sure that we weren't continually keyed.

04 12 36 07 CC Don't sound like it.

04 12 36 26 CDR Want to put the light back up?  
(TRANQ)

04 12 36 36 CC Neil, this is Houston. Would you verify your RCU vent window's clear? Over.

04 12 36 46 CDR That's verified.  
(TRANQ)

04 12 36 48 CC Roger. Out.

04 12 37 12 LMP That's good.  
(TRANQ)

04 12 37 14 CDR Okay.  
(TRANQ)

04 12 37 19 LMP ...  
(TRANQ)

04 12 37 41 CDR Okay. We can stow this.  
(TRANQ)

04 12 38 03 CDR Okay. It is stowed. All right, PREP for EVA.  
(TRANQ)

04 12 38 17 LMP First you connect the water hose.  
(TRANQ)

04 12 38 19 CDR Okay. Let me get yours.  
(TRANQ)

04 12 38 36 LMP Okay. Now we should be able to stow these. Huh?  
(TRANQ)

04 12 40 10 CC Columbia, this is Houston. Any joy on the LM  
that pass? Over.

04 12 40 19 CDR Okay. They're all stowed. Connect PLSS water  
(TRANQ) hose to PGA. Let's see; let me do that.

04 12 41 03 LMP Okay. That's in and locked.  
(TRANQ)

04 12 41 04 CDR Okay.  
(TRANQ)

04 12 41 36 LMP Houston, Buzz here. Over.  
(TRANQ)

04 12 41 39 CC Go ahead, Buzz. This is Houston.

04 12 41 44 LMP Roger. Our COMM just seemed to clear up a good  
(TRANQ) bit. Did CSM just go over the hill?

04 12 41 52 CC Negative. He's been over the hill, here, for  
a minute or so.

04 12 41 59 CC Correction -

04 12 42 00 CDR Okay.  
(TRANQ)

04 12 42 01 CC He should be losing contact with you in about a  
minute.

04 12 42 10 LMP The flag locks are comp - checked. \*\*\* locks are  
(TRANQ) checked, blue locks are checked, lock locks, red  
locks, purge locks; and on this side, the PLSS  
locks, and lock locks; both sides, water locks  
and the COMM.

04 12 42 32 CDR Okay.  
(TRANQ)

04 12 42 34 LMP I'll fix the gloves. Locked.  
(TRANQ)

04 12 44 15 CC Columbia, this is Houston. Do you read? Over.

04 12 44 21 CMP Columbia reads you loud and clear on OMNI C -  
(COLUMBIA) Charlie.

\*\*\* Three asterisks denote clipping of word and phrases.

04 12 44 25           CC           Roger. Columbia, I have LOS and AOS times for you this pass with MSFN. LOS 109 plus 21 plus 12. AOS coming around on the corner 110 07 35. Over.

04 12 44 52           CMP  
(COLUMBIA)       Thank you. That's fine.

04 12 44 53           CC           Roger. Out.

04 12 45 32           LMP  
(TRANQ)          Okay.

04 12 45 33           CDR  
(TRANQ)          Okay.

04 12 45 34           LMP  
(TRANQ)          All locked. Verify your diverter valve open. Up position.

04 12 45 47           LMP  
(TRANQ)          Diverter valve up.

04 12 45 49           CDR  
(TRANQ)          Diverter valves up in the minimum.

04 12 45 52           LMP  
(TRANQ)          PLSS pump on.

04 12 45 57           CDR  
(TRANQ)          PLSS \*\*\* on. Running.

04 12 46 02           LMP  
(TRANQ)          And mine's running, also, and it's cooling already.

04 12 46 08           CDR  
(TRANQ)          Me, too.

04 12 46 10           LMP  
(TRANQ)          Audible tone.

04 12 46 12           CDR  
(TRANQ)          Verified.

04 12 46 14           LMP  
(TRANQ)          That's what it is. Yes. \*\*\* Why don't you bend down and let me stow that. See if we \*\*\*.

04 12 46 38           LMP  
(TRANQ)          Mine is back to EMU. Already done that pretty well.

04 12 46 43           CDR  
(TRANQ)          Pretty well, complete.

\*\*\* Three asterisks denote clipping of word and phrases.



04 12 46 47 LMP (TRANQ) Okay.

04 12 47 08 CC Columbia, this is Houston. Over.

04 12 47 16 CMP (COLUMBIA) Houston, Columbia. Go ahead.

04 12 47 18 CC Roger. Were you successful in spotting the LM on that pass? Over.

04 12 47 26 CMP (COLUMBIA) That's negative. I checked both locations, and no joy.

04 12 47 30 CC Okay. If you'd like to look again next pass, we have a different set of coordinates based on the onboard P57 solution of the LM. These are Echo 0.3 and 4.8. I say again Echo 0.3, 4.8, same chart. Over.

04 12 48 00 CMP (COLUMBIA) Roger. I'll look there. And, also, how about putting that in your machine and coming out with some coordinates: latitude and longitude over 2, and altitude for P22, so it can help me as best it can.

04 12 48 14 CC Roger.

04 12 48 21 CMP (COLUMBIA) That P22 is still pointing in the wrong way.

04 12 48 26 CC Columbia, this is Houston. Latitude plus 0.523, longitude divided by 2, 11.710. Over.

04 12 48 48 CMP (COLUMBIA) Roger. Understand plus 00523 and plus 11710. Thank you.

04 12 48 58 CC Houston. Roger. Out.

04 12 49 08 CC Columbia, this is Houston. We're requesting high-gain antenna, pitch, yaw, - pitch 0, yaw 200. That is, pitch 0, yaw 200. Over.

04 12 51 42 CDR (TRANQ) \*\*\* cooling unit circuit \*\*\*

04 12 52 36 CDR (TRANQ) Houston, this is Neil. How do you read?

04 12 52 39 CC Neil, this is Houston. Loud and clear.

\*\*\* Three asterisks denote clipping of word and phrases.

04 12 52 41 LMP (TRANQ) Okay. That's a little bit better now. There we go.

04 12 52 42 CDR (TRANQ) Roger. Read you and clear.

04 12 52 47 LMP (TRANQ) You're not too loud and clear, but I think it's the same problem. Houston, how do you read Buzz?

04 12 52 52 CC Buzz, this is Houston. Loud and clear. You're really coming in beautifully. Over.

04 12 52 58 LMP (TRANQ) Very good.

04 12 53 00 CDR (TRANQ) Okay. Cabin REPRESS closed.

04 12 53 33 LMP (TRANQ) Okay.

04 12 53 41 CDR (TRANQ) Now. Now for the gymnastics.

04 12 53 46 LMP (TRANQ) What?

04 12 53 47 CDR (TRANQ) Now comes the gymnastics.

04 12 53 49 LMP (TRANQ) Oh, I think it'll be a lot easier.

04 12 53 56 CDR (TRANQ) Okay. I want to go to DUMP and go down to 3.5 and back to AUTO.

04 12 54 08 LMP (TRANQ) Okay. Going dump and it's down to 4.2, 4.1, - -

04 12 54 25 CDR (TRANQ) That's 3.5. Are you in AUTO? Verify cabin pressure at 3.5 and LM suit circuit pressure between 3.6 and 4.3.

04 12 54 44 LMP (TRANQ) It is. Suit circuit's at about 43.

04 12 54 48 CDR (TRANQ) Okay. Verify the PGA pressure is above 45, minus 46.

04 12 54 53 LMP (TRANQ) Minus 47.

04 12 54 54        CC        Neil, this is Houston. Will you give us back  
when you start - -

04 12 54 57        CDR        \*\*\*  
(TRANQ)

04 12 54 58        CC        - - your chronometer. Over.

04 12 55 03        CDR        Roger.  
(TRANQ)

04 12 55 08        LMP        Give it to them later.  
(TRANQ)

04 12 55 12        CDR        Okay. Okay, let's go to dump.  
(TRANQ)

04 12 55 17        LMP        Dump. Go to dump.  
(TRANQ)

04 12 55 40        CDR        Houston, I'll set my watch at 56. Over.  
(TRANQ)

04 12 55 50        CC        Roger.

04 12 56 00        CDR        3, 2, 1.  
(TRANQ)

04 12 56 02        CDR        MARK.  
(TRANQ)

04 12 56 03        CMP        Houston, Columbia is back on the high gain.  
(COLUMBIA)

04 12 56 05        CC        Roger, Columbia. Loud and clear. And we copied  
you Mark there, Buzz.

04 12 56 09        CDR        Okay. I've got my water warning.  
(TRANQ)

04 12 56 18        LMP        Okay. Water warning.  
(TRANQ)

04 12 56 20        CDR        Is that yours?  
(TRANQ)

04 12 56 21        LMP        Yes. Got mine.  
(TRANQ)

\*\*\* Three asterisks denote clipping of word and phrases.

04 12 56 22 CDR Okay. Cabin pressure going towards zero. Verify  
(TRANQ) LM suit circuit 36 to 43. That's verified. FIPGA  
pressure above 4.5. Okay. 4.7, coming down. Ready  
to open the hatch when we get to zero.

04 12 57 06 LMP You want to bring down one of your visors now or  
(TRANQ) leave them up? I'll read \*\*\* okay.

04 12 57 19 CDR Inner visor down.  
(TRANQ)

04 12 58 18 CDR Four-tenths of a pound in the cabin.  
(TRANQ)

04 12 59 06 CDR Down to about 0.2.  
(TRANQ)

04 13 01 12 LMP Sure takes a long time to get all the way down,  
(TRANQ) doesn't it?

04 13 01 14 CDR Yes.  
(TRANQ)

04 13 02 45 LMP Let me see if it will open now.  
(TRANQ)

04 13 02 48 CDR Okay.  
(TRANQ)

04 13 03 02 CDR Open my RCU there, would you, Buzz?  
(TRANQ)

04 13 03 52 CDR Push outward.  
(TRANQ)

04 13 04 23 CDR Need some light?  
(TRANQ)

04 13 04 26 LMP It's unlocked, yes.  
(TRANQ)

04 13 04 27 CDR Unlocked.  
(TRANQ)

04 13 04 37 LMP That'll be good enough.  
(TRANQ)

04 13 04 40 CDR It'll pop open.  
(TRANQ)

\*\*\* Three asterisks denote clipping of word and phrases.

04 13 05 23 LMP (TRANQ) Get a steady tone in the background?

04 13 05 28 CDR (TRANQ) I have a - static. A little bit of static.

04 13 05 34 LMP (TRANQ) I've got a little bit of a steady tone.

04 13 05 39 CDR (TRANQ) I don't guess I hear that.

04 13 06 15 CC Neil, this is Houston. What's your status on hatch opening? Over.

04 13 06 22 CDR (TRANQ) Everything is GO here. We're just waiting for the cabin pressure to bleed so - to blow enough pressure to open the hatch. It's about 0.1 on our gage now.

04 13 06 48 LMF (TRANQ) Sure hate to tug on that thing. Alternative would be to open \*\*\* too.

04 13 06 59 CC Neil, this is Houston. Over.

04 13 07 04 CDR (TRANQ) Go ahead, Houston.

04 13 07 05 CC Roger. We're showing a relatively static pressure on your cabin. Do you think you can open the hatch at this pressure of about 1.2 psi?

04 13 07 18 CDR (TRANQ) We're going to try it.

04 13 07 20 CC Roger.

10:31pm 04 13 07 33 CDR (TRANQ) The hatch is coming open.

04 13 07 40 LMP (TRANQ) Okay. Hold it from going closed and I'll get the valve to - -

04 13 07 43 CDR (TRANQ) Okay.

04 13 07 45 LMP (TRANQ) No. I'd better get up first.

\*\*\* Three asterisks denote clipping of word and phrases.

04 13 08 11 LMP Okay. The valves in AUTO.  
(TRANQ)

04 13 08 12 CDR Okay.  
(TRANQ)

04 13 08 20 LMP Might want to fill it up to FORWARD.  
(TRANQ)

04 13 08 37 CDR Your window cleared yet? Your water window  
(TRANQ) cleared yet?

04 13 08 46 LMP It was, yes.  
(TRANQ)

04 13 08 48 CDR Mine hasn't cleared yet.  
(TRANQ)

04 13 08 55 CC Columbia, this is Houston. Over.

04 13 09 01 CMP Columbia. Go ahead.  
(COLUMBIA)

04 13 09 03 CC Columbia, this is Houston. We'd like you to  
cycle the fans in CRYO hydrogen tank number 1,  
and LOS time this orbit is 111 19 31.

04 13 09 23 CC Correction - Make that for the next orbit. You  
already have the AOS/LOS for this orbit.

04 13 09 35 CMP Roger on time, and you want to cycle the fan in  
(COLUMBIA) CRYO hydrogen tank 1.

04 13 09 41 CC Roger. Out.

04 13 10 39 CDR Have you got your water valve on there?  
(TRANQ)

04 13 10 41 LMP Yes.  
(TRANQ)

04 13 12 35 CC Columbia, this is Houston. We show you nearing  
high-gain antenna scan limits. When you lose lock  
on us, we request OMNI Delta. OMNI Delta when you  
lose lock. Over.

04 13 12 52 CMP Roger. OMNI Delta.  
(COLUMBIA)

04 13 13 22 CDR Okay. My window's cleared. I'm going to go to  
(TRANQ) turn my cooling up a little bit.

04 13 13 26 LMP Okay. My window's clear.  
(TRANQ)

04 13 13 40 CDR All RCU windows are clear. And suit circuit  
(TRANQ) is 42 - 43. And I got ascent pressure light,  
a VF light, and a ECS light.

04 13 14 00 LMP And we've got a water separator light Hold it  
(TRANQ) and I'll check.

04 13 14 03 CDR All right.  
(TRANQ)

04 13 14 05 LMP And I'll look at your cabin fan 1 circuit breaker,  
(TRANQ) and you look at glycol secondary.

04 13 14 26 LMP I've got good cooling now.  
(TRANQ)

04 13 14 28 CDR Me, too.  
(TRANQ)

04 13 14 35 LMP Okay. Glycol pump secondary circuit breaker open?  
(TRANQ)

04 13 14 40 CDR I can see that. I have to lean this way.  
(TRANQ)

04 13 14 48 LMP Can't go any further.  
(TRANQ)

04 13 14 52 CDR My cabin fan 1 \*\*\*  
(TRANQ)

04 13 14 58 LMP Yes. That's good.  
(TRANQ)

04 13 15 00 CDR Can you check it?  
(TRANQ)

04 13 15 05 LMP It's open. Verified.  
(TRANQ)

04 13 15 14 CDR Okay. PGNS radar circuit breaker's open.  
(TRANQ)

04 13 15 29 LMP Well, I'm looking head on at it. I'll get it.  
(TRANQ)

\*\*\* Three asterisks denote clipping of word and phrases.

04 13 15 32 CDR Okay. Let's get your antenna.  
(TRANQ)

04 13 15 33 LMP You'll have to fix my antenna.  
(TRANQ)

04 13 15 43 CDR Well, ready? - -  
(TRANQ)

04 13 15 45 LMP About ready to go down and get some Moon rock?  
(TRANQ)

04 13 15 47 CDR My antenna's out. Okay. Now we're ready to  
(TRANQ) hook up the LEC here.

04 13 16 12 LMP All right. That should go down with no twists  
(TRANQ) at all. Put the bag up this way, that's even.  
Neil, are you hooked up to it?

04 13 16 26 CDR Yes. Okay. Now we need to hook this.  
(TRANQ)

04 13 16 30 LMP Move that up there.  
(TRANQ)

04 13 16 34 CDR Okay.  
(TRANQ)

04 13 16 38 CDR Okay. Your visor.  
(TRANQ)

04 13 16 49 LMP Okay. Your back is up against the purse. All  
(TRANQ) right. Now it's on top of the DSKY. Forward and  
up; now you are clear. Little bit toward me.  
Straight down, to your left a little bit. Plenty  
of room. Neil, you're lined up nicely. Toward  
me a little bit, down. Okay. Now you're clear.  
You're catching the first hinge on the bottom.

04 13 17 26 CDF What hinge?  
(TRANQ)

04 13 17 29 LMP All right. Move, here roll to the left. Okay.  
(TRANQ) Now you're clear. You're lined up on the platform.  
Put your left foot to the right a little bit. Okay.  
That's good. Roll left. Good.

04 13 17 54 CDR Okay. Now I'm going to check PLSS here.  
(TRANQ)

04 13 18 05 LMP Okay. You're not quite squared away. Roll to  
(TRANQ) the - roll right a little. Now you're even.



04 13 18 14 CDR That's okay?  
(TRANQ)

04 13 18 15 LMP That's good. You've got plenty of room to your  
(TRANQ) left. It's a little close on the \*\*\*.

04 13 18 28 CDR How am I doing?  
(TRANQ)

04 13 18 29 LMP You're doing fine.  
(TRANQ)

04 13 18 51 LMP Okay. Do you want those bags?  
(TRANQ)

04 13 18 53 CDR Yes. Got it.  
(TRANQ)

04 13 19 16 CDR Okay. Houston, I'm on the porch.  
(TRANQ)

04 13 19 20 CC Roger, Neil.

04 13 19 36 LMP Okay. Stand by, Neil.  
(TRANQ)

04 13 19 37 CC Columbia, Columbia, this is Houston. One minute  
and 30 seconds to LOS. All systems GO. Over.

04 13 19 46 CME Columbia. Thank you.  
(COLUMBIA)

04 13 19 47 LMP Stay where you are a minute, Neil.  
(TRANQ)

04 13 19 48 CDF Okay. Need a little slack?  
(TRANQ)

04 13 20 38 CDR You need more slack, Buzz?  
(TRANQ)

04 13 20 40 LMP No. Hold it just a minute.  
(TRANQ)

04 13 20 41 CDR Okay.  
(TRANQ)

04 13 20 56 LMP Okay. Everything's nice and straight in here.  
(TRANQ)

\*\*\* Three asterisks denote clipping of word and phrases.

04 13 20 58 CDR (TRANQ) Okay. Can you pull the door open a little more?

04 13 21 00 LMP (TRANQ) All right.

04 12 21 03 CDR (TRANQ) Okay.

04 13 21 07 LMP (TRANQ) Did you get the MESA out?

04 13 21 09 CDR (TRANQ) I'm going to pull it now.

04 13 21 18 CDR (TRANQ) Houston, the MESA came down all right.

04 13 21 22 CC This is Houston. Roger. We copy. And we're standing by for your TV.

04 13 21 39 CDR (TRANQ) Houston, this is Neil. Radio check.

04 13 21 42 CC Neil, this is Houston. Loud and clear. Break. Break. Buzz, this is Houston. Radio check, and verify TV circuit breaker in.

04 13 21 54 LMP (TRANQ) Roger, TV circuit breaker's in, and read you five-square.

04 13 22 00 CC Roger. We're getting a picture on the TV.

04 13 22 09 LMP (TRANQ) You got a good picture, huh?

04 13 22 11 CC There's a great deal of contrast in it, and currently it's upside-down on our monitor, but we can make out a fair amount of detail.

04 13 22 28 LMP (TRANQ) Okay. Will you verify the position - the opening I ought to have on the camera?

04 13 22 34 CC Stand by.

04 13 22 48 CC Okay. Neil, we can see you coming down the ladder now.

04 13 22 59 CDR (TRANQ) Okay. I just checked getting back up to that first step, Buzz. It's - not even collapsed too far, but it's adequate to get back up.

04 13 23 10           CC           Roger. We copy.

04 13 23 11           CDR  
(TRANQ)       It takes a pretty good little jump.

04 13 23 25           CC           Buzz, this is Houston. F/2 - 1/160th second  
for shadow photography on the sequence camera.

04 13 23 35           LMP  
(TRANQ)       Okay.

04 13 23 38           CDR  
(TRANQ)       I'm at the foot of the ladder. The LM footpads  
are only depressed in the surface about 1 or  
2 inches, although the surface appears to be very,  
very fine grained, as you get close to it. It's  
almost like a powder. Down there, it's very fine.

04 13 23 13           CDR  
(TRANQ)       I'm going to step off the LM now.

*is it 46*  
*per* { 04 13 24 48       CDR  
(TRANQ)       THAT'S ONE SMALL STEP FOR MAN, ONE GIANT LEAP  
FOR MANKIND.

04 13 24 48           CDR  
(TRANQ)       And the - the surface is fine and powdery. I  
can - I can pick it up loosely with my toe.  
It does adhere in fine layers like powdered  
charcoal to the sole and sides of my boots. I  
only go in a small fraction of an inch, maybe an  
eighth of an inch, but I can see the footprints  
of my boots and the treads in the fine, sandy  
particles.

04 13 25 30           CC           Neil, this is Houston. We're copying.

04 13 25 45           CDR           There seems to be no difficulty in moving around  
as we suspected. It's even perhaps easier than  
the simulations at one-sixth g that we performed  
in the various simulations on the ground. It's  
actually no trouble to walk around. Okay. The  
descent engine did not leave a crater of any size.  
It has about 1 foot clearance on the ground.  
We're essentially on a very level place here. I  
can see some evidence of rays emanating from the  
descent engine, but a very insignificant amount.

04 13 26 54           CDR           Okay, Buzz, we ready to bring down the camera?

04 13 26 59           LMP           I'm all ready. I think it's been all squared away  
and in good shape.

04 13 27 03           CDR           Okay.

04 13 27 05 LMP Okay. You'll have to pay out all the LEC. It looks like it's coming out nice and evenly.

04 13 27 13 CDR Okay. It's quite dark here in the shadow and a little hard for me to see that I have good footing. I'll work my way over into the sunlight here without looking directly into the Sun.

04 13 27 28 LMP Okay. It's taut now.

04 13 27 51 LMP Okay. I think you're pulling the wrong one.

04 13 27 55 CDR I'm just - Okay. I'm ready to pull it down now. There was still a little bit left in the -

04 13 28 01 LMP Okay. Don't hold it quite so tight.

04 13 28 02 CDR Okay.

04 13 28 17 CDR Looking up at the LM, I'm standing directly in the shadow now looking up at Buzz in the window. And I can see everything quite clearly. The light is sufficiently bright, backlighted into the front of the LM, that everything is very clearly visible.

04 13 28 55 LMP Okay. I'm going to be changing the \*\*\*

04 13 28 58 CDR Okay.

04 13 30 23 CDR The camera is installed on the RCU bracket, and I'm storing the LEC on the secondary strut.

04 13 30 53 CDR I'll step out and take some of my first pictures here.

04 13 31 05 CC Roger. Neil, we're reading you loud and clear. We see you getting some pictures and the contingency sample.

04 13 32 19 CC Neil, this is Houston. Did you copy about the contingency sample? Over.

04 13 32 26 CDR Roger. I'm going to get to that just as soon as I finish these picture series.

04 13 33 25 LMP Okay. Going to get the contingency sample there, Neil.

\*\*\* Three asterisks denote clipping of words and phrases.

04 13 33 27 CDR Right.

04 13 33 30 LMP Okay. That's good.

04 13 33 58 LMP Okay. The contingency sample is down and it's \*\*\*. Looks like it's a little difficult to dig through the initial crust.

04 13 34 12 CDR This is very interesting. It's a very soft surface, but here and there where I plug with the contingency sample collector, I run into a very hard surface, but it appears to be very cohesive material of the same sort. I'll try to get a rock in here. Just a couple.

04 13 34 54 LMP That looks beautiful from here, Neil.

04 13 34 56 CDR It has a stark beauty all its own. It's like much of the high desert of the United States. It's different but it's very pretty out here. Be advised that a lot of the rock samples out here, the hard rock samples, have what appear to be vesicles in the surface. Also, I am looking at one now that appears to have some sort of phenocryst.

04 13 35 30 CC Houston. Roger. Out.

04 13 35 43 LMP Okay. The handle is off the \*\*\* in about 6 or 8 inches into the surface. I could \*\*\* easy \*\*\*.

04 13 35 56 CDR Yes, it is. It's - I'm sure I could push it in farther, but it's hard for me to bend down further than that.

04 13 36 07 LMP Now, you can throw so far.

04 13 36 08 CDR You can really throw things a long way up here.

04 13 36 32 CDR That pocket open, Buzz?

04 13 36 35 LMP Yes, it is. It's not up against your suit though. Hit it back once more. More toward the inside. Okay. That's good.

04 13 36 57 CDR That in the pocket?

04 13 36 52 LMP Yes. Push down.

\*\*\* Three asterisks denote clipping of words and phrases.

04 13 36 55 CDR Got it?

04 13 36 57 LMP No. It's not all the way in. Push it. There you go.

04 13 37 08 CDR Contingency sample is in the pocket. My oxygen is 81 percent. I have no flags, and I'm in minimum flow.

04 13 37 22 CC This is Houston. Roger, Neil.

04 13 37 40 LMP Okay. I have got the cameras on at one frame a second.

04 13 37 44 CDR Okay.

04 13 37 52 LMP And I've got the 80 percent, no flags.

04 13 38 00 CDR Are you getting a TV picture now, Houston?

04 13 38 05 CC Neil, yes we are getting a TV picture.

04 13 38 22 CC Neil, this is Houston. We're getting a picture. You're not in it at the present time. We can see the bag on the LEC being moved by Buzz, though. Here you come into our field of view.

04 13 38 33 CDR ...

04 13 38 35 LMP Roger.

04 13 38 36 CDR Hold it a second. First let me move that over the edge for you.

04 13 38 41 LMP Okay. Are you ready for me to come out?

04 13 38 42 CDR Yes. Just stand by a second. I'll move this over the handrail.

04 13 39 06 CDR Okay.

04 13 39 07 LMP All right. That's got it. Are you ready?

04 13 39 11 CDR All set. Okay. You saw what difficulties I was having. I'll try to watch your PLSS from underneath here.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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04 13 39 43 LMP All right. The backup camera's positioned.

04 13 39 57 CDR Okay. Your PLSS is - Looks like it is clearing okay. Your toes are about to come over the sill. Okay. Now drop your PLSS down. There you go; you're clear. And laterally you're good. You've got an inch clearance on top of your PLSS.

04 13 40 18 LMP Okay. You need a little bit of arching of the back to come down. ... How are are my feet from the edge?

04 13 40 27 CDR Okay. You're right at the edge of the porch.

04 13 40 30 LMP Okay. Back in \*\*\* little of foot movement \*\*\* porch. Little arching of the back. Helmet comes up and clears the bulkhead without any trouble at all.

04 13 40 48 CDR Looks good.

04 13 41 08 CC Neil, this is Houston. Based on your camera transfer with the LEC, do you foresee any difficulties in SRC transfer? Over.

04 13 41 18 CDR Negative.

04 13 41 28 LMP Okay. Now I want to back up and partially close the hatch.

04 13 41 47 LMP Making sure not to lock it on my way out.

04 13 41 53 CDR (Laughter) A pretty good thought.

04 13 41 56 LMP That's our home for the next couple of hours and we want to take good care of it. Okay. I'm on the top step and I can look down over the RCU, landing gear pads. It's a very simple matter to hop down from one step to the next.

04 13 42 18 CDR Yes. I found I could be very comfortable, and walking is also very comfortable.

04 13 42 28 CDR You've got three more steps and then a long one.

\*\*\* Three asterisks denote clipping of words and phrases.

04 13 42 42 LMP Okay. I'm going to leave that one foot up there and both hands down to about the fourth rung up.

04 13 42 50 CDR There you go.

04 13 42 53 LMP Okay. Now I think I'll do the same \*\*\*

04 13 43 01 CDR A little more. About another inch.

04 13 43 05 CDR THERE YOU GOT IT.

04 13 43 08 CDR That's a good step. About a 3-footer.

04 13 43 16 LMP Beautiful view!

04 13 43 18 CDR Isn't that something! Magnificent sight out here.

04 13 43 24 LMP Magnificent desolation.

04 13 43 47 LMP Looks like the secondary strut \*\*\* little thermal effects on it right here, Neil.

04 13 43 54 CDR Yes. I noticed that. That seems to be the worst, although similar effects are on - all around.

04 13 44 -- BEGIN LUNAR REV 18

04 13 44 07 MS ... powder, isn't it?

04 13 44 09 CDR Isn't it fine?

04 13 44 11 LMP Right in this area I don't think there's much of any \*\*\* fine powder \*\*\* clods together, and it's hard to tell whether it's a clod or a rock.

04 13 44 23 CDR Notice how you can kick it out.

04 13 44 28 LMP Yes. And it bounces and then -

04 13 44 55 LMP Reaching down is fairly easy. I got my suit dirty at this stage.

\*\*\* Three asterisks denote clipping of words and phrases.



04 13 45 11 LMP The mass of the backpack does have some effect in inertia.

04 13 45 30 LMP There's a slight tendency, I can see now, to \*\*\* backwards \*\*\* due to the soft, very soft texture.

04 13 45 45 CDR You're standing on a rock, a big rock there now.

04 13 46 01 LMP This pad sure didn't \*\*\*

04 13 46 05 CDR No. It didn't.

04 13 46 08 LMP There's absolutely no crater there at all from the engine.

04 13 46 10 CDR No.

04 13 46 12 LMP I wonder if about right under the engine is where the probe might have hit.

04 13 46 20 CDR I'd like that.

04 13 46 25 CDR Yes. I think that's a good representation of our sideward velocity at touchdown there - hole at the probe.

04 13 46 30 LMP I see that probe over on the minus-Y strut. It's broken off and bent back up.

04 13 46 40 CDR It did, didn't it? The other two both bent over.

04 13 47 04 LMP Can't say too much for the visibility right here without the visor up. It's dark. It looks like there is a \*\*\* surface of it is \*\*\* pounded rock \*\*\* And incidentally, these rocks \*\*\* very powdery surface \*\*\*

04 13 47 40 CC Say again, please, Buzz; you're cutting out.

04 13 47 45 LMP I say that the rocks are rather slippery.

04 13 47 50 CC Roger.

04 13 47 52 LMP A powdery surface when the sun hits. \*\*\* they split up all the very little fine porouses \*\*\*. Will tend to slide over it rather easily.

04 13 48 25 LMP Traction \*\*\* seems quite good. \*\*\*

\*\*\* Three asterisks denote clipping of words and phrases.

04 13 48 30 LMP \*\*\* About to lose my balance in one direction and recovery is a quite natural and very easy \*\*\* And, moving your arms around, Jack, doesn't \*\*\* off the surface \*\*\* not quite that light-footed.

04 13 49 06 CDR And, I have the insulation off the MESA now and MESA seems to be in good shape.

04 13 49 13 LMP Got to be careful that you are leaning in the direction you want to go, otherwise you \*\*\* slightly inebriated. In other words, you have to cross your foot over to stay underneath where your center-of-mass is.

04 13 49 37 LMP And, Neil, didn't I say we might see some purple rocks?

04 13 49 42 CDR Find a purple rock?

04 13 49 44 LMP Yes. They are small, sparkly \*\*\* fragments \*\*\* places \*\*\* would make a first guess that some sort of biotite \*\*\* We'll leave that to further analysis \*\*\*

04 13 50 28 LMI \*\*\* compact underneath \*\*\* completely no \*\*\* you don't sink down more than ... a quarter of an inch.

04 13 50 59 CDR Okay, Houston. I'm going to change lenses on you.

04 13 51 05 CC Roger, Neil.

04 13 51 30 CDR Okay, Houston. Tell me if you're getting a new picture.

04 13 51 35 CC Neil, this is Houston. That's affirmative. We're getting a new picture. You can tell it's a longer focal length lens. And for your information, all LM systems are GO. Over.

04 13 51 46 LMP We appreciate that. Thank you.

04 13 52 19 LMP Neil is now unveiling the plaque \*\*\* gear.

04 13 52 27 CC Roger. We got you boresighted, but back under one track.

\*\*\* Three asterisks denote clipping of words and phrases.

04 13 52 40 CDR For those who haven't read the plaque, we'll read the plaque that's on the front landing gear of this LM. First there's two hemispheres, one showing each of the two hemispheres of the Earth. Underneath it says "Here Man from the planet Earth first set foot upon the Moon, July 1969 A.D. We came in peace for all mankind." It has the crew members' signatures and the signature of the President of the United States.

04 13 53 35 CDR Ready for the camera?

04 13 53 38 LMF No. I'll get it. No, you take this TV on out.

04 13 53 45 CDR Watch the LEC, there.

04 13 53 53 LMP Now I'm afraid these ... materials are going to get dusty \*\*\*

04 13 54 07 LMF The surface material is powdery! \*\*\* How good your lens is, but if you can \*\*\* smudges ... very much like a very finely powdered carbon, but it's very pretty looking.

04 13 54 40 CDR Would you pull out some of my cable for me, Buzz?

04 13 54 58 LMF Houston. How close are you able to get things in focus?

04 13 55 02 CC This is Houston. We can see Buzz's right hand. It is somewhat out of focus. I'd say we were focusing down to probably - oh, about 3 inches to a foot behind the position of his hand when he was pulling out the cable.

04 13 55 21 LMP Okay. How's the temperature on there?

04 13 55 25 CDR Temperature of the camera is showing zero.

04 13 55 32 LMP I'm a little cool. I think I'll trade \*\*\*

04 13 55 43 LMP I'm on intermediate now, Houston, and I show 3.78. No flags, 70 \*\*\*

04 13 55 50 CC Houston. Roger. Out.

04 13 55 57 LMP And, we'll probably need a little \*\*\* distance \*\*\* back location \*\*\* television camera.

\*\*\* Three asterisks denote clipping of words and phrases.

04 13 56 14 LMP Neil, look at the minus Y-strut, the direction of travel there \*\*\* travel from right to left.

04 13 56 24 CDR Right.

04 13 56 25 LMP This one over here underneath the ascent engine where the probe first hit - the minus-Y probe first hit.

04 13 56 35 CDR I got plenty of cable?

04 13 56 38 LMP You've got plenty. Plenty more.

04 13 56 48 LMP Okay. I think I've got the end of it.

04 13 56 51 CDR Something interesting: in the bottom of this little crater here - It may be -

04 13 57 01 LMP Now keep going. We've got a lot more.

04 13 57 03 CDR Okay.

04 13 57 04 LMP Getting a little harder to pull out, here.

04 13 57 30 CDR How far would you say I am, Buzz?

04 13 57 33 LMP Forty, 50 feet. Why don't you turn around and let them get a view from there and see what the field of view looks like?

04 13 57 42 CDR Okay.

04 13 57 45 LMP You're backing into the cable.

04 13 57 46 CDR Okay.

04 13 57 50 LMP Turn around to your right, would be better.

04 13 57 53 CDR I don't want to go into the Sun if I can avoid it.

04 13 57 55 LMP That's right. Yes.

04 13 57 59 CDR I'll just leave it --

04 13 58 01 LMP - - All right.

04 12 58 02 CDR - - sit like that and walk around it.

\*\*\* Three asterisks denote clipping of words and phrases.

04 13 58 06 LMP Houston. How's that field of view going to pick up the MESA? \*\*\* far away?

04 13 58 15 CC Roger.

04 13 58 20 CC Neil, this is Houston. The field of view is okay. We'd like you to aim it a little bit more to the right. Over.

04 13 58 28 CDR Okay.

04 13 58 32 LMF Okay. That's all the cable we have. \*\*\* not going out. I'll start working on the solar wind - -

04 13 58 40 CC A little bit too much to the right. Can you bring it back left about 4 or 5 degrees?

04 13 58 50 CC Okay. That looks good Neil.

04 13 58 55 CDR Okay, now. Do you think I ought to be farther away, or closer?

04 13 59 01 LMF Can't get too much further away.

04 13 59 05 CDR Let's try it like that for a while. I'll get a couple of panoramas with it, here.

04 13 59 13 CC Roger. You look okay as far as distance goes, Neil. And we'll line you up again when you finish the panorama. Now you're going too far on the panorama sweep. You're going to have to stop, or -

04 13 59 28 CDR I haven't stopped - I haven't set it down yet. That's the first picture in the panorama. Right there.

04 13 59 35 CC Roger.

04 13 59 40 CDR It's taken just a little - about north, north-east.

04 13 59 52 CDR Tell me if you've got a picture, Houston.

04 13 59 54 CC We've got a beautiful picture, Neil.

04 13 59 58 CDR Okay. I'm going to move it.

\*\*\* Three asterisks denote clipping of words and phrases.

04 14 00 10      CC      Okay. Here's another good one.

04 14 00 23      CC      Okay, we got that one.

04 14 00 29      CDR      Okay. Now, this one is right down front, straight west. And I want to know if you can see an angular rock in the foreground.

04 14 00 41      CC      Roger. We have a large angular rock in the foreground, and it looks like a much smaller rock a couple of inches to the left of it. Over.

04 14 00 52      CDR      All right. And then on beyond it about 10 feet is an even larger rock that's very rounded. That rock is about - The closest one to you is about sticking out of the sand about 1 foot. And it's about a foot and one-half long, and it's about 6 inches thick, but it's standing on edge.

04 14 01 16      CC      Roger.

04 14 01 26      LMP      Okay, Neil. I've got the table out and the bag deployed.

04 14 01 33      CC      We've got this view, Neil.

04 14 01 42      CDR      This is straight south.

04 14 01 45      CC      Roger. And we see the shadow of the LM.

04 14 01 48      CDR      Roger. The little hill just beyond the shadow of the LM is a pair of elongate craters about - probably the pair together is about 40 feet long and 20 feet across, and they're probably 6 feet deep. We'll probably get some more work in there later.

04 14 02 20      CC      Roger. We see Buzz going about his work.

04 14 02 22      CDR      How's that for a final?

04 14 02 26      CC      For a final orientation, we'd like it to come left about 5 degrees. Over.

04 14 02 36      CC      Now back to the right about half as much.

04 14 02 42      CDR      Okay?

04 14 02 53      CC      Okay. That looks good there, Neil.

04 14 03 00 CDR Okay.

04 14 03 20 CDR Okay. You can make a Mark, Houston. \*\*\* de-  
ployed.

04 14 03 24 CC Roger. Solar wind.

04 14 03 36 LMF And, incidently, you can use the shadow that the  
staff makes to \*\*\* getting it perpendicular \*\*\*.

04 14 03 50 CC Roger.

04 14 04 05 LMF Some of these small depressions \*\*\* tend to sink -  
oh, maybe 2 or 3 inches. \*\*\* suggest exactly  
what the Surveyor pictures showed when they  
pushed away a little bit. You get a force trans-  
mitted through the upper surface of the soil and  
about 5 or 6 inches of bay breaks loose and moves  
as if it were caked on the surface, when in fact  
it really isn't.

04 14 04 43 CDR I noticed in the soft spots where we had foot-  
prints nearly an inch deep that the soil is very  
cohesive and it will retain a - will retain a  
slope of probably 70 degrees along side of the  
footprints.

04 14 06 29 CDR Okay?

04 14 06 30 LMF Yes. I think that's excellent.

04 14 06 39 LMF They didn't come off?

04 14 06 46 LMF \*\*\* get the \*\*\*

04 14 07 01 CDR \*\*\* that part? \*\*\* a rock here.

04 14 07 38 LMF You'll have to extend that one.

04 14 07 58 CC Columbia, Columbia, this is Houston. Over.

04 14 08 26 LMF \*\*\*

04 14 08 53 CMI Houston, Columbia on the high gain. Over.  
(COLUMBIA)

04 14 08 55 CC Columbia, this is Houston. Reading you loud and  
clear. Over.

04 14 09 03 CMP Yes. Reading you loud and clear. How's it going?  
(COLUMBIA)

\*\*\* Three asterisks denote clipping of words or phrases.

04 14 09 05           CC           Roger. The EVA is progressing beautifully. I believe they are setting up the flag now.

04 14 09 14           CMP  
(COLUMBIA)           Great.

04 14 09 18           CC           I guess you're about the only person around that doesn't have TV coverage of the scene.

04 14 09 25           CMP  
(COLUMBIA)           That's all right. I don't mind a bit.

04 14 09 33           CMP  
(COLUMBIA)           How is the quality of the TV?

04 14 09 35           CC           Oh, it's beautiful, Mike. It really is.

04 14 09 39           CMP  
(COLUMBIA)           Oh, gee, that's great! Is the lighting half-way decent?

04 14 09 43           CC           Yes, indeed. They've got the flag up now and you can see the stars and stripes on the lunar surface.

04 14 09 50           CMP  
(COLUMBIA)           Beautiful. Just beautiful.

04 14 10 16           LMP           That's good. See if you can pull that end off a little bit. Take that end up a little.

04 14 10 33           CDP           It won't pull out.

04 14 10 39           CDP           Okay.

04 14 12 21           CC           Neil, this is Houston. Radio check. Over.

04 14 12 27           CDR           Roger, Houston. Loud and clear.

04 14 12 29           CC           Roger. Out.

04 14 12 30           LMP           Loud and clear, Houston.

04 14 12 32           CC           Roger, Buzz.

04 14 13 15           LMP           I'd like to evaluate the various paces that a person can \*\*\* traveling on the lunar surface. I believe I'm out of your field of view. Is that right, now, Houston?

\*\*\* Three asterisks denote clipping of words and phrases.



04 14 13 30 CC That's affirmative, Buzz.

04 14 13 37 CC You are in our field of view now.

04 14 13 42 LMP Okay. You do have to be rather careful to keep track of where your center of mass is. Sometimes, it takes about two or three paces to make sure you've got your feet underneath you.

04 14 14 05 LMP About two to three or maybe four easy paces can bring you to a nearly smooth stop. \*\*\* change directions, like a football player, you just have to to \*\*\* foot out to the side and cut a little bit.

04 14 14 38 LMP So-called kangaroo hop does work, but it seems that your forward mobility is not quite as good as - it is in the conventional - more conventional one foot after another.

04 14 15 06 LMP It's hard saying what a sane pace might be. I think it's the one that I'm using now - would get rather tiring after several hundred \*\*\* but this may be a function of this suit, as well as lack of gravity forces.

04 14 15 47 CC Tranquility Base, this is Houston. Could we get both of you on the camera for a minute, please?

04 14 16 00 CDF Say again, Houston.

04 14 16 02 CC Roger. We'd like to get both of you in the field of view of the camera for a minute.

04 14 16 09 CC Neil and Buzz, the President of the United States is in his office now and would like to say a few words to you. Over.

04 14 16 23 CDR That would be an honor.

04 14 16 25 CC Go ahead, Mr. President. This is Houston. Out.

THE FOLLOWING IS A MESSAGE FROM RICHARD M. NIXON, PRESIDENT OF THE UNITED STATES; THE MESSAGE ORIGINATED FROM THE OVAL ROOM OF THE WHITE HOUSE, WASHINGTON, DISTRICT OF COLUMBIA

04 14 16 30 PRESIDENT Neil and Buzz, I am talking to you by telephone  
NIXON from the Oval Room at the White House, and this certainly has to be the most historic telephone

\*\*\* Three asterisks denote clipping of words and phrases.



04 14 20 06 LMP Houston, it's very interesting to note that when I kick my foot \*\*\* with no atmosphere here, and this gravity \*\*\* they seem to leave, and most of them have about the same angle of departure and velocity. From where I stand, a large portion of them will impact at a certain distance out. Several \*\*\* the percentage is, of course, that will impact \*\*\* different regions \*\*\* it's highly dependent upon \*\*\* the initial trajectory upward \*\*\* where most of the \*\*\* already the particles are found, ... terrain.

04 14 21 08 CC Roger, Buzz. And break. Break. Columbia, this is Houston. When you track out of high-gain antenna, then let's request OMNI Delta, OMNI Delta. Over.

04 14 21 20 CMP So be it.  
(COLUMBIA)

04 14 21 24 LMP I've noticed several times in going from the sunlight into the shadow, that just as I go in, I catch an additional reflection off the LM \*\*\* along with the reflection off my face onto the visor, makes visibility very poor just at the transition \*\*\* sunlight into the shadow. I essentially have so much glare coming onto my visor \*\*\* shadow \*\*\* helmet actually gets the shadow. Then it takes a short while for my eyes to adapt to the lighting conditions. \*\*\* inside the shadow area, visibility, as we said before, is not too great, but both visor's up \*\*\* what sort of footprints we have and the general condition of the soil. Then, after being out in the sunlight a while, it takes - Watch it, Neil! Neil, you're on the cable.

04 14 22 40 CDR Okay.

04 14 22 41 LMP Yes. Lift up your right foot, right foot. It's still - your toe is still hooked in it.

04 14 22 45 CDR That one?

04 14 22 46 LMP Yes. It's still hooked in it. Wait a minute. Okay. You're clear now.

\*\*\* Three asterisks denote clipping of words and phrases.

04 14 22 51 CDR Thank you.

04 14 22 55 LMP Now, let's move that over this way.

04 14 23 04 LMP Okay. I've got it.

04 14 23 32 LMP The blue color of my boots has completely disappeared now into this \*\*\* still don't know exactly what color to describe this other than ash-cocoa color. It seems to be covering most of the lighter part of the boot \*\*\* color that \*\*\* very fine particles \*\*\*.

04 14 24 11 CC Buzz, this is Houston. You're cutting out on the end of your transmissions. Can you speak a little more closely into your microphone? Over.

04 14 24 23 LMP Roger. I'll try that.

04 14 24 25 CC Beautiful.

04 14 24 30 LMP Well, I had that one inside my mouth that time.

04 14 24 35 CC It sounded a little wet.

04 14 25 09 LMP In general, time spent in the shadow doesn't seem to have any \*\*\* thermal effects. \*\*\* inside the suit. There is a difference, of course, in the ... radiation and the helmet. So I think there's a tendency to feel a little cooler in the shadow than the Sun.

04 14 25 41 CC Columbia, this is Houston. Over.

04 14 26 05 CC Columbia, this is Houston. Over.

04 14 26 55 CC Columbia, this is Houston. Over.

04 14 27 03 CMP  
(COLUMBIA) Houston, Columbia in Delta.

04 14 27 05 CC Roger. You should have VHF AOS with the LM right about now. VHF LOS will be about 40 minutes 15 seconds. Over.

04 14 27 20 CMP  
(COLUMBIA) Thank you.

\*\*\* Three asterisks denote clipping of words and phrases.

04 14 28 22        LMP        As I look around the area, the contrast, in general, is \*\*\* comes about completely by virtue of the shadow \*\*\* down Sun ... very light-colored gray, light gray color, a halo around my own shadow, around the shadow of my helmet. Then, as I look off across \*\*\* the contrast becomes strongest in that the surrounding color is still fairly light. As you look down into the Sun \*\*\* a larger amount of \*\*\* shadowed area is looking toward us. The general color of the \*\*\* surrounding \*\*\* the contrast is not as great. Surveying all the dusty area that we've kicked up \*\*\* considerably darker in texture. Now, I've kicked up one, and I imagine that this is \*\*\* Surveyor. The same is true when I survey across on - along the area that we're walking. In general \*\*\* to the fact that there are footprints there. General terrain where I've been kicking up a lot of this surface material is generally of a darker contrast \*\*\* color.

04 14 31 29        LMP        The panorama I'll be taking is about 30 or 40 feet out to plus \*\*\*

04 14 31 39        CC        Say again which strut, Buzz?

04 14 31 43        LMP        The plus-Z strut.

04 14 31 47        CC        Roger.

04 14 31 48        LMP        And right in this area, there are two craters. The one that's right in front of me now as I look off in about the eleven o'clock position from the spacecraft, about 30 to 35 feet ... There's several eral rocks and boulders 6 to 8 inches across ... sizes.

04 14 34 13        LMP        I'm now in the area of the minus-Y strut taking some ... photographs.

04 14 35 52        LMP        How's the bulk sample coming, Neil?

04 14 35 56        CDR        Bulk sample is just being sealed.

04 14 36 58        CMP  
(COLUMBIA)        Houston, Columbia.

04 14 37 01        CC        Columbia, this is Houston. Go ahead. Over.

\*\*\* Three asterisks denote clipping of words and phrases.

04 14 37 09           CMP  
                  (COLUMBIA)     Roger. No marks on the LM that time. I did see  
                                  a suspiciously small white object whose coordi-  
                                  nates are - -

04 14 37 25           CC                   Go ahead with the coordinates on the small white  
                                  object.

04 14 37 28           CMP  
                  (COLUMBIA)     Easy - Easy 0.3, 7.6, but I ... right on the  
                                  southwest end of a crater. I think they would  
                                  know it if they were in such a location. It  
                                  looks like their LM would be pitched up quite  
                                  a degree. It's on the southwest wall of a  
                                  smallish crater.

04 14 37 58           CC                   Roger. Copy Echo 0.3 and 7.6, and -

04 14 38 27           CC                   Columbia, this is Houston. While I'm talking  
                                  to you, LOS will be at 111 19 31; AOS, 112 05 43.  
                                  Over.

04 14 39 04           CC                   Columbia, this is Houston. Did you copy LOS AOS  
                                  times? Over.

04 14 39 14           CMP  
                  (COLUMBIA)     Negative, Houston. You broke. Disregard. I'll  
                                  get them off the flight plans.

04 14 39 19           CC                   Roger. Out.

04 14 39 56           LMP                  The jet deflector that's mounted on quad 1 seems  
                                  to be a good bit more wrinkled \*\*\* right now on  
                                  quad 4.

04 14 40 12           CC                   You're breaking up again, Buzz.

04 14 40 18           LMP                  I say the jets deflector that's mounted on quad 4  
                                  seems to be - the surface of it seems to be more  
                                  wrinkled than the one that's on quad 1. Generally,  
                                  underneath part of the LM seems to have stood up  
                                  quite well to the \*\*\* get some pictures in the aft  
                                  part of the LM that will illuminate the thermal  
                                  effects much better than we could get them up here  
                                  in the front.

04 14 40 53           CC                   Roger. Out.

04 14 40 58           LMP                  We're going to get some particular photographs of  
                                  the bulk sample area, Neil?

\*\*\* Three asterisks denote clipping of words and phrases.

04 14 41 07 CDR Okay.

04 14 41 25 LMP And, Houston? Buzz here. I'm showing 3.78 psi, 63 percent, no flags, adequate, slight warming \*\*\* fingered.

04 14 42 01 CDR Roger. And Neil has 66 percent O<sub>2</sub>, no flags, minimum cooling, and the suit pressure is 382.

04 14 42 14 CC Houston. Roger. Out.

04 14 42 39 CC Buzz, this is Houston. Have you removed the closeup camera from the MESA yet? Over.

04 14 42 50 LMP Negative. Thank you.

04 14 43 18 LMP \*\*\* get the panorama now. Okay.

04 14 43 33 LMP Did you get it?

04 14 43 50 CDR Houston, how does our timeline appear to be going?

04 14 43 55 CC Roger. It looks like you're about a half hour slow on it. We're working on consumables. Over.

04 14 44 03 CDR All right.

04 14 44 45 CC Neil and Buzz, this is Houston. To clarify my last, your consumables are in good shape at this time. The 30-minute reference was with respect to the nominal timeline. Over.

04 14 45 03 CDR Roger. I understand that.

04 14 46 36 CDR I don't note any abnormalities in the LM. The pods seem to be in good shape. The primary and secondary struts are in good shape. Antennas are all in place. There's no evidence of problem underneath the LM due to engine exhaust or drainage of any kind.

04 14 47 17 CC Roger. Out.

04 14 47 18 LMP It's very surprising, the very surprising lack of penetration of all four of the foot pads. I'd say if we were to try and determine just how far below the surface they would have penetrated, you'd measure maybe 3 inches, wouldn't you say, Neil?

\*\*\* Three asterisks denote clipping of words and phrases.

04 14 47 37 CDR At the most, yes. That Y-strut there is probably even less than that.

04 14 47 55 LMP Nice paint job.

04 14 48 04 CDR I get a picture of the plus-Y strut taken from near the descent stage, and I think we'll be able to see a little bit better what the thermal effects are. Seem to be quite minimal.

04 14 48 48 LMP There's one picture taken in the right rear of the spacecraft looking at the skirt of the descent stage, shows a quite darkening of the surface color, a rather minimal amount of radiating or etching away or erosion of the surface. On descent, both of us remarked that we could see a large amount of very fine dust particles moving out. It was reported beforehand that we would probably see an upgassing from the surface after actual engine shutdown, but as I recall, I was unable to confirm that.

04 14 50 26 LMP This is too big an angle, Neil.

04 14 50 34 CDR Yes. I think you are right.

04 14 51 29 LMP We're back at the minus-Z strut now. \*\*\* very little force of impact that we actually had.

04 14 52 01 LMP And, Neil, if you'll take the camera, I'll get to work on the SEQ bay.

04 14 52 05 CDR Okay.

04 14 52 07 CC Columbia, Columbia, this is Houston. I notice that -

04 14 52 16 CC Go ahead, Buzz.

04 14 52 20 LMP Taking some close-up pictures of that rock.

04 14 52 27 LMP I was saying that, Houston, \*\*\* stop and take a photograph or something and then want to start moving again sideways, there's quite a tendency to start doing it with just gradual sideways hops until you start getting \*\*\*

04 14 52 47 CC Roger.

\*\*\* Three asterisks denote clipping of words and phrases.



04 14 52 57 LMP Can you see us underneath the LM over at the SEQ bay, Houston?

04 14 53 00 CC Yes indeed, Buzz. We can see your feet sticking our underneath the structure of the LM descent stage.

04 14 53 08 LMP Okay. I'm just on the other side of the - -

04 14 53 13 CC Now we can see you through the structure of the minus-Z secondary strut.

04 14 53 38 LMP All right. The doors are open, and it looks like they are going to stay up without any problem.

04 14 53 46 CC Columbia, Columbia, this is Houston. We are about to lose you on the OMNI's. Request high-gain antenna, REACQ mode Fish 20, yaw 135. Over.

04 14 54 03 LMP You want to pick an area, Neil?

04 14 54 05 CC Make that yaw 175, Columbia, yaw 175 on the high gain.

04 14 54 14 CMP Columbia is locked up on the high gain, Houston.  
(COLUMBIA)

04 14 54 16 CC Roger. Out.

04 14 55 42 LMP Houston, the passive seismometer has been deployed manually.

04 14 55 49 CC Roger.

04 14 56 30 LMP And the manual deployment of the LR cubed, the little spring that is at the end of the string is pulled off of the picks head. However, I was able to reach up and get hold of the picks head and pull it loose. So, it will be deployed manually, also.

04 14 56 51 CC Roger.

04 14 57 05 CDR And, the panorama is complete. \*\*\* and the LM - got the LM at 7 30 position at about 60 feet.

04 14 57 39 CDR And the doors are closed and locked.

04 14 57 43 CC Roger.

04 14 57 50 LMP Have you got us a good area picked out?

04 14 57 53 CDR Yes. I think right out on that rise out there is probably as good as any.

04 14 58 08 CDR I'll probably stay on the high ground there and - -

04 14 58 16 LMP Watch it; the edge of that crater is - drops - -

04 14 58 19 CDR Yes. It drops off there, doesn't it?

04 14 58 24 LMP Get a couple of close-ups on these quite rounded large boulders.

04 14 58 44 CDR About 40 feet out - I'd say out at the end of that next - -

04 14 58 50 LMP It's going to be a little difficult to find a good level spot here.

04 14 58 55 CDR The top of that next little ridge there. Wouldn't that be a pretty good place?

04 14 59 03 LMP All right. Should I put the LR cubed right about here?

04 14 59 07 CDR All right.

04 14 59 10 LMP I'm going to have to get on the other side of this rock here.

04 14 59 19 CDR I would go right around that crater to the left there. Isn't that a level spot there?

04 14 59 25 LMP I think this right here is just as level.

04 15 00 00 CDR These boulders look like basalt, and they have probably 2-percent white minerals in them, the white crystals. And the thing that I reported as the vesicular before, I'm not - I don't believe I believe that any more. I think that small craters - they look like little impact craters where shot - B-B shot has hit the surface.

04 15 02 08 LMP Houston. I have the seismic experiment flipped over now, and I'm aligning it, but I'm having a little bit of difficulty getting the B-B in the center. It wants to move around and around on the outside. \*\*\*

\*\*\* Three asterisks denote clipping of words and phrases.

04 15 02 34        CC        You're cutting out again, Buzz.

04 15 02 49        LMP        Roger. I say I'm not having too much success in leveling the PSE experiment.

04 15 03 57        CDR        The laser reflector is installed and the bubble is leveled and the alignment appears to be good.

04 15 04 16        CC        Neil, this is Houston. Roger. Out.

04 15 04 23        LMP        Hey, you want to take a look at this B-B and see what you make out of it?

04 15 04 30        CDR        I find it pretty hard to get perfectly level, too.

04 15 04 37        LMP        That B-B likes the outside. It won't go on the inside.

04 15 04 48        CDR        That little cup is convex now, instead of concave.

04 15 04 53        LMP        I think you're right.

04 15 04 56        CDR        Believe it is.

04 15 04 57        LMP        Houston, I don't think there's any hope for using this leveling device to come up with an accurate level. It looks to me as though the cup here that the B-B is in is now convex instead of concave. Over.

04 15 05 19        CC        Roger, ll. Press on. If you think it looks level by eyeball, go ahead.

04 15 05 28        LMP        Okay.

04 15 06 03        CDR        ...

04 15 06 20        CDR        There you go. Good work; good show. Hey, whoa; stop, stop! Back up.

04 15 06 34        LMP        Houston, as I was spacing the PSE, the right-hand solar array deployed automatically. The left-hand I had to manually \*\*\* the bar at the far end.

04 15 06 56        LMP        All parts of the solar array are clear of the ground now.

04 15 07 02        CC        Buzz, this is Houston. I understand that you did successfully deploy both solar arrays. Over.

\*\*\* Three asterisks denote clipping of words and phrases.

04 15 07 10 LMP Roger. That's affirmative. And there isn't any way of telling whether that's lined up. I'm getting in the way; maybe I can get down here.

04 15 07 38 LMP Neil, how does that appear to be pointing?

04 15 08 08 CC Neil, this is Houston. Over.

04 15 08 13 CDR Go ahead, Houston.

04 15 08 15 CC Roger. We've been looking at your consumables, and you're in good shape. Subject to your concurrence, we'd like to extend the duration of the EVA 15 minutes from nominal. We will still give Buzz a hack at 10 minutes for heading in. Your current elapsed time is 2 plus 12. Over.

04 15 08 45 CDR Okay. That sounds fine.

04 15 08 47 CC Roger. Out.

04 15 09 07 CC Buzz, this is Houston. If you're still in the vicinity of the PSE, could you get a photograph of the ball level? Over.

04 15 09 16 CDR I'll do that, Buzz.

04 15 09 18 LMP Right. We'll get a photograph of that. Houston, what time would you estimate we could allow for the documented sample? Over.

04 15 09 43 CDR Oh, shoot. Would you believe the ball is right in the middle now?

04 15 09 50 LMP Wonderful. Take a picture before it moves.

04 15 10 00 CC Neil, this is Houston. We're estimating about 10 minutes for the documented sampling. Over.

04 15 10 25 CC Columbia, Columbia, this is Houston. Over.

04 15 10 34 CMP Go ahead, Houston. Columbia.  
(COLUMBIA)

04 15 10 36 CC Roger. Like you to terminate charging battery Bravo at 111 plus 15. Over.

\*\*\* Three asterisks denote clipping of words and phrases.

04 15 10 47           CMP       How about right now?  
                  (COLUMBIA)

04 15 10 49           CC        Roger.

04 15 11 15           CC        Buzz, this is Houston. You've got about 10 minutes  
  left now prior to commencing your EVA termination  
  activities. Over.

04 15 11 31           LMF       Roger. I understand.

04 15 12 32           CC        Tranquility Base, this is Houston. The passive  
  seismic experiment has been uncaged and we're  
  observing short-period oscillations in it. Over.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOCS NET 1)

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04 15 15 13 LMP I hope you're watching how hard I have to hit this into the ground, to the tune of about 5 inches, Houston.

04 15 15 22 CC Roger.

04 15 15 35 LMP It almost looks wet.

04 15 15 46 CDR Got a sample.

04 15 15 57 LMP Wait a minute. Wait a minute. Wait a minute, you cut the cable again.

04 15 16 03 CC All right, Neil and Buzz, this is Houston. We'd like you to - -

04 15 16 04 MS ...

04 15 16 10 CDR That clear?

04 15 16 11 LMP Not quite.

04 15 16 13 CC Neil, this is Houston. We'd like you all to get two core tubes and the solar wind experiment; two core tubes and the solar wind. Over.

04 15 16 25 CDR Roger.

04 15 16 51 LMP Okay. While I'm getting the next one, maybe you can - ... away the box a little bit.

04 15 17 04 CDR ...

04 15 18 04 CC Buzz, this is Houston. You have approximately 3 minutes until you must commence your EVA termination activities. Over.

04 15 18 14 LMP Roger. Understand.

04 15 18 22 CC Columbia, this is Houston. Approximately 1 minute to LOS. Over.

04 15 18 32 CMP  
(COLUMBIA) Columbia. Roger.

04 15 18 37 CC And, do you plan on commencing your sleep on the backside this pass? If so, we'll disable uplink to you while we're talking to the LM. Over.

04 15 18 51 CMP  
(COLUMBIA) Negative that.

04 15 18 59 LMP Houston, were you able to record the documentary way where the two core tube samples were taken?

04 15 19 12 CC Negative. Out.

04 15 19 19 CDR I didn't get a stereopair of those two, but they are right in the vicinity of the solar wind.

04 15 19 29 CC Neil, this is Houston. After you've got the core tubes and the solar wind, anything else that you can throw into the box would be acceptable.

04 15 19 44 CDR Righto.

04 15 19 58 CDR Cap ...

04 15 20 01 LMP I got the cap.

04 15 20 03 CDR Got the cap?

04 15 20 04 LMP They're both good caps on ...

04 15 20 05 CDR Okay.

04 15 20 07 LMP And, you want to pick up some stuff, and I'll - -

04 15 20 09 CDR Get these aseptic ones.

04 15 20 11 LMP - - Move the solar wind in.

04 15 21 05 CC Buzz, this is Houston. It's about time for you to start your EVA closeout activities.

04 15 21 16 LMP Roger. That's in progress.

04 15 22 20 CC Neil and Buzz, this is Houston. We'd like to remind you of the closeup camera magazine before you start up the ladder, Buzz.

04 15 22 30 LMP Okay. Got that over with you, Neil?

04 15 22 34 CDR No, the closeup camera's underneath the MESA. I'll have to pick it up with the prong. I'm picking up several pieces of really vesicular rock out here, now.

04 15 22 53 LMP You didn't get anything in those environmental samples, did you?

04 15 22 56 CDR Not yet.

04 15 22 59 LMP Well, I don't think we'll have time.

04 15 23 07 CC Roger, Neil and Buzz. Let's press on with getting the closeup camera magazine and closing out of the sample return container. We're running a little low on time.

04 15 23 19 LMP Roger.

04 15 24 04 LMP Okay. Can you quickly stick this in my pocket, Neil, and I'll head on up the ladder?

04 15 24 07 CDR Okay.

04 15 24 18 LMP I'll hold it. You open the packet up.

04 15 24 39 CDR ... that'd kill us. Just hold it right there. Okay. Let the packet go.

04 15 24 49 LMP About through?

04 15 24 52 CDR Got it.

04 15 24 53 LMP Okay. Adios, amigo.

04 15 24 56 CDR Okay.

04 15 24 58 LMP Anything more before I head on up, Bruce?

04 15 25 04 CC Negative. Head on up the ladder, Buzz.

04 15 25 57 LMP How are you coming, Neil?

04 15 25 58 CDR Okay.

04 15 26 22 CDR Did you get that solar wind rolled up there, Buzz?

04 15 26 24 LMP Right. That's it right there.

04 15 26 25 CDR Okay.

04 15 26 47 LMP Think you can reach the - reach this hook that's hanging over here? You might entertain the idea of sending up the second one that way.

04 15 26 59 CDR Okay.

04 15 27 05 LMP Get the film off of that.

04 15 27 08 CDR I will. Get that up now.

04 15 27 23 LMP Okay. I'm heading on in.

12:57 am



04 15 27 24 CDR Okay.

04 15 27 26 LMP And I'll get the LEC all ready for the rock box.

04 15 28 02 CC Neil, this is Houston. Did the Hasselblad magazine go up on that sample return container also?

04 15 28 12 CDR I've got the Hasselblad magazine hooked to the SRC now, yes.

04 15 28 17 CC Roger.

04 15 28 58 CDR How are you doing, Buzz?

04 15 29 00 LMP I'm okay.

04 15 29 34 LMP About ready to send up the LEC?

04 15 29 39 CDR Yes. Just about.

04 15 30 01 LMP Okay.

04 15 30 45 LMP Okay. That's got it clear.

04 15 31 04 CDR Oh. Uh - oh. The camera came off. I mean the film pack came off.

04 15 31 30 LMP Okay. Just ease it down now. Don't pull so hard on it. All right, let it go.

04 15 31 46 CDR While you're getting that, I've got to get the camera.

04 15 31 55 LMP Okay. This - This one's in. No problem.

04 15 31 58 CDR Okay. Stand by a second.

04 15 32 02 CC Neil, this is Houston. Request an EMU check. Over.

04 15 32 09 CDR Roger. Got 3.8 and I got 54 on the O<sub>2</sub> and no flags, and my flow is in N.

04 15 33 46 CC Neil and Buzz, for your information, your consumables remain in good shape. Out.

04 15 33 53 LMP Roger. How's it coming, Neil?

04 15 33 56 CDR Okay. I've got one side hooked up to the second box and I've got the film pack on.

04 15 34 01 LMP Okay. Good.

04 15 34 20 CDR Boy, that bilge from on the LEC is kind of falling all over me while I'm doing this.

04 15 34 30 LMP All that soot, huh?

04 15 34 36 CDR That's what it looks like down here.

04 15 34 43 LMP I think my watch stopped, Neil.

04 15 34 47 CDR Did it?

04 15 35 01 LMP No, it didn't either. Second hand.

04 15 35 12 LMP Okay. If you can just kind of hold it, why, I think I can do the pulling.

04 15 35 16 CDR Okay. Stand by a minute. Let me move back.

04 15 35 40 LMP Okay. Easy. All right, easy in the hatch now.

04 15 35 51 LMP Okay. I'll get it the rest of the way. And I'll give it to you to - No, wait, just a second. Yes, a little more.

04 15 36 32 CDR Buzz?

04 15 36 33 LMP Okay. It's unhooked.

04 15 36 39 CDR How about that - package out of your - brief. Get that?

04 15 36 54 LMP No.

04 15 36 56 CDR Okay. I'll get it when I get up there.

04 15 37 02 LMP ... now?

04 15 37 04 CDR ...

04 15 37 12 CDR Okay?

04 15 37 13 LMP Okay.

04 15 37 21 CC Neil, this is Houston. Did you get the Hasselblad magazine?

04 15 37 35 CDR Yes, I did. And we got about, I'd say, 20 pounds of carefully selected, if not documented, samples.

04 15 37 42 CC Houston. Roger. Well done. Out.

04 15 37 48 CDR ...

04 15 38 08 LMP Just keep your head down close. Now start arching your back. That's good. Plenty of room. Now, all right, arch your back a little, your head up against \*\*\* Roll right just a little bit. Head down. ... in good shape.

04 15 38 26 CDR Thank you. Am I bumping now?

04 15 38 33 LMP No, you're clear. You're rubbing up against me a little bit.

04 15 38 36 CDR Okay?

04 15 38 38 LMP \*\*\* All right. That's right. A bit to the left. Okay. Now move your foot, and I'll get the hatch.

04 15 38 58 CDR Okay.  
(TRANQ)

04 15 39 13 LMP Okay. The hatch is closed and latched, and verified secure.  
(TRANQ)

04 15 39 25 CDR Okay. Now we turn the feedwater valve - CLOSED. And I got your PLSS antenna ...  
(TRANQ)

04 15 39 52 LMP Okay. Feedwater valve's CLOSED.  
(TRANQ)

04 15 40 02 LMP And your antenna's ...  
(TRANQ)

04 15 40 16 CDR Okay.  
(TRANQ)

04 15 40 20 LMP ...  
(TRANQ)

04 15 40 23 CDR Okay. That's out. ... I did my part ... Okay.  
(TRANQ)

04 15 40 37 LMP ...  
(TRANQ)

04 15 40 44 CC This is Houston. Go ahead.

04 15 40 49 LMP \*\*\*  
(TRANQ)

*0415 39 13  
EV*

\*\*\* Three asterisks denote clipping of words and phrases.

04 15 40 54        CC        You're cutting out, Neil. You're not readable. I understand you said something about contingency sample container on the ascent engine?

04 15 41 11        CC        We are not reading you, Neil. Buzz, Buzz, this is Houston. Do you read? Over.

04 15 41 24        LMP        \*\*\*  
(TRANQ)

04 15 41 28        CC        Tranquility Base, this is Houston. We're reading neither one of you, but standing by.

04 15 42 --               BEGIN LUNAR REV 19

04 15 52 46        CC        Neil, this is Houston. Neil, this is Houston. Radio check. Over.

04 15 52 58        CC        Buzz, Buzz, this is Houston. Radio check, radio check. Over.

04 15 53 31        CDR        Houston. \*\*\*  
(TRANQ)

04 15 53 38        CC        This is Houston. I copy a transmission calling Houston; all else was broken up. Over.

04 15 54 12        CC        Neil, this is Houston. If you read, we suggest you unstow one PLSS antenna so we can have communications. Over.

04 15 56 08        CDR        Okay \*\*\* read?  
(TRANQ)

04 15 56 18        CDR        A, receive. B, off.  
(TRANQ)

04 15 56 25        CC        Neil, this is Houston. We seem to be reading you now. How do you read us? Over.

04 15 56        CDR        ICS, push to talk.  
(TRANQ)

04 15 56 44        CDR        Houston, this is Tranquility. How do you read?  
(TRANQ)

\*\*\* Three asterisks denote clipping of words and phrases.

04 15 56 47           CC           Tranquility Base, this is Houston. Loud and clear. How us?

04 15 56 53           CDR  
(TRANQ)           Loud and clear. We're in the process of switching over to LM COMM here.

04 15 56 56           CC           Roger.

04 15 59 41           CC           Tranquility Base, this is Houston. We'd like to verify your steerable antenna in track mode slew. We're going to do a communications handover here on Earth. Over.

04 15 59 55           LMP  
(TRANQ)           Roger. That's affirmative. We're in track mode slew.

04 16 00 00           CC           Roger. Out.

04 16 06 06           CC           Columbia, Columbia, this is Houston. Over.

04 16 06 12           CMP  
(COLUMBIA)       Roger, Columbia on Charlie. How do you read?

04 16 06 16           CC           Roger, Columbia. This is Houston. Reading you loud and clear on OMNI Charlie. The crew of Tranquility Base is back inside their base, repressurized, and they're in the process of doffing the PLSS's. Everything went beautifully. Over.

04 16 06 36           CMP  
(COLUMBIA)       Hallelujah.

04 16 06 38           CC           And we'd like to get POO and ACCEPT from you. We have a state vector uplink. And, after that, we'd like you to realign your platform to the new REFSMMAT that we sent up a REV or two ago. Over.

04 16 06 59           CMP  
(COLUMBIA)       Roger. Understand. You want a option 1, P52 option 1.

04 16 08 53           CC           Columbia, this is Houston. We're going to uplink you a new state vector, and then we'll send the REFSMMAT up again, because sending the state vector up will wipe out the one that you have on board; and then you can do a P52 option 1. Over.

04 16 09 11           CMP  
(COLUMBIA)       P52.

04 16 14 44           CC           Columbia, this is Houston. Do you read? Over.

04 16 14 53           CMP  
(COLUMBIA)       Roger, Houston. Columbia's reading you.

04 16 14 56           CC           Okay, Columbia. We've completed the uplink; the computer is yours. You can go BLOCK; however, we'd like you to hold off on the P52 option 1 align until after you've passed landing site 2; and we're requesting that you perform another P22 and attempt to find the LM this pass. I've got some numbers for you when you're ready to copy. Over.

04 16 15 22           CMP  
(COLUMBIA)       Roger. Stand by.

04 16 15 49           CMP  
(COLUMBIA)       Ready to copy.

04 16 15 51           CC           Roger, Columbia. P22 landmark ID is lunar module - make that Tranquility Base; P1, 112 25 08; P2, 112 30 17, 4 nautical miles south. Time of closest approach, 112 31 52; shaft 357. 051, trunnion 047. 432, roll zero, pitch 250, yaw zero. Readback. Over.

04 16 17 06           CC           Columbia, this is Houston. Did you copy my P22 update? Over.

04 16 17 39           CMP  
(COLUMBIA)       Houston, Columbia.

04 16 17 45           CC           Columbia, this is Houston. Did you copy my P22 PAD?

04 16 18 03           CC           Columbia, this is Houston. Do you copy my PAD? Over.

04 16 18 09           CMP  
(COLUMBIA)       Negative, Bruce. Just give me the latitude and longitude over 2, altitude, and the grid squares. Never mind the other. You're broken up.

04 16 18 21           CC           Stand by.

04 16 18 30           CMP  
(COLUMBIA)       Well, that is, if you have new information. Otherwise, I'll just use the old numbers.

04 16 18 34           CC           No, wait a minute. We've got new information.

04 16 18 39           CMP           Okay.  
                  (COLUMBIA)

04 16 20 42           CC           Tranquility Base, this is Houston. Can you give us some idea of how you're progressing on the PLSS doffing and preparation for DEPRESS?

04 16 20 56           CDR           Roger, Houston. Tranquility Base. We're in the process of using up what film we have, and I'm just getting ready to change the primary ECS canister. Over.  
                  (TRANQ)

04 16 21 14           CC           Roger, Tranquility. We'd like to hold off as long as possible on the lithium hydroxide canister. Make that one of the last things you do in getting ready for the DEPRESS, if you can. Over.

04 16 21 31           CDR           Roger. We're planning on doing that. I was just wondering how much longer we want to wait, though. We've probably got another half an hour's worth of picture taking, and I guess we could run through an eat cycle and then change the canister, and then DEPRESS. Over.  
                  (TRANQ)

04 16 21 56           CC           Roger. That sounds fine to us.

04 16 22 02           CDR           Well, it'll be a little crowded in here for a while.  
                  (TRANQ)

04 16 22 06           CC           Well, we don't mind a bit.

04 16 22 20           CMP           Houston, Columbia. You got the new coordinates?  
                  (COLUMBIA)

04 16 22 27           CC           Columbia. This is Houston. Go ahead.

04 16 22 34           CMP           Roger. Have you got the new coordinates for me?  
                  (COLUMBIA)

04 16 22 37           CC           Roger. Latitude 00.691 - that would be plus 00.691 - and longitude over 2 is plus 11.713. The altitude is minus 1.44 nautical miles. Over.

04 16 23 15           CMP           Roger. Thank you.  
                  (COLUMBIA)

04 16 23 31           CC           Columbia, this is Houston. On latitude, make that plus 00.692, rounding off. Over.

04 16 23 45           CMP           Okay.  
                  (COLUMBIA)

04 16 23 59        CMP        Okay. I read back plus 00.692, plus 11713, and  
(COLUMBIA)        minus 00144. And you have a grid square for me?

04 16 24 10        CC        Roger. Stand by.

04 16 24 25        CC        Columbia. This is Houston. Grid coordinates:  
Kilo 0.9, 6.3, on LAM-2. Over.

04 16 24 38        CMP        Kilo 0.9 and 6.3. Thank you. One of these grid  
(COLUMBIA)        squares is about as much as you can scan on a  
single pass.

04 16 24 48        CC        Roger.

04 16 25 22        CC        And for your information, Columbia, you're  
approaching the VHF line-of-site COMM limit with  
Tranquility Base. LOS will be at 38 minutes  
plus 25 seconds. Over.

04 16 25 40        CMP        Roger.  
(COLUMBIA)

04 16 25 42        CC        Roger. And we've had to disable the one-way  
MSFN relay owing to a ground-site reconfiguration  
down here. Over.

04 16 25 53        CMP        Okay.  
(COLUMBIA)

04 16 33 59        CMP        Houston, Columbia. ...  
(COLUMBIA)

04 16 34 06        CC        This is Houston. Go ahead. Over.

04 16 34 12        CMP        Roger. I can't see them.  
(COLUMBIA)

04 16 34 17        CC        Roger. I guess that takes care of the news for  
today, Mike.

04 16 34 23        CMP        All right. Roger.  
(COLUMBIA)

04 16 34 29        CC        You might be interested in knowing, Mike, that  
we have gotten reflections back from the laser  
reflector ray they deployed, and we may be able  
to get some information out of that a little  
later.

04 16 34 45        CMP        Roger. I need a very precise position, because  
(COLUMBIA)        I can only do a decent job of scanning maybe one



of those grid squares at a time. The area that we've been sweeping covers 10's and 20's and 30's of them.

04 16 35 00        CC        Roger. We understand. This is intended to be your last P22. We don't want to use up too much fuel in this effort. Over.

04 16 35 12        CMP  
(COLUMBIA)        Roger. How's the fuel coming?

04 16 35 18        CC        Roger. There's no problem fuel-wise. It's just that there seems to be a limit to the number of P22's and the number of grid squares you can search over.

04 16 35 32        CMP  
(COLUMBIA)        Roger. Well, I'll continue this maneuver then to roll 82, pitch 218, yaw zero, if that's okay with you, and do a P52 in that attitude. And that'll be a sleep ...

04 16 35 48        CC        Roger. That's fine with us. And P52 in that attitude.

04 16 35 59        CC        Roger. A P52 and then the sleep attitude.

04 16 43 46        CC        Tranquility Base, this is Houston. Over.

04 16 43 52        LMP  
(TRANQ)        Houston, Tranquility Base. Go ahead.

04 16 43 55        CC        Roger. When you all have a free moment, I have your T8 through T12 block data. Over.

04 16 44 08        LMP  
(TRANQ)        Roger. Stand by one.

04 16 45 24        LMP  
(TRANQ)        Houston, Tranquility Base. Ready to copy.

04 16 45 29        CC        Roger, Tranquility. T8, 114 30 57; T9, 116 29 10; T10, 118 27 23; T11, 120 25 36; T12, 122 23 49. Readback. Over.

04 16 46 14        LMP  
(TRANQ)        Roger. T8, 114 30 57; T9, 116 29 10; T10, 118 27 23; T11, 120 25 36; T12, 122 23 49. Over.

04 16 46 45        CC        Readback correct. Houston out.

END OF TAPE



04 16 50 11 CDR  
(TRANQ) Okay. 10837.

04 16 53 16 CMP  
(COLUMBIA) Houston, Columbia. Did you copy the P52?

04 16 53 30 CC Columbia, this is Houston. Affirmative.

04 16 53 39 CMP  
(COLUMBIA) Okay.

04 16 55 05 CC Tranquility Base, this is Houston. In the flight plan configuration, we show that the stability control circuit breaker ATCA on panel 16 should be open at this time. Over.

04 16 55 49 LMP  
(TRANQ) Houston, Tranquility. Say again which one should be closed?

04 16 55 54 CC Roger. Panel 16, row 2, STAB control ATCA, that is A-T-C-A, and it should be open at this time. Over.

04 16 56 06 LMP  
(TRANQ) Roger. Coming open.

04 16 56 12 CC Roger. Out.

04 16 56 28 LMP  
(TRANQ) Housquin - Houston, Tranquility. Do you have a way of showing the configuration of the engine arm circuit breaker? Over. The reason I'm asking is because the end of it appears to be broken off. I think we can push it back in again. I'm not sure we could pull it out if we pushed it in, though. Over.

04 16 56 56 CC Roger. We copy. Stand by please.

04 16 57 21 CC Tranquility Base, this is Houston. Our telemetry shows the engine arm circuit breaker in the OPEN position at the present time. We want you to leave it open until it is nominally scheduled to be pushed in, which is later on. Over.

04 16 57 41 LMP  
(TRANQ) Roger. Copy.

04 16 59 39 CDR  
(TRANQ) Houston, Tranquility Base. The CDR's FRD reads 11014.

04 16 59 51 CC Roger. 11014 for the CDR.

04 17 00 01 LMP  
(TRANQ) Roger. LMP reads 09018. Over.

04 17 00 06 CC Roger. 09018.

04 17 04 39 CMP  
(COLUMBIA) Houston, Columbia. Over.

04 17 04 43 CC Columbia, this is Houston. Go ahead.

04 17 04 48 CMP  
(COLUMBIA) Roger, Bruce. When you get a few minutes could you give me some words on tomorrow's activities - when they're going to start?

04 17 04 57 CC Roger.

04 17 11 45 CC Columbia, Columbia, this is Houston. Over.

04 17 11 57 CC Columbia, this is Houston. Over.

04 17 12 03 CMP  
(COLUMBIA) Go ahead.

04 17 12 05 CC Roger, Mike. Couple of quick flight plan updates here. First off, we'd like to get an O<sub>2</sub> fuel cell purge at time 113 30. You - Are you copying? Over.

04 17 12 23 CMP  
(COLUMBIA) Roger. And copy.

04 17 12 26 CC Secondly, we will return to the nominal timeline with your scheduled wakeup of 121 hours and 12 minutes. We sort of slipped by lithium hydroxide canister change number 9 during the EVA and EVA PREP. We'd like you to accomplish that now. The COMM for sleep will be the normal lunar COMM configuration, the RCS configuration. We're requesting you use quads Alfa and Bravo. A DAP data load for R2 should be 01111. Readback. Over.

04 17 13 28 CMP  
(COLUMBIA) Roger. Oxygen fuel cell purge at 113 30. Return to the nominal timeline at 121 hours wakeup. Lithium hydroxide change number 9 right now. Normal lunar COMM sleep configuration, I'm in that now. On the RCS, I understood before you wanted to load the DAP register 2 011000 which made sense, and then later to pitch only

on quad A, enable all on quad B, and C and D off. But you don't want to do that any more, huh?

- 04 17 15 20           CC           Columbia. This is Houston. On your DAF load in R2, we're requesting a 0 and four 1's, that is, 01111. Over.
- 04 17 15 34           CMP  
(COLUMBIA)       Okay.
- 04 17 15 38           CC           And you - -
- 04 17 15 39           CMP  
(COLUMBIA)       Load's going in right now.
- 04 17 15 41           CC           Roger. And you'll be enabling quads Alfa and Bravo on the AUTO RCS select switches. Disable Charlie and Delta.
- 04 17 15 51           CMP  
(COLUMBIA)       All right.
- 04 17 15 59           CC           And we have a little less than 2 minutes to LOS. If you're still up, AOS next time around will be 114 04. Over.
- 04 17 16 18           CMP  
(COLUMBIA)       Roger.
- 04 17 16 27           CC           And, Columbia, if it's agreeable with you, we'd like you to stay awake until we have one successful reacquisition on the high-gain antenna. And I guess you can plan on turning in shortly after AOS this next pass. Over.
- 04 17 16 47           CMP  
(COLUMBIA)       Okay.
- 04 17 16 49           CC           Roger. Out.
- 04 17 17 34           CC           Tranquility Base, Tranquility Base, this is Houston. Radio check. Over.
- 04 17 17 42           CDR  
(TRANQ)           Go ahead. Houston.
- 04 17 17 44           CC           Roger. Reading you loud and clear. Just wanted to make sure we still had COMM.

04 17 17 52 CDR (TRANQ) Roger. We just finished up - we're just finishing up our eat period. Be ready to go back into PREP for DEPRESS.

04 17 17 59 CC Roger.

04 17 39 -- BEGIN LUNAR REV 20

04 17 46 23 CC Tranquility Base, this is Houston. Over.

04 17 46 29 CDR (TRANQ) Roger. Go ahead, Houston.

04 17 46 32 CC Roger. On your next depressurization, it's acceptable to use the overhead hatch dump valve in addition to or instead of the forward hatch dump valve to speed up the depressurization of the cabin. I have a T13 update for you, and if you could, sometime here, give us POO and DATA; we'll uplink you a new CSM state vector. Over.

04 17 47 04 CDR (TRANQ) All right.

04 17 47 19 LMP (TRANQ) You've got the DSKY.

04 17 47 22 CC Roger. Your T13 time is 124 22 02. Over.

04 17 47 40 LMP (TRANQ) Roger. It's T13, 124 22 - is that 02? Over.

04 17 47 49 CC That's affirmative. That is 02. And do you have a time estimate for us until you're ready to start cabin DEPRESS? Over.

04 17 48 05 CDR (TRANQ) Fifteen minutes, maybe?

04 17 48 10 CC Roger.

04 17 50 30 CC Tranquility Base, this is Houston. Uplink complete. The computer's yours, and you can go out of DATA.

04 17 50 39 CDR (TRANQ) Roger.

04 17 59 50 CC Tranquility Base, Houston.

04 17 59 59 CDR (TRANQ) Go ahead. Tranquility Base, here.

04 18 00 02 CC Roger. Just want to let you guys know that since you're an hour and a half over your timeline and we're all taking a day off tomorrow, we're going to leave you. See you later.

04 18 00 13 CDR (TRANQ) I don't blame you a bit.

04 18 00 16 CC That's a real great day, guys. I really enjoyed it.

04 18 00 23 CDR (TRANQ) Thank you. You couldn't have enjoyed it as much as we did.

04 18 00 26 CC Roger.

04 18 00 28 LMP (TRANQ) It was great.

04 18 00 30 CC Sure wish you'd hurry up and get that trash out out of there, though.

04 18 00 34 CDR (TRANQ) Yes. We're just about to do it.

04 18 00 36 CC Okay.

04 18 03 34 CC Tranquility Base, this is Houston. We show the suit relief valve still in the AUTO position. It should be closed. Over.

04 18 05 19 CC Columbia, this is Houston. Over.

04 18 05 33 CMP (COLUMBIA) Houston, Columbia. Go ahead.

04 18 05 35 CC Roger. We've successfully reacquired high-gain antenna. Unless you have some other traffic with us, I guess we'll bid you a good night and let you get some sleep, Mike. Over.

04 18 05 48 CMP (COLUMBIA) Okay. Sounds fine.

04 18 05 50 CC And we're going to power down the voice sub-carrier part of our uplink to you in order that we don't disturb you while we're talking to Tranquility Base. If you need us, just give us

a call, and we can respond with a time lag of about a minute to a minute and a half in getting reconfigured. Over.

04 18 06 13       CMP  
                  (COLUMBIA)       Okay. Thank you.

04 18 06 15       CC                   Roger. And good night.

04 18 06 20       CMP  
                  (COLUMBIA)       Good night, Bruce. Thanks a lot.

04 18 09 23       CC                   Columbia, Columbia, this is Houston. We'd like you to ENABLE the thrusters in Bravo 1 and Bravo 2, AUTO RCS SELECT. Over.

04 18 09 46       CMP  
                  (COLUMBIA)       Okay. Bravo 1 and Bravo 2 ENABLE.

04 18 09 49       CC                   Roger. Out.

04 18 10 18       CC                   Tranquility, this is Houston. For a reference, which dump valve are you using? Over.

04 18 10 28       CDR  
                  (TRANQ)       We used the forward dump valve until about 2 psi, and we're using the overhead now.

04 18 10 34       CC                   Roger. Out.

04 18 10 37       CDR  
                  (TRANQ)       They're both - they're both open now.

04 18 18 27       CDR  
                  (TRANQ)       Houston, Tranquility Base. REPRESS complete.

04 18 18 31       CC                   Roger, Tranquility. We observed your equipment jettison on the TV, and the passive seismic experiment recorded shocks when each PLSS hit the surface. Over.

04 18 18 47       CDR  
                  (TRANQ)       You can't get away with anything anymore, can you?

04 18 18 51       CC                   No, indeed.

END OF TAPE



APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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04 18 21 28           CC           Tranquility Base, this is Houston. Over.

04 18 21 34           CDR  
(TRANQ)       Go ahead, Houston.

04 18 21 36           CC           Roger. When you get back into your surface checklist and come over to the COMM reconfiguration on page Surface-45, we'd like you to enable the ranging feature on your S-band. That is, when you come down to S-band configuration, instead of CAUTION and WARNING ELECTRONICS, ENABLE TV, we'd like you to go into the RANGE position and leave it there for as long as you conveniently can until you get ready to commence your rest period; and we'll try to get a little more ranging data on you. Over.

04 18 22 20           CDR  
(TRANQ)       Roger. Copy.

04 18 22 23           CC           And of course, when you get ready to turn in, go back into caution and warning, ENABLE, and we'd like to say from all of us down here in Houston and really from all of us in all the countries and in the entire world, we think that you've done a magnificent job up there today. Over.

04 18 22 46           CDR  
(TRANQ)       Thank you very much.

04 18 22 48           LMP  
(TRANQ)       It's been a long day.

04 18 22 51           CC           Yes, indeed. Get some rest there and have at it tomorrow.

04 18 24 06           LMP  
(TRANQ)       Houston, Tranquility. Did you all come up with any other solution that we might try to the mission timer problem? Over.

04 18 24 27           CC           Stand by, Tranquility. We'll be back with you in just a minute.

04 18 25 29           LMP  
(TRANQ)       And, Houston, Tranquility. Have you had enough TV for today?

04 18 25 34           CC           Tranquility, this is Houston. Yes, indeed. It's been a mighty fine presentation there.

04 18 25 43           LMP  
(TRANQ)       Okay. Signing off. See you again tomorrow.

04 18 25 46        CC        Roger.

04 18 26 53        CC        Columbia, Columbia, this is Houston. Over.

04 18 27 00        CMP  
(COLUMBIA)        Go ahead, Houston.

04 18 27 02        CC        Roger. Sorry to bother you, Columbia. Two things: we request that you select 10-degree deadband in your DAP in accordance with the procedures on Foxtrot 9-7 in your checklist; and secondly, we'd like to leave a display on the DSKY that is not one that's cycling, being continuously updated. What you have when you get through widening the deadband will be a static display, and that'll be satisfactory. Over.

04 18 27 41        CMP  
(COLUMBIA)        Okay.

04 18 27 42        CC        Roger. Goodnight again.

04 18 28 09        CC        Tranquility Base, this is Houston. Over.

04 18 28 16        LMP  
(TRANQ)        Roger. Go ahead.

04 18 28 19        CC        Roger. On your mission timer, we wanted to pull the circuit breaker and let it cool down for an hour and a half to 2 hours. I believe the breaker is currently open. It has been off, so go ahead and reset the mission timer circuit breaker. Put the timer control to RESET and hold it in RESET for 30 seconds, and then slew it to your desired settings left to right, and place the timer control to START. Over.

04 18 29 04        LMP  
(TRANQ)        Okay. We'll try it.

04 18 29 55        CDR  
(TRANQ)        Houston, our mission timer seems to be slewing okay. You want to give us a time hack? Or can we get it off the CMC - LGC, I mean?

04 18 30 23        CC        Roger, Tranquility. I'll give you a time hack at 114 31 00. It's about 30 seconds from now. Over.

04 18 30 51        CC        Stand by for a Mark at 114 31.

04 18 30 52 LMP Okay. ... you.  
(TRANQ)

04 18 30 57 CC Stand by.

04 18 31 00 CC MARK.

04 18 31 14 CC Tranquility, this is Houston. Did you copy my  
Mark at 114 31?

04 18 31 22 CDR Roger. Thank you, and our mission timer is running  
(TRANQ) now.

04 18 31 27 CC Roger. Very good. And, I've got a consumables  
update for you if you're ready to copy or listen.  
Over.

04 18 31 38 LMP Stand by.  
(TRANQ)

04 18 31 43 LMP Okay. Go ahead.  
(TRANQ)

04 18 31 45 CC Okay. RCS Alfa is 81 percent, RCS Bravo 75 percent.  
Coming up on 115 hours GET, descent oxygen is  
31.8 pounds or 59 percent; descent amp hours 858,  
and ascent amp hours 574. Over.

04 18 32 28 LMP Roger. Copy. Thank you very much.  
(TRANQ)

04 18 32 32 CC Roger. Out.

04 18 33 06 CC Tranquility, this is Houston. We also have a set  
of about 10 questions relating to observations  
you made, things you may have seen during the EVA.  
You can either discuss a little later on this  
evening or sometime later in the mission at  
your option. How do you feel? Over.

04 18 33 35 CDR I guess we can take them up now.  
(TRANQ)

04 18 33 39 CC Okay. And your friendly Green Team here has  
pretty well been relieved by your friendly  
Maroon Team, and I'll put Owen on with the  
questions.

04 18 33 52 CC Tranquility - -

04 18 33 53 CDR Okay. Thank you, Bruce. Go ahead.  
(TRANQ)

04 18 33 59           CC           Tranquility, Houston. First question here is how your best estimate of the yaw on the - of the LM as compared to the nominal preflight plan. Over.

04 18 34 16           LMP  
(TRANQ)           We got 13 degrees left on the ball, and I think that's probably about right. Looking at the shadow and so on, we prob - probably about 13 degrees left of the shadow.

04 18 34 31           CC           Roger. That's 13 degrees left of the shadow. And, next question relates to the depth of the bulk sampling that you obtained near the first part of the EVA and any changes in composition that you might have observed during the bulk sampling interval. Over.

04 18 35 02           CDR  
(TRANQ)           I'm not sure I understand that question, but we got a good bit of the ground mass in the bulk sample plus a sizable number of selected rock fragments of different types.

04 18 35 22           CC           Roger, Neil. One of the implications here is the depth from which the bulk sample was collected. Did you manage to get down there several inches or nearer the surface? Over.

04 18 35 37           CDR  
(TRANQ)           We got some down from as much as 3 inches in the area where I was looking at variation with depth in the bulk sample. There really wasn't appreciable difference, and I didn't run into any hard bed. Later on, or at some other times and other areas, why, I'd get down just a short distance, an inch or two, and couldn't go any further.

04 18 36 06           CC           Roger. Believe we understand down as deep as 3 inches, did not hit any hard bed, and no significant changes in composition to that depth. Next question, the - the second SRC was packed rather hurriedly due to the time limitation, and wonder if you would be able to provide any more detailed description of the samples which were included in the second SRC. Over.

04 18 36 40           CDR  
(TRANQ)           We got two core tubes and solar wind and about half of the big sample bag full of assorted rocks which I picked up hurriedly from around the area. I tried to get as many representative types as I could.

- 04 18 37 09           CC           Roger, Neil. Next topic here relates to the rays which emanate from the DPS engine burning area. We're wondering if the rays emanating from the - beneath the engine are any darker or lighter than the surrounding surface. Over.
- 04 18 37 42           LMP  
(TRANQ)           The ones that I saw back in the aft end of the spacecraft appeared to be a good bit darker; of course, viewed from the aft end, why, they did have the Sun shining directly on them. It seemed as though the material had been baked somewhat and also scattered in a radially outward direction, but in that particular area, this feature didn't extend more than about 2, maybe 3 feet, from the skirt of the engine. Over.
- 04 18 38 24           CC           Roger. Understand that near the aft end out to the east that the rays did appear darker. I understand, Buzz, that these were - this was the appearance of the material which had been uncovered by the rays that appeared darker for 2 or 3 feet extending outward. Is that correct?
- 04 18 38 49           LMP  
(TRANQ)           No. I wouldn't say it was necessarily material that had been uncovered. I think some of the material might have been baked or in some way caused to be more cohesive and perhaps flow together in some way, I don't know. Now, in other areas, before we started trampling around out front, why, we could see that small erosion had taken place in a radially outward direction, but it had left no significant mark on the surface other than just having eroded it away. Now, it was different back in the - right under the skirt itself. It seems as though the surface had been baked in a streak fashion, and I think a couple of pictures on film will show this. But that didn't extend out very far. Over.
- 04 18 39 48           CC           Roger, Tranquility. And this baked appearance that you described, at least the suggestion is that it was due to the heat of the engine at any rate. Next subject, did - -
- 04 18 40 01           LMP  
(TRANQ)           I believe so.
- 04 18 40 02           CC           Roger. Next subject, did either of the solar panels on the PSE touch the surface of the Moon during deployment? Over.

- 04 18 40 19           LMP  
                  (TRANQ)       I think that two corners did touch, since when it was deployed, both of them didn't come out at the same time. It unfolded a little unevenly, and of course, the terrain that it was on was a little bit - not quite as level as it was - as I would like to have it. And I think that two corners did touch to about 1 inch - no, three-quarters to a half an inch deep; and maybe along the bottom, it might have been maybe 3 inches, leaving a small triangular coating on two of the corners; and I think these are on the western ones. Over.
- 04 18 41 06           CC                   Roger. Understand the description there. And the next subject, on the two core tubes which you collected, how did the driving force required to collect these tubes compare? Was there any difference? Over
- 04 18 41 27           LMP  
                  (TRANQ)       Not significantly. I could get down to about the first 2 inches without much of a problem, and then as I would pound it in about as hard as I could do it, and the second one took two hands on the hammer, and I was putting pretty good dents in the top of the extension rod, and it just wouldn't go much more than - I think the total depth might have been about 8 or 9 inches. But even there, it didn't - For some reason it didn't seem to want to stand up straight. In other words, I'd keep driving it in and it would dig some sort of a hole but it wouldn't - just penetrate in a way that would support it and keep it from falling over, if that makes any sense at all. It didn't really to me. Over.
- 04 18 42 22           CC                   Roger, Buzz. I think I've got the picture. You indicate that little difference between the two samples and that in each case you got down about 2 inches without any problems and then had to continue hammering rather vigorously in order to continue driving it in to a total depth of 8 or 9 inches, and even at that point the rods did not want to stay vertical, that they'd tend to fall over on you even after pounding in that far. Is that correct?
- 04 18 42 59           LMP  
                  (TRANQ)       Yes. That's about it. It wasn't a rapid change in resistive force. And also I noticed when I took the bit off that the material was quite well packed, a good bit darker, and it - The way it adhered to the core tube gave me the distinct impression of being moist. Over.

04 18 43 23           CC           Roger. Understand the general impression of being moist as it packed in the core tube. Next question: we did copy your comments prior to the EVA of your general description of the area. We wonder if either of you would have any more lengthy description or more detailed description of the general summary of the geology of the area. Over.

04 18 44 01           LMP  
(TRANQ)           Yes let's - we'll - We'll postpone our answer to that one until tomorrow. Okay?

04 18 44 08           CC           Yes, indeed. That'll be fine. Just a couple more here, and I think these may not be quite as lengthy as number 7 there. Can you estimate the stroke of the primary and secondary struts? Over.

04 18 44 31           CDR  
(TRANQ)           Well, I could do it like this, Owen. About all the struts are about equally stroked, and the height from the ground to the first step is about 3 feet or maybe 3 and 1/2 feet, huh?

04 18 44 52           CC           Roger. Understand, Neil. Next topic, as - just after landing, you pointed out that there was a hill to the west along the plus-Z axis from the LM. Are there any large rocks in that direction that might block the solar ray during the sunset - as sunset approaches in your locality - Are there any large rocks that might tend to obscure the ray? Over.

04 18 45 32           LMP  
(TRANQ)           No. I don't believe so. I think that it's - It's about as level as any other areas that we chose.

04 18 45 46           CC           Roger. I - -

04 18 45 47           LMP  
(TRANQ)           There's nothing large, anyway, that's going to get in the way.

04 18 45 50           CC           Roger. Copy. That's also the way it appeared from the television, I think. And now the final question. You commented, Neil, that on your approach to the landing spot, you had passed over a football field-sized crater containing rather large blocks of solid rock perhaps 10 to 15 feet in size. Can you estimate the distance to this football-sized crater from your present position? Over.

04 18 46 25 CDR (TRANQ) I thought we'd be close enough so that when we got outside we could see its rim back there, but I couldn't. But I don't think that we're more than a half mile beyond it. That is, a half mile west of it.

04 18 46 45 CC Roger. So you estimate your present position less than half a mile approximately west of this large crater. Over.

04 18 46 56 CDR (TRANQ) That's correct.

04 18 46 58 CC Okay. Well, that takes care of the questions from our geologists for tonight, and unless you have something else, that'll be all for - from us for the evening. Over.

04 18 47 12 LMP (TRANQ) Okay. Thank you.

04 18 49 01 CC Tranquility Base, Houston. We've now collected all the ranging data that we can use, and you can go back to caution and warning ENABLE. Over.

04 18 49 14 LMP (TRANQ) Roger. Will do.

04 18 52 18 CC Tranquility Base, Houston. Over.

04 18 52 27 LMP (TRANQ) Go ahead, Houston.

04 18 52 28 CC Roger. Two more verifications, here. Can you - will you verify that the disk with messages was placed on the surface as planned, and also that the items listed in the flight plan - all of those listed there were jettisoned. Over.

04 18 52 48 LMP (TRANQ) That's - All that's verified.

04 18 52 51 CC Roger. Thank you, and I hope this will be a final good night.

04 18 52 57 LMP (TRANQ) Okay.

4:15 am  
EW

END OF TAPE



APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

Tape 75/1  
Page 431

04 19 37 --

BEGIN LUNAR REV 21

REST PERIOD - NO COMMUNICATIONS

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

Tape 76/1  
Page 432

04 21 36 --

BEGIN LUNAR REV 22

REST PERIOD - NO COMMUNICATIONS

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

Tape 77/1  
Page 433

04 23 33 --

BEGIN LUNAR REV 23

REST PERIOD - NO COMMUNICATIONS

(GOSS NET 1)

Tape 78/1

Page 434

05 00 59 04        CC        Columbia, Columbia, good morning from Houston.

05 00 59 12        CMP        Hi, Ron.  
(COLUMBIA)

05 00 59 14        CC        Hey, Mike, how's it going this morning?

05 00 59 17        CMP        How goes it?  
(COLUMBIA)

05 00 59 18        CC        Hey, real fine. While you're --

05 00 59 20        CMP        I don't know yet, how's it going with you?  
(COLUMBIA)

05 00 59 23        CC        Real fine here. Columbia, request P00 and ACCEPT.  
We'll shove the state vector in for you right  
away.

05 00 59 57        CC        Okay. It's coming up now, Columbia. We're going  
to keep you a little busy here. As soon as we  
get the state vector in, we'd like you to go  
ahead and do a P52 option 3 on this night pass,  
and then when you come on around the other side  
there, we'll give you some landmark tracking  
information on prime 130.

05 01 00 29        CMP        Okay.  
(COLUMBIA)

05 01 00 34        CC        And for your information, we're also going to  
have Tranquility Base do a P52 when you come  
around the other time; and I have the P22 infor-  
mation if you're ready to copy.

05 01 00 54        CMP        Go ahead.  
(COLUMBIA)

05 01 00 56        CC        Okay. Track landmark 130 prime using P22, and  
for information, this will properly position  
your rendezvous radar transponder. T1 is 122  
plus 16 plus 05 - whoops, okay. Stand by.

05 01 02 04        CC        Columbia, Houston. The computer is yours.

05 01 02 12        CMP        Okay. And I'd like the grid square of this  
(COLUMBIA)        crater 130 prime. Over.

05 01 02 24        CC        Columbia, Houston. Say again about 130 prime.



05 01 07 53        CC        Affirmative. We want this for one last fix on your plane.

05 01 08 00        CMP  
(COLUMBIA)        All right. Fine. Understand. Thank you.

05 01 08 05        CC        And when the LM does his P22 on your transponder, well then, that'll be our last shot at the LM's position.

05 01 08 14        CMP  
(COLUMBIA)        Roger. Understand. Do you care whether my transponder is on before T1?

05 01 08 35        CC        Roger. It'll be on WARMUP prior to that time, and you can go to OPERATE anywhere around that time.

05 01 08 44        CMP  
(COLUMBIA)        Yes. I gather it's on its 24-minute warmup now?

05 01 08 47        CC        Roger.

05 01 08 53        CC        And, Houston. The computer is yours, you can go to BLOCK anytime.

05 01 08 59        CMP  
(COLUMBIA)        Roger. BLOCK, going P52, option 3.

05 01 09 02        CC        Roger. And we'll see you coming around the other side. About 1 minute to go, and all your systems are looking good.

05 01 09 11        CMP  
(COLUMBIA)        Thanks, Ron.

05 01 32 --               BEGIN LUNAR REV 24

05 01 40 36        CC        Tranquility Base, Tranquility Base, Houston. Over.

05 01 40 45        CDR  
(TRANQ)        Good morning, Houston. Tranquility Base. Over

05 01 40 49        CC        Roger. Loud and clear. And how is the resting standing up there. Did you get a chance to curl up on the engine can?

05 01 41 02        LMP  
(TRANQ)        Roger. Neil has rigged himself a really good hammock with a waste tether, and he's been lying

11:12 am  
EDT

on the ascent engine cover, and I curled up on the floor. Over.

05 01 41 14        CC        Roger. Copy, Buzz. Got a couple of changes to your surface checklist here, and in general, what we're going to want you to do is P22, tracking the command module for one last hack on your position there. And this will be - in other words, P57, P22, and then to press on with the checklist, and the rest of them are a couple of minor changes in the checklist. The main one being that we do not want the rendezvous radar on during the ascent, and we think that this will take care of some of the overflow of program alarms which we're getting during descent.

05 01 42 05        CDR  
(TRANQ)        Okay. We had the rendezvous radar in SLEW during descent, though.

05 01 42 14        CC        Tranquility Base, Houston. I missed that. Say again.

05 01 42 21        CDR  
(TRANQ)        Roger. I say again. We had the rendezvous radar switch in the SLEW position, not the LGC position.

05 01 42 33        CC        Roger. We copy that. But there's a greater duty cycle on - There's a good 15-percent duty cycle on the ascent program there, so just go ahead and leave it off. And I have the changes there if you want to get out your surface checklist, and I can go ahead and start giving them to you.

05 01 42 59        CDR  
(TRANQ)        All right. Go ahead. I've got it out.

05 01 43 01        CC        Okay. Before we start here, request P00 and DATA, and we'll give you some vectors.

05 01 43 23        CDR  
(TRANQ)        Now you've got P00 and DATA.

05 01 43 25        CC        Okay. And on Surface-50 will be the first change there.

05 01 43 35        CDR  
(TRANQ)        Okay. And I understand you want us to do a P57 option 3 and then a P22, is that the general idea? Over.

05 01 43 44        CC        That's affirmative. So on Surface-50 there, down at the bottom of the page, just after PRO after two recycles, stick in a time of 122 plus 15; do P22 as per PGNS-20 of G&N dictionary. Over.

05 01 44 21 CDR (TRANQ) Roger. Understand that's 122 15, do 122 as per PGNS-20, G&N dictionary.

05 01 44 29 CC Roger. Okay. Let's skip on over to Surface-59.

05 01 44 50 CDR (TRANQ) Okay.

05 01 44 51 CC Okay. This is going to be for one last vent on the DPS tank there, so at the top of the page just after EPS INVERTER 1, CLOSE, add - Okay, after EPS INVERTER 1, CLOSE, add PROP DESCENT HELIUM REG/VENT CLOSE, and then after STABILIZATION/CONTROL AELD, CLOSE, add PROP DISPLAYS/ENGINE OVERRIDE/LOGIC, CLOSE. Over.

05 01 46 02 CDR (TRANQ) Roger. Copy. These are two circuit breakers, right?

05 01 46 20 CC Tranquility Base, affirmative. Those are just the circuit breakers at that time.

05 01 46 53 CC Tranquility Base, Houston. Did you get those two on the propulsion circuit breakers?

05 01 47 02 CDR (TRANQ) Roger. I have those two.

05 01 47 04 CC Okay. Let's go over to Surface-60, and then down the middle of the page, after launch guidance system recommendation from MSFN, then I add the switches there.

05 01 47 37 CDR (TRANQ) Roger. Go ahead then.

05 01 47 38 CC Okay. After launch guidance system recommendation from MSFN, add DESCENT PROPULSION FUEL VENT, OPEN; add DESCENT PROPULSION OXIDIZER VENT, OPEN; add verify talkback gray. Over.

05 01 48 22 CDR (EAGLE) Roger. DESCENT PROPELLANT FUEL VENT, OPEN; DESCENT PROPELLANT OXIDIZER VENT, OPEN; verify talkback gray.

05 01 48 29 CC Roger. You got that one, so that'll be the last vent and it will continue venting. Skip over to Surface-61 down there at TIG minus 17.

05 01 49 10 CDR (TRANQ) Roger. I'm there. Go ahead.



05 01 49 12 CC Okay. At TIG minus 17, delete CB(11). AC BUR A: RENDEZVOUS RADAR, CLOSE, wait 30 seconds; delete PGNS: RENDEZVOUS RADAR, CLOSE; and then add UP-DATA LINK switch to VOICE BACKUP. Over

05 01 49 47 CDR (TRANQ) Roger. I have that. We'll leave those two circuit breakers open, and have the UP-DATA LINK to VOICE BACKUP; and we'll make the appropriate changes on the following circuit breaker status card.

05 01 50 01 CC Roger. And then you might add a little note down there at the bottom of the page - Note: - This is at the bottom of page 61 - Note: Do not use tape meter in PGNS, i.e., do not place MODE SELECT switch to PGNS. Over.

05 01 50 35 CDR (TRANQ) Okay. We'll put it in AGS.

05 01 50 40 CC Roger. Fair enough. That's some more of that computer load business.

05 01 50 49 CC Okay. That's all the changes we have for the checklist here. I've got some - just some general notes, I'll read to you on P22, and just for some information. Over.

05 01 51 08 CDR (EAGLE) Okay. Then it looks to me like we ought to get hopping on this P57.

05 01 51 21 CC Roger. We agree wholeheartedly. And while you're starting on that, I'll read - just read these notes on P22. Call P22 possible program alarm 5.6, range greater than 400 nautical miles, and then use the P22 as described on PGNS-20. Take option 1 in NOUN 06, and use the no-update mode. The rendezvous radar will lock on at about 25 degrees elevation above the horizon. If 503 alarm occurs, designate fail. Key a PROCEED and allow the rendezvous radar to search for the CSM. And place the range altitude monitor switch in altitude/altitude rate to prevent the tape meter from driving into the stops. And press on.

05 01 52 29 CDR (EAGLE) Roger. I think I have that.

05 01 58 18 CC Columbia, Columbia, Houston. Over.

05 01 59 17 CC Columbia, Columbia, Houston. Over.

05 01 59 33       CMP       Houston, Columbia.  
                  (COLUMBIA)

05 01 59 35       CC         Roger, Columbia. We'd like a CRYO stir in all  
                                  four tanks and the standard 1 minute. Over.

05 01 59 47       CMP       In work.  
                  (COLUMBIA)

05 01 59 48       CC         Roger. And do you have any torquing angles from  
                                  the P52?

05 01 59 55       CMP       Roger. Stand by one.  
                  (COLUMBIA)

05 02 00 12       CC         Tranquility, Houston. Request ERROR RESET at  
                                  this time. Over.

05 02 00 21       LMP       Roger. ERROR RESET, and would you tell me when  
                  (EAGLE)           you're satisfied with the LGC self-test?

05 02 00 30       CC         Tranquility, LGC is a GO.

05 02 00 36       LMP       Roger.  
                  (EAGLE)

05 02 00 39       CMP       Torquing angles when you're ready.  
                  (COLUMBIA)

05 02 00 41       CC         Columbia, Houston. Go ahead.

05 02 00 51       CMP       Roger. Stars 25 and 42; angle difference 5 balls;  
                  (COLUMBIA)       NOUN 93, plus 00165, plus 00186, minus 00039,  
                                  time of torquing 121 15. Over.

05 02 01 12       CC         Columbia, Houston. We copy. Thank you.

05 02 01 26       CMP       And CRYO stir complete.  
                  (COLUMBIA)

05 02 01 29       CC         Roger. Thank you, Columbia.

05 02 05 35       LMP       Houston, Tranquility. Would you like a recycle  
                  (TRANQ)           on the VERB 6 04? Over.

05 02 05 47       CC         Tranquility, Houston. We copy. Stand by one.

05 02 05 55       CC         Tranquility, Houston. Request recycle.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

Tape 79/1

Page 441

05 02 11 43           CMP           Houston, Columbia. My rendezvous radar transponder is operating.  
(COLUMBIA)

05 02 11 52           CC           Spacecraft calling Houston? Say again.

05 02 11 57           CMP           This is Columbia saying the rendezvous radar transponder is operating.  
(COLUMBIA)

05 02 12 02           CC           Roger. Copy, Columbia.

05 02 13 56           CC           Tranquility, Houston. Request rendezvous radar breakers in about now.

05 02 14 33           CC           Columbia, Houston. Request OMNI D - OMNI Delta.

05 02 15 47           CC           Tranquility Base, Houston. Request you go ahead and start the warmup on the rendezvous radar.

05 02 15 56           LMP           Roger.  
(TRANQ)

05 02 16 58           CDR           Houston, you copying NOUN 93?  
(TRANQ)

05 02 17 01           CC           Tranquility, affirmative. Go.

05 02 17 07           CDR           Roger. We're going to a torque.  
(TRANQ)

05 02 17 10           CC           Houston. Roger.

05 02 18 00           CC           Tranquility Base, Houston. Columbia will be overhead at 122 plus 22 plus 51. His LOS will be 29 35. Over.

05 02 18 21           LMP           Roger.  
(TRANQ)

05 02 20 35           CDR           Houston, we'd like to check this on the tape meter against the AGS. We'll go back to altitude - altitude rates as soon as the rate starts to build up. Over.  
(TRANQ)

05 02 20 50           CC           Tranquility, Houston. Roger.

05 02 21 03           CDR           On second thought, since that will peg the range rate, I guess maybe we'd better not do that. And  
(TRANQ)

for this range that the AGS are showing now, 425 miles with a signal strength of 2.2. It looks like we ought to proceed on this. Over.

05 02 21 31        CC        Roger. Stand by one. Tranquility, affirmative. Proceed.

05 02 21 56        LMP  
(TRANQ)        Are you getting the information on the downlink now?

05 02 22 04        CC        Tranquility, affirmative, and we're saving it. We've got 4 so far, and it's looking good.

05 02 22 18        CDR  
(TRANQ)        Okay. What do you people think about calling up a VERB 83?

05 02 22 41        CC        Tranquility, Houston. Stand by on that now. We're getting the data now. We're checking on the VERB 83.

05 02 22 50        LMP  
(TRANQ)        And we expect that we may lose lock when it passes overhead because of the MAX rate that the radar has.

05 02 23 05        CC        Tranquility, Houston. Negative on VERB 83.

05 02 23 11        LMP  
(TRANQ)        Understand.

05 02 24 09        CDR  
(TRANQ)        We just lost lock.

05 02 24 12        CC        Tranquility, Houston. Go.

05 02 24 23        CMP  
(COLUMBIA)        They've just lost lock, Ron.

05 02 24 25        CC        Roger. We had about 20 some points before you did that. And for your information, the reason the AGS is a little different there - The reason the AGS is a little different is because the K-factor is a little bit wrong.

05 02 24 40        LMP  
(TRANQ)        Has he already gone? Over. Okay. Okay. Has he already gone overhead, or do you want us to try and get in lock on again?

05 02 24 51        CMP  
(COLUMBIA)        Houston, Columbia. You got NOUN 49. Five good marks.

05 02 24 57 CC Tranquility, affirmative. Try to lock on again, and you'll lose him at about 29 minutes and 35 seconds.

05 02 25 09 LMP  
(TRANQ) Okay. Do you have a real quick procedure how to do that?

05 02 25 21 CC Columbia, Houston. Say again about your NOUN 49.

05 02 25 28 CMP  
(COLUMBIA) I say I got five good marks. You got NOUN 49. When you get everything you need off the down-link, let me know.

05 02 25 36 CC Columbia, Houston. Stand by one.

05 02 25 56 CDR  
(TRANQ) Ron, did you say on the 526 alarm to proceed or do a VERB 32?

05 02 26 03 CC Roger. It's just that radar thinks the range is greater than 400 miles now.

05 02 26 13 CC Tranquility Base, Houston. Recommend you terminate P22. Over.

05 02 26 22 CDR  
(TRANQ) Roger. Will do.

05 02 26 24 CC And, Columbia, Houston. Same for you. You can terminate P22.

05 02 26 34 CMP  
(TRANQ) I have. I'm running fast.

05 02 26 36 CC Roger.

05 02 27 14 CMP  
(TRANQ) I'm staying in P22 here a second just to record the NOUN 89 and then over VERB 34.

05 02 27 21 CC Columbia, Houston. Roger. We copy, and that's good.

05 02 27 57 CC Tranquility, Houston.

05 02 28 07 LMP  
(TRANQ) Roger. Go ahead.

05 02 28 09 CC Roger. Request S-BAND FUNCTION switch to RANGE. We're going to do some ranging on you. Also, I have an updated AGS K-factor when you are ready to copy. Over.

05 02 28 24 CDR Roger. Go ahead with the K-factor.  
(TRANQ)

05 02 28 27 CC Roger. 119 plus 59 plus 59.92. Over.

05 02 28 44 CDR Roger. A little closer this time.  
(TRANQ)

05 02 28 46 CC Yes. It sure is.

05 02 28 47 LMP 119 59 5992. Over.  
(TRANQ)

05 02 28 52 CC Tranquility, Houston. Readback correct.

05 02 30 10 CC Columbia, Houston - -

05 02 30 11 CDR Houston, Tranquility. I see what you mean now  
(TRANQ) about the K-factor.

05 02 30 15 CC Roger.

05 02 30 23 CMP This is Columbia. Go ahead. And I'd like to  
(COLUMBIA) know about this P52 coming up. Is that the one  
I just completed or do you want a pair of them  
back to back?

05 02 30 36 CC Columbia, Houston. You do not need to do another  
P52 unless you want to. Break. And also, Columbia,  
when you get a chance, request BATT C and the  
PYRO readouts. Over.

05 02 31 08 CMP BATT C says 37 volts even. PYRO A, 37. PYRO B, 37.  
(COLUMBIA)

05 02 31 20 CC Columbia, Houston. Roger. We copy. Thank you.

05 02 31 28 CMP BATT bus B is 37. BATT bus A is 36, or I'd  
(COLUMBIA) think the gauge is stuck.

05 02 31 35 CC Roger. And you're looking good to us - to us,  
Columbia.

05 02 31 43 CMP Yes sir. Keep it that way.  
(COLUMBIA)

05 02 32 06 CMP Columbia is coming up on a VERB 45 ENTER to reset  
(COLUMBIA) the surface flag.

05 02 32 15 CC Columbia, Houston. Negative. Stand by on the  
VERB 45.

05 02 32 22           CMP  
                  (COLUMBIA)       Roger that.

05 02 32 43           CMP  
                  (COLUMBIA)       And a crew status report from Columbia. I figure I got about 5 hours' good sleep, although you guys probably know better than I do.

05 02 32 52           CC                   Columbia. Roger. We copy.

05 02 33 31           CC                   Columbia, Houston. We've got a couple more vectors to send up to you. They'll be coming up shortly and then you can do the VERB 45 after you get those in. Over.

05 02 33 44           CMP  
                  (COLUMBIA)       Okay. That's fine. Just wanted to make sure that we're both in SYNC on the order.

05 02 33 54           CC                   Roger.

05 02 35 24           CC                   Columbia and Tranquility Base, this is Houston. In case you haven't noticed, the MSFN relay is not activated, so I can go ahead and relay anything if you want to talk directly.

05 02 35 44           CMP  
                  (COLUMBIA)       Columbia. Roger.

05 02 35 54           CDR  
                  (TRANQ)       Houston, Tranquility. Be advised we've got - -

05 02 35 57           CMP  
                  (COLUMBIA)       ...

05 02 36 01           CDR  
                  (TRANQ)       Coming ... on schedule - - showing red right now. We just put a VERB 77 in. I believe that there's ... let me check here.

05 02 36 20           CC                   Tranquility Base, Houston. We've got a lot of static down here. Could you say again?

05 02 36 31           CDR  
                  (TRANQ)       Roger. We have four out of eight circuit breaker talkbacks indicating red. We still have the circuit breakers out as of right now. I believe at this moment we have just entered VERB 77 on tape 3052 and are ready to proceed with the hot fire. Is it normal to have these four red flags? Over.

05 02 37 09           CC                   Tranquility Base, Houston. We think that's okay. Go ahead and reset them and press on with the hot fire. Over.

05 02 37 28           CC           Roger. They are reset.

05 02 37 33           CC           Columbia, Columbia, Houston. Request P00 and  
ACCEPT, and we'll send some state vectors up to  
you.

05 02 37 44           CMP  
(COLUMBIA)       Here we going P00 and ACCEPT.

05 02 41 58           CDR  
(TRANQ)          Houston, Tranquility. I used Capella in the last  
sighting, and it's a good ways near the edge. A  
good ways away from the center of detent 4. I'm  
wondering if it would pay any to use Alpheratz,  
star number 1. It might be a little closer.  
However, it would delay things a little, since  
I'd have to designate the radar out of the way.  
Over.

05 02 42 36           CC           Tranquility. Roger. We copy. Stand by 1. And,  
break, break, Columbia. We're having a little  
trouble getting the stuff in there. Request  
high gain, pitch minus 20, yaw plus 150. Over.

05 02 43 06           CC           And, Tranquility, Houston. We'd prefer to save  
the time; press on with Capella. Over.

05 02 43 19           CDR  
(TRANQ)          Roger.

05 02 43 30           CC           And, Tranquility, Houston. The RCS check looked  
mighty fine to us.

05 02 43 37           CDR  
(TRANQ)          It looks good up here.

05 02 43 48           CC           Columbia, Columbia, Houston. Over.

05 02 44 22           CC           Columbia, Houston. Over.

05 02 44 57           CC           Columbia, Houston in the blind - high gain. Pitch  
minus 20, yaw plus 150.

05 02 45 52           LMP  
(TRANQ)          Houston, Tranquility. Could you give me the  
fixed portion of the ascent PAD so I can load  
it in for a P57? Over.

05 02 46 02           CC           Tranquility. Roger. Stand by one. We want  
to wait on that P57 until about TIG minus 50 min-  
utes. Over.

05 02 46 19           LMP  
(TRANQ)          Roger.



05 02 47 03        CC        Columbia, Columbia, Houston. Over.

05 02 48 30        CC        Columbia, Columbia, Houston. Over.

05 02 50 24        LMP  
(TRANQ)        Houston, Tranquility. It turns out that detent 4  
isn't usable anyway with the yaw that we have,  
because the Earth appears in both detent 2 and  
detent 3.

05 02 50 39        CC        Tranquility Base, Houston. Roger.

05 02 50 54        CC        Columbia, Houston. Over.

05 02 51 22        CC        Tranquility, Houston. I have your LM ascent  
and CSI data PAD's when you are ready to copy.

05 02 51 33        CDR  
(TRANQ)        We're ready to copy.

05 02 51 36        CC        Roger. LM ascent PAD: TIG 124 22 00 00 00  
NOUN 76 55349 00322, plus 0017; DEDA 47,  
plus 37104, minus 70470, plus 58604, plus 56936.  
Your LM weight 10837. Your T14 126, plus 20,  
plus 12. Over.

05 02 53 18        CDR  
(TRANQ)        What figure is the crossrange and NOUN 76?

05 02 53 26        CC        Roger. Your crossrange for NOUN 76 - By the  
way, we may update this later, but now it is  
plus 0017. Over.

05 02 53 47        CDR  
(TRANQ)        Roger. Readback follows. TIG 124 22 0000  
55349 00322, plus 0017, plus 37104, minus 70470,  
plus 58604, plus 56936. LM weight 10837. T14,  
126 20 12. Go.

05 02 54 30        CC        Tranquility, Houston. Roger. Your readback  
correct. Now I have your CSI PAD.

05 02 54 50        CDR  
(TRANQ)        Going to CSI PAD.

05 02 54 52        CC        Roger. CSI PAD. TIG of CSI 125 19 3470;  
TIG of TPI 126 57 0000; NOUN 81, 0532 plus 0000;  
FDAI NA; DEDA 373 03196; DEDA 275 04170; NOUN 86  
plus 0532, plus 0000, plus 0012. Tranquility  
readback.

05 02 56 21 CDR (TRANQ) CSI Apollo PAD follows. TIG 125 19 3470; TIG of TPI 126 57 0000; NOUN 81, 0532, plus all zeroes, 373 03196 275 04170; NOUN 86 plus 0532, plus 0000, plus 0012. Go.

05 02 57 10 CC Tranquility Base, Houston. Your readback is correct. And, Tranquility, no need for any GYRO compensation. It's GO.

05 02 57 26 LMP (TRANQ) Roger. Understand.

05 02 57 34 CC Columbia, Houston. Over.

05 02 57 48 CC Columbia, Houston in the blind. Request high gain. Pitch minus 30, yaw plus 170. Over.

05 02 58 35 CMP (COLUMBIA) Houston, Columbia on the high gain. Over.

05 02 58 38 CC Roger, Columbia. We still need to finish your uplink there, and then I have your CSI and TPI times and also the lift-off.

05 02 58 53 CMP (COLUMBIA) Go ahead. Ready to copy.

05 02 58 57 CC Roger. LM ascent lift-off time: 124 22 0000. Your CSI TIG, say again CSI TIG: 125 19 3470. Your TIG of TPI: 126 57 0000. And the LM's NOUN 81 values for CSI: 0532 - that's 53.2 for DELTA  $V_X$ , DELTA  $V_Y$  all zeros. Columbia, Houston. Over.

05 03 00 12 CMP (COLUMBIA) Roger. I readback lift-off TIG 124 22 even, CSI 125 19 3470, TPI 126 57 even, the LM's NOUN 81 for CSI 53.2 DELTA  $V_X$ . Over.

05 03 00 35 CC Columbia, Houston. Roger. Your readback correct.

05 03 01 00 CC Columbia, Houston. We're coming up with your second load now.

05 03 01 12 CMP (COLUMBIA) Roger that.

05 03 01 49 CC Columbia, Houston. The computer is yours, and you can do your VERB 45 ENTER now.

05 03 01 58 CMP (COLUMBIA) Roger. Go into BLOCK and VERB 45 ENTER.

05 03 02 02 CC Roger.

05 03 02 11 CMP How's the Black Team today? All primed and  
(COLUMBIA) raring to go?

05 03 02 14 CC You bet you there, Mike.

05 03 02 20 CMP Good signal.  
(COLUMBIA)

05 03 05 43 CC Columbia, Houston. About 3 minutes to LOS, and  
I have your consumables update.

05 03 05 52 CMP Ready to copy.  
(COLUMBIA)

05 03 05 53 CC Roger. At 123 plus 00, RCS total minus 7 percent,  
Alfa minus 12 percent, Bravo plus 4.5, Charlie  
minus 7, Delta minus 6.5. Your hydrogen total  
minus 1.4 pounds, oxygen - oxygen plus 1.7. Over.

05 03 06 40 CMP Whoever figured those hydrogens and oxygens out  
(COLUMBIA) a couple of days ago must have known what he was  
doing.

05 03 06 46 CC Okay. I think I read that oxygen - it's a plus  
17 pounds.

05 03 06 54 CMP Roger. Still close.  
(COLUMBIA)

05 03 06 56 CC Roger.

05 03 07 52 CC Eagle and Columbia, this is the backup crew.  
Our congratulations for yesterday's performance,  
and our prayers are with you for the rendezvous.  
Over.

05 03 08 04 CDR Thank you, Jim.  
(TRANQ)

05 03 08 06 LMP Thank you, Jim.  
(TRANQ)

05 03 08 10 CMP Glad to have all you big room full of people  
(COLUMBIA) looking over our shoulder.

05 03 08 15 CDR We had a lot of help down there, Jim.  
(TRANQ)

05 03 10 32

CDR  
(TRANQ)

And, Houston, Tranquility Base is going to give you a few comments with regard to the geology question of last night. We are landed in a relatively smooth crater field of elongate secondary - circular secondary craters, most of which have rims irrespective of their - raised rims irrespective of their size. That's not universally true. There are - There are a few of the smaller craters around which do not have a discernable rim. The ground mass throughout the area is a very fine sand to a silt. I'd say the thing that would be most like it on Earth is powdered graphite. Immersed in this ground mass are a wide variety of rock shapes, sizes, textures, rounded and angular, many with varying consistencies. As I said, I've seen plain - what looked to be plain basalt and vesicular basalt. Others with no crystals, some with small white phenocrysts, maybe one to less than 5 percent. And the boulder - we are in a boulder field where the boulders range generally up to 2 feet with a few larger than that. Now, some of the boulders are lying on top of the surface, some are partially exposed, and some are just barely exposed. And in our traverse around on the surface and particularly working with the scoop, we've run into boulders below the surface - it was probably buried under several inches of the ground mass.

05 03 12 55

CC

Tranquility, Houston. Roger. Very fine description.

05 03 13 05

CDR  
(TRANQ)

I suspect this boulder field may have some of its origin with this large sharp-edged rocky rim crater that we passed over at final descent. Now yesterday I said that was about the size of a football field, and I have to admit it was a little - little hard to measure coming in. But I thought that it might just fit in the Astro-dome as we came by it. And the rocks in the vicinity of the - of this rocky rim crater are much larger than these in this area. Some are 10 feet or so and perhaps bigger, and they are very thickly populated out to about one crater diameter beyond the crater rim. Beyond that, there is some diminishing, and even out in this area the blocks seem to run out in rows with irregular patterns, and then there are paths between them where there are considerably less surface evidence of hard rocks. Over.

05 03 14 16      CC      Tranquility Base, Houston. We copy. Thank you very much.

05 03 14 32      CC      And, Tranquility Base, we're through with the ranging. You can take your S-band function switch to OFF RESET.

05 03 14 42      CDR  
(TRANQ)      Roger.

05 03 14 45      CC      And, Tranquility, I have a LM consumables update for you.

05 03 14 53      CDR  
(TRANQ)      Roger. Ready to copy.

05 03 14 55      CC      Okay. At 123 plus 00, RCS Alfa 78 - 78 percent; PQMD, Bravo is 76 percent PQMD, descent O<sub>2</sub> is 62 percent - 62 percent. Descent ampere hours are 590, 590 remaining, ascent ampere hours are 574, 574 remaining. Over.

05 03 15 41      CDR  
(TRANQ)      Roger. Copy. Sounds very good. Thank you.

05 03 15 44      CC      Roger.

05 03 18 35      CC      Tranquility Base, Houston.

05 03 18 41      CDR  
(TRANQ)      Go ahead, Houston.

05 03 18 43      CC      Roger. For your P57 ..., we did a little looking around, and it looks like Sirius and Rigel out at detent 6 would be real good on that. The Sun angle on Sirius is about 43 degrees, and on Rigel, it's about 55 degrees. Over.

05 03 19 08      LMP  
(TRANQ)      Roger, Houston. The only trouble is that the Sun is in number 5, the closed one. And it appears to also be close enough to detent 6 to shine on the far side of the cone. And it completely obscures detent 6. I'm - unable to use that at all.

05 03 19 37      CC      Okay. We understand it now, and thank you.

05 03 20 43      CC      Tranquility, Houston. For your information, the circuitry looks real fine on that ascent engine arm circuit breaker.

05 03 20 54 LMP (TRANQ) Roger. I don't think I could get it out now if I wanted to.

05 03 21 00 CC Roger. We copy.

05 03 21 05 LMP (TRANQ) And it looks like in detent 6 I can pick up Venus right at the fringe, but I can't get anything else.

05 03 21 15 CC Roger.

05 03 21 33 CDR (TRANQ) And by the way, Houston, our EVA antenna did retract.

05 03 21 37 CC Roger. Mighty fine. Thank you.

05 03 22 45 CC Tranquility, Houston.

05 03 22 52 LMP (TRANQ) Roger. Go ahead.

05 03 22 54 CC Roger. It looks like you're going to have to reposition the radar here. We suggest you may want to start your TIG minus 45 minute - that point in the checklist at about TIG minus 50. Over.

05 03 23 10 LMP (TRANQ) Roger. Why do you think I need to move the radar?

05 03 23 14 CC Well, we thought that you probably wouldn't be able to get the star there.

05 03 23 36 LMP (TRANQ) On the rear detent, the radar can be pointing plus-X, and I'm - I'll be using right rear. That's okay.

05 03 23 44 CC Roger. That's fine then.

05 03 25 43 CC Tranquility Base, Houston. I have one more late checklist change there on the rendezvous radar position for lift-off. Over. From page Surface-57.

05 03 26 00 LMP (TRANQ) Roger. Go ahead.

05 03 26 01 CC Okay. On Surface-57 there on your VERB 21 NOUN 73 trunnion, leave it 180; the shaft we'd like 335. Over.

05 03 26 25 LMP (TRANQ) Roger. Understand. Shaft 335.

05 03 26 29 CC Roger. And if the steerable doesn't quite hack it on lift-off, looks like the forward OMNI is good for about 30 to 60 seconds after lift-off. And then the aft OMNI antenna is good for the rest of the ascent. Over.

05 03 26 52 LMP (TRANQ) Roger. Copy.

05 03 27 10 LMP (TRANQ) Houston, we've got two angles here at 3 minutes in ascent. Would you confirm those? Pitch 134 and yaw minus 32. Over.

05 03 27 25 CC Tranquility Base. Roger. We verify; those are correct.

05 03 30 41 CC Tranquility Base, Houston.

05 03 30 46 CDR (TRANQ) Go ahead.

05 03 30 48 CC Roger. Eagle's looking real fine to us down here. We have a fairly high confidence that we know the position of the LM. However, it is possible that we may have a planes change, but the - In the worst case, it would be up to 30 feet per second. And, of course, we don't expect that at all.

05 03 31 -- BEGIN LUNAR REV 25

05 03 31 15 CDR (TRANQ) Okay.

05 03 31 24 LMP (TRANQ) Houston, Tranquility Base. Since we've still got plenty of time I think I'll go ahead and recycle on this 604.

05 03 31 38 CC Tranquility. Roger. That's okay with us, and we assume that the primary canister is still aboard. Is this correct?

05 03 31 52 LMP (TRANQ) We have one primary canister on board and one secondary. The other primary is - out in front of the Z - plus - Z pad. Over.

05 03 32 06 CC Roger. We copy. Thank you.

05 03 33 41

CDR  
(TRANQ)

Ready for the blue bag - -

05 03 33 44

LMP  
(TRANQ)

The FGNS looks consistent today.

05 03 33 47

CC

Hey, that's affirmative, by gosh. Looking great.

END OF TAPE



APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOCC NET 1)

Tape 80/1  
Page 455

05 03 44 15	LMP (TRANQ)	Houston, did you copy NOUN 05, and are you looking at 93? Over.
05 03 44 21	CC	Tranquility Base. It's beautiful.
05 03 44 28	LMP (TRANQ)	Okay. We'll proceed.
05 13 44 31	CC	Roger.
05 13 44 35	LMP (TRANQ)	I know where the star is; I'm not sure the PGNS knows where gravity is.
05 03 44 39	CC	Okay.
05 03 48 04	LMP (TRANQ)	Houston, these are your angles, not ours.
05 03 48 12	CC	Roger, Tranquility.
05 03 48 13	LMP (TRANQ)	Stand by for some change or modification in the angles.
05 03 48 23	CC	Tranquility Base, Houston. Recommend 334, and that should just keep it out of the limit.
05 03 48 32	LMP (TRANQ)	Okay.
05 03 55 19	CMP (COLUMBIA)	Houston, Columbia on OMNI D Delta. Over.
05 03 55 23	CC	Columbia, Houston. Roger. Loud and clear. And if you would like to take it down, we have the latest position of Tranquility Base. Over.
05 03 55 33	CMP (COLUMBIA)	Go ahead.
05 03 55 36	CC	Roger. It's just west - at west crater, Juliett 0.5, 7.7. Over.
05 03 55 52	CMP (COLUMBIA)	Understand that it is just west of the crater Juliett 0.5 and 7.7. Is that correct?
05 03 56 01	CC	Columbia, Houston. That is correct.
05 03 56 06	CMP (COLUMBIA)	Okay. Thank you, Ron.

05 03 56 15 CC Tranquility Base, Houston.

05 03 56 20 LMP Go ahead.  
(TRANQ)

05 03 56 21 CC Roger. Because of the lower load with the rendezvous radar off, we'd like to have battery 5 and 6 on the line now, 1 and 3 off. Over.

05 03 56 53 LMP In work.  
(TRANQ)

05 03 56 55 CC Roger. Thank you.

05 03 57 36 CC Columbia, Houston. You're still looking mighty fine to us.

05 03 57 43 CMP ...  
(COLUMBIA)

05 03 58 09 CMP Columbia is holding inertially at lift-off attitude, my DAP is configured as per my procedures at a time of 124 02.  
(COLUMBIA)

05 03 58 19 CC Columbia, Houston. Roger. We copy you.

05 03 58 36 CMP I'm using B and D roll.  
(COLUMBIA)

05 03 58 41 CC Tranquility, Houston. Say again.

05 03 58 51 CDR Houston, we were not calling.  
(TRANQ)

05 03 58 54 CC Roger. Columbia, was that Bravo and Delta roll? Over.

05 03 59 00 CMP Columbia, affirmative.  
(COLUMBIA)

05 03 59 03 CC Roger.

05 04 01 27 CC Columbia and Tranquility, I'll give you a Mark at 20 minutes to go, and that's in about 20 seconds.

05 04 01 56 CC Stand by.

05 03 01 59 CC MARK.

05 04 02 00 CC 20 minutes.



So I'm not sure that it's really indicative that it didn't go. Over.

05 04 09 17           CC           Roger. We copy and we agree.

05 04 09 55           LMP  
(TRANQ)       Okay. I assume we're - we're GO for lift-off, and we'll proceed with the ascent feed.

05 04 10 02           CC           Roger. That's correct, and we'll go ahead and watch tank 2. If it doesn't - tank 2 doesn't decrease, we'll tell you to close the ascent feeds and open the shutoffs. Over.

05 04 10 26           LMP  
(TRANQ)       Okay. Ascent feeds are open and shutoffs are closed.

05 04 10 31           CC           Roger.

05 04 10 32           LMP  
(TRANQ)       And I've got the cross feed on.

05 04 12 06           CC           Tranquility Base, little less than 10 minutes here. Everything looks good and we assume the steerable's in track mode AUTO.

05 04 12 20           LMP  
(TRANQ)       Roger. It is in track mode AUTO.

05 04 12 24           CC           Roger.

05 04 13 10           LMP  
(TRANQ)       And both ED batteries are GO.

05 04 13 15           CC           Tranquility, Houston. Roger.

05 04 14 44           CMP  
(COLUMBIA)   Neil, I'm reading you on VHF. You sound good.

05 04 14 50           CDR  
(TRANQ)       Yes sir. Couldn't be better. It's just purring along.

05 04 17 17           LMP  
(TRANQ)       Rate scale, 25?

05 04 17 18           CDR  
(TRANQ)       25.

05 04 17 19           LMP  
(TRANQ)       ATT translation, four jets. Balance couple ON.

05 04 17 23 CDR Balance couple, ON.  
(TRANQ)

05 04 17 24 LMP TTCA jets, PROP PUSHBUTTON RESET, ABORT, ABORT  
(TRANQ) STAGE RESET.

05 04 17 32 CDR RESET.  
(TRANQ)

05 04 17 34 LMP DEADBAND, MINIMUM. ATT CONTROL to MODE CONTROL;  
(TRANQ) MODE CONTROL, AUTO, both.

05 04 17 42 CDR AUTO, AUTO.  
(TRANQ)

05 04 17 49 LMP Okay. We're standing by for 2 minutes to - for  
the guidance steering in the AGS.

05 04 18 23 CC Eagle, Houston. You're looking good to us.

05 04 18 29 CDR Roger.  
(TRANQ)

05 04 19 26 LMP ...  
(TRANQ)

05 04 19 59 CC MARK.

05 04 20 00 CC TIG minus 2.

05 04 20 05 LMP Roger. Guidance steering in the AGS.  
(TRANQ)

05 04 20 58 LMP Okay. MASTER ARM ON.  
(TRANQ)

05 04 21 33 LMP DSKY blanks.  
(TRANQ)

05 04 21 44 CDR Got that ascent ... ?  
(TRANQ)

1.53 p → 05 04 21 54 LMP 9, 8, 7, 6, 5, abort stage, engine arm ascent,  
EDT (TRANQ) proceed.

05 04 22 07 LMP ... Beautiful.  
(EAGLE)

05 04 22 09 LMP (EAGLE) 26, 36 feet per second up. Be advised of the pitchover. Very smooth. Balance couple, OFF. Very quiet ride. There's that one ... on now.

05 04 22 40 CC Eagle, Houston. Request manual start override.

05 04 22 47 LMP (EAGLE) Roger.

05 04 22 52 LMP (EAGLE) ...

05 04 23 04 CC Eagle, Houston. One minute and you're looking good.

05 04 23 10 LMP (EAGLE) Roger.

05 04 23 19 LMP (EAGLE) A very quiet ride, just a little bit of slow wallowing back and forth. Not very much thruster activity.

05 04 23 31 CC Roger. Mighty fine.

05 04 23 37 LMP (EAGLE) 700, 150 up, beautiful. 9000. PGNS-AGS agrees within a foot per second.

05 04 23 59 CC Eagle, Houston. You're looking good at 2. PGNS, AGS, and MSFN all agree.

05 04 24 06 LMP (EAGLE) And that's a thousand, 170 up, beautiful. 14 000. And a foot per second again, AGS to PGNS.

05 04 24 32 LMP (EAGLE) S-band looks like it's holding good, Houston.

05 04 24 36 CC Roger. We concur. It's great.

05 04 24 38 LMP (EAGLE) 1500, 185.

05 04 25 01 CC Eagle, Houston. You're GO at 3 minutes. Everything's looking good.

05 04 25 07 CDR (EAGLE) Roger.

05 04 25 17 LMP (EAGLE) Right on H-dot.

05 04 25 21 CDR Coming up to, ... to the right.  
(EAGLE)

05 04 25 22 LMP -- this is H-dot MAX now.  
(EAGLE)

05 04 25 35 CDR We're going right down U.S. 1.  
(EAGLE)

05 04 25 39 CC Roger.

05 04 26 01 CC Eagle, Houston. Four minutes; you're going right  
down the track. Everything's great.

05 04 26 12 LMP Now we got - got Sabine off to our right now.  
(EAGLE)

05 04 26 18 CC Roger.

05 04 26 33 LMP 240 to go.  
(EAGLE)

05 04 26 56 LMP Okay. There's Ritter out there. There it is,  
(EAGLE) right there, there's Schmidt Man, that's im-  
pressive looking, isn't it?

05 04 27 10 CC Eagle, Houston. You're looking good.

05 04 27 13 LMP ... 55.  
(EAGLE)

05 04 27 17 CDR Looking good here. It's a pretty spectacular  
(EAGLE) ride.

05 04 27 40 LMP ... of to the right.  
(EAGLE)

05 04 28 02 CC Eagle, Houston. You're still looking mighty fine.

05 04 28 09 LMP Roger. Good agreement in DELTA-V to go in both  
(EAGLE) AGS and PGNS.

05 04 28 13 CC Roger.

05 04 28 34 LMP Got 800 to go.  
(EAGLE)

05 04 28 41 LMP 700 to go. Okay, I'm going to open up the main  
(EAGLE) shutoffs.

05 04 28 56 LMP Ascent feed closed; pressure's holding good,  
(EAGLE) cross feed ON, 350 to go.

05 04 29 11 LMP Stand by on the engine arm. 90, okay, OFF, 50.  
(EAGLE)

05 04 29 17 LMP SHUTDOWN.  
(EAGLE)

05 04 29 23 LMP We got 53373, 32.8 feet per second, 60 666.  
(EAGLE)

05 04 29 33 CC Eagle. Roger. We copy. It's great. Go.

05 04 29 35 LMP And we got - got our residuals.  
(EAGLE)

05 04 29 45 LMP ...  
(EAGLE)

05 04 29 50 CC Eagle, Houston. Trim residuals.

05 04 29 53 LMP ...  
(EAGLE)

05 04 30 14 LMP We're working on it.  
(EAGLE)

05 04 30 33 CC Eagle, Houston. Trim looks good.

05 04 30 43 LMP That's good.  
(EAGLE)

05 04 30 45 CMP Eagle, Columbia. ... got a solid lock on in  
(COLUMBIA) VHF ranging and ... 480 feet per second.

05 04 30 53 CDR Okay. That sounds a little - little on the  
(EAGLE) high side.

05 04 30 57 CMP Yes. I'll update it here shortly.  
(COLUMBIA)

05 04 30 59 CDR Okay.  
(EAGLE)

05 04 31 00 LMP Okay, Houston. We show 47.3 by 9.5.  
(EAGLE)

05 04 31 07 CC Roger. 47.2 by 9.5.



05 04 31 14 LMP (EAGLE) AGS has 9.5, 46.6.

05 04 31 23 CC Eagle, Houston. Copy.

05 04 31 44 CC Eagle, Houston. Request abort stage, reset, ... PROP reset, and mode control to ATT HOLD when you get a chance to.

05 04 31 52 LMP (EAGLE) Roger.

05 04 32 44 CC Eagle, Houston. You can go ahead and proceed with P52 as per nominal.

05 04 32 55 CDR (EAGLE) Roger, Houston. The Eagle is back in orbit, having left Tranquility Base and leaving behind a - a replica from our Apollo 11 patch and the olive branch.

05 04 33 15 CC Eagle, Houston. Roger. We copy. The whole world is proud of you.

05 04 33 26 CDR (EAGLE) We had a lot of help down there.

05 04 33 37 CMP (COLUMBIA) Eagle, Columbia. I've got 470 now for R-dot, and I just broke lock. Could you hold silent for a few seconds here while I reacquire.

05 04 34 09 CMP (COLUMBIA) Columbia's reacquired you.

05 04 35 23 CC Columbia, Houston. Request POO in ACCEPT, and we'll give you a good GO LM vector. Over.

05 04 35 37 CMP (COLUMBIA) Roger. Houston. Going to ACCEPT.

05 04 37 29 CC Eagle, Houston. You can go ahead and turn your updata link switch off.

05 04 37 39 CDR (EAGLE) Roger. It's off.

05 04 37 41 CC Roger.

05 04 39 06 CC Columbia, Houston. The computer is yours. Press on.





05 04 50 35 LMP I can't tell.  
(EAGLE)

05 04 50 54 LMP Okay. Mark Y.  
(EAGLE)

05 04 51 06 LMP That enough? Beautiful! All zeros. Okay.  
(EAGLE) Let's torque them. I'll write them down. Minus  
06, plus 64, plus ... 7. Torque ... Radar cir-  
cuit breakers in?

05 04 50 58 CMP \*\*\*  
(COLUMBIA)

05 04 52 06 CDR Yes. We're pointed down pretty much. We're  
(EAGLE) going to be up - -

05 04 52 08 LMP Okay. ... circuit - -  
(EAGLE)

05 04 52 12 CMP Roger.  
(COLUMBIA)

05 04 52 13 LMP - - breaker in? Both circuit breakers in?  
(EAGLE)

05 04 52 18 CMP \*\*\* - -  
(COLUMBIA)

05 04 52 19 MS ...

05 04 52 20 CMP - - \*\*\*  
(COLUMBIA)

05 04 52 26 LMP Okay. AUTO maneuver.  
(EAGLE)

05 04 52 36 CMP \*\*\*  
(COLUMBIA)

05 04 52 40 CC Columbia, Houston. Did you call?

05 04 52 51 CMP That's affirmative. I called you before about  
(COLUMBIA) the VHF ranging. It's not working. \*\*\*

05 04 53 01 LMP Houston, Eagle. Did you copy our star angle  
(EAGLE) difference and torquing angles.

\*\*\* Three asterisks denote clipping of words and phrases.

05 04 53 07        CC        Eagle, Houston. We didn't have them on the  
downlink but we copied them on the VOX.

05 04 53 18        LMP        Okay. It was zero for star angle difference,  
(EAGLE)        minus 06, plus 64, and plus 1.37. Over.

05 04 53 28        CC        Eagle, Houston. Roger. We have that.

05 04 54 02        LMP        That's it. Got a good lockon, Houston.  
(EAGLE)

05 04 54 26        LMP        ... take that.  
(EAGLE)

05 04 54 59        LMP        How about that?  
(EAGLE)

05 04 55 28        LMP        Your really think its apogee is 125 21, huh?  
(EAGLE)        25 ... That circuit breaker is in.

05 04 55 54        LMP        Engine arm circuit breaker.  
(EAGLE)

05 04 57 03        LMP        Okay. There's a mark. Buy that?  
(EAGLE)

05 04 57 24        CC        Eagle, Houston. If you have time, pitch 162,  
yaw minus 16.

05 04 58 32        LMP        You load the REFSMMAT? Okay.  
(EAGLE)

05 04 58 36        CMP        Eagle, Columbia. Your Y-dot is minus 1.0. Over.  
(COLUMBIA)

05 04 58 44        CDR        Mike, you're ...  
(EAGLE)

05 04 58 53        CMP        Eagle, do you read Columbia? Over.  
(COLUMBIA)

05 04 59 04        CMP        Eagle, this is Columbia. Over.  
(COLUMBIA)

05 04 59 10        CMP        Houston, Columbia. Over.  
(COLUMBIA)

05 04 59 12        CC        Roger, Columbia. Loud and clear now. This  
is Houston.

05 04 59 17           CMP  
                  (COLUMBIA)     Roger. Would you tell Eagle his Y-dot is minus  
                                  1.0. Over.

05 04 59 24           CC                   Roger. Eagle, Columbia says your Y-dot is minus  
                                  1.0. Over.

05 04 59 37           CDR  
                  (EAGLE)     Roger, Houston. We got that. Thank you.

05 04 59 39           CC                   Roger. And you can go high bit rate now. Eagle  
                                  can.

05 05 00 29           CMP  
                  (COLUMBIA)     Eagle, Columbia. How do you read?

05 05 00 44           LMP  
                  (EAGLE)     AGS agrees very closely, and pointing ...

05 05 00 57           CMP  
                  (COLUMBIA)     Houston, Columbia is unable to read Eagle on  
                                  either antenna or on VHF duplex Bravo. You got  
                                  any suggestions?

05 05 01 07           CC                   Roger. Columbia, we understand. You are unable  
                                  to read Eagle. Stand by.

05 05 01 23           CDR  
                  (EAGLE)     Houston, tell Columbia that we read him about  
                                  strength 2.

05 05 02 00           LMP  
                  (EAGLE)     Okay. Wide deadband on.

05 05 02 04           CMP  
                  (COLUMBIA)     Houston, Columbia. Also my VHF ranging is not  
                                  working now, and I'd like to know whether you'd  
                                  like me to continue making sextant marks or do  
                                  nothing. I'm supposed to be doing VHF marks  
                                  only, and it's for the next 6 or 7 minutes.

05 05 02 20           CC                   Columbia, Houston. Roger. We copy. And, Eagle,  
                                  looks like the best antenna would be forward for  
                                  the LM. And, break. Eagle, we missed your  
                                  loading of the TPI TIG and P32. Could you con-  
                                  firm you've done that?

05 05 03 00           CC                   Columbia, Houston. Recommend you take sextant  
                                  marks and do not reinitialize. Over.

05 05 03 15           CMP  
                  (COLUMBIA)     Roger, Houston. Columbia's got the VHF ranging  
                                  back now. I'll stick with the nominal. Thank  
                                  you.

05 05 03 20 CC Roger. Mighty fine.

05 05 03 38 CMP  
(COLUMBIA) Columbia reading you loud and clear now, Eagle.

05 05 04 54 CC Columbia, Houston.

05 05 05 00 CMP  
(COLUMBIA) Go ahead, Houston.

05 05 05 02 CC Roger. Mike, you can go ahead and get as many VHF and sextant marks as you can here in this period of time.

05 05 05 12 CMP  
(COLUMBIA) Roger. I've just got time for maybe two sextant marks, then get on with the final count.

05 05 05 57 CC Eagle and Columbia, about 1 minute till LOS there on Columbia. It looks like we have about 51.5 for CSI, and we tend to confirm your Y-dot. And, break. For Eagle, verify VHF Bravo transmitter is off.

05 05 06 22 LMP  
(EAGLE) Roger. VHF Bravo is off.

05 05 06 35 CC Eagle, Houston. Recommend aft OMNI and are you GO for CSI, so we can let Columbia know. Over.

05 05 06 47 LMP  
(EAGLE) Roger. We're GO for CSI.

05 05 06 52 CC Columbia, Houston. Did you copy? Eagle is GO for CSI.

05 05 06 58 CMP  
(COLUMBIA) No, I did not copy. I'm reading them only intermittently, but thank you.

05 05 07 02 CC Roger.

05 05 08 09 CC Eagle, Houston. We'll see you coming around the other side. Your AOS time - is 1 minute ahead of the flight plan.

05 05 08 18 CDR  
(EAGLE) Okay. Thank you.

(GOSS NET 1)

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05 05 30 --

BEGIN LUNAR REV 26

END OF TAPE





05 05 59 01 LMP  
(EAGLE) Roger. Stand by.

05 05 59 24 LMP  
(EAGLE) Okay. The CSI burn was on scheduled time of 125 19 3470, 51.5 feet per second was our solution. After chasing residuals a little bit, we ended up with a minus 0.2, plus 0.7, and minus 0.1. And in the AGS, at that time, we had plus 0.4, plus 0.9, and plus 0.3.

05 05 59 57 CC Eagle - Eagle, Houston. We copy. Any plane change? Over.

05 06 00 04 LMP  
(EAGLE) No. There was no plane change on CSI, and CSM had a 2.3 foot per second burn. We had a 2.9, and we elected to postpone that. Over.

05 06 00 18 CC Roger. We copy, Eagle. Thank you.

05 06 00 28 CMP  
(COLUMBIA) Houston, how do you read Columbia now?

05 06 00 41 CMP  
(COLUMBIA) Eagle, how about asking them for some high gain angles for me, will you, please?

05 06 00 46 LMP  
(EAGLE) Roger. Houston, do you have some high gain angles for Columbia? Over.

05 06 00 54 CC Roger, Eagle. And, Columbia, stand by. We'll have them for you shortly.

05 06 01 15 CC Eagle, Houston. Could you verify you switched lithium hydroxide canisters? Over.

05 06 01 24 LMP  
(EAGLE) That's affirmative. We started getting an erratic indication on primary, so we switched to secondary, and it was again erratic and I thought it might have been a sensor. But it's settled down now, and we're on the secondary. Over.

05 06 01 38 CC Roger. We copy. Mighty fine.

05 06 01 47 CC Columbia and Eagle. Request OMNI Delta for Columbia.

05 06 01 57 CMP  
(COLUMBIA) Roger, Houston. I've been in Delta the whole time but it doesn't ...

05 06 02 09 CDR  
(EAGLE) Houston. Columbia's been on Delta, but he hasn't had much luck with you.

05 06 02 18 CC Eagle, Houston. Roger. We copy.

05 06 03 20       CMP  
                  (COLUMBIA)       Eagle, are you ready to copy your Y-dot?

05 06 03 29       CDR  
                  (EAGLE)       Go ahead.

05 06 03 30       CMP  
                  (COLUMBIA)       \*\*\*

05 06 04 25       CC       Eagle, Houston. At your convenience, we'd like to go ahead and try your lithium hydroxides on the primary and let us take a look at it down here.

05 06 05 04       CC       Columbia, Houston. Over.

05 06 05 09       CMP  
                  (COLUMBIA)       Go ahead, Houston. \*\*\*

05 06 05 39       CDR  
                  (EAGLE)       Houston, Eagle. Columbia's been reading you loud and clear on his OMNI's, but he hasn't had any luck in transmitting to you.

05 06 05 50       CC       Roger, Eagle. Mighty fine. We don't hear Columbia though.

05 06 06 00       CDR  
                  (EAGLE)       Okay.

05 06 07 32       LMP  
                  (EAGLE)       We're burning ours, Mike. Minus 1.8.

05 06 08 32       CC       Eagle, Houston. ...

05 06 08 40       CC       Columbia, Houston. ...

05 06 09 42       CC       Columbia, Houston. Over.

05 06 09 59       CC       Columbia, Houston. You can go ahead and go to REACQ in the high gain. We should get you then.

05 06 10 16       LMP  
                  (EAGLE)       Do you have some angles for him, Houston?

05 06 10 18       CC       Roger. Pitch minus 30, yaw 180, for Columbia.

05 06 10 29       LMP  
                  (EAGLE)       Okay. And what was your CSI - CDH solution, Mike?

\*\*\* Three asterisks denote clipping of words and phrases.

05 06 10 43           CMP           \*\*\*  
                  (COLUMBIA)

05 06 11 18           LMP           Roger. Copy. Thank you.  
                  (EAGLE)

05 06 11 31           CDR           And, Houston, Eagle. Got an ECS light - a  
                  (EAGLE)           CO<sub>2</sub> light. Partial pressure's reading about  
                                  one-half millimeter.

05 06 11 42           CC           Eagle and Columbia, Houston. Roger. We copy.

05 06 12 03           CMP           Houston, how do you read Columbia?  
                  (COLUMBIA)

05 06 12 08           CC           Columbia, Houston. Go.

05 06 12 22           CC           Eagle, Houston. We're sure that's a sensor  
                                  problem. You can leave it on PRIMARY.

05 06 12 30           CDR           Okay.  
                  (EAGLE)

05 06 12 41           CDR           Roger. We pulled the circuit breakers.  
                  (EAGLE)

05 06 12 45           CC           Roger, Eagle.

05 06 13 01           CDR           And our water separator apparently isn't  
                  (EAGLE)           working too well. We're getting a lot of  
                                  water through the suit loop, and we've changed  
                                  water separators, but it doesn't seem to have  
                                  improved the situation any.

05 06 13 20           CC           Eagle, Houston. Roger. We copy.

05 06 13 47           CMP           Eagle, Columbia. Standing by to back you up  
                  (COLUMBIA)           on the burn. Just let me know how it's going.

05 06 13 53           CDR           Okay.  
                  (EAGLE)

05 06 13 58           LMP           Okay. You want to know what our NOUN 81 is?  
                  (EAGLE)

05 06 14 03           CMP           Ready to copy.  
                  (COLUMBIA)

05 06 14 05           LMP           Okay. I think you already got the burn time;  
                  (EAGLE)           minus 8.1, minus 1.8, minus 18.2.

\*\*\* Three asterisks denote clipping of words and phrases.

05 06 14 19           CMP           Okay. That's pretty close agreement. And,  
(COLUMBIA)           for burn time, I still have 126 17 46.

05 06 14 26           LMP           Roger.  
(EAGLE)

05 06 15 06           CC           Eagle, Houston. For warm feeling, we are  
                          agreeing with your CDH.

05 06 15 15           LMP           Congratulations.  
(EAGLE)

05 06 15 28           LMP           Unfortunately, the chart doesn't agree with it,  
(EAGLE)           because the range rate at 36 minutes was off  
                          the chart.

05 06 17 18           CMP           Thirty seconds.  
(COLUMBIA)

05 06 17 20           CDR           We're ready to burn.  
(EAGLE)

05 06 17 21           CMP           Okay.  
(COLUMBIA)

05 06 17 31           CMP           Yes. I'm ready. ...  
(COLUMBIA)

05 06 18 49           CMP           Burn complete?  
(COLUMBIA)

05 06 18 51           CDR           Burn complete.  
(EAGLE)

05 06 18 52           CMP           Thank you.  
(COLUMBIA)

05 06 19 47           CC           Eagle, Houston. When you get a chance, are  
                          your LCG's hooked up? And if so, what does  
                          the LCG accumulator show?

05 06 20 37           CMP           Eagle, Columbia. Passing over the Landing Site.  
(COLUMBIA)           It sure is great to look down there and not  
                          see you.

05 06 20 46           LMP           ...  
(EAGLE)

05 06 21 04           CC           Eagle, Houston.

05 06 21 08           CDR           Go ahead.  
(EAGLE)

05 06 21 09        CC            Roger. Did you copy on the LCG, there, and  
the reading on the water accumulator?

05 06 21 15        CDR  
(EAGLE)        Yes. Roger. I did. I'm getting ...

05 06 22 20        LMP  
(EAGLE)        Houston, the water accumulator is right on  
the line between the red and the green. Over.

05 06 22 26        CC            Eagle, Houston. Roger. We copy.

05 06 24 13        CC            Eagle, Houston.

05 06 24 19        LMP  
(EAGLE)        Houston, Eagle.

05 06 24 20        CC            Roger. On the water problem, we can't add  
anything more to it, except the fact that it  
looks like the water accumulators are up to  
speed to us down here.

05 06 24 35        CDR  
(EAGLE)        Okay. It's not going to be too much trouble.

05 06 24 39        CC            Roger. Fine.

05 06 24 40        LMP  
(EAGLE)        It's just in one suit, too, for some reason.

05 06 26 29        CC            Columbia, Houston. Our COMM problem was traced  
to a ground station here.

05 06 26 38        CMP  
(COLUMBIA)     Okay. Glad to hear it.

05 06 26 39        CC            Roger. You're mighty fine now.

05 06 32 35        LMP  
(EAGLE)        Range rate at 30.

05 06 32 43        CMP  
(COLUMBIA)     I have a TPI TIG when you guys want to compare  
them.

05 06 32 48        LMP  
(EAGLE)        Stand by.

05 06 33 05        LMP  
(EAGLE)        ... 19.8.

05 06 33 15        LMP  
(EAGLE)        Go ahead, Mike. What have you got?

05 06 33 19        CMP            127 02 3450.  
                  (COLUMBIA)

05 06 33 25        LMP            You're about 32 seconds \*\*\* than we are.  
                  (EAGLE)

05 06 33 29        CMP            Okay, fine.  
                  (COLUMBIA)

05 06 35 01        LMP            \*\*\*  
                  (EAGLE)

05 06 39 12        SC             \*\*\* and I'll do it.

05 06 39 52        LMP            \*\*\* want to get another \*\*\* data update \*\*\*  
                  (EAGLE)

05 06 40 50        CMP            Mark it \*\*\* range.  
                  (COLUMBIA)

05 06 42 55        LMP            Mark.  
                  (EAGLE)

05 06 42 56        LMP            Range rate at 40.  
                  (EAGLE)

05 06 44 16        CMP            Buzz, I would like to confirm that your TPI  
                  (COLUMBIA)        TIG is 127 02 02. Over.

05 06 44 25        LMP            We haven't settled on a final one yet. The  
                  (EAGLE)        last one was - stand by.

05 06 45 04        CMP            Roger. Understand.  
                  (COLUMBIA)

05 06 45 12        CMP            Just as soon as you know what TPI TIG is going  
                  (COLUMBIA)        to be, I would appreciate a call.

05 06 45 18        LMP            Okay.  
                  (EAGLE)

05 06 45 24        CMP            Last I got was 32 seconds earlier than mine  
                  (COLUMBIA)        which would make it 127 02 02.

05 06 45 40        CMP            Thank you. Are you going to be revising that  
                  (COLUMBIA)        one?

05 06 45 44        LMP            I think probably so. How late - How late can  
                  (EAGLE)        you take a revision?

\*\*\* Three asterisks denote clipping of words and phrases.

05 06 45 56           CMP  
                  (COLUMBIA)       Well, to stay on my time line, I should have  
                                  it in the next couple of minutes.

05 06 48 07           LMP  
                  (EAGLE)       Okay. Latest estimate, 127 03 39.

05 06 48 14           CMP  
                  (COLUMBIA)     Thank you kindly.

05 06 48 41           CC                   Eagle, Houston.

05 06 48 45           LMP  
                  (EAGLE)       Roger. Go ahead.

05 06 48 47           CC                   Roger. In the event of the possibility that  
                                  we may have had some water channeling in those  
                                  hydroxide canisters, we recommend you stay in  
                                  the cabin mode from now on. Over.

05 06 49 03           LMP  
                  (EAGLE)       Roger.

05 06 51 25           CC                   Eagle, Houston.

05 06 51 30           LMP  
                  (EAGLE)       Go ahead.

05 06 51 32           CC                   Roger. I'd better clarify that cabin mode a  
                                  little bit there. What we mean is you go ahead  
                                  and stay in the cabin mode. Helmets and gloves  
                                  on are your option. And we really have no  
                                  concern with the CO<sub>2</sub>. Over.

05 06 51 52           LMP  
                  (EAGLE)       Roger. Understand.

END OF TAPE



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05 06 52 51 LMP Mike, you already loaded that time? We've got a  
(EAGLE) final one here.

05 06 52 58 CMP I've already loaded it. I don't think it'll make  
(COLUMBIA) much difference.

05 06 53 01 LMP Roger. Only 9 seconds difference.  
(EAGLE)

05 06 53 04 CMP Mox nix.  
(COLUMBIA)

05 06 54 06 CC Columbia, Houston.

05 06 54 12 CMP Columbia. Go ahead.  
(COLUMBIA)

05 06 54 13 CC Roger, Mike. You can go ahead and arm your logic  
anytime you want to, and we'll give you a GO so  
that you can get your PYRO ARM at your convenience.

05 06 54 23 CMP That's a good idea, babe. You standing by to  
(COLUMBIA) watch the logic?

05 06 54 26 CC Affirmative. Give us a Mark.

05 06 54 30 CMP MARK LOGIC 1.  
(COLUMBIA)

05 06 54 32 CMP MARK LOGIC 2.  
(COLUMBIA)

05 06 54 59 CC Columbia, Houston. We need the SEQ ARM circuit  
breakers closed.

05 06 55 08 CMP Okay. Going in SEQ ARM BATT A, and BATT B.  
(COLUMBIA)

05 06 55 27 CC Columbia, Houston. Logic looks good. You can  
arm your PYRO's at your convenience.

05 06 55 36 CMP Thank you.  
(COLUMBIA)

05 06 55 55 CMP Eagle, Columbia's starting to maneuver to TPI  
(COLUMBIA) attitude.

05 06 55 58 CDR Okay.  
(EAGLE)

05 06 57 20 CC Eagle and Columbia, Houston. All your solutions look good to us. Out.

05 06 58 18 LMP And, Mike, if you want our target DELTA-V, I'll  
(EAGLE) give it to you.

05 06 58 22 CMP Ready to copy.  
(COLUMBIA)

05 06 58 23 LMP 127 03 3082, plus 22.7, plus 1.7, minus 10.6.  
(EAGLE) Over.

05 06 58 41 CMP 127 03 3082, plus 22.7, plus 1.7, minus 10.6.  
(COLUMBIA) Thank you.

05 07 00 55 CDR I'm showing a good bit of out-of-plane velocity  
(EAGLE) on my cross-pointers, Mike.

05 07 01 03 CMP Roger. I have no indication of it.  
(COLUMBIA)

05 07 02 32 CMP Coming up on 1 minute to TIG, Neil. How's it  
(COLUMBIA) looking?

05 07 02 38 CDR Pretty good.  
(EAGLE)

05 07 02 40 CMP Good.  
(COLUMBIA)

05 07 02 43 CDR That out-of-plane was in the AGS, not in the radar.  
(EAGLE)

05 07 02 47 CMP Roger that.  
(COLUMBIA)

05 07 03 52 CDR We're burning.  
(EAGLE)

05 07 03 54 CMP That-a-boy!  
(COLUMBIA)

05 07 04 36 CMP Burn complete?  
(COLUMBIA)

05 07 04 40 CDR Read burn complete.  
(EAGLE)

05 07 04 42 CMP Roger. Thank you.  
(COLUMBIA)

05 07 04 43           CC           Eagle, Houston. Aft. OMNI, low-bit rate, and we'll see you at 127 plus 51.

05 07 27 --           BEGIN LUNAR REV 27

05 07 51 42           CDR           Okay. You've got me.  
(EAGLE)

05 07 52 00           CC           Eagle and Columbia, Houston. Standing by.

05 07 52 05           CDR           Roger. We're stationkeeping.  
(EAGLE)

05 07 52 08           CC           Roger.

05 07 54 13           CDR           Okay, Mike. I'll get - try to get in position  
(EAGLE)           here, then you got it.

05 07 54 39           CDR           How does the roll attitude look?  
(EAGLE)

05 07 54 55           CDR           I'll stop. Matter of fact, I can stop right here  
(EAGLE)           if you like that.

05 07 56 30           CC           Eagle, Houston. Middle gimbal. And you might  
pass to Columbia, we don't have him yet.

05 07 56 35           CDR           That's right.  
(EAGLE)

05 07 57 34           CDR           I'm not going to do a thing, Mike. I'm just let-  
(EAGLE)           ting her hold in ATTITUDE HOLD.

05 07 57 40           CMP           Okay.  
(COLUMBIA)

05 08 00 50           CDR           You ...  
(EAGLE)

05 08 00 56           CDR           Okay.  
(EAGLE)

05 08 03 12           CDR           Okay. We're all yours. Roger.

05 08 03 17           CMP           Okay. Okay, I have thrusters B3 and C4 safetied.

05 08 03 30           LMP           Okay.

05 08 03 43           CMP           I'm pumping up cabin pressure.

05 08 04 29       CMP       That was a funny one. You know, I didn't feel a shock, and I thought things were pretty steady. I went to RETRACT there, and that's when all hell broke loose. Were you guys - did it appear to you to be - that you were jerking around quite a bit during the retract cycle?

05 08 04 50       CDR       Yes. It seemed to happen at the time I put the plus X thrust to it, and apparently it wasn't centered, because somehow or other I accidentally got off in attitude and then the attitude hold system started firing.

05 08 05 09       CMP       Yes. I was sure busy there for a couple of seconds.

05 08 05 19       CMP       Are you hearing me all right? I got a horrible squeal.

05 08 05 22       CDR       Yes. I agree with that, but we hear you okay. Over.

05 08 05 36       CMP       Houston, Apollo 11. Over.

05 08 05 39       CC       Apollo 11, Houston. Go.

05 08 05 44       CMP       Roger. I'm supposed to adjust the oxygen flow in this thing to six-tenths of a pound per hour, but being as how this transducer is not working right, could you give me an updated number?

05 08 05 55       CC       Affirmative. You want to go ahead and adjust your O<sub>2</sub> flow until it just goes off the peg, and then crank the direct O<sub>2</sub> valve back down about 5 degrees. Over.

05 08 06 14       CMP       Boy, you were really waiting for that one, weren't you? Okay, Ron. Thank you.

05 08 06 59       CMP       Houston, I did that, and I believe we are flowing oxygen, but the gage is just pegged FULL SCALE LOW.

05 08 07 08       CC       Roger. That's fine. That's what we expect.

05 08 07 13       CMP       Okay.

05 08 07 24       CMP       Okay. I'm going to go ahead with the tunnel leak check.

05 08 07 32       CC       Columbia, Houston. I have a new LM weight for you whenever you're ready to copy.

05 08 07 45       CMP       Not right now, Ron. Remind me of it later,  
would you please?

05 08 07 50       CC        Roger. We'll stand by.

05 08 08 56       CMP       Houston, Apollo 11. I let P47 run longer than  
I should. I may have deteriorated our state  
vector slightly.

05 08 09 06       CC        Roger, Apollo 11. That's okay. We'll see later.

05 08 11 03       CMP       Houston, Apollo 11. Go ahead with your DAP up,  
please.

05 08 11 07       CC        Roger. Your LM weight, 5785. For an R1 we'd like  
to have 61102, R2 01111. Use BD roll. Over.

05 08 11 35       LMP       Roger. I'm configured now at ... for BD roll,  
and I have thrusters C4 and B3 turned off, and  
I copy register 1 61102 01111 and LM weight 5785.  
Thank you.

05 08 11 52       CC        Roger, Columbia.

05 08 13 57       CMP       Houston, Columbia has completed the leak check,  
and proceeding with opening the hatch dump valve.

05 08 14 07       CC        Roger, Columbia. Understand you're doing the  
leak check. I missed anything after that.

05 08 14 13       CMP       I say the leak check is complete, and I'm pro-  
ceeding with opening the hatch dump valve.

05 08 14 23       CC        Eagle - Columbia, Roger.

05 08 20 03       CMP       Eagle, Columbia.

05 08 20 07       LMP       Go ahead.

05 08 20 08       CMP       My hatch is removed. You can open yours, and I'll  
start passing stuff up to you.

05 08 20 12       LMP       Okay.

05 08 20 22       CMP       No. Stand by one, first.

05 08 20 27       LMP       Okay.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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05 08 28 30 LMP Mike, you ...

05 08 28 32 CMP Yes, everything is going fine. Be with you in just a second.

05 09 30 10 CC Eagle, Houston. Over.

05 08 30 16 LMP Go ahead, Houston. Eagle here.

05 08 30 17 CC Roger. Any time prior to jettison there, we'd like an AGS to PGNS align: 400 plus 30 000. Over.

05 08 30 34 LMP Okay. Any particular attitude you would like the PGNS in when we do that?

05 08 30 47 LMP No. We're not getting any. Could you give us some course align gimbal angles to move the PGNS to, and then we will align the AGS to the PGNS. Over.

05 08 30 58 CC Roger. Eagle. We concur. Stand by on the gimbal angles. And also, Eagle, while we've got the command module direct  $O_2$  on there, there's a possibility that your cabin relief might relieve if we get up around cabin pressure of about 5.4 or 5.5.

05 08 31 24 LMP Roger.

05 08 32 05 CC Eagle, Houston.

05 08 32 10 LMP Roger. Go ahead.

05 08 32 11 CC Roger. All we are trying to do is get PGNS and AGS aligned together. Doesn't make any difference on the gimbal angle.

05 08 32 28 CDR ...

05 08 32 34 LMP Okay. We are pretty close to 000. Is that all right?

05 08 32 38 CC Eagle, that's beautiful.

05 08 32 44 LMP Now, you might want to take into account what will happen when the CSM maneuvers to jettison attitude.

05 08 32 56 CC Eagle, Houston. We don't care what - All we are trying to do is get a drift rate and see how long it takes them to drift apart on the thing after you jettison.

05 08 33 08 LMP Okay. Will we be jettisoning at about this attitude? That's okay. I'll align the AGS with the PGNS. You can tell me a little later if you need some help.

05 08 33 22 CC Eagle, Houston. That's fine.

05 08 36 31 CMP Houston, Columbia. You want me to roll over and get high gain or anything like that?

05 08 36 38 CC Columbia, Houston. I can give you some REACQ angles for the high gain on the LM jettison attitude. Then you can go there whenever you want to. The angles are pitch minus 50, and yaw zero.

05 08 37 02 CMP Okay.

05 08 38 07 CMP Houston, Columbia. Say again the jettison roll, pitch, and yaw, please.

05 08 38 22 CC Columbia, Houston. Roll zero, pitch 025, and yaw zero. Over.

05 08 38 36 CMP Roger. Understand roll zero, pitch 025, yaw zero.

05 08 38 40 CC That's affirmative.

05 08 39 13 CMP ... in progress. We've moving. Houston.

05 08 40 09 LMP Houston, Eagle. Over.

05 08 40 12 CC Eagle, Houston. Go.

05 08 40 18 LMP Roger. It doesn't appear as though the red hose is going to be much of a competitor to the leading vacuum cleaner brands. Over.

05 08 40 27 CC There's a little noise there, Buzz. Say again.

05 08 41 54 CC Eagle, Houston.

05 08 42 02 LMP Roger. Go ahead.

05 08 42 05 CC Roger. Just a reminder to be sure to zero the AGS errors before you enable the AGS attitude hold there after you get in burn attitude.

05 08 42 26 LMP Roger. You mean SEP attitude?

05 08 42 47 CMP Houston, how do you read Columbia on high gain now?

05 08 42 50 CC Hey, Columbia. Houston. Mighty fine; loud and clear.

05 08 42 56 CMP Same here, Ron. Thanks.

05 08 43 00 CC And Eagle, Houston. Your steerable antenna angles for jettison attitude are - Over.

05 08 43 22 CDR Roger. Go ahead.

05 08 43 23 CC Roger. Pitch 165, yaw 68. Over.

05 08 43 35 CDR Roger. Pitch 165, yaw 68.

05 08 43 38 CC Eagle, Houston. Correct.

05 08 45 07 CC Columbia, Houston.

05 08 45 13 CMP Columbia. Go ahead.

05 08 45 15 CC Roger, Mike. You want to tweak the O<sub>2</sub> flow up just a bit there?

05 08 45 22 CMP Okay. Coming up. Houston, do you have any preferences as to what you want us to do with the probe? Over.

05 08 45 36 CC Columbia, Houston. Stand by one.

05 08 45 43 CMP Okay. Eagle says they've got a place for it inside there, so no problem.

05 08 45 48 CC Roger. That's all we were assuming.

05 08 46 50 CC Eagle, Houston.

05 08 47 06 CDR Eagle. Go ahead.

05 08 47 07 CC Roger. Neil, it looks like your steerable's good. You can put your track mode to slew and high bit rate, please. Over.

05 08 47 19 CDR Okay. Track mode to slew and high bit rate.

05 08 47 48 CMP Okay. Stand by just one, please.



05 08 48 24 CMP Okay. Shoot them on down.

05 08 49 28 CC Eagle, Houston.

05 08 49 35 CDR Go ahead, Houston.

05 08 49 36 CC Roger. Neil, just a reminder again, the ACA out of detent to zero; the AGS out of there just in case you go to ATTITUDE HOLD shortly.

05 08 49 47 CDR Okay.

05 08 50 20 CMP You say you wanted the probe now?

05 08 53 46 CC Eagle, Houston.

05 08 53 53 CDR Houston, Eagle. Go ahead.

05 08 53 54 CC Roger. That ACA out of detent didn't quite do it because the mode control switches were off. Request guidance control to PGNS and then back to AGS, and that will zero the AGS, there. Over.

05 08 54 12 CDR Say again, please.

05 08 54 14 CC Roger. Request guidance control switch to PGNS and then back to AGS. Over.

05 08 54 23 CDR Okay. We still have both mode control switches off. Over.

05 08 54 28 CC That's okay. That's good.

05 08 54 39 CDR And I thought I'd just take about 5 seconds here and see if I could get 000 gone, since we're fairly close to gimbal lock right now.

05 08 54 56 CC Eagle, Houston. That's fine.

05 08 58 03 CC Columbia and Eagle, Houston. About 5 minutes to LOS. Your IM jet time will be 131 plus 52, and I have the rest of the maneuver PAD if you want it now, or I can give it to you on the next time around.

05 08 58 25 CMP Stand by one.

05 08 58 43 CMP Could you read it around the next time around, please?

05 08 58 47 CC Sure, Mike. That's fine. We'll get it to you then.

05 09 01 52 CC Apollo 11, Houston. About a minute and a half to LOS. You're looking great. It's been a mighty fine day.

05 09 02 02 CMP Boy, you're not kidding.

05 09 26 -- BEGIN LUNAR REV 28

05 09 50 55 CC Hello, Eagle. Houston. Do you read? Over.

05 09 51 02 CDR Houston, this is Columbia. Reading you loud and clear. We're all three back inside; the hatch is installed. We're running a pressure check leak check. Everything's going well.

05 09 51 11 CC Roger, Eagle. Correction - Roger, Columbia. We copy. You guys are speedy; you beat us to the punch. We had a couple of things for you.

05 09 51 25 CDR What are they?

05 09 51 26 CC Oh, it was just - We wanted you to close the CO<sub>2</sub> sensor breaker and give us an RCS onboard readout out of Eagle, but that's all. Columbia, Houston. We've got a state vector for you if you'll give us P00 in ACCEPT. Over.

05 09 51 54 CDR Buzz says the CO<sub>2</sub> sensor circuit breaker is IN.

05 09 51 58 CC Roger. Thank you very much.

05 09 52 09 CDR The RCS quantity was approximately 60 at A and 45 percent at B.

05 09 52 14 CC Roger.

05 09 52 19 CDR And we're going P00 in ACCEPT.

05 09 52 21 CC Roger. Thank you.

05 09 54 07 CC Columbia, Houston. Your friendly White Team's going to be on till we get you on the way home, and we'd like to congratulate everybody on a successful rendezvous and a beautiful EVA. It was a great show for everybody. Over.

05 09 54 25 CMP Thank you, sir. I'll tell Neil and Buzz.

05 09 54 39 CDR Houston, the hatch passes its integrity check. I'm going to go to LM tunnel VENT now, and leave it there.

05 09 54 51 CC Roger, Columbia. We copy. That's good, and we'd like a readout on the TEP of about the time you - that Eagle selected the secondary loop. Over.

05 09 55 05 CDR Stand by.

05 09 55 17 CC Hello, Columbia. Houston. We got the load in. You can do the VERB 66 and the computer is yours. Over.

05 09 55 24 CDR Roger.

05 09 56 01 LMP Houston, Apollo 11. I'd say that the secondary loop was actuated about 15 to 20 minutes ago. Over.

05 09 56 11 CC Roger. Copy. Columbia. Thank you very much.

END OF TAPE

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05 09 57 20 CC Columbia, Houston. It looks like you guys are so speedy on us that we're thinking about moving up jettison time to about a GET of 130 plus 30, if that's okay with you all. Over.

05 09 57 41 CMP That's fine. I've still got to get a P30 PAD from you.

05 09 57 49 CC Roger. We want to talk to you about that. Mike, we can - for your druthers, we can do it either way. We can either let you do it in the jettison in P30 - correction P47, or we can send you a P30 target load up and then you - let you call P41, whichever you want to do. Over.

05 09 58 13 CMP Yes, I see. Ron was going to give me a P30 PAD and the flight plan says P47. Out of the two, I prefer to go to P30, P41 route.

05 09 58 20 CC Roger. Beautiful. We've got the load. If you'll give us P00 and ACCEPT, we'll send you a load up. Stand by.

05 09 58 41 CC Columbia, Houston. We'd like you to terminate direct O<sub>2</sub> flow, and stand by on your P00 and ACCEPT. We'll have to generate a new load due to the moveup on time. Over.

05 09 58 56 CMP Roger.

05 10 02 13 CC Columbia, Houston. Over.

05 10 02 19 CMP Go ahead.

05 10 02 21 CC Roger, Mike. It looks like if we move up this jettison time and give you a new load, it would require a new attitude, and we can't do that due to the LM already closed out, and it would fight us all the way around and we'd lose COMM with it. We're thinking separating in P47 in about 10 minutes. We're looking at trajectories and we'll be right with you momentarily. Over.

05 10 02 46 CMP Okay. It's no big thing with me either way.

05 10 02 48 CC Roger.

05 10 04 34 CC Hello, Columbia. Houston. We'd like you to start down your jettison checklist. We recommend

picking up page F11 — 12 and we'd like to jettison at 10 minutes. That'll be 130 14 45. Over.

05 10 04 54 CMP

Right.

05 10 04 57 CC

Columbia, Houston. If that's not satisfactory, let us know. Over.

05 10 05 05 CMP

Right.

05 10 05 36 CDR

Houston, Columbia. How about a GO for logic BUS ARM.

05 10 05 40 CC

Stand by.

05 10 05 48 CC

Columbia, Houston. You've got a GO.

05 10 05 55 CDR

Thank you.

05 10 06 46 CC

Columbia, Houston. You can undock at your convenience, correction, jettison at your convenience. We would like you to jettison Eagle and stationkeep - in P47 and stationkeep, and we'll have another attitude and a maneuver for you so we'll be okay for TEL. Over.

05 10 07 08 CDR

Roger that.

05 10 07 45 CMP

And I'm standing by to go to P47 just as soon as you give me a go for PYRO ARM.

05 10 07 49 CC

Roger. I thought we gave you that. Mike, you're GO for PYRO ARM and you're GO for jettison.

05 10 07 57 CMP

Okay.

05 10 09 13 CMP

Okay. Let her go in 10 seconds.

05 10 09 15 CC

Copy. Out.

05 10 09 40 CMP

NOUN 83 reading minus four balls, minus three balls, 3 or - correction - minus - both register 1 and register 2 are reading minus four balls 3, register 3 is zeros, the EMS remained on 100.0. A fairly loud noise, and it appears to be departing - oh, I would guess several feet per second.

05 10 10 06 CC

Roger, can you kind of stationkeep with it, Mike? Just stand by now.

05 10 10 12 CMP

Will do.

*Letting  
in 2nd on  
noon 320*

05 10 10 23 CC Columbia, Houston. Don't try to chase it, just hold what you've got.

05 10 10 32 LMP Charlie, did it hold cabin pressure this time?

05 10 10 35 CC Say again, Buzz. Over.

05 10 10 36 LMP Okay. I thrust back - I thrust back toward it a little bit, Charlie, and I'm now reading NOUN 83, plus four balls 4, minus four balls 8, and you want me to kill average D. Right?

05 10 10 53 CC Stand by. That's affirmative. You can exit P47.

05 10 11 05 CDR There she goes. It was a good one.

05 10 11 08 CC Roger dodger. We got Eagle looking good. It's holding cabin pressure and it picked up about 2 feet per second from that jettison.

05 10 11 19 LMP I believe that. I can see some cracks on the outer coating around the tunnel. In the thermal protective covering, I don't think it has anything to do with the structure.

05 10 11 35 CC Roger.

05 10 12 43 CC Hello, Columbia, Houston. We'll have an attitude and a little blip burn for you in about 130 30, so we can separate from Eagle. Over.

05 10 12 56 CMP That's fine.

05 10 16 49 CC Columbia, Houston. Would you start a maneuver to a pitch of 230 for this little tweak burn? Over.

05 10 17 01 CMP Roger. Pitch 230.

05 10 17 03 CC Roger, Mike. And verify track mode in AUTO for the high gain.

05 10 17 15 CMP We're in REACQ. Is that all right?

05 10 17 17 CC Say again. We need AUTO.

05 10 17 23 CMP Say again. We're in REACQ - AUTO REACQ.

05 10 17 26 CC Roger. We need AUTO, please, sir.

05 10 17 31 CMP Okay. You got it.

05 10 17 42       CMP       Roll zero, pitch 320, yaw zero?

05 10 17 47       CC       Right now that's what we're looking at. Stand by. We might have you roll so we can keep the high gain. Stand by.

05 10 17 56       CMP       Roger.

05 10 19 05       CC       Columbia, Houston. Over.

05 10 19 09       CMP       Go ahead.

05 10 19 10       CC       Roger, Mike - -

05 10 19 11       CDR       Apollo 11, these days.

05 10 19 12       CC       Oh, Roger, Apollo 11. We got you going to a posigrade attitude and we want you - this burn will be using minus X thrusters at about 2 or 3 feet per second, and we got a load for you. We'll send it up momentarily. Over.

05 10 19 33       CMP       Okay.

05 10 20 56       CC       Apollo 11, Houston. Would you give us P00 and ACCEPT? We have a load for you. Over.

05 10 21 02       CMP       You got it.

05 10 21 04       CC       Roger, Mike. And our pitch attitude's a little wrong here. If you're ready to copy, I'll give you the SEP PAD. Over.

05 10 21 13       CMP       Go ahead. Ready to copy.

05 10 21 14       CC       Roger. Starting with NOUN 33: 130 30 0000, plus 00020, plus all zeros, plus all zeros. Roll all zeros, pitch 230, yaw zero. NOUN 44 is NA. DELTA-V<sub>P</sub> 00020, burn time 007, DELTA-V<sub>C</sub> 00020. We have - The rest of the PAD is NA.

05 10 22 15       CMP       Roger. GET 130 hours 30 minutes, DELTA-V<sub>X</sub> 2.0, roll zero, pitch 230, yaw zero, DELTA-V<sub>C</sub>, 2.0.

05 10 22 32       CC       That's affirmative, Apollo 11. And, Mike, it's similar to the SEP burn prior to flight after the undocking here. And the P41 you should see on register 1 - 2, and then you burn minus X until you read 4. Over.

05 10 24 11 CC Apollo 11, Houston. Computer's yours. Over.

05 10 24 19 CMP Roger, Charlie. We switched our OMNI-D - Delta, and I lost that last transmission. Would you say again, please? The thing I'm wondering about specifically is that earlier you said it would be minus X thrusters and the PAD indicates plus X. Do you want me to null that to zero or do you want to add 2 and leave it as a 4?

05 10 24 39 CC Roger, Apollo 11. The way we gave it to you in the attitude we're in, it'll be just like the SEP burn that you had yesterday. You'll see - NOUN 85 will give you a plus 2 and then you just burn minus X until you read 4. Over.

05 10 24 58 CMP Understand.

05 10 25 50 CC Apollo 11, Houston. We see you in P41 now. It might take you a couple of minutes to integrate these vectors that we gave you and if you don't make TIG, it's pretty insensitive. You can just let P41 bring you up to TIG, and when you get to zero, you can burn on that. Over.

05 10 26 12 CMP Okay.

05 10 30 24 CMP Okay. Burn complete. Residuals: plus three balls 40, plus four balls 7, plus four balls 2, DELTA-V counter 102.1. Over.

05 10 30 38 CC Copy, Apollo 11. Looks good to us. Over.

05 10 30 43 CMP Okay.

05 10 33 24 CMP Houston, Apollo 11. How about coming up with a good communications attitude for us to go to between now and the time we maneuver at TEI attitude.

05 10 33 33 CC Roger, sir. Stand by.

05 10 34 40 CC Hello, Apollo 11, Houston. A couple of things for you. Over.

05 10 34 46 CMP Go ahead.

05 10 34 47 CC Okay. Mike, you can maneuver to your preliminary TEI attitude as shown on page 398 of the flight plan, and the high-gain angles are good as shown in the flight plan, and we'd like you to dump the waste water at 131 05 down to 10 percent. Over.



05 10 35 13       CMP       Okay. Understand. I'm going to go to roll 1.1, pitch zero - or 52.6, and yaw 13.8, and you want a waste-water dump 10 percent starting at 131 05.

05 10 35 28       CC       That's affirmative. Right out the LOS.

05 10 37 10       CMP       Maneuver is in progress, Houston.

05 10 37 14       CC       Copy, 11. Out.

05 10 40 14       CC       Apollo 11, Houston. Over.

05 10 46 46       CMP       Apollo 11 under high gain. How do you read?

05 10 46 50       CC       Five-by, 11. How me? Over.

05 10 46 54       CMP       You're loud and clear, Charlie. What - What numbers are you looking at for TEI TIG preliminary; 135 hours 23 minutes, something like that?

05 10 47 05       CC       That's affirmative, Mike. We're looking at about nominal time. We've considered kicking it up a REV, but we don't think this REV-track is going to be any good since we had the RCS burn and we need some more tracking to get you a good TEI. Over.

05 10 47 26       CMP       That's what we're looking for.

05 10 47 27       CC       Roger.

05 10 47 39       CC       11, Houston. Looks like it's going to be pretty relaxed time here for the next couple of hours. We'll have you a PAD, of course, the next REV or so, and we'll keep you posted on TEI. Looks like nominal time. Over.

05 10 47 52       CMP       Thank you, Charlie.

05 10 47 57       CC       And your little maneuver back here a moment ago will put you about 20 miles ahead of the LM at TEI.

05 10 48 07       CMP       Okay.

05 10 48 42       CMP       Imagine that place has cleared out a little bit after that rendezvous. You can find a place to sit down almost, huh?

05 10 48 47       CC       Roger. Our MOCR's about empty right now. We're taking it a little easy. How does it feel up there to have some company?

05 10 48 57       CMP       Damn good, I'll tell you.

05 10 49 00       CC        I'll bet. I bet, you'd almost be talking to yourself up there after 10 REVS or so.

05 10 49 07       CMP       No, no. It's a happy home here. It'd be nice to have company. As a matter of fact, it'd be nice to have a couple of hundred million Americans up here.

05 10 49 18       CC        Roger. Well, they were with you in spirit.

05 10 49 19       CMP       Let them see what they're getting for their money.

05 10 49 22       CC        Roger. Well, they were with you in spirit anyway, at least that many. We heard on the news today, 11, that last night - yesterday after you made your landing, New York Times came out with a - headlines, the largest headlines they've ever used in the history of the newspaper.

05 10 49 48       CMP       Save us a copy.

05 10 49 55       CDR       I'm glad to hear it was fit to print.

05 10 49 59       CC        It was great.

05 10 50 08       CC        That's why we didn't read you up any newscast. There really wasn't anything to talk about.

05 10 50 15       CMP       Hello, there, Boss.

05 10 51 36       CC        Apollo 11, Houston. We've got 10 minutes to LOS; see you over the hill at 131 48. Over.

05 10 51 45       CMP       Okay, Charlie. I'll dump the water as soon as we go around the corner.

05 10 51 48       CC        Roger. Everything's looking real good now.

05 10 51 53       CMP       Yes. Same here.

05 10 57 08       CC        Hello, Apollo 11. Houston. Coming up about 4 30 LOS. You're looking great on all your systems. Eagle is purring right along after an hour 30 without any cooling. The PNGS is still looking good. Over.

05 10 57 24       CMP       Roger.

05 11 00 26       CC        Apollo 11, Houston. Will you verify that your rendezvous radar transponder is off? Over.

05 11 00 38       CMP       It's not, but I'll get it off.

05 11 00 41       CC       Roger. We were seeing - believe it or not, we were seeing some funnies on the Eagle's rendezvous radar, and that was the only theory that we had. It looked like it was a good one.

05 11 00 55       CMP       Good theory.

END OF TAPE

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05 11 25 -- BEGIN LUNAR REV 29

05 11 49 29 CC Hello, Apollo 11. Houston. We are standing by. Everything is looking great here. Over.

05 11 49 42 LMP Apollo 11. Roger.

05 12 16 00 CC Hello, Apollo 11. Houston. If you guys want it, we've got some news, here, we can read up. Over.

05 12 16 09 CDR Be pleased to have it.

05 12 16 11 CC Roger, Neil. Starting off: Congratulatory messages on the Apollo 11 mission have been pouring into the White House from world leaders in a steady stream all day. Among the latest are telegrams from Prime Minister Harold Wilson of Great Britain and the King of Belgium. The world's press has been dominated by news of Apollo 11. Some newsmen estimate that more than 60 percent of the news used in papers across the country today concerned your mission. The New York Times which, as we mentioned before, has had such a demand for its edition of the paper today (even though it ran 950 000 copies) said it will reprint the whole thing on Thursday as a souvenir edition. And Premier Alexei Kosygin has sent congratulations to you and President Nixon through former Vice President Humphrey who is visiting Russia. The cosmonauts have also issued a statement of congratulations. Humphrey quoted Kosygin as saying "I want you to tell the President and the American people that the Soviet Union desires to work with the United States in the cause of peace."

05 12 17 21 CC And Mrs. Robert Goddard said today that her husband would have been so happy. "He wouldn't have shouted or anything. He would just have glowed." She added, "That was his dream, sending a rocket to the Moon." People around the world had many reasons to be happy about the Apollo 11 mission. The Italian police reported that Sunday night was the most crime-free night of the year. And in London, a boy who had the faith to bet \$5 with a bookie that a man would reach the Moon before 1970 collected \$24 000. That's pretty good odds.

- 05 12 18 00      CC      You're probably interested in the comments your wives have made. Neil, Jan had said about yesterday's activities, "The evening was unbelievably perfect. It is an honor and a privilege to share with my husband, the crew, the Manned Spacecraft Center, the American public, and all mankind; the magnificent experience of the beginning of lunar exploration." She was then asked if she considered the Moon landing the greatest moment in her life. She said "No, that was the day we were married." And Mike, Pat said simply, "It was fantastically marvelous." Buzz, Joan said - apparently couldn't quite believe the EVA on the Moon. She said, "It was hard to think it was real until the men actually moved. After the Moon touchdown, I wept because I was so happy." But she added, "The best part of the mission will be the splashdown."
- 05 12 18 52      CC      In other news, and there was a little bit, another explorer: Thor Heyerdahl had to give up his attempt to sail a papyrus boat across the Atlantic. The storm-damaged boat was abandoned about 650 miles from Bermuda. The speed of the craft had been reduced to about 25 miles a day, and Heyerdahl said the object of the voyage had not been to provide an endurance test for the crew.
- 05 12 19 21      CC      Looking at the world of sports, let's see here. While you were busy the other day, Joe Namath and football Commissioner Pete Rozelle made the announcement that "Broadway Joe" had agreed to sell his interest in the Bachelors III restaurant and report to the New York Jets. Joe arrived at the Jets' training camp today and had his first workout. Several other Jet players who had held out along with Joe also reported. And Davy Hill, from Jackson, Michigan, won his third major golf in as many starts in the past week. He won the Philadelphia Classic. Hill has won four tournaments so far this year and is the leading money winner this year with a cool \$129 000. And in baseball, the west division of the National League remains a tight race. LA and San Francisco are one game behind league-leading Atlanta. The Astros have a record of 48 wins and 48 losses, and are now in fifth place, seven games out. A twin bill between the Astros and Cincinnati last night was postponed because of rain. The Chicago Cubs

are still in first place in the East Division. They lead the New York Mets by four and one-half games. And in the American League, Baltimore is breezing toward the Eastern Division title. They lead second-place Boston by 11 games. Looking ahead, the All-Star baseball game is scheduled for tomorrow. And President Nixon was scheduled to see the game and then leave immediately after the game for the Pacific splashdown area before going on his tour of Europe. And that about covers the news this day. You guys have been making most of it and I'm sure we couldn't fill you in on any of the details that you don't already know. Out.

05 12 21 22        CDR        Thank you much, Charlie.

05 12 21 24        CC         You're welcome.

05 12 21 42        CC         11, Houston. We've got a preliminary TEI 30 PAD, if you're ready to copy.

05 12 22 06        CMP        Ready to copy.

05 12 22 10        CC         Roger. Coming at you. TEI 30, SPS/G&N: 36691; minus 061, plus 067 135 23 4149; NOUN 81, plus 32020, plus 06713, minus 02773 181 054 013; NOUN 44, HA is NA, plus 00230 32833 228, DELTA-V<sub>c</sub> 32625 24 1510 355. Next three lines are NA. NOUN 61 plus 1103, minus - minus 17237 11806 36275 195 04 52. Your set stars are Deneb and Vega, 242 172 012. We like two-jet ullage to 16 seconds. The horizon will be on the 11-degree mark at TIG minus 2 minutes. And other comments: your sextant star is visible after GET of 134 50. Ready for your readback. Over.

05 12 24 39        CMP        Roger. We have a TEI 30, SPS/G&N: 36691, minus 061, plus 067 135 23 4149; plus 32020, plus 06713, minus 02773 181 054 013; NA, plus 00230, plus 32833 228 32625, 24 1510 355; NA three times, plus 1103, minus 17237 11806 36275 195 04 52. Deneb and Vega 242 172 012, two-jet ullage, 16 seconds; horizon 11-degree line at TIG minus 2 minutes; sextant star visible after 134 50. Over.

05 12 25 58        CC         Roger, Mike. Good readback. Out.

(GOSS NET 1)

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05 12 53 02

CC

Hello, Apollo 11. Houston. Seven minutes to  
LOS; next AOS 133 46. You're looking good going  
over the hill. Out.

END OF TAPE

(GOSS NET 1)

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05 13 23 -- BEGIN LUNAR REV 30

05 13 49 44 CC Hello, Apollo 11. Houston. We're standing by.

05 13 49 54 CMP Roger. Apollo 11.

05 13 49 56 CC Roger. We'd like you, sometime at your convenience, to stir up the CRYO's on this pass. And we're wondering if you got the fuel cell purge. Over.

05 13 50 08 CMP Roger. \*\*\* fuel cell purge ...

05 13 50 12 CC Say again. You're breaking up.

05 13 50 18 CMP Roger. The O<sub>2</sub> fuel cell purge is complete.

05 13 50 22 CC Roger. Copy.

05 13 52 42 CC Hello, Apollo 11, Houston. We've got a load for you, if you give us POO and ACCEPT. The load consists of a CSM pre-TEI state vector that's going in the CSM slot, and a post-TEI state vector that'll go into the LM slot, if that's okay; and also a TEI target load. Any comments? Over.

05 13 53 07 CMP Very good. Thank you very much.

05 13 53 08 CC Yes, sir.

05 13 53 09 CMP POO and ACCEPT. You got it.

05 13 53 10 CC Thank you.

05 13 53 31 CC And, 11, Houston. A reminder: you can scratch the VERB 66 at 134 30.

05 13 53 41 CMP Understand.

05 13 54 03 CC And, 11, Houston. For your information, Eagle, we had an ISS fail light came on at about 3 19 due to a CDU overheating; and at about this time at AOS it looks like we're about to lose the platform.

\*\*\* Three asterisks denote clipping of words and phrases.



05 13 54 25 CMP ...

05 14 00 09 CC Apollo 11, Houston. We got the load in. You can have the computer - -

05 14 00 12 LMP 11. Are you through with the computer?

05 14 00 14 CC That's affirmative, Buzz.

05 14 00 20 LMP All right. That's timing for you.

05 14 00 41 CC And, Apollo 11, Houston. Your friendly White Team has your coming-home information, if you're ready to copy. Over.

05 14 00 56 LMP Stand by.

05 14 01 14 LMP Apollo 11. Ready to copy.

05 14 01 16 CC Roger, 11. Got two PADS for you, TEI-30 and then a TEI-31. TEI-30 SPS/G&N: 36691, minus 061, plus 066 135 23 4156. NOUN 81: 32 - correction, plus 32011, plus 06818, minus 02650 181 054 014. Apogee is NA, perigee plus 00230 3286 - correction, 32836; burn time 2 28 32628 24 1511 357. Next three lines are NA. NOUN 61: plus 1103, minus 17237 11806 36275 195 04 52. Set stars are Deneb and Vega, 242 172 012. We'd like ullage from two jets for 16 seconds, and the horizon is on the 10-degree line at TIG minus 2 minutes; and your sextant star is visible after 13<sup>4</sup> plus 50. Stand by on your readback. I have a TEI-31 if you're ready to copy. Over.

05 14 04 14 LMP Roger. TEI-30, SPS/G&N: 36691, minus 061, plus 066 135 23 4156, plus 32011, plus 06 818, minus 02650, 181 054 014; apogee NA, plus 00230 32836 228 32628 42 1511 357, NA three lines, plus 1103, minus 17237 11806 36275 195 04 52, Deneb and Vega, 242 172 012, two-jet ullage, 16 seconds, horizon out-of-the-window, 10 degrees, TIG minus 2 minutes, sextant star at 13<sup>4</sup> 10. Over.

05 14 05 43 CC Roger, Buzz. Good readback. You're very weak. If you're ready to copy, I got a TEI-31 for you. Over.

05 14 06 01 LMP All right. Go ahead.

05 14 06 09 CC Apollo 11, Houston. You were cut out. Say again.

05 14 06 17 LMP Roger. Stand by one.

05 14 06 18 CC Roger.

05 14 06 24 LMP All right. Go ahead. I'm ready to copy.

05 14 06 27 CC Roger, 11. TEI-31, SPS/G&N: 36691, minus 061, plus 066 137 22 3985, plus 32838, plus 06845, minus 02487, NA, pitch 052. Rest of the PAD is NA. Ready for your readback. Over.

05 14 07 25 LMP Roger. TEI-31, SPS/G&N: 36691 minus 061, plus 066, 137 22 3985, plus 32838, plus 06845, minus 02487, NA, pitch 052. The rest is NA. Over.

05 14 07 56 CC Roger. Good readback. And, Buzz, did you say sextant star is visible after 134 50?

05 14 08 11 LMP No. I wrote down 134 10. I wasn't real sure about that.

05 14 08 18 CC Roger. It went by me there. RETRO caught it. It's 134 50. Over.

05 14 08 26 LMP Okay. 134 50. Thank you.

05 14 08 29 CC Yes, sir.

05 14 16 53 CC Hello, Apollo 11. Houston. After the burn, we'd like you to trim X and Z. Over.

05 14 17 05 CMP Okay, Charlie.

05 14 17 07 CC Roger. And that's to 0.2 foot per second, as shown in the flight plan.

05 14 17 23 CMP Sounds like there's a story behind that one, too.

05 14 17 28 CC We'll tell you when you get back.

05 14 20 22 CC Hello, Apollo 11. Houston. Would you verify that you've stirred up the CRYO's? Over.

05 14 20 31 CMP Roger. We've stirred them up.

05 14 20 33 CC Thank you, sir.

END OF TAPE

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05 14 37 53        CC        Apollo 11, Houston. You are GO for TEI. Over.

05 14 37 59        CMP        Apollo 11. Thank you.

05 14 49 25        CC        Hello, Apollo 11. Houston. You've got about  
8 minutes till LOS. Your AOS with the burn,  
135 34 05, no burn 135 44. Over.

05 14 49 43        CMP        Okay. Thank you.

05 14 49 46        CC        Yes, sir.

05 14 56 35        CC        Apollo 11, Houston. One minute to LOS. Go  
sic 'em.

05 14 56 41        CMP        Thank you, sir. We'll do it.

05 15 19 --               BEGIN LUNAR REV 31

05 15 35 14        CC        Hello Apollo 11. Houston. How did it go?  
Over.

05 15 35 22        CMP        Time to open up the LRL doors, Charlie.

05 15 35 25        CC        Roger. We got you coming home. It's well  
stocked.

05 15 35 33        CDR        Okay. Burn status: DELTA-TIG was zero, burn  
time was 2 plus 30. PAD angles: DELTA V<sub>gx</sub>  
after trim was 0.1, V<sub>gy</sub> 0.9, V<sub>gz</sub> 0.1. DELTA-V<sub>C</sub>  
minus 17.9, fuel 10.6, OX 10.4, unbalance  
minus 50.

05 15 36 01        CC        Roger. Copy, Neil. Sounds good to us.

05 15 36 16        CC        And Apollo 11, Houston. All your systems look  
real good to us. We'll keep you posted.

05 15 36 27        CDR        Roger.

05 15 36 28        CDR        Hey, Charlie boy, looking good here. That was  
a beautiful burn. They don't come any finer.

05 15 36 31        CC        Roger.

05 15 36 48        CC        Apollo 11, Houston. I wondered if you've compared your state vector accuracy with the one in the IM flights? Over.

05 15 36 59        CDR        Yes, sir, and it looked very nice. VERB 83 was plus 00070 and minus 00008.

05 15 37 10        CC        Roger.

05 15 37 38        CC        11, Houston. I was looking at your bank Bravo nitrogen tank. It didn't leak a bit - correction - didn't leak a bit this time. Over.

05 15 37 51        CDR        Roger. Looked good here.

05 15 37 53        CMP        Chamber pressure was hanging in there around 100. The latter part of the burn it started oscillating a little bit and got down a little bit below 100.

05 15 37 59        CC        Roger.

05 15 38 00        CMP        96 or so.

05 15 38 01        CC        Roger.

05 15 47 24        CC        Apollo 11, Houston. Would you give us P00 in ACCEPT? We've got a REFSMMAT for you. Over.

05 15 47 36        CMP        Okay.

05 15 47 37        CC        Thank you.

05 15 50 07        CC        Hello, Apollo 11. Houston. We've got the load in. You can go back to BLOCK. Over.

05 15 50 16        CMP        We're there.

05 15 50 18        CC        Roger.

05 15 50 38        CMP        Your command module film seems to be working out pretty well, Charlie, the amount we carried. Looks like we carried just about what we needed.

05 15 50 45        CC        Wonderful.

05 15 50 51        CMP        We have one 16-millimeter roll on the ASA-1000 color interior film. We were thinking of shooting that during the entry, out window number 4 on a bracket, and you might get the camera guide sometime in the next couple of days and give us all the good settings for that.

05 15 51 09        CC        Roger.

05 15 54 46        CC        Hello, Apollo 11. Houston. I wondered if during the TEI burn you utilized the oxidizer flow valve on the PUGS. Over.

05 15 55 06        LMP        Yes, we did. Based on your very excellent briefing I was expecting the thing to continue desiring increase for the whole time, so we started out with it in INCREASE. I saw that we pretty quickly crossed the line and started falling about 6 or 7 percent behind, so I was still expecting it to move up, and then I went down to FULL DECREASE and brought it back down to a difference of 2 percent. Over.

05 15 55 40        CC        Roger. Thank you very much, Buzz.

05 15 55 41        LMP        Two-tenths of a percent, I'm sorry.

05 15 55 43        CC        Roger. Thank you.

05 15 59 37        CC        Apollo 11, Houston. You can go to PTC attitude and torque at your - and do the P52 and torque at your convenience. Over.

05 15 59 50        CMP        Hey, we got to take some more pictures, Charlie. Is there any constraint, normally, in staying here for awhile?

05 15 59 55        CC        No, sir.

05 16 00 00        CMP        Thank you.

END OF TAPE

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05 16 20 37        CC        Go ahead, 11. Over.

05 16 20 42        CMP        How does that tracking look, or is it too early to tell?

05 16 20 45        CC        Stand by, Mike.

05 16 21 12        CC        Apollo 11, Houston. FIDO's are looking at the data. It's too early to tell yet exactly. It's looking real good so far. We'll have you some answers shortly on trajectory. Over.

05 16 21 27        CMP        Okay. What FIDO is that?

05 16 21 33        CC        That's Jay Green.

05 16 21 40        CMP        Howdy, Jay.

05 16 21 54        CC        11, Houston. We have a DAP CSM update for you.

05 16 22 03        CMP        Go ahead.

05 16 22 04        CC        Roger. CSM weight, Mike: 26370. Over.

05 16 22 12        CMP        Thank you, sir.

05 16 22 14        CC        Welcome.

05 16 24 11        CC        Apollo 11, Houston. We've taken your onboard vector and propagated it forward, and it's looking real good. We only got about 24 minutes of tracking now. Really too early to tell on the radar. Over.

05 16 24 26        CMP        Roger. Understand.

05 16 28 08        CC        Hello, Apollo 11. Houston. Mike, did you notice any transients at ignition on TEI? Over.

05 16 28 21        CMP        Yes. The transients were more noticeable than on the previous burns, Charlie. I just wrote it off on the fact we had a light command module, but there was considerable roll activity which dampened down after the first 20 seconds, I would guess, of the burn; but then there was also some pitch and yaw activity. I don't believe it was abnormal, and it seemed to be deadbanding ratherly crisply in roll plus or minus about 8 degrees either side of the center line; and after the

first couple of - oh, after the first 20 seconds or so, the gimbals were quiet, and pitch and yaw were relatively quiet. Before that, there was some oscillation but mostly just in rates. Total attitude hung in there pretty well.

05 16 29 12      CC      Roger. Thank you much. We were looking at the playback, and we saw some things that - right at start up. We'll be back with you later on that.

05 16 29 22      CMP      Okay.

05 16 42 26      CC      Apollo 11, Houston. Have you finished taking pictures? Over.

05 16 42 36      CMP      We're just finishing up, Charlie.

05 16 42 38      CC      Roger.

05 16 42 45      CMP      About to get started on the P52 here pretty soon.

05 16 42 48      CC      Copy.

05 16 42 50      CMP      Another eight or nine of them.

05 16 52 26      CC      Hello, Apollo 11. Houston. You can crank up on the PTC at any time. Over.

05 16 52 33      CMP      All right-o.

05 16 52 45      CC      Apollo 11, Houston.

05 16 52 50      CDR      Go ahead, Houston.

05 16 52 52      CC      Roger, 11. This is the regional CAP COMM. Congratulations on an outstanding job. You guys have really put on a great show up there. I think it's about time you powered down and got a little rest, however. You've had a mighty long day here. Hope you're all going to get a good sleep on the way back. I look forward to seeing you when you get back here. Don't fraternize with any of those bugs in route except for the Hornet.

05 16 53 21      CDR      Okay. Thank you, boss. We'll - We're looking forward to a little rest and a restful trip back. And see you when we get there.

05 16 53 30 CC Roger. You've earned it.

05 16 54 13 CC Hello, Apollo 11. Houston. We'd like you to turn off O<sub>2</sub> tank number 1 heaters. Over.

05 16 54 27 CMP It's off. Thank you.

05 16 54 29 CC Roger.

05 16 54 57 CC Hello, Apollo 11. Houston. For your information, the LGC in Eagle just went belly up at 7 hours. Over.

05 16 55 10 CDR Okay. Very good, ... death of a real winner, there.

05 16 55 26 CMP Charlie, we're going to rotate about pitch 270 degrees on the way home vice 1 - or 090 on the way out. Right?

05 16 55 34 CC Right, sir.

05 16 55 39 CMP Okay. VERB 49 maneuver to that attitude is in progress.

05 16 55 43 CC Roger.

05 16 56 14 CDR Houston, crew status report. Radiation: CDR 11017, CMP 10019, LMP 09020. No medication.

05 16 56 29 CC Say again, please, Neil. We - you were breaking up. We missed that. Over.

05 16 56 37 CDR Okay. This is crew status report. Radiation: CDR 11017, CMP 10019, LMP 09020. No medication.

05 16 56 56 CC Roger. Thank you.

05 16 57 00 CC And we didn't get any crew status report from you this morning. Wondered if you could give us an estimate of sleep last night. Over.

05 16 57 12 CDR Okay ...

05 16 57 48 CDR Okay. We'll take a guess, Charlie, and try to give an equivalent amount. Oh, it's CDR 3, and LMP 4.

05 16 58 00 CC Roger. Thank you very much.



05 16 58 25 CDR And, Charlie, you want the fans cycled ...  
Right?

05 16 58 30 CC That's affirmative, and we'd like you to disable  
quads Charlie and Delta. Over.

05 16 58 38 CMP Okay. Charlie and Delta.

05 16 59 09 CC Apollo 11, Houston. If it's convenient, we'd  
like to go through your onboard readout. Over.

05 16 59 21 CMP Of what?

05 16 59 22 CC Oh, excuse me. It's on the flight plan, 3102.  
We'd like BATTs and RCS. Over.

05 16 59 33 CMP Stand by.

05 17 00 38 CMP Ready to copy, Houston?

05 17 00 40 CC Roger. Go ahead.

05 17 00 44 CMP BATT Charlie 370, PYRO BATT A 370, BATT B 370;  
RCS, 55, 65, 64, and 62. Over.

05 17 00 59 CC Roger. We copy all that. Thank you much.

05 17 01 05 CMP Roger.

05 17 17 01 CC Apollo 11, Houston. A couple of questions for  
the Moon walkers, if you got a second. Over.

05 17 17 09 CDR Go ahead.

05 17 17 11 CC Roger, Neil. We're seeing some temperature  
rises on the passive seismic experiment that  
are a little higher than normal and were won-  
dering if you could verify the deployed posi-  
tion. We understand it's about 40 feet from  
the LM in the eleven o'clock position. Over.

05 17 17 37 CDR No. It's about in the nine or nine-thirty  
position, and I'd say it's about 50 or 60 feet.

05 17 17 50 CC Roger. Copy. Also, did you notice - was there  
any indication of any dust cloud as you lifted  
off? Over.

05 17 18 02 CDR Not very much. There was quite a bit of Kapton and parts of the LM that went out in all directions, usually for great distances, as far as I can tell. But I don't remember seeing anything of a dust cloud to speak of.

05 17 18 21 CC Roger. Understand all you could see was parts of the LM going out. What was your - your first - first comment? Over.

05 17 18 35 CDR I don't remember. Just that the Kapton and other parts on the LM staging scattering all around the area for great distances, but I didn't see much dust.

05 17 18 50 CC Roger. Thank you very much.

05 17 21 09 CMP Houston, Apollo 11. Could you keep me honest on the lithium hydroxide changes? When do you have the next one scheduled for?

05 17 21 16 CC Stand by.

05 17 22 09 CC Apollo 11, Houston. Mike, on that canister, we had you due to change one at 133 before TE, and it's on page 399. The next one we got is at 147. Over.

05 17 22 30 CMP Okay.

05 17 25 31 CC Hello, Apollo 11, Houston. We'd like to extend our damping period for another 5 minutes; let the rates get way down. Over.

05 17 25 42 CMP 11. Roger.

05 17 30 12 CMP Houston, Apollo 11.

05 17 30 14 CC Go ahead, 11. Over.

05 17 30 19 CMP Roger, Charlie. Like to bring you up to date on our chlorination status. In compartment B4, we have one, two, three, four, five, six, seven - correction, we have eight pockets for chlorine and buffer ampules, of which - Let me correct that. We have seven pockets, of which one is empty and always has been empty, leaving six remaining. On the other side over there in B7, we have another container with seven pockets, so we have a total of seven plus six, and those are filled with six chlorines and seven buffers. Now, I've been using one chlorine and one buffer per day which, at this point in time, prior to

this chlorination I'm about to do, leaves me one chlorine and two buffers. Seems to me I'm one chlorine short, and that being the case, I'd like to ask your advice on postponing this chlorination using the last container until some later date, like maybe tomorrow. Over.

05 17 31 41      CC      Roger. We copy, Mike. Stand by.

05 17 31 46      CMP      Okay.

05 17 37 21      CC      Hello, Apollo 11. Houston. Check in Al, Mike, and see what you can find in there. Over.

05 17 37 34      CC      We think you might have some more chlorine up in Al. Over.

05 17 38 25      CC      Hello, Apollo 11. Houston.

05 17 38 42      CMP      Houston, Apollo 11.

05 17 38 50      CC      Apollo 11, Houston. Do you read? You're breaking up. Over.

05 17 38 57      CMP      Roger. Read.

05 17 39 02      CC      Roger, 11. You're breaking up. Mike, please look in compartment Al. We think there might be some more chlorine up there. Over.

05 17 39 21      CMP      Eureka!

05 17 39 26      CC      11, Houston. Reading you about one-by. Over.

END OF TAPE

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05 17 41 43       CC       11, Houston. We're having a downlink problem. That's the reason we can't read you. We're switching sites. Stand by.

05 17 42 02       CC       Hello, Apollo 11. Houston. How do you read now? Over.

05 17 42 09       CMP       Fine.

05 17 42 10       CC       Roger. You're five-by now, too, Mike. Thank you much. Did you copy that about Al on that chlorine?

05 17 42 20       CMP       Eureka!

05 17 42 21       CC       How about that, sports fans!

05 17 45 26       CC       Apollo 11, Houston. We're having a little trouble getting the yaw rate damped out to the appropriate value. We'd like you all to be quite like mice for a couple of minutes and let's see if that will help it out. Over.

05 17 45 45       CC       11, Houston. You did great work there. We're ready to spin it up. Over.

05 17 46 30       CC       11, Houston. Did you copy? Over.

05 17 46 43       LMP       Yes. We read you, Charlie. Would you stand by a minute?

05 17 46 46       CC       Roger. No hurry.

05 17 47 18       CC       11, Houston. Shift change time, here. White Team bids you good night; we'll see you tomorrow. Over.

05 17 47 27       CDR       Good night, Charlie. Thank you.

05 17 47 30       LMP       Good night, Charlie. Thank you.

05 17 47 33       CMP       Adios.

05 17 47 35       CC       Adios. Thanks again for a great show, you guys.

05 17 47 41       CMP       Thanks for a great job down there.

05 18 01 52       CC       Apollo 11, Houston. Over.

05 18 01 59       CMP       Good morning, Ron.

05 18 02 01       CC       Howdy there, Mike. We're ready to go ahead and have you switch to your OMNI positions for your sleep period, and we would like the following high-gain switch positions: your high gain antenna in MANUAL, beam width WIDE, pitch is minus 50, and yaw is a plus 270. And just follow the flight plan for remaining COMM configuration. Over.

05 18 02 37       CDR       Roger. Out.

05 18 02 48       LMP       You "Purple" people keep funny hours.

05 18 02 52       CC       Your COMM is pretty weak at this point, Mike. Please say again.

05 18 02 59       CMP       Roger. Disregard.

05 18 03 39       CMP       Houston, Apollo 11.

05 18 03 41       CC       Go ahead, 11.

05 18 03 56       CMP       It's on the way now.

05 18 06 20       CC       Apollo 11, Houston. We'd like for you to go ahead and put your S-band antenna OMNI to OMNI and OMNI B. Over.

05 18 07 51       CC       Apollo 11, Houston. How do you read me through Honeysuckle now? Over.

05 18 08 02       CMP       You're loud and clear. Over.

05 18 08 03       CC       Very good. Reading you better now. And did you copy we'd appreciate going S-band OMNI and OMNI B at this time? Over.

05 18 08 14       CMP       That's the configuration we're in.

05 18 08 17       CC       Okay. Thank you.

05 18 08 24       CMP       I'll say you "Purple" people keep funny hours.

END OF TAPE

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REST PERIOD - NO COMMUNICATIONS

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

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REST PERIOD - NO COMMUNICATIONS

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REST PERIOD - NO COMMUNICATIONS



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REST PERIOD - NO COMMUNICATIONS

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REST PERIOD - NO COMMUNICATIONS

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06 03 47 11       CMP       Good afternoon, Houston. Apollo 11. Over.

06 03 47 24       CC        Good morning, 11. This is Houston. Over.

06 03 47 31       CMP       Okay. Crew status report: 88 and 8.5.

06 03 47 38       CC        Roger. 88 and 8.5. When you're ready, we've got a small flight plan update for you.

06 03 48 14       LMP       Houston, we're ready to copy.

06 03 48 16       CC        Roger. At about 148 hours, if you've not already done so, a CO<sub>2</sub> filter change, and the H<sub>2</sub> purge line heater on 20 minutes before the O<sub>2</sub> and H<sub>2</sub> purge. At 148 hours, we'd like you to initiate a charge on battery Alfa instead of at 151 hours, and leave the charge on until we notify you further. At 150 hours GET, waste-water dump to 10 percent. We do plan to burn midcourse correction 5. It will be an RCS burn about 5 feet per second at about the nominal time in the flight plan. Over.

06 03 49 24       LMP       Roger. Understand. We'll be accomplishing the filter change shortly, the purge line heater is on \*\*\*, O<sub>2</sub> and H<sub>2</sub> purge shortly, and at 148 will initiate a charge on battery A until you notify us further. At 150 hours, waste-water dump to 10 percent. And we're looking forward to mid-course correction 5 at about 5 feet per second at the nominal time. Over.

06 03 49 52       CC        Roger. I've got your consumables update, if you're ready to copy.

06 03 50 02       LMP       Copy.

06 03 50 04       CC        Okay. At GET of 147 plus 00, RCS total minus 2.0 percent, which is about minus 14 pounds. Alfa minus 12.0, Bravo plus 10.0, minus 3.0, minus 2.0. Hydrogen total minus 1.5 pounds, O<sub>2</sub> total plus 20 pounds. Over.

06 03 50 50       LMP       Roger. I copy, and our onboard readouts: Alfa, \*\*\* 2 percent, Bravo 54 percent, Cocoa's 64 percent, Delta 61 percent. Over.

\*\*\* Three asterisks denote clipping of words and phrases.

06 03 51 19 CC Roger, 11. Would you read that quad Alfa again, please, Buzz. You're cutting out. It may be - are you operating on VOX? Over.

06 03 51 29 LMP Negative. Alfa is 53 percent. Over.

06 03 51 36 CC Roger. We copy.

06 03 51 53 CC 11, from down here on telemetry, all your systems look to be in good shape.

06 04 01 51 CC Apollo 11, this is Houston. Over.

06 04 01 57 CMP Go ahead.

06 04 01 58 CC Roger. Would you ask Buzz to check his biomedical TM sensors for a loose or dried out sensor? We're getting an erratic electrocardiogram reading. That would be one of the three sternal leads. Over.

06 04 02 18 CMP Okay.

06 04 02 45 CMP ...

06 04 03 58 CC Apollo 11, this is Houston. Say again your last, please.

06 04 04 07 CMP Disregard.

06 04 04 11 CC Roger. Out.

06 04 07 14 CC Apollo 11, this is Houston. Stand by for a Mark leaving the lunar sphere of influence.

06 04 07 22 CC MARK.

06 04 07 23 CC You're leaving the lunar sphere of influence. Over.

06 04 07 31 CMP Roger. Is Bill Shaffer down there?

06 04 07 34 CC Negative. But we've got a highly qualified team on in his stead.

06 04 07 42 CMP Roger. I wanted to hear him explain it again to the press conference.

06 04 07 50 CC Okay.

06 04 07 54 CMP That's old Apollo 8 junk, but tell him the spacecraft gave a little jump as it went through the ...

06 04 07 58 CC Okay. I'll pass it on to him. Thanks a lot, and Dave Reed is sort of burying his head in his arms right now.

06 04 08 10 CMP Roger. Out.

06 04 08 15 CDR Those guys down there in the press room did a pretty good job this morning.

06 04 08 20 CC Yes, they have.

06 04 08 30 CDR We don't want them to give up yet, though.

06 04 08 34 CC No. They'll hang in there for about another 47 hours or so.

06 04 08 39 CDR Okay.

06 04 22 48 CC Apollo 11, this is Houston. If you're not busy now, I can read you up the morning news.

06 04 23 01 LMP Okay. We're all listening.

06 04 23 05 CC Say again, 11?

06 04 23 11 LMP Roger. We're all listening. Go ahead.

06 04 23 13 CC Roger. From the hot wires of the Public Affairs Office: Apollo 11 still dominates the news around the world. Only four nations, Communist China, North Korea, North Viet Nam, and Albania, have not yet informed their citizens of your flight and landing on the Moon. One newsman said that he has run out of ways to describe your success. Tonight, President Nixon is scheduled to watch the All Star baseball game in Washington. After the game, he will depart for the Pacific recovery area. Wednesday evening, he will fly from Johnston Island by helicopter to the Navy communications ship Arlington. Then on Thursday morning, he will reboard the helicopter and fly to the Hornet in time to witness your splashdown. Accompanying the President will be Secretary of State William Rogers and Frank Borman. They will watch the splashdown from the bridge of the recovery ship with Admiral John Sidney McCain, Jr., Commander of the Pacific Forces. Following the President's stay aboard the Hornet, he will depart for his tour of Asia and scheduled visit to Romania. Luna 15 is believed to have crashed into the Sea of Crises yesterday after orbiting the Moon 52 times. The Soviet News Agency TASS reported that "scientific

research in near-Moon space was carried out." Sir Bernard Lovell at Jodrell Bank Observatory said that Luna 15 hit the surface of the Moon at a speed of about 300 miles per hour. Things have been relatively quiet recently in Viet Nam. GI's on patrol were observed carrying transistor radios tuned into your flight. The Armed Forces radio and TV network in Viet Nam gave the mission full coverage. Skirmishes still continue between the Egyptians and Israelis along the Suez Canal. U.N. observers there are trying to halt the action. In Washington, the House Ways and Means Committee has voted to reduce the 27.5-percent oil depletion allowance to 20 percent. We've had rain several times here in the Houston area. Today it is cloudy, and more showers are expected. On the sports front, as we mentioned earlier, the All Star game is tonight. There were no games played yesterday. Last night in New York, the Baseball Writers Association of America named Babe Ruth the greatest ball player of all time. Joe DiMaggio was named the greatest living ball player. Frank Borman made the announcements at a dinner honoring the players. Joe Namath put in a full day at the New York Jets' training camp. Five policemen had a hard time restraining about 500 kids who wanted to touch Broadway Joe. He said he feels fine and will play in the All Star game August 1, if Coach Weeb Eubank lets him. The Oilers' camp at Kerrville got wet yesterday, but the workouts continued. There have been some minor injuries, but nothing too serious. Coach Wally Lemm is satisfied so far with the workouts. The Oilers are expecting attendance by over 30 000 for the preseason game with Buffalo. Apparently, Don Meredith's announced retirement isn't expected to dampen enthusiasm, especially around here in Houston. Mario Andretti won the 200-mile Trenton Auto Race Sunday and is now the leading race driver in the U.S. Auto Club's point standings. And that's about the summary of the morning news this afternoon in Houston. Over.

06 04 26 52 LMP Look up the Dow Jones Industrials for us.

06 04 26 55 CC Roger. Stand by a minute, please.

06 04 33 45 CC Apollo 11, this is Houston. We see you in P00. When you can give us ACCEPT, we have a state vector and target load uplink ready for you.

(GOSS NET 1)

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06 04 34 15

LMP

Roger, Houston. I'm going ahead and start the computer.

06 04 34 18

CC

Roger. Thank you.

END OF TAPE

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(GOSS NET 1)

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06 04 38 41        CC        Apollo 11, we've completed the uplink. The computer's yours.

06 04 38 48        CMP        Thank you.

06 04 43 41        CC        Apollo 11, this is Houston. Over.

06 04 43 47        LMP        Go ahead.

06 04 43 49        CC        Roger. With respect to the Dow Jones industrials, since closing on Tuesday afternoon the 15th up to about 1:05 p.m. Houston time this afternoon, why, the effect has been a net drop; that is, minus 6 points on the industrial average. So far today since opening, the Dow Jones industrial average has gone down by 11.05 after rising 1-1/2 shortly after opening. Today's performance on the utilities is a drop of 1.63, and railroads a drop of 1.58. Over.

06 04 44 36        CMP        Every flight has to have some disadvantages, I guess.

06 04 44 40        CC        Roger. There is some speculation that you all are responsible for that 1-1/2-point rise right after opening.

06 04 44 55        CMP        Well, don't blame the 11-point drop on us, anyway.

06 04 44 59        CC        Roger.

06 04 45 30        CC        Apollo 11, this is Houston. If you have a minute or so free, I wonder if we could get Mike to give us a little bit of clarification on what happened around about the time of docking. We copied him as mentioning that contact was very smooth, almost imperceptible; and we're a little bit inquisitive or curious about his remarks as to what happened after probe retraction. Over.

06 04 46 00        CMP        Roger. I docked in CMC AUTO, and as I said, I wasn't really sure of the moment of contact. I kept cross-checking the docking probe indicators. I got two barber poles indicating that the three capture latches - not capture latches, but the three ... latches had made, and we were soft



docked. And at that time the situation looked very stable. So, I went to CMC FREE, glanced back out the window and it still looked stable; and I fired primary 2 bottle. And at that time, a gyration began between the two vehicles due I'm not sure to what. Perhaps the LM thrusting or perhaps it was building up prior, and I hadn't noticed it. But anyway, during the RETRACT of the probe, there were yaw - my yaw excursions of, I would guess, around 15 degrees, and I had to come back on, take the FREE switch and throw it back to AUTO, and try to damp them out; and I guess Neil was doing the same in the LM. I'll let him tell you about his side of it. And I thought that we were not going to get a successful RETRACT and hard dock. However, in about - oh, I guess 6 or 8 seconds, I did hear - could see the situation damping out, and then we heard the noise indicating the docking latches had fired; and later on when I got into the tunnel, all 12 of them had properly engaged.

06 04 47 44        CC        Roger.

06 04 47 49        CDR        And on the LM side, we were in AGS MIN deadband ATT HOLD; and at contact, I thrust plus-X; and shortly after that we had a sizable attitude oscillation and thruster firing, so we opened up the deadband to MAX and manually flew the vehicle into stable attitude during the retraction. It went to OFF after ...

06 04 48 28        CC        Roger. Thank you very much. Out.

06 04 50 48        CC        Apollo 11, this is Houston. I have your midcourse-correction-5 PAD available when you're ready to copy.

06 04 50 56        LMP        Stand by.

06 04 51 56        CMP        Houston, Apollo 11. Ready to copy.

06 04 52 02        CC        11, this is Houston. Midcourse correction number 5, RCS/G&N: 26025, pitch and yaw trim NA, TIG 150 29 5453, minus 00048, plus all balls, plus 00001 075 159 328;  $H_A$  is NA;  $H_P$  plus 00230 00048 011 00048; sextant star 03 0908 382. Boresite star block, none available. Latitude plus 1102, minus 17204 11803 36275 195 03 33, GDC align,

Deneb and Vega, 007 144 068, no ullage, of course, four-quad thrusting. Over. Readback.

06 04 53 51 LMP Roger. Midcourse number 5, RCS/G&N: 26025, pitch and yaw NA, 150 29 5453, minus 00048, plus all zeros, plus 00001 075 159 328, NA, plus 00230 00048 011 00048 03 0908 382, NA three times, plus 1102, minus 17204 11803 36275 195 03 33, Deneb and Vega, 007 144 068, and four quads for the burn. Over.

06 04 55 17 CC Apollo 11, this is Houston. Readback correct. Out.

06 05 03 11 CC Apollo 11, this is Houston. Over.

06 05 03 18 CMP Roger. Go ahead, Houston.

06 05 03 20 CC Roger. If Neil has a free minute, we've got a question or two regarding the CO<sub>2</sub> partial pressure and water in the suit loop discrepancies noted yesterday. Over.

06 05 03 33 CDR Go ahead.

06 05 03 36 CC Roger, 11. Was water noted in both suits or only in yours, Neil?

06 05 03 44 CDR I think only in my suit.

06 05 03 48 CC Okay. Can you locate that occurrence for us in time when you first noticed water in the suit, either by mission time or relation to any particular event?

06 05 04 17 CDR I think it was after insertion sometime, Bruce. I don't remember exactly when. I - It was when we were in orbit and had our - after we took our helmets off.

06 05 04 31 CC Roger. Did you call it to us when you first noticed it, or was it sometime after when you called it?

06 05 04 38 CDR I'd guess it might have been probably 20 minutes after I noticed it that I mentioned it to you.

06 05 04 44 CC Roger. Was this noticing the water accompanied by erratic CO<sub>2</sub> partial pressure readings, or was that a separate problem? Over.

06 05 04 57 CDR Well, the water problem evidenced itself before we noted any erratic motions of the PCO<sub>2</sub> gage.

06 05 05 06 CC Roger. And what was the relative sequence on selecting water separator number 2 and the secondary CO<sub>2</sub> canister; that is, did you go to the secondary water separator first and then the secondary CO<sub>2</sub>? Over.

06 05 05 27 LMP I believe we went to secondary CO<sub>2</sub> first.

06 05 05 33 CDR Secondary hydroxide - lithium hydroxide.

06 05 05 37 CC Roger. We copy. And was there any change in your suit loop - -

06 05 05 40 CDR No.

06 05 05 41 CC Go ahead.

06 05 05 44 LMP I should mention, Bruce, that when I went to water secondary - water separator to secondary there, I didn't notice any change. But about after 15 minutes or 20 minutes, the water stopped coming out. So maybe that was just water that was already in the loop that was still blowing out, but the secondary water separator was operating properly.

06 05 06 11 CC Roger. Did you make any changes in the suit loop configuration after you went from the egress mode to the cabin mode after insertion; that is, in particular, they're interested in knowing if you recall changing the diverter valve position to EGRESS at any time while you were on the secondary canister? Over.

06 05 06 36 CMP No. I don't believe we did that at all, Bruce.

06 05 06 40 CC Okay, ll. Thank you. That sums up our questions for now, and we'll crank these back into the engineering pipeline and see what we can come up with.

06 05 06 51 LMP Okay. Are you satisfied that the CO<sub>2</sub> circuit breaker was in on jettison? Over.

06 05 07 00 CC Say again, please?

06 05 07 04 LMP Roger. On LM jettison, are you satisfied that the CO<sub>2</sub> circuit breaker was in? Over.

06 05 07 10 CC Yes. It was in.

06 05 07 17 LMP Roger. Could you confirm that? I thought there was some question after we got into the command module as to whether that had been left in or not. Over.

06 05 07 34 CC Roger, 11. It was in and confirmed in, and the readings after jettison stayed about 0.1 to 0.2.

06 05 24 24 CC Apollo 11, this is Houston. We have not noticed any change in the signal coming through on the LMP's EKG. When he has a little free time, we'd like him to check into it again. Over.

06 05 24 41 LMP Roger. I looked at all three of the upper chest center ones, and they appear to be fairly tight. I'll push them back in again. Over.

06 05 24 53 CC Roger. On the TM here, we noticed some fluctuations that may have been attributed to your moving the sensors around or pushing on them, but the erratic problem seems to be persisting.

06 05 44 27 LMP Houston, Apollo 11. Over.

06 05 44 40 CC 11, this is Houston. Over.

06 05 44 45 LMP Roger. I wonder if you've noticed any change in the BIOMED returns you're getting. Over.

06 05 44 54 CC Negative, Buzz. It still looks kind of bad. Apparently, when you move around, it's cutting in and out. Have you checked the little electrical connector where it goes into the signal conditioner? Over.

06 05 45 07 LMP Yes. They're all about as tight as can be. I tell you what; I'll take them off and put them back on again and see if that makes any difference.

06 05 45 17 CC Okay. If you would, at your convenience, we'll be watching it down here.

END OF TAPE

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06 06 10 19 CC Apollo 11, this is Houston. We'd like you to try acquisition on the high-gain antenna for us at pitch minus 90, yaw 270. Over.

06 06 10 33 CDR Roger. That's in work.

06 06 10 37 CC Roger. Out.

06 06 12 36 CC 11, this is Houston. We're showing about 6.8 percent on waste water on our telemetry now. Over.

06 06 12 48 CMP Okay. We've got about 9, up here. Over.

06 06 12 51 CC Roger. Out.

06 06 28 31 CC 11, Houston. We're standing by for your burn. Everything's looking good from down here.

06 06 28 39 LMP Thank you, Bruce. You've got about a minute and 20 seconds.

06 06 28 42 CC Roger. We concur.

06 06 31 16 CMP Houston, do you copy our residuals?

06 06 31 33 CC Roger. We've got your residual fuel counter reading for us.

06 06 31 43 CMP DELTA-V<sub>C</sub> is plus 0.2.

06 06 31 46 CC Roger. Plus 0.2.

06 06 31 50 CMP That was actually plus 100.2. Okay?

06 06 31 54 CC Okay.

06 06 43 34 CMP Houston, Apollo 11.

06 06 43 38 CC Go ahead, 11.

06 06 43 43 CMP Roger. We're in PTC attitude and would you please give us a call when our thruster activity has subsided sufficiently?

06 06 43 52 CC Roger. Stand by.

06 06 56 41 CC Apollo 11, this is Houston. We're going to hand over from Madrid to Goldstone at 151 hours even.

If you should lose lock on the high gain at this time, you may reacquire at pitch minus 45, yaw 270. Break. We're still watching your rates. Over.

06 06 57 05 CDR Okay. Thank you.

06 07 08 49 CC Apollo 11, this is Houston. Over.

06 07 08 56 CDR This is 11, Houston.

06 07 09 07 CC Apollo 11, this is Houston. Over.

06 07 09 15 CDR Go ahead, Houston.

06 07 09 17 CC 11, we're still seeing rates on your spacecraft above those we would like for the continuation of the PTC mode which we are still monitoring, and we'll advise you when it has settled down. Over.

06 07 09 34 CDR Okay.

06 07 21 51 CC Apollo 11, this is Houston. You are go for the spinup on PTC. Over.

06 07 22 59 CDR Thank you.

06 07 24 23 CDR Houston, Apollo 11. Over.

06 07 24 27 CC Go ahead, 11.

06 07 24 32 CDR Roger. It didn't like it that time. When I got down to the entry 27303 ENTER, it took off in roll at a high rate in excess of 1 degree per second. Over. I've stopped it now, and we are going to have to go back and do it over again. I'd like to try to find out the reason it did that.

06 07 24 55 CC Roger. You might as well start setting up for it, and we will be working the problem here.

06 07 25 02 CDR Okay. Do you have us on high bit rate here now?

06 07 25 07 CC That's affirmative.

06 07 25 11 CDR Okay, good. I'll maneuver back to PTC initiation attitude while you guys look at the data and see what you think.

06 07 25 20 CC Roger.

06 07 25 50 CDR Houston, Apollo 11. I think the reason is in having 1620 on the DSKY during the subsequent entries, or at least that's one possibility.

06 07 26 06 CC Roger. We'll check it out.

06 07 33 33 CC Apollo 11, this is Houston. While you're waiting for the CSM to settle down and for us to look at the tapes on your latest maneuver, would you feel like answering some more questions with relation to the lunar surface? Over.

06 07 33 52 CDR Go ahead.

06 07 33 57 CDR Go ahead, Houston.

06 07 33 59 CC Roger. For 64 thousand dollars, we're still trying to work out the location of your landing site, Tranquility Base. We think it is located on LAM-2 chart at Juliet 0.5 and 7.8. Do you still have those charts on board? Over.

06 07 34 24 CDR Yes. Stand by one. They're packed.

06 07 34 31 CC Roger. You may not have to unpack it. The position which I just gave you is slightly west of West Crater. I guess it's about two-tenths of a kilometer west of it, and we were wondering if Neil or Buzz had observed any additional landmarks during descent, lunar stay, or ascent which would confirm or disprove this. One thing that we're wondering about is that if you were at this position, you would have seen the Cat's Paw during ascent just up to the north of your track. Over.

06 07 35 18 CDR We were looking for the Cat's Paw, too, thinking we were probably downrange, beyond the Big V. But I think that it's likely that that might have been West Crater that we went across in landing, but - Stand by.

06 07 36 22 CDR We're hoping, Bruce, that our 16-mm film was working at that point in descent, and we'll be able to confirm our touchdown position. We thought that during ascent we might be able to pick up some recognizable objects close to the landing site, and we did see a number of small craters, and crater rows, and things like that, which we may be able to pick out after the fact, but we haven't been able to yet.

06 07 36 58        CC        Roger. And the next question from our panel is for Buzz. We recall that he reported seeing a laser upon AOS of the Earth the first time after - the first REV after ascent, and we're wondering what color the beam was and if he could determine at the approximate location with respect to the Earth. Over.

06 07 37 25        LMP        It was mostly white, perhaps a tinge of yellowish color to it; and it seemed to be - as I recall it, the terminator of the Earth was toward the horizon and seemed to be about a quarter to a third of the way down from - down towards the terminator of the Earth - from the opposite horizon. That's a third to a quarter Earth radii. Over.

06 07 38 10        CC        Roger. And that puts it in the light side? Over.

06 07 38 18        LMP        Roger. Yes, it was in the light side. The Earth was about - a two-thirds lit Earth, with the terminator down toward the horizon. And now coming from the opposite limb of the Earth, the sunlight limb, coming down about one-quarter to one-third of a radius in from the limb. Generally, pensively located with respect to a line drawn perpendicular to the terminator that goes through the center. Over.

06 07 38 58        CC        Roger, Buzz. We copy.

06 07 39 02        LMP        And I got pictures of that. I'm sure that will show up.

06 07 39 07        CDR        And I saw that, too. It was a very bright spot of light and I confirm Buzz's observation of its position.

06 07 39 15        CC        Okay, ll. Very good. Now, with respect to the documented sample container: on television it appeared to us as though the samples for that container were in fact being given - being selected in accordance with some thought or consideration being given to the rocks themselves. And we were wondering if you could give any further details from memory about any of these samples, and the context of the material or the surface from which they were taken. Over.



06 07 39 56            CDR            Yes. You remember I initially started on the cut side of the LM that the TV camera was on, and I took a number of samples of rocks on the surface, and several that were just subsurface - about 20 - 15 to 20 feet north of the LM. And then I recalled that that area had been probably swept pretty well by the exhaust of the descent engine, so I crossed over to the southern side of the LM, and took a number of samples from the area around the elongate double crater that we commented on, and several beyond that, and tried to take as many different types - of rock types as I could see by eye - as I could in the short time we had available. There were a number of other samples that I had seen earlier in our stroll around the LM that I had hoped to get back and pick up and put in the documented sample, but I didn't get those, and I'll be able to comment in detail when we get in the debriefing session.

06 07 41 17            CC            Roger. Did you observe any small craters with conspicuously blocky rims? Over.

06 07 41 28            CDR            Well, aside from the one big one that we went over, I guess there were none in our area. I took a stroll back after putting up the EASEP, and while Buzz was starting to unpack the documented samples - took a stroll back to a crater behind us that was maybe 70 or 80 feet in diameter and 15 or 20 feet deep, and took some pictures of it. It had rocks in the bottom of pretty good size, considerably bigger than any that were out on the surface, but there was no - we apparently, at 15 feet or so, had not gotten below the regolith. We were essentially showing no bedrock, at least in the walls of the crater at that depth. Over.

06 07 42 28            CC            Roger. We copy.

06 07 42 50            CC            Okay. Thank you, Neil. That about wraps up the questions we have on hand for now.

06 07 43 00            CDR            Okay.

06 07 43 50            CDR            My compliments to the chef. The food is outstanding. This cream of chicken soup I give at least three spoons.

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06 07 43 58

CC

Okay. Cream of chicken, three spoons.

END OF TAPE

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06 07 46 22        CC        Apollo 11, this is Houston. Over.

06 07 46 27        CMP        Go ahead.

06 07 46 29        CC        11, we concur that having VERB 16, NOUN 20 up on the DSKY may well have had some effect on your PTC initiation. It looks like this would give - let the computer work with a knowledge of the actual CDU angles. What we'd like you to do is do a CDU zero which is VERB 40, NOUN 20, ENTER, and then start the PTC procedure again at step 2 with loading VERB 6, NOUN 22, desired attitude in the AUTO maneuver, and all that. Over.

06 07 47 08        CMP        Okay. The only thing I don't understand about that is why it took off at the rate it did. What rate should it have taken off at under that theory?

06 07 47 17        CC        Stand by a minute, Mike.

06 07 52 17        CC        11, CMP, this is Houston. Over.

06 07 52 25        CMP        Go ahead, Houston.

06 07 52 27        CC        Mike, over here on page 9-7 of your checklist where we're setting up PTC, there's been a note penciled in after, "Wait 20 minutes for rate to damp. Do not monitor VERB 16, NOUN 20." It turns out that the significance of that is that, if you are monitoring 16 NOUN 20, then when you get down here in step 7, the second time you do a VERB 24, you've got to reload the NOUN 01 to make it VERB 24, NOUN 01, ENTER, before you load the three registers. Over.

06 07 53 09        CMP        Roger, that. I was just questioning the rate at which the maneuver would begin if that were not done.

06 07 53 17        CC        Roger. We're still working on computing the rate for you.

06 07 53 39        CC        Apollo 11, this is Houston. We'd like you to select REACQ mode on the high-gain antenna. Looks like we're about to lose you. Over.

06 08 17 13      CC      Apollo 11, Apollo 11, this is Houston broadcasting in the blind. If you read us, attempt to acquire on OMNI antennas. Attempt to acquire us on OMNI antennas, if you read. This is Houston. Out.

06 08 18 34      CC      Apollo 11, Apollo 11, this is Houston broadcasting in the blind. If you read, attempt acquisition on an OMNI antenna. Attempt acquisition using an OMNI antenna. Over.

06 08 20 14      CC      Apollo 11, Apollo 11, this is Houston broadcasting in the blind. If you read, attempt contact using OMNI antenna, using an OMNI antenna. This is Houston. Out.

06 08 35 08      CC      Apollo 11, Apollo 11, this is Houston broadcasting in the blind. If you read us, attempt acquisition using an OMNI antenna. Attempt acquisition using an OMNI antenna. This is Houston. Out.

06 08 43 48      CT      ... Goldstone.

06 08 43 54      CC      Apollo 11, Apollo 11, this is Houston. Radio check. Over.

06 08 46 15      CT      ...

06 08 46 46      CC      Apollo 11, this is Houston. How do you read? Over.

06 08 46 51      CMP      Loud and clear, Bruce. How me?

06 08 46 54      CC      Roger. What antenna are you using?

06 08 47 27      CMP      Houston, Apollo 11 is calling you on the high gain. How do you read? Over.

06 08 47 31      CC      Roger. Loud and clear on the high gain.

06 08 47 48      CMP      So what's new?

06 08 47 51      CC      Oh, we were wondering what was new with you up there.

06 08 47 56      CMP      It's all very quiet. We're just sitting here letting the thruster firing damp down. When they get good enough, let us know, and we'll start this PTC.

06 08 48 06      CC      Roger.

06 08 48 29      CMP      Nice to sit here and watch the Earth getting  
larger and larger and the Moon smaller and  
smaller.

06 08 48 37      CC      Roger. We'll give you a call when your rates  
have damped down sufficiently, and we're unable  
at the present time to predict what rate you  
should have seen at your last attempt to initiate  
PTC. We saw about 2-1/2 degrees per second.  
Over.

06 08 48 57      CMP      Yes. I believe that.

06 08 49 21      CMP      Buzz thinks we should have a PTC program built in  
the computer. He could very well be right.

END OF TAPE

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06 09 19 17       CMP       Houston, Apollo 11.

06 09 19 21       CC       Go ahead, 11.

06 09 19 27       CMP       Roger. I was just checking the radios, and how  
is the thruster activity coming?

06 09 19 51       CC       11, Houston. The radios are still in good shape,  
and we are still waiting for your rates to decay.  
We've got 0.03 degrees per second in pitch now.

06 09 20 05       CMP       Okay. We're - we're in no rush. This is a very  
pleasant attitude, as a matter of fact. The Sun  
is down in the LEB, so it's not shining through  
the windows and heating the place up. We've got  
the Earth steady out window 1. We have the Moon  
steadily out window 3 and, of course, we are  
locked up on the high gain. So as long as the  
thermal people are happy, we're happy.

06 09 20 29       CC       Roger. We copy.

06 09 33 27       CC       Apollo 11, this is Houston. Over.

06 09 33 33       CMP       Go ahead, Houston.

06 09 33 35       CC       Okay, 11. We are about ready to start PTC. I  
would like to give you some high-gain-antenna  
angles, though. We'd like to operate in the  
REACQ mode, and do you plan on spinning up in  
the positive or negative direction? Over.

06 09 33 52       CMP       We can do it either way. I had planned the  
positive.

06 09 33 53       CC       Okay. For positive, the high-gain-antenna  
setting should be pitch plus 30, yaw 270, and  
in REACQ. Over.

06 09 34 10       CMP       Understand. REACQ, pitch plus 30, yaw 270.  
Thank you.

06 09 34 14       CC       Roger. And if you would, when you're making  
your DSKY entries to set up for PTC, go a little  
slower, and we'll try to follow each entry from  
down here. Over.

06 09 34 28       CMP       Roger. Out.

06 09 39 47       CMP       Houston, 11.   PTC established.

06 09 39 50       CC       Roger, 11.

06 09 43 05       CC       11, Houston.  We observe the PTC to be fairly  
well established here, and we'll keep you posted  
on how it's going, and your friendly White Team  
commentator is taking over now.

06 09 43 23       CMP       Okay.  Thanks to all you Black Team.

06 09 43 26       CC       That was the Green Team.

06 09 43 28       CMP       Correction, all you Green Team - correction,  
Green Team.  Excuse me.

06 09 43 31       CC       Roger.  Out.

06 09 43 48       CMP       How could I forget.  I used to be a "Green"  
one.

06 09 45 42       CC       Hello, Apollo 11, Houston.  Your White Team is  
now on.  We're standing by for an exciting  
evening of TV and a presleep report.  Over.

06 09 53 03              (Unidentifiable Noise)

06 09 53 12       SC       (Laughter)

06 09 53 31       CC       Apollo 11, Houston.  You sure you don't have  
anybody else in there with you?

06 09 53 38       CMP       Houston, Apollo 11.  Say again, please.

06 09 53 41       CC       We had some strange noises coming down on the  
downlink, and it sounded like you had some  
friends up there.

06 09 53 55       CDR       Where - where do the White Team go during their  
off hours anyway?

06 09 53 59       CC       Say again.

06 09 56 30              (Unidentifiable Noise)

06 09 58 59              (Unidentifiable Noise)

06 10 40 58       CC       Apollo 11, Houston.  Over.

06 10 41 05       LMP       Go ahead, Houston.

06 10 41 07      CC      Roger. Would you ver - We've lost COMM with you for about the last 10 minutes. Would you verify that the S-band track switch is in REACQ? Over.

06 10 41 17      LMP      Negative. It's not. The last time we broke lock, we went to AUTO, and I left it there. Sorry.

06 10 41 22      CC      Roger. We'd like to have you to put it in REACQ, and monitor. In about 2 minutes, we'll be coming up on the high gain. Would you monitor the REACQ? If it doesn't take, acquire manually. Over.

06 10 41 39      LMP      Okay. Say again the angles you'd like.

06 10 41 42      CC      We'll - we'll try to switch it ourselves. Stand by on the angles.

06 10 41 52      CC      Buzz, it's pitch plus 30, yaw 270. Over.

06 10 41 58      LMP      Roger. I've got them.

06 10 42 01      CC      Thank you.

06 10 46 11      CC      Hello, Apollo 11. Houston. Would you please terminate battery charge now? Over.

06 10 46 19      LMP      Roger. Terminating battery charge.

06 10 46 22      CC      Roger.

06 10 50 51      CC      Hello, Apollo 11. Houston. Any special attitude you'd like us to look at for the TV? Over.

06 10 51 09      CMP      I don't guess we have a requirement there, Charlie.

06 10 51 14      CC      Roger. We have an attitude that we can get the Earth out of a window or the Moon. We're trying to look at - find one that we can get both, if that's what you'd like. Over.

END OF TAPE



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06 10 51 33       CMP       A 50-degree roll attitude will probably give us that, Joe.

06 10 51 37       CC       Roger.

06 10 51 49       LMP       That's a good one because it puts the Earth out window 1 and the Moon out window 3 and puts the Sun down in the LEB, so the lighting in here remains relatively constant.

06 10 52 03       CC       Roger. Well, we'll just stop on the 50 roll, then, and we'll give you the word when to do that. Over.

06 10 52 09       CMP       Okay.

06 11 23 08       CC       Apollo 11, Houston. We'll have high-gain coverage about 155 30. At that time, you can turn on the TV if you desire, and continue your roll-around until you get 50 degrees roll. Over.

06 11 23 26       CDR       Okay.

06 11 28 25       CC       Apollo 11, Houston. We were going to give you the All Star game tonight, but it was rained out. Over.

06 11 28 35       SC       ...

06 11 30 05       CC       11, Houston. We're on the high gain. You can warm up the SM now if you like. Over.

06 11 32 45       CC       Apollo 11, Houston. We see you coming up on 50 roll. How does that attitude look? Over.

06 11 34 52       CC       Apollo 11, Houston. We're ready for the TV; we're all configured. At your convenience. Over.

06 11 36 34       CDR       Houston, Apollo 11. Over.

06 11 36 36       CC       Roger. Go ahead, 11. Over.

06 11 36 40       CDR       Are you picking up our TV signals?

06 11 36 42       CC       That's affirmative. We have it up on the Eidephor now. The focus is a little bit out. We see the Earth in the center of the screen.

Still have a little white dot in the bottom of the camera, apparently. And see some land-masses in the center, at least I guess that's what it is. It's very hazy at this time on our Eidephor. Over.

06 11 37 06      CC      Let me change - -

06 11 37 07      CMP      Believe that's where we just came from.

06 11 37 10      CC      It is, huh? Well, I'm really looking at the bad - at a bad screen here. Stand by one. Hey, you're right.

06 11 37 34      CMP      It's not bad enough not finding the right landing spot --

06 11 37 35      CC      ... screen now.

06 11 37 42      CMP      It's not bad enough not finding the right landing spot when you haven't even got the right planet!

06 11 37 46      CC      I'll never live that one down.

06 11 37 55      CMP      We're making it get smaller and smaller here to make sure that it really is the one we're leaving.

06 11 38 02      CC      All right. That's enough you guys.

06 11 38 14      CC      ll, that was a good picture there.

06 11 38 16      CDR      Okay. That's enough of the Moon.

06 11 38 20      CDR      Okay. That's enough of the Moon, Charlie. We're getting set up now for some inside pictures.

06 11 38 22      CC      Roger.

06 11 40 32      CDR      We know there's a lot of scientists from a number of countries standing by to see the lunar samples, and we thought you'd be interested to see them as they really are here. These two boxes are the sample return containers. They - They're vacuum-packed containers that were closed in a vacuum on the lunar surface, sealed, and then brought inside the LM and put inside these fiber-glass bags, zippered, and resealed around the outside, and placed in these receptacles in the side of the command module. These are the two boxes. And as soon as we get onto the ship,

I'm sure these boxes will immediately be transferred and delivery started to the Lunar Receiving Laboratory. These boxes include the samples of the various types of rock, the groundmass of the soil, the sand and silt, and the particle collector for the solar wind experiment, and the core tubes that took depth samples of the lunar surface.

06 11 42 07      CC      Roger, Neil. Thank you much for that description. We've got a pretty dark picture down here. Could you check your f-stop? We'd like to have it - See if you can open it up a little bit. Over.

06 11 42 20      LMP      Okay. Our monitor showed that to be very bright.

06 11 42 22      CC      Roger.

06 11 42 23      CDR      ... We're down around between, well around f:4, which we thought would be plenty light. Well, we'll lighten it up some more.

06 11 42 31      CC      Well, we'd appreciate it. It's pretty dark on all our monitors here.

06 11 42 39      CDR      Okay. Fine.

06 11 42 43      CC      It's looking a lot better now, Neil.

06 11 42 49      CC      There's Buzz.

06 11 43 14      CC      ll, Houston. We have an excellent picture now. Over.

06 11 43 19      LMP      Okay. How do you read me, Charlie?

06 11 43 21      CC      Five-by now, Buzz. Over.

06 11 43 24      LMP      Okay. The more mundane affairs, now that we've left the Moon, I'd like to trace through them a little bit for you \*\*\* developments that have taken place in the food department. I'm sure you've already \*\*\* type of a drink container. A little later, Mike will show you how the water gun operates with its new filter to take out the hydrogen. Essentially, this water gun is put in this end and fills up this bag with water, and the drink then dissolves in the water, and this end of the \*\*\* outfeeding. Likewise, we have other foods that are more solid nature. You can

\*\*\* Three asterisks denote clipping of words and phrases.

probably see this shrimp cocktail meal. \*\*\*  
this afternoon while the two of us had salmon  
salad. \*\*\* another early development was the  
use of bite-size food \*\*\*

06 11 44 37        CC        11, Houston. Buzz, you're breaking up badly.  
Will you check your VOX? Over.

06 11 44 47        LMP        Roger. How am I coming through now, Charlie?

06 11 44 49        CC        Roger. You're very clear when you come through.  
It's just that your VOX is not keying at every  
word. Over.

06 11 44 57        LMP        Okay. These bite-sized objects were designed  
to remove the problem of having so many crumbs  
floating around in the cabin, so they designed  
a particular size that would be able to go  
the mouth all at once. I think since all of  
our experience, we've discovered that we could  
progress a good bit further than that back  
some of the type meals that we have on Earth.  
As a matter of fact, on this flight we've car-  
ried along pieces of bread, and along with the  
bread we have a ham spread; and I'll show you,  
I hope, how easy it is to spread some ham while  
I'm in zero g.

06 11 46 17        LMP        I think we've discovered that it is quite easy  
to \*\*\* you're all very familiar with.

06 11 46 44        CC        Apollo 11, Houston. We notice your roll rate  
increasing. Will you please see if you can  
bring that down to about 04 or we'll be losing  
high gain shortly. Over.

06 11 47 03        LMP        You can also use zero gravity to demonstrate  
many things that we've all learned in school.  
I'd like to demonstrate briefly how easy it is  
to explain the action of the gyroscope. If I  
spin this can, we know that according to the  
equations of motion that we would expect that  
once this is given a spin, and has a spin axis  
in this direction, if we give it a particular  
torque, and I'll do this by pushing my hands  
against it in this fashion once it's spinning.  
By the equations we can predict that, as I put  
this torque on it, it will in fact rotate this  
direction. Let's see how well this works out.

\*\*\* Three asterisks denote clipping of words and phrases.

06 11 47 53 LMP See that as I apply the torque this way, it's rotated this way.

06 11 48 12 CMP Too close, I think.

06 11 48 32 CC ll, Houston. It's a pretty good demonstration.

06 11 48 46 CMP Houston, this next is a little demonstration for the kids at home, all kids everywhere, for that matter. I was going to show you how you drink water out of a spoon, but I'm afraid I filled the spoon too full and if I'm not careful, I'm going to spill water right over the sides. Can you see the water slopping around on the top of the spoon, kids?

06 11 49 07 CC That's affirmative, ll.

06 11 49 12 CMP Okay. Well, as I said, I was going to show you but I'm afraid I filled it too full and it's going to spill over the sides. I'll tell you what. I'll just turn this one over and get rid of the water and start all over again. Okay?

06 11 49 27 CC Okay.

06 11 49 35 CMP And you can see, up here we don't know where over is. One up is as good as another. That really is water, though. I'll show you.

06 11 50 04 CMP That's really not the way we drink. We really have a water gun which I'll show you.

06 11 50 15 CMP Here's the water gun. This cylindrical thing on the end of it is a filter with several membranes: one allows water to pass, but not any gas; the other allows gas to pass, but not any water. So, by routing the gaseous water which comes from our tank through this filter, we're enabled to drink purified water without the gas in it, filtered water. And, of course, all we do to - to get it started is just pull the trigger.

06 11 50 58 CMP It's sort of messy. I haven't been at this very long. It's sort of the same system that the Spaniards used to drink out of wineskins at bull fights, only I think this is even more fun. Well, be seeing you, kids.

06 11 51 14 CC Thank you from all us kids in the world, here in the MOCR, who can't tell the Earth from the Moon.

06 11 51 23 CMP Roger. Stand by one, and we'll get you that Earth one.

06 11 51 29 CC Looks like you need a wine skin up there, Mike.

06 11 51 35 CMP That'd be nice.

06 11 52 50 CMP Okay.

06 11 52 54 CC 11, Houston - -

06 11 52 55 CMP You have a picture now, Houston?

06 11 52 56 CC That's affirmative. I refuse to bite on this one, though. You tell us.

06 11 53 02 CDR Okay. This should be getting larger, and if it is, it's the place we're coming home to.

06 11 53 12 CC Roger.

06 11 53 40 CDR No matter where you travel, it's always nice to get home.

06 11 53 46 CC We concur, 11. We'll be happy to have you back.

06 11 53 53 CDR This is Apollo 11. Signing off.

06 11 53 56 CC Roger. Thank you very much, 11. That was a good demonstration and a good show. We appreciate it very much.

06 11 57 25 CC Apollo 11, Houston. We were curious to see if there was any excess moisture up around the tunnel hatch area as we saw on 10. Over.

06 11 57 39 CMP It just so happens that's what we were talking about now. There is a little bit of dampness around the outside edge of the hatch, but a very, very slight amount. We've got a hose up there that we're hoping will sort of help keep it a little bit dry.

06 11 57 58 CC Roger, Mike. Thank you much. Have you seen any more water collecting on the aft bulkhead? Over.

06 11 58 07 CMP No, we haven't, as a matter of fact. It's been dry in that area since we got rid of that last time.

06 11 58 14 CC Roger. Thank you.

06 11 58 47 CMP Apollo 11 is back in PTC attitude. Standing by for thruster quieting.

06 11 58 53 CC Roger. We see that. Thank you much, Mike.

06 12 07 20 CMP Houston, Apollo 11. Could you get a little summary of the evening news for us?

06 12 07 26 CC Yes, sir. We'll have it for you momentarily. Also, a little flight plan update, Mike. If you - On page 3-113, you can delete the O<sub>2</sub> fuel cell purge. Over.

06 12 07 38 CMP Will do.

06 12 07 45 CC There is a flurry of activity in the PAO side for the evening news.

06 12 07 52 CMP Bully.

06 12 08 03 CMP How's the weather down there? You got any rain?

06 12 08 05 CC Roger. We've been having a little bit, thunderstorm-type, the last couple of days. We had a pretty good rain today, and it's been overcast. A slow storm system's been moving through the area in the last couple of days, and primarily evening and afternoon thundershowers.

06 12 08 26 CMP Roger. We were watching a few clouds in your area through the monocular along the Texas Gulf Coast this afternoon, and we also noticed there were clouds over Baja California, which is a little bit unusual.

06 12 08 40 CC Roger. Thank you for the weather report. We can't quite see that far. It seems to have

cleared up outside now, according to some of the people coming in. This constant overcast in the MOCR here is a little hard to see outside.

- 06 12 08 58 LMP Yes. We also noticed it was a little overcast down over - in the Antarctic ice cap, too.
- 06 12 09 05 CC Roger. It's apparently raining pretty hard up - -
- 06 12 09 08 CMP How's that for one-upsmanship?
- 06 12 09 10 CC Yes. (Laughter).
- 06 12 09 16 CDR He may know that, but he doesn't even know whether his grass is wet or dry.
- 06 12 09 25 CC It's apparently raining fairly hard up in Washington where the All Star game was to be played tonight. They started out, I understand, and then it was rained out and they called it off.
- 06 12 09 36 CMP They need a roof on their stadium so they can catch all those flys.
- 06 12 09 39 CC Roger.
- 06 12 09 41 CMP In the rain.
- 06 12 09 43 CC Touche.
- 06 12 10 01 LMP Hey, Charlie, what's the preliminary outlook for the weather in our recovery area?
- 06 12 10 05 CC Stand by, Buzz. It looks pretty good as far as I could tell. We got the - along the tropical convergence line there, there's a few clouds shown on the weather map I'm looking at here, but nothing of significance. Right now - Stand by. Let's see, right now in the mid - yes, at the MPL, we've got 3000 scattered, visibility 10, wave height 3 feet, is the present weather. I don't think there's anything forecast to be of significance. There are a couple of - FLIGHT just informed me that what I just gave you was the forecast. There



are a couple of tropical storms in the - well, not in the area of landing but in the Pacific. A storm called Claudia which is north - correction - about east of Hawaii. It's going northwest and dissipating. And there's one called Viola, which is out over Guam, and so they aren't any factor at all. It looks like it's going to be real nice for recovery.

06 12 11 35       CC       Navy called up those special calm seas for you guys from up there on the Hudson.

06 12 11 40       LMP       Well, we might need it. We'll get a look at it tomorrow, I guess, though. We'll probably be giving it a pretty close eye.

06 12 11 46       CC       Roger.

06 12 14 03       CC       11, Houston. The RETRO's were wondering if you could fill us in on any non-nominal stowage that we have on board. Just location and weight is about all they're interested in. Over.

06 12 14 09       CMP       Roger. We'll do some work on that and let you know, Charlie.

06 12 14 27       CC       Thank you, sir.

06 12 14 44       CC       And, Apollo 11, Houston. Would you please place O<sub>2</sub> tank 1 heater to AUTO? Over.

06 12 14 55       CMP       AUTO it is.

06 12 17 02       CDR       Houston, Apollo 11.

06 12 17 04       CC       Go ahead.

06 12 17 10       CDR       What we'll do Charlie, tomorrow, is go through and reconfigure our stowage as closely as possible to nominal. Some things that will not be nominal are as follows: the EVA visors were brought back into the command module, and we have not yet found a home for them. We'll let you know where they go. In addition, there's about 5 pounds of miscellaneous weight from the LM

in compartment Able-8, and it's taking the place of the LCG's which we moved from A-8 into the suit bag. We got rid of one miscellaneous trash bag, mostly old food wrapping and also old underwear and that helmet protective visor of the CMP's. We left all that with Eagle. And those are about the only off-nominals we have.

06 12 18 07        CC        Thank you very much. We appreciate it. Out.

06 12 18 12        CDR        Roger.

06 12 22 12        CC        Apollo 11, Houston. We got the rates looking copacetic. You can go ahead and initiate PTC. Over.

06 12 22 22        CMP        Okay. Thank you.

06 12 22 24        CC        And Buzz, we're still not getting any data from your EKG. It looks like the only way that we're going to be able to get any is if, at your convenience, you would take your - change out your EKG leads, which are the center ones that are connected to the blue pin; and there's a spare one in the medical box. Over.

06 12 22 55        LMP        Roger. How many did you want me to change?

06 12 22 57        CC        Just the center one. I'll get the right nomenclature from the Doc. Stand by. It's called the sternal EKG, which are the three center ones, and it's got - they lead into a - into the blue-stringed lead ones. Over.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(COSS NET 1)

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06 12 23 24       CMP       Okay. There's three of them, is that right?

06 12 23 26       CC       That's affirmative.

06 12 23 30       LMP       And you want me to change all three.

06 12 23 32       CC       That's affirmative and they're all hooked together from the picture I'm looking at, and they go into the center belt, signal conditioner, and it's got the blue strain relief on it.

06 12 23 46       LMP       Yes. I checked the connectors at both ends on that. I don't guess we have a spare signal conditioner or anything like that, do we?

06 12 23 52       CC       No. We do not.

06 12 24 02       LMP       Well, I can show you my heart's still working.

06 12 24 06       CC       We believe it.

06 12 24 23       LMP       Charlie, what we suggest here is, before we start that, turn our two suit powers off and plug his blue lead into my blue signal conditioner and see if we can get his signal through my signal conditioner. Okay?

06 12 24 38       CC       Roger. That's a good suggestion, Neil. We concur. Over.

06 12 26 23       LMP       Okay, Charlie. We're transmitting, and let's see if you get any EKG signal on the CDR at this point.

06 12 26 32       CC       Roger. Stand by.

06 12 26 42       CC       11, Houston. We get some data, but it's got the same problem that we had through Buzz's signal conditioner, so apparently the lead is broken and we'd like you to change it out if you could. Over.

06 12 26 56       LMP       Okay.

06 12 26 58       CC       Thank you.

06 12 38 12       LMP       Houston, Apollo 11.

06 12 38 14       CC       Go ahead, sir.

06 12 38 17 LMP Roger. I think the problem was that the center lead had dried out. ... put the new one on, and I'll see how that works. Over.

06 12 38 32 CC Roger.

06 12 38 36 LMP I can't tell you how good it feels to get it off.

06 12 38 38 CC Yes. I can imagine.

06 12 48 41 LMP Houston, Apollo 11. Houston, Apollo 11.

06 12 48 42 CC Go ahead, 11. Over.

06 12 48 45 LMP Roger. How do you read my EKG now?

06 12 48 48 CC Stand by. We'll let the docs look at it. Buzz, we're on low bit rate. We'll get you on a high gain momentarily, and we'll let you know then. Over.

06 12 49 04 LMP Okay. I got my high gain antenna coming out.

06 12 49 11 CC Roger. Just leave on REACQ. We'll get you.

06 12 52 38 CC Apollo 11, Houston. Buzz, your EKG looks good now. The doc said thanks a lot.

06 12 52 47 LMP Okay. They're welcome.

06 13 03 55 CC Apollo 11, Houston. Based on our sighting since the midcourse, we're showing a gamma of minus 6.57. This is preliminary, though, and we think that after some more tracking it should come on in, and we could tweak it right on into the corridor. It's just about in the center of the corridor; everything's looking fine. We'll have you an entry PAD in a couple of hours before you go to sleep. And from our friends in public affairs, a few headlines, other than your flight. You're still dominating the news. However, there are some other things of interest for you. As I mentioned earlier, the All Star game was rained out. It's going to be played tomorrow. However, President Nixon will not be able to see it as he planned. We'll keep you posted on results. And, also, the weathermen are going to be good to you. Our forecast is, looks like it's holding good for the recovery area; it should be real fine out there. President Nixon, as he prepares to fly out to greet

your return, predicted that within 31 years man will have visited at least one other planet bearing some form of life. "In the year 2000, we, on this Earth, will have visited new worlds where there will be a form of life," he told 2000 foreign exchange students at the White House. Before he left for his week-long trip, the President sent Congress his proposal for organizing - reorganizing the Interstate Commerce Commission. He also conferred with chairman Earl Wheeler of the Joint Chiefs of Staff on his return from Viet Nam, and the launch of Intelstat was scrubbed and has been rescheduled for 10 p.m., eastern daylight time on Wednesday. The second stage fuel ground support system showed some contamination.

06 13 05 50      CC      And back in Washington, the House Ways and Means Committee agreed to tax changes affecting oil companies, banks, and utilities that could add nearly 2 billion a year to federal revenue. And, also today, NASA announced it will launch a large orbital workshop in 1972, with a cutdown version of the Saturn V. And, your television pictures attracted a lot of interest. They were shown live throughout just about the whole world, and, we're expecting hundreds of telephone calls from mothers all over the world complaining that their youngsters are trying to drink milk from spoons, thanks to you, Mike.

06 13 06 37      CMP      I take it all back.

06 13 06 40      CC      You need more practice.

06 13 53 37      CC      Hello, Apollo 11. Houston. Buzz, you brought the surgeon right out of his chair. We see you exercising. Over.

06 13 53 49      CDR      Say again.

06 13 53 50      CC      We see you exercising. Is that correct, Buzz?

06 13 53 54      CDR      Yes, that's right. Buzz is.

06 13 53 57      CC      Roger. We've got his heartbeat way up.

06 13 54 03      CDR      Right. He's sort of out of shape.

06 13 54 06      CC      Yes. That's what we thought.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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06 13 56 32       CMP       White Team's really got a busy one tonight, huh, Charlie?

06 13 56 36       CC       Say again, Mike. Over.

06 13 56 41       CMP       Say the old White Team's really got a busy one tonight, huh?

06 13 56 43       CC       Oh, boy. We're really booming along here with all this activity. Can barely believe it.

06 13 56 51       CMP       What are you doing? Sitting around with your feet on the console drinking coffee?

06 13 56 55       CC       (Laughter) You must have your X-ray eyes up. You sure can see a long way.

06 13 57 05       CMP       Yes. We're watching you as well, you know.

06 13 57 08       CC       All right.

06 13 57 27       CMP       Two people in the viewing room and that's more than is in the trench.

06 13 57 43       CC       We've got eight in the viewing room, and let's see, about six in the trench right now. And this is the highlight of the day; Buzz's exercise for the surgeon.

06 13 58 10       CC       11, you copy? Over.

06 13 58 15       CDR       Roger. 11.

06 13 58 17       CC       Roger. Neil has the highest heartbeat ever seen on a manned space flight, and we just went low bit rate. The surgeon is about to die. (Laughter)

06 13 58 35       CDR       I measured it up here. It came out to be 247.

06 13 58 45       CC       Boy, that's super.

06 13 59 01       CMP       The unit's on that furlong per fortnight.

06 13 59 04       CC       Roger. We copy that. EECOMM says if you keep that up, you're going to have to change your CO<sub>2</sub> canister.

06 13 59 15       CMP       You were going to make me do that in another  
45 minutes anyway.

06 13 59 19       CC       That's true.

06 13 59 26       CMP       That's the highlight of my day. I'm really look-  
ing forward to that.

06 14 01 00              (Music: "Music Out of the Moon")

06 14 01 03       CC       Thank you, ll. We appreciate you turning that  
off. (Laughter)

06 14 03 24       CDR       Charlie, could you copy our music down there?

06 14 03 28       CC       Did we copy what, Neil?

06 14 03 32       CDR       Did you copy our music down there?

06 14 03 34       CC       Roger. We sure did. We're wondering who select-  
ed - made your selections?

06 14 03 41       CDR       That's an old favorite of mine, about - It's an  
album made about 20 years ago, called "Music Out  
of the Moon."

06 14 03 49       CC       Roger. It sounded a little scratchy to us, Neil.  
Either that or your tape was a little slow.

06 14 04 01       CDR       It's supposed to sound that way.

06 14 04 03       CC       That's one of those - -

06 14 04 04       CMP       - - it sounds a little scratchy to us too, but  
the czar likes it.

06 14 04 09       CC       That's what we figured. He and his 40 000 votes.

06 14 04 24       CC       For your info, we got you - It looks like about  
150 000 out now.

06 14 04 31       MS       ...

06 14 04 33       CMP       It's getting appreciably larger now. It's look-  
ing more like the world.

06 14 04 38       CC       Roger. I'm looking at the right side of the  
screen this time.

06 14 04 42       CMP       How's everything going on the - Say again, Charlie?

06 14 04 46      CC      Oh, just - I - I'll never hear the last of that one about that Earth/Moon business during the TV there, and I was just saying that I was looking at the right side of the board here, so you are going towards the Earth. What are - What were you going to say, Mike?

06 14 05 01      CMP      You'll have - You'll have fun at the press conference after this shift then, won't you?

06 14 05 06      CC      It's 2:30. Everybody will be asleep. I going to sneak off through the back way.

06 14 05 13      CMP      Okay. I was just wondering how everything is going at the home front. All the wives and kids in one piece?

06 14 05 19      CC      Roger. Sure are. Everything's doing fine. All the gals are having a little party tonight, as far as I know.

06 14 05 27      CMP      Oh, good. Glad to hear it.

06 14 20 40      CC      Apollo 11, Houston. I was just reading some of the transcripts of earlier today about this earlier PTC that we attempted, and when you keyed into VERB 24 and did the two ENTER's, it took off on you. I think we got a story on that, if you'd like to listen to why it had such a high rate, Mike. Over.

06 14 21 06      CMP      Yes. I'm all ears.

06 14 21 08      CC      Okay. I think it would be better if you got your checklist out on 97, and we could walk you through it, and that way I could probably get the story straight. Over.

06 14 21 21      CMP      Okay. I got it.

06 14 21 22      CC      Okay. Mike, what happened is - you know, you were sitting there monitoring VERB 16, NOUN 20, and at step 7 you went into VERB 24, NOUN 01, and keyed in the address and then INFORMATION INFORMATION; and on the final ENTER of that 35400 ENTER, right after that, it - that then put you back into the 16, NOUN 20. Then when you did the VERB 24, ENTER, you were really entering the information in the actual CDU; and when you got the two entries in, in register 1 and 2, it was an - it was an instantaneous change in the actual CDU, and the CM DAP looked at that and saw - saw what it thought it



had. My - my gosh, I got a 600-degree-per-second rate. And it turns on the jets to try to take that rate out. And the rate filters that it's looking at - it - well, the rate it's looking at is filtered, so it doesn't really sense the actual rate until the thing is already built up, and then it starts reading the rate filters, and it says, "Well, I really didn't have 600 degrees." So then it turns it off and tries to slow it down. But until that happens, and it is some time lag, and that's why the rate was building up. The jets were on, and they were going to stay on due to that instantaneous 600 - suspected 600-degree-per-second rate. Over.

06 14 22 48       CMP       Okay. I got you.

06 14 22 50       CC        Roger.

06 14 22 51       CMP       Man.

06 14 23 24       LMP       Hey, Charlie, are you saying that for a short period of time, he actually loaded NOUN 20 with some value other than was being read by the CDU?

06 14 23 34       CC        I think I got that, Buzz. That's affirmative. But when he did that second VERB 24, you were - the NOUN was 20, so when he did the 3175 and then a 002 ENTER, what he actually did there was load the first two actual CDU locations, and the computer looked at it - the DAP looked at it as an instantaneous change in the actual CDU. Stand by on your comments. We're switching antennas.

06 14 24 03       LMP       Roger.

06 14 24 05       CC        - - We're very scratchy.

06 14 24 08       LMP       Okay.

06 14 24 43       CC        11, Houston. We got you back now on the high gain. Did you copy all that, Buzz? Over.

06 14 24 51       LMP       Yes. I think so. I - I thought maybe that NOUN 20 was one of those that you could never load from the DSKY, and that still may be. Maybe it was loaded just for the short period of time, and then when the counters read the - the gimbal angles, why they changed it back to what they actually are. But in the meantime, the DAP saw this different number. Is that right?

06 14 25 17        CC        Well, our guidance guy was telling me that you can actually load those ACDU's, the actual CDU's, but we'll - we're checking on that. Over.

06 14 25 30        LMP        Okay.

06 14 25 42        CC        11, Houston. Buzz, the word from the back room is that you can actually load the NOUN 20, but you should not.

06 14 25 55        LMP        Yes. I got that. Thank you.

06 14 25 57        CC        You're welcome.

06 14 33 30        CC        Apollo 11, Houston. We got a recommendation for you on your stowage of the EVVA's. Over.

06 14 33 39        LMP        Go ahead.

06 14 33 41        CC        Okay. We'd like - the SPAN guys say it looks - they think that one would go on the helmet that you're going to have in B1, and you could put the other one on Mike's helmet, which will be in the sleep restraint. Over.

06 14 34 01        CDR        I doubt if it will fit on the helmet in B1. The other one might - might go in the sleep restraint. We've got them in our helmet bags, and I guess we're going to have to keep the helmets in the helmet bags, and the LEVVA's in the LEVVA bags.

06 14 34 20        CC        Roger.

06 14 34 22        CDR        Yes. I've been thinking maybe they ought to stay sealed up.

06 14 34 26        CC        Okay. We - -

06 14 34 27        CMP        It won't hack B1, Charlie, with the cover. I tried it already.

06 14 34 31        CC        Okay. Fine. We weren't sure of that. It was just a suggestion. We thought we'd - You check it out. Sounds like you've already done that, so I guess whatever you can come up with, just let us know.

06 14 34 44        LMP        Okay. There's no problem. We'll let you know where they end up.

06 14 34 47        CC        Roger.

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06 15 49 04 CDR Hello, Houston. Apollo 11.

06 15 49 06 CC Go ahead, 11. Over.

06 15 49 10 CDR Okay. Crew status report. Radiation:  
CDR 11020, CMP 10022, LMP 09024. No medica-  
tion.

06 15 49 28 CC Roger. Copy.

06 15 49 35 CC And, Neil, we got - we'd like your onboard read-  
outs of batteries and RCS. Over.

06 15 49 43 CDR Okay.

06 15 50 54 CDR Okay, Charlie. Ready to copy?

06 15 50 56 CC Roger. Go ahead. Over.

06 15 50 59 CDR Okay. BATT C, PYRO BATT A, and PYRO BATT B are  
37.0. RCS A, 51; B, 63; C, 63; D, 59. Go.

06 15 51 14 CC Roger. Copy all that, Neil. And we got an  
entry PAD if you're ready to copy. Over.

06 15 52 00 LMP Houston, Apollo 11. Ready to copy. Over.

06 15 52 02 CC Roger, Buzz. It's an entry PAD, MPL, starting  
with roll 05, 35 - correction - 359 152 001.  
GET 194 46 03 267, plus 1102, minus 17203, 068,  
NOUN 60, 36194 656 11894 36275 195 03 03 0027,  
NOUN 69, all four lines are NA. Picking up  
with D zero: 400 02 09. RET of blackout,  
00 17 03 38 08 20. Sextant star, 02 0945 149.  
Boresight star is Scorpii theta, that's Scorpii  
theta. Up 315, right 35, left vector up. And  
the comments: This entry PAD assumes no mid-  
course 6. And for your information, looking  
at it right now, based on all the tracking we  
got, that maneuver would only be a tenth of a  
foot per second. So, we'll probably skip it.  
We'll let you know more about that later.  
Okay. Your horizon check at EI minus 30 minutes,  
GET of 194 33 03, gives you a pitch angle of  
298. Okay. The GDC, your backup align - Your  
set stars for the entry REFSMMAT are Deneb and  
Vega, 079 234 340. Standing by for your read-  
back. Over.

06 15 55 27 LMP Roger. Lunar entry, MPL: 359 152 001 194 46 03 267, plus 1102, minus 17203 068 36194 656-11894 36275; 195 03 03 0027, four NA, 400 02 09 00 17 03 38 08 20 02 0945 149, Scorpii theta. Up 315, right 35, up. Assumes no MCC-6. Horizon at EI minus 30 194 33 03, and pitch 298. Set stars Deneb and Vega, 079 234 340. Over.

06 15 57 04 CC Roger. Very good readback, Buzz, and for your communication setup for tonight's sleep, we'd like OMNI to OMNI. Stand by.

06 15 58 51 CC Apollo 11, Houston. If you didn't copy that, Buzz, it was a good readback on the PAD. We've got a clock update for you that we'll have to you as soon as we can get it out to the site. We're in the process of handing over to Honey-suckle, and it will be a couple of minutes. Over.

06 15 59 11 LMP Okay. You want the computer to BLOCK?

06 15 59 15 CC We'll call you. You can stay BLOCK right now. We'll give you a call.

06 16 00 54 CC Hello, Apollo 11. Houston. Would you please give us POO and ACCEPT? We've got a clock update for you.

06 16 01 13 CMP Go ahead, Charlie. We're POO and ACCEPT.

06 16 01 21 CC Roger.

06 16 03 19 CC 11, HOUSTON. We've got the load in. You can go back to BLOCK. Over.

06 16 03 26 CMP Roger. Thank you.

06 16 03 32 CC And 11, Houston. One final thing. We'd like you to select your OMNI to OMNI, OMNI A to Bravo, high-gain track to MANUAL, and beam WIDE. Your angles are 270 in yaw, pitch minus 50. Over.

06 16 03 56 LMP Roger. Fifty and minus 70.

06 16 04 04 CC The angles, Buzz, were yaw 270, pitch minus 50. Over.

06 16 04 13 LMP Okay. Yaw 270, pitch minus 50.

06 16 04 19      CC      That's Roger.

06 16 04 27      CC      And Apollo 11, it's good night from a sleepy  
White Team. Over.

06 16 04 39      LMP      Roger. Thank you very much. We're not as sleepy  
tonight as we were last night.

06 16 04 46      CC      Yes. I guess you guys were pretty tired last  
night after that busy day.

06 16 04 54      CMP      That's affirmative. I couldn't even find the  
chlorine.

06 16 04 57      CC      (Laughing) Yes.

06 16 25 45      CC      Hello, Apollo 11. Houston. Sorry to bother you,  
but we'd like to have you do a VERB 34 to get  
the NOUN 65 off of there. Over.

END OF TAPE

(GOSS NET 1)

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Rest Period - No Communications

(GOSS NET 1)

Tape 105/1  
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Rest Period - No Communications

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REST PERIOD - NO COMMUNICATIONS



(GOSS NET 1)

Tape 107/1  
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Rest Period - No Communications

(GOSS NET 1)

Tape 108/1  
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Rest Period - No Communications

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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REST PERIOD - NO COMMUNICATIONS

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07 02 59 56 CC Apollo 11, Houston. Are you up and at them yet? Over.

07 03 00 04 CDR Well, we're up, at least, Owen.

07 03 00 09 CMP Eyeballing my Magellanic clouds. Over.

07 03 00 12 CC 11, Houston. Got your signals loud and clear, here. How are things this morning? Over.

07 03 00 24 CDR Do you read us, Owen?

07 03 00 27 CC Roger. Loud and clear, 11.

07 03 00 31 CDR Okay. Everything \*\*\* to be all right here. So far, we haven't been looking in the cockpit yet. We've been spending our time looking outside the cockpit. \*\*\*

07 03 00 42 CC Roger, 11. You're breaking up just a little bit there, Neil. Your signals are loud but are breaking up occasionally. Your spacecraft all looks good here from the ground. We noticed you stirring around the cockpit and thought we'd give you a call. Over.

07 03 00 59 CDR Good morning.

07 03 01 07 CC 11, Houston. We do have a few items for you here, entry PAD's, consumables, and so forth. After you've had a chance to get organized, whenever you're ready to start on a few of these items, why, we'll read them up to you. Over.

07 03 01 22 LMP Okay. Stand by.

07 03 01 50 LMP Go ahead, Owen. I've got the book now, I'm ready to copy.

07 03 01 52 CC Okay, Buzz. On your flight plan items, a few updates first of all. We've cancelled midcourse number 6. Just remain - remain in PTC. I'll give you a little more time this morning. Second item on the flight plan is we're ready for a BATT B charge anytime you want to put it on the line; and third item, we'd like a waste-water dump a little differently this time. We'd like

\*\*\* Three asterisks denote clipping of words and phrases.

*looks out*

to do it on our marks from the ground. The PTC is a little bit ragged, and we would like to make the water dump at a time which we think will hold it in its proper configuration, so it looks like we'll have a desirable opportunity coming along in - between 15 and 20 minutes. And on our mark, we would like to have a waste-water dump down to about 40 percent. I'll give you a more accurate level for the water dump a little later. Over.

- 07 03 02 53 LMP Roger. You must have stayed up all night figuring this one out.
- 07 03 03 00 CC ll, Houston. Stand by just a moment here until we get out of the NO position on the antenna.
- 07 03 04 14 CC ll, Houston. We're over on OMNI Delta now. I think we can read you better. Did you get all those first three items on your flight plan update? Over.
- 07 03 04 25 LMP I got midcourse correction cancelled; battery B charge and water dump on your call. Over.
- 07 03 04 35 CC That's right, Buzz; and the last item here, we do request that we do a P52, even though we're not doing midcourse correction; and we suggest you get to that after the waste-water dump has been complete. We also have a state vector update for you, if you can give us POO and ACCEPT. Over.
- 07 03 05 09 LMP Okay. You have the DSKY now.
- 07 03 05 12 CC Roger. We'll be sending that up, and I'll give you your consumables update now. It's - for a time of 170 hours, your RCS total is minus 3.5 percent, Alfa is minus 14.5, Bravo plus 7, Charlie minus 4.5, Delta minus 3; hydrogen total is minus 1, and your oxygen total is plus 24. Over.
- 07 03 05 50 CMP Roger. Copy those. And onboard readouts, D is 69, C is 73, D is - Let me start over again. Okay. A is 51 and B is 62; C is 63 and D is 59. Over.
- 07 03 06 47 CC Roger, ll. Copy those, and we've checked them here on the ground, also. One correction to my last transmission. We would like that P52 prior to the waste-water dump, which is coming up in about 30 minutes from now. Will that be possible? Over.

*2em 339*

07 03 07 03      CMP      Oh, yes. We'll take care of that.

07 03 07 07      CC      Roger. And if you're ready for an entry PAD, I'll read that up to you now, also, 11.

07 03 07 16      CMP      Ready to copy.

07 03 07 19      CC      Okay. Entry PAD is area MIDPAC: 359 153 001 194 46 03 267, plus 1102, minus 17203 067 36194 655 11875 36275 195 03 03 00 28; DL and VL, all four are not applicable; DO, 4 00 02 10 00 18 03 38 08 21 44 2932 380; boresight star is Scorpio Theta, up 314, right 34, lift vector up. Comments: Entry data assumes no midcourse maneuvers. Your earth entry: minus 30 minutes; horizon check, 194 plus 33 plus 03. Your pitch is 297. This assumes an entry REFSMMAT. Your GDC align stars are Deneb and Vega. Roll, pitch, yaw, 078, 233, 340. Read back. Over.

07 03 09 57      CMP      Roger. MIDPAC entry PAD: 359 153 001 194 46 03 267, plus 1102, minus 17203 067 36194 655 11875 36275 195 03 03 0028, DL and VL NA, 4 00 02 10 00 18 03 38 08 21 44 2932 380, Scorpii Delta - Scorpii Theta, up 314, right 34, up. No midcourse correction, horizon, TI minus 30, 194 33 03, pitch 297, Deneb and Vega, 078, 233, 340. Over.

07 03 11 17      CC      11, Houston. That's Roger. Copy. 11, it's also your computer. You can go back to BLOCK.

07 03 11 28      CMP      Roger.

07 03 18 51      CDR      Okay, Houston. The crew status report is 8-1/2, 7, and 8.

07 03 19 00      CC      11, Houston. Roger, Neil. 8-1/2, 7, and 8 for your crew status.

07 03 19 08      CDR      Right.

07 03 19 13      CC      11, Houston. Your P52 looks good here on the ground, and we are now estimating that water dump will occur along about 171 plus 40; and we'd like for you to dump to 45 percent. This should let you arrive at Earth interface with just about a full load of waste water. Over.

07 03 19 37      CDR      Understand 171 40, approximately, 40 percent.

07 03 22 14 CC 11, Houston. We'd like to advance the time on that water dump to about 171 plus 30 just after we reacquire on the next OMNI, and - as I mentioned, it'll be down to 45 percent - is the new quantity. Also, we're standing by for your CM RCS ejector temperature readout. Over.

07 03 25 38 CC Apollo 11, Houston. I'm not certain you copied my last transmission, as we were just in the process of switching OMNI's. We'd like to advance the time on that water dump until about 5 minutes from now. And we'll give you a precise mark on the time to start the dump, and we are standing by for a readout on your CM RCS ejector temperatures. Over.

07 03 26 00 CMP Okay, Owen. We're standing by for your mark, and stand by for the readout.

07 03 26 03 CC Roger.

07 03 26 40 CMP Houston, Apollo 11. Are you ready to copy ejector temperatures? I'll read them in volts.

07 03 26 46 CC That's affirmative. Go ahead, Mike.

07 03 26 49 CMP Okay. 2-4 is reading 4.7 volts, 2-5 is reading 4.8 volts, 1-2 is reading 4.8 volts, 1-4 is reading 4.8, 1-6 4.5, And 2-1 4.8. Over.

07 03 26 52 CC 11, Houston. Roger. Those - I got them all.

07 03 29 46 CC Apollo 11, Houston. We're ready for you to start your waste-water dump at this time. Over.

07 03 33 00 CMP Roger. Dumping.

07 03 33 30 CC Apollo 11, Houston. We show you - -

07 03 33 32 CMP Houston, Apollo 11. We've dumped to 45 percent, and we're stopping now. Do you concur?

07 03 33 37 CC Roger, 11. We concur.

07 03 53 35 CC Apollo 11, Houston. I can read up your forecast weather for the recovery any time you'd like to hear about it. Over.

07 03 53 45 LMP Go ahead.

07 03 53 47

CC

11, Houston. Present forecast shows acceptable conditions in your recovery area: 2000-foot scattered, high scattered, wind from 070 degrees, 13 knots, visibility 10 miles, and sea state about 4 feet. The forecast yesterday showed a tropical storm, Claudia, some 500 to 1000 miles east of Hawaii. The - the pictures from Earth satellites taken yesterday afternoon - afternoon showed Claudia dissipating, so this appears to be even less a factor than it was before. Your recovery area is now believed to be just a little ways north of the intertropical convergence zone, which you can probably see when you look out your windows there. Yesterday there was also a report of a tropical storm, Viola, further to the west. Its present location is some thousand miles east of the Phillipines and moving north-west. Tropical storm Viola has been intensifying, and should be transferred to the typhoon category within the next 12 hours or so; however, that will be far to your west. As a matter of fact, sunrise terminator has not yet reached Viola. When it does several hours from now, you can probably distinguish it from your viewpoint quite readily. As a matter of fact it should be of interest to perhaps take some pictures. Comment on it when you get a chance to see Viola in a few hours. So that's about the present weather state and situation for your recovery area. Over.

07 03 55 40

CMP

That sounds pretty good ...

END OF TAPE



APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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07 04 17 16        CC        Apollo 11, Houston. Over.

07 04 17 22        CDR        Go ahead, Houston.

07 04 17 24        CC        11, Houston. We'd like to try operation with  
the high-gain array here. If you would select  
reacquire and your S-band antenna to HIGH GAIN,  
your positions are pitch plus 40 and yaw 270,  
and then monitor for acquisition. Over.

07 04 17 48        CMP        Okay. It's in work.

07 04 21 25        CC        11, Houston. We're just now ready to switch  
from OMNI Delta over to your high-gain antenna.  
Can you confirm that you have gone to REACQ?  
Over.

07 04 21 35        CMP        Confirmed.

07 04 23 04        CC        That looks real good, Mike. Looks like we picked  
up about 30 dB on the signal strength.

07 04 23 11        CMP        Yes. It came in quite quickly. However, I'm  
showing about 240 yaw and about zero on pitch,  
now.

07 04 23 22        CC        Roger. About 240 and 0.

END OF TAPE

(GOSS NET 1)

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07 05 35 23           CC       Apollo 11, Houston. Over.

07 05 35 28           CDR       Go ahead.

07 05 35 29           CC       Roger. Just wanted to make sure you fellows hadn't gone back to sleep again. And I also have a little bit of late news here if you'd like to find out what's happened in the last 12 - 14 hours. Over.

07 05 35 42           CDR       Okay. Go ahead.

07 05 35 44           CC       Okey doke. Hot off the press here: We find Juan Carlos was formally designated yesterday - Tuesday - to become General Franco's successor as the Chief of State of Spain and eventual King. Juan Carlos will be sworn in today as his successor designate after taking an oath of loyalty to the law and the National Movement, Spain's only legal political organization. He will apparently be called the Prince of Spain.

07 05 36 14           CC       House Ways and Means Committee also has agreed yesterday to tax changes affecting oil companies, also banks and utilities, which could add as much as 2 billion dollars per year to the federal revenue. The committee also voted tentatively to change the accounting procedures for telephone, electric, gas, and oil pipeline companies and to reduce tax benefits of mutual savings and loan institutions. So, it looks as if tax reform may be on the way.

07 05 36 42           CC       Looking overseas, we find South Korea's first super highway, linking Seoul with the Port of Incheon, has been named the Apollo Highway to commemorate your trip. I think we mentioned last night that President Nixon has already started on his round-the-world trip, and today he is in San Francisco on his first stop which will take him to the U.S.S. Hornet, from which he'll watch the return of your spacecraft. He plans to visit seven nations including Rumania during this trip. He, as I think you also knew, had to miss the All Star baseball game yesterday, as it was rained out; but it is being played today.

07 05 37 28           CC       The West Coast residents in Seattle, Washington; Portland, Oregon; Vancouver, British Columbia; and San Francisco all plan to make their areas visible to the three of you by lighting their lights between 9 pm and midnight tonight, according to the Associated Press. We do have clear weather predicted there, so you may be able to see Christmas lights, porch lights, store lights, and whatever may be turned on.

07 05 37 38           CDR       Good show.

07 05 37 39           CC       A little closer to home here, back in Memphis,, Tennessee, a young lady who is presently tipping the scales at 8 pounds, 2 ounces, was named "Module" by her parents, Mr. and Mrs. Eddie Lee McGhee. "It wasn't my idea," said Mrs. McGhee, "It was my husband's." She said she had balked at the name Lunar Module McGhee, because it didn't sound too good, but apparently they have compromised on just Module. Over.

07 05 38 29           SC       (Laughter) ...

07 05 38 32           CC       Roger. Hear a few chuckles coming from that direction. And we do have a late report on the sports here also. The All Star game currently being played. The present score at the end of the fourth inning has the National League leading the American League by 9 to 3. So the hitters are having a good day, you can tell.

07 05 38 54           CC       And rain clouds are over the MSC area at the moment. It began raining here just about 10 minutes ago, and last report, we were having a pretty heavy deluge. So, that's it from the news front for the afternoon here, Apollo 11. Over.

07 05 39 19           CDR       Thank you very much, Owen. I think my yard could use some water.

07 05 39 23           CC       That's very true. I've forgotten exactly how many days it did go, Buzz, but something like 30 days without rain; and we can appreciate the rain we're getting right now.

07 05 39 34 LMP That was Neil. This is Buzz, here. I wish we could find out when the last time my lawn was cut. Over.

07 05 39 39 CMP That might be a little more difficult to find out. I'm not sure whether the -- whether Mike is ready to admit when he last did the job, but I'll look into that for you.

07 05 39 51 LMP Well, he'll tell you. He's got a new mower.

07 05 39 53 CC Roger.

07 05 40 04 CMP Hey, ask my chinch bugs how they're doing?

07 05 40 07 CC Well, I'm not sure about your's. I can let you know about my own, and the report isn't very good.

07 05 47 45 CC ll, Houston. Over.

07 05 47 50 LMP Go ahead.

07 05 47 51 CC Roger. Joan wasn't home right now, Buzz, but Janis reports the grass is getting pretty high, and I would estimate that it's going to be close to your knees by the time you get out of quarantine. Over.

07 05 48 08 LMP Okay. I'll have to schedule a little discussion after I get back.

07 05 48 13 CC Roger. And no reports - no report from the chinch bugs there, Mike.

07 05 48 21 CMP Well, they're sort of taciturn little fellows. They don't say much; they just chomp away.

07 05 48 26 CC Concur on that.

07 05 48 47 CMP Which is about what we're doing up here.

07 05 48 52 CC We concur on that, too.

07 05 49 18 CMP Breakfast was magnificent as usual. I had sliced peaches, sausage patties, two cups of coffee, and I forget all what else.

(GOSS NET 1)

07 05 49 27      CC      That does sound pretty good. As a matter of fact, I'm way overdue for a meal myself, here. I could use some of that.

07 05 49 50      CMP      Why don't you get Milt to give you 5 minutes off and grab a hamburger?

07 05 50 00      CC      I suggested that awhile ago. He was pointing out about the weight problem here. We've got to keep the calories low, so I'd better stand by without it.

07 05 52 46      CMP      Houston, Apollo 11. We've been doing a little flight planning for Apollo 12 up here.

07 05 52 54      CC      Roger. Go ahead.

07 05 52 57      CMP      We're trying to calculate how much spaghetti and meatballs we can get on board for Al Bean.

07 05 53 05      CC      I'm not sure the spacecraft will take that much extra weight. Have you made any estimates?

07 05 53 12      CMP      It'll be close.

07 05 55 52      CC      11, Houston. The medics at the next console report that the shrew is one animal which can eat six times its own body weight every 24 hours. This may be a satisfactory base line for your spaghetti calculations on Al Bean. Over.

07 05 56 11      CMP      Okay. Thank you. That's <sup>the</sup> in works 341

07 05 59 15      CMP      Houston, Apollo 11. It was slightly colder in here last night than it has been on any previous night. Does EECOMM notice any change in his data or any explanation for that?

07 05 59 25      CC      Roger. Stand by just a moment. We've got to check some temperatures.

07 05 59 35      CMP      Up until last night it was - if anything, a little on the warm side at night. Last night it was on the chilly side.

07 05 59 43      CC      Roger there. We'll run down the temperatures for the 2 nights.

07 05 59 50      CMP      Oh, it's no big thing. Just as a matter of interest.

07 05 59 52      CC      Roger.

07 06 00 05      CMP      And how'd you like the command module RCS temperatures?

07 06 00 17      CC      ll, Houston. They all look very good. The lowest temperature was 40 degrees, and we're taking a look at your cabin temperatures now.

07 06 00 27      CMP      We agree on the CM RCS. No heaters are going to be required by a country mile.

07 06 00 38      CC      We think that's correct.

07 06 00 50      CMP      We don't like those heaters, anyway, working off the direct coils.

07 06 00 53      CC      Roger.

07 06 01 34      CMP      Peculiar thing, Owen, on the platform alignment is that when I really take my time and do a very slow, careful, precise job of marking. I'm getting about the same star angle difference as when I'm doing it in DTC and have to do a hurried rush job with relatively poor tracking. Star angle differences seem insensitive. It almost made me believe there's a very small bias there somewhere in the sextant.

07 06 02 07      CC      Roger, ll. Perhaps the 3 degrees per second just isn't that much of a bother. Over.

07 06 02 16      LMP      Well, he's really trying to explain why he can't get all zeros.

07 06 02 20      CMP      I think Buzz is probably right. As a matter of fact, one time I made a mark which I thought was a little bit in error, but I thought, "Well, heck. I'll go ahead and see how it works out anyway," and I got five zeros that time. And when I have thought everything was exactly precisely on, I have consistently been getting 0.01.

07 06 02 52 CC Roger. Apparently it pays to hurry.

07 06 02 59 CMP I usually do.

07 06 03 07 CMP The visibility through the telescope has been very poor. It's, I would say, even worse than the simulator is right now. It requires long periods of dark adaptation which most times are most inconvenient; so it's really a tremendous asset to keep the platform powered up at all times and to keep it tweaked within the capability of the sextant field of view.

07 06 03 37 CC Understand, Mike.

07 06 05 07 CC 11, Houston. Checking your temperatures, it does look like the spacecraft may have cooled down perhaps 2 or 3 degrees in the last 24 hours, and that sounds to be consistent with your report on the comfort level there. Over.

07 06 05 25 CMP Okay.

07 06 05 29 CDR Is that a LM-off phenomenon?

07 06 05 59 CC 11, Houston. It looks like we'll have to think a little more about that, as to whether it's a LM-off or some effect of being out of Lunar orbit. We don't know, so we'll have to puzzle before we can give a better answer.

07 06 06 12 CDR Okay.

07 06 06 15 CMP Well, if the systems guys have anything they want chased down, we'll be happy to give you any readings or reports or what have you.

07 06 06 23 CC Roger. We'll think about that and see if there aren't some other tests to be usefully performed here.

07 06 06 31 CMP Okay.

07 06 13 09 CC 11, Houston. I'll be turning things over to the Green CAP COMM at this time, and see you on the ground tomorrow.

(GOSS NET 1)

07 06 13 25 CDR Okay, Owen. I want to thank you and the whole Purple/Maroon group there for a good job helping Apollo 11.

07 06 13 35 CC Thank you, sir.

07 06 13 41 LMP Thanks from us to all of you. It was really appreciated.

07 06 13 45 CMP Great job, you guys.

07 06 13 50 *James* CC Roger, out.

07 06 26 30 CC Apollo 11, this is Houston. Over.

07 06 26 34 CMP Go ahead, Houston. Apollo 11.

07 06 26 37 *McCauley has come on says Fink in Moon 341* CC 11, this is Houston. With reference to your subjective evaluation that it felt cooler inside the spacecraft last night, we reported earlier that we did indeed see a drop of about 3 degrees over the previous night. Looking back, it appears the crew of Apollo 10 reported similar feelings during the translunar and transearth coast phases. We're wondering if you could give us any indication of the relative amounts of free or condensed water in the cabin last night and the night before from which we could infer humidity. Over.

07 06 27 27 CDR Roger. That might be a little bit difficult to do. We'll take a look at the tunnel now. It does seem as though, between the dirt, we had a little bit more moisture in the tunnel. Of course, the LM hadn't been vented when we did translunar.

07 06 27 45 CC Roger. We were more curious about the relative amount of moisture between, say, last night and the night before, both of which would have the LM missing.

07 06 28 04 CMP There's more moisture in the tunnel now than there has been at any previous time. Subjectively we have been unable to determine any change in - any buildup in humidity. There appears to be no moisture any other place in the spacecraft. For example, the windows are not fogging or - and various other cool spots around the spacecraft - all of them appear to be completely dry.



(GOSS NET 1)

07 06 28 35 CC This is Houston. Roger. Thank you.

07 06 42 07 CMP How are all the "Greens" today, Bruce?

07 06 42 14 CC Oh, the Greens are in good shape. The actual Green Team has been here for several hours. We're dogging the watch down here to position Ron for entry. Over.

07 06 42 25 CMP Roger. Understand. Did Dave Reed get to explain the lunar ... at the press conference?

07 06 42 32 CC No, but your comments about <sup>Bill</sup>~~Bill~~ Shaifer and the explanations were quoted in the paper last night.

07 06 42 40 CMP Oh, oh.

07 06 42 45 CC Do you want to say anything more while you're on the line?

07 06 42 51 CMP He's right. He's absolutely right.

07 06 44 05 CMP How's old White, Bruce? Did he ever let you go get a cup of coffee when we were over on the back side?

07 06 44 15 CC Oh, things have been going pretty smoothly down here. He's really not that hard to get along with.

07 06 44 21 CMP Oh, he must be mellowing.

07 06 44 23 CC We've only got two of them back here right now.

07 06 44 30 CMP He always used to make me sit at the console through the back-side passes, just for training.

07 06 44 41 CC Well, the word we have here is - that was because whenever you came back, you had to be retrained.

07 06 44 50 CMP Touché.

07 06 51 08 CMP Houston, Apollo 11. Out of curiosity, on those 70-mm cameras, we figure we exposed around 300 in the LM and around a thousand in the command module; and both cameras - or all the 70-mm cameras worked just fine.

07 06 51 26 CC Okay. Very good. Thank you.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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07 07 07 14 CC Apollo 11, this is Houston. Over.

07 07 07 19 CMP Go ahead, Houston.

07 07 07 21 CC 11, this is Houston. Do you all have 'Change Lima' for your entry operations checklist dated July 23? Over.

07 07 07 34 CDR Dated when?

07 07 07 36 CC July 23.

07 07 07 39 CDR I'm not sure that we hung around long enough to pick that one up.

07 07 07 44 CC Okay. If you've got the entry operations checklist handy, then I'll pass it up to you. Over.

07 07 07 53 CDR How can you make changes after lift-off??

07 07 08 04 CMP You sure you don't mean June?

07 07 08 06 CC Negative. It just came up today. Over.

07 07 08 12 CMP So, you're the first to get to us. Go ahead.

07 07 08 18 CC Okay. On page 6-1 of the entry-out checklist down toward the bottom after "MAIN DEPLOY pushbutton," we have three additional steps we'd like you to accomplish. The intent of this is to reduce the oxygen pressure in your manifold and to eliminate the oxygen bleed flow through the potable and waste-water tanks during descent. Over.

07 07 08 56 CMP Okay. We've got 6-1 out. Go ahead.

07 07 09 00 CC Okay. Down at the bottom, you've got "10 000 feet MAIN PARACHUTE DEPLOY, MAIN DEPLOY pushbutton, PUSH within 1 second." And after that step, we'd like you insert "SURGE TANK O<sub>2</sub> valve, OFF; RE-PRESS PACKAGE valve, OFF; and DIRECT O<sub>2</sub> valve, OPEN." Do you copy?

07 07 09 49 CMP Okay. Down at the bottom, after "MAIN DEPLOY pushbutton, PUSH; SURGE TANK O<sub>2</sub>, OFF; and RE-PRESS PACKAGE VALVE, OFF, DIRECT O<sub>2</sub>, OI." Over.

07 07 10 04 CC Roger. And then down at the very bottom of page 6-2 where you see "DIRECT O<sub>2</sub>, OFF VERIFY," delete that step completely. Over.

07 07 10 20 CMP Roger.

07 07 10 22 CC And for record purposes, this will be "Change Lima." Over.

07 07 10 30 CMP Okay. We've got it. How far open do you want this the DIRECT O<sub>2</sub> valve to be opened at this point? I guess you want it - just leave it open from that point on?

07 07 10 46 CC Roger. It should go all the way open, and you can just leave it on from that point on. The intent is to completely depressurize the oxygen manifold. Over.

07 07 10 59 CMP Roger. Copy.

07 07 15 34 CC Apollo 11, this is Houston. For your information the All Star game has just ended with the National League winning 9 to 3 over American. Over.

07 07 15 48 CDR Roger. Thank you.

07 07 15 52 CC And I have a message here for Mike that says "All the chinch bugs are gone." Over.

07 07 16 05 CMP Having done their job I guess.

07 07 16 10 CC Well, along with one tree, it turns out.

07 07 16 15 CMP Yes. I heard about that. That was right before the flight.

07 07 16 18 CC Right. That big storm.

07 08 23 55 CC Apollo 11, this is Houston. Are you still up there? Over.

07 08 24 07 CDR Yes, we are. But not quite so far as we were a while ago.

07 08 24 12 CC Roger. We concur. We just wanted to make sure that we had good COMM with you.

07 08 24 18 CDR Okay.

2  
10  
✓  
37  
min

07 08 26 26      CC      For general information, 11, you are now  
95 970 miles out from the Earth. Over.

07 08 26 39      CDR      Right in our own back yard.

07 08 26 41      CC      Say again.

07 08 26 46      CDR      Right in our own back yard.

07 08 26 54      CC      Roger that.

07 08 27 03      LMP      Trying to come down hill a little bit now. What's  
our velocity?

07 08 27 12      CC      Your velocity is 5991 feet per second.

07 08 27 20      LMP      Thank you.

07 08 27 21      CC      And you are indeed coming down hill.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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07 09 08 35 CC Apollo 11, this is Houston. Over.

07 09 08 42 CMP Go ahead, Houston.

07 09 08 45 CC Roger, 11. I've got a flight plan update for you to give you an optimum attitude for the Earth in the number 1 window and the Moon in number 5 window. Over.

07 09 09 00 CMP Ready to copy.

07 09 09 03 CC Roger. Your attitude will be roll 12 degrees, pitch 270 degrees, yaw 0 degrees. High-gain antenna angles, pitch plus 14, yaw 263. Over.

07 09 09 25 CMP Roger. I copy. Roll 012, pitch 270, yaw 0. High-gain antenna, pitch plus 14 and yaw 263.

07 09 09 35 CC Roger. And when coming out of PTC, you might be advised that your deadband has been collapsed, so follow the checklist items. Over.

07 09 09 46 CMP Roger that.

07 09 12 23 CC 11, this is Houston. We're receiving a black signal from you right now, but we are getting TV. Over.

07 09 24 10 CC Apollo 11, this is Houston. Over.

07 09 24 14 CMP Go ahead.

07 09 24 16 CC From signal strength indications, it appears that we may be locked up on a side lobe with a high-gain antenna. We'd like you to go into wide bandwidth for about 15 seconds and then back to narrow. Over.

07 09 24 29 CMP All right.

07 09 31 18 CDR You have good S-band signal strength now, Houston?

07 09 31 22 CC That's affirmative, 11.


07 09 31 29 CDR You all set for TV?

07 09 31 35 CC Roger. We're all set whenever you're ready to send.

07 09 31 39 CDR Okay.

07 09 31 52 CC Okay. You're coming through loud and clear now, 11, with your patch.

07 09 32 24 CDR Good evening. This is the Commander of Apollo 11. A hundred years ago, Jules Verne wrote a book about a voyage to the Moon. His spaceship, Columbia, took off from Florida and landed in the Pacific Ocean after completing a trip to the Moon. It seems appropriate to us to share with you some of the reflections of the crew as the modern-day Columbia completes its rendezvous with the planet Earth and the same Pacific Ocean tomorrow. First, Mike Collins.



07 09 33 35 CC 11, this is Houston. We have an LOS here.

07 09 33 39 CDR We'll be right back with you.

07 09 33 40 CC Roger.

07 09 33 51 CC In the interim, you may be interested in knowing that Jan and the children and Pat and the youngsters and Andy Aldrin are down here in the viewing room watching this evening.

07 09 34 05 CDR We're glad to hear that.

07 09 34 38 CC Okay, 11. You're back on, with Mike in the middle of the screen there.

07 09 34 44 CMP Roger. This trip of ours to the Moon may have looked, to you, simple or easy. I'd like to assure you that has not been the case. The Saturn V rocket which put us into orbit is an incredibly complicated piece of machinery, every piece of which worked flawlessly. This computer up above my head has a 38 000-word vocabulary, each word of which has been very carefully chosen to be of the utmost value to us, the crew. This switch which I have in my hand now, has over 300 counterparts in the command module alone, this one single switch design. In addition to that, there are myriads of circuit breakers, levers, rods, and other associated controls. The SPS engine, our large rocket engine on the aft end of our service module, must have performed flawlessly, or we would have been stranded in lunar orbit. The parachutes up above my head must work perfectly tomorrow or we will plummet into the

ocean. We have always had confidence that all this equipment will work, and work properly, and we continue to have confidence that it will do so for the remainder of the flight. All this is possible only through the blood, sweat, and tears of a number of people. First, the American workmen who put these pieces of machinery together in the factory. Second, the painstaking work done by the various test teams during the assembly and retest after assembly. And finally, the people at the Manned Spacecraft Center, both in management, in mission planning, in flight control, and last, but not least, in crew training. This operation is somewhat like the periscope of a submarine. All you see is the three of us, but beneath the surface are thousands and thousands of others, and to all those, I would like to say, thank you very much.

- 07 09 37 52        CC        11, this is Houston. We're getting a good picture of Buzz now, but no voice modulation. And would you open up the f-stop on the TV camera; try 22, please?
- 07 09 38 13        CC        That appears to be a lot better now. We're still not receiving Buzz's audio.
- 07 09 38 20        LMP        Good evening. I'd like to discuss with you a few of the more symbolic aspects of the flight of our mission, Apollo 11. As we've been discussing the events that have taken place in the past 2 or 3 days here on board our spacecraft, we've come to the conclusion that this has been far more than three men on a voyage to the Moon; more, still, than the efforts of a government and industry team; more, even, than the efforts of one nation. We feel that this stands as a symbol of the insatiable curiosity of all mankind to explore the unknown. Neil's statement the other day upon first setting foot on the surface of the Moon, "This is a small step for a man, but a great leap for mankind," I believe sums up these feelings very nicely. We accepted the challenge of going to the Moon; the acceptance of this challenge was inevitable. The relative ease with which we carried out our mission, I believe, is a tribute to the timeliness of that acceptance. Today, I feel we're fully capable of accepting expanded roles in the exploration of space. In retrospect, we have all been particularly pleased with the call signs that we very laboriously

chose for our spacecraft, Columbia and Eagle. We've been particularly pleased with the emblem of our flight, depicting the U.S. eagle bringing the universal symbol of peace from the Earth, from the planet Earth to the Moon; that symbol being the olive branch. It was our overall crew choice to deposit a replica of this symbol on the Moon. Personally, in reflecting on the events of the past several days, a verse from Psalms comes to mind to me. "When I consider the heavens, the work of Thy fingers, the moon and the stars which Thou hast ordained, what is man that Thou art mindful of him."

07 09 41 42            CDR            The responsibility for this flight lies first with history and with the giants of science who have preceded this effort; next with the American people, who have through their will, indicated their desire; next, to four administrations, and their Congresses, for implementing that will; and then, to the agency and industry teams that built our spacecraft, the Saturn, the Columbia, the Eagle, and the little EMU, the space suit and backpack that was our small spacecraft out on the lunar surface. We would like to give a special thanks to all those Americans who built the spacecraft, who did the construction, design, the tests, and put their - their hearts and all their abilities into those crafts. To those people, tonight, we give a special thank you, and to all the other people that are listening and watching tonight, God bless you. Good night from Apollo 11.

07 09 43 52            CC            11, this is Houston. We're getting a zoom view out the window now.

07 09 44 24            CDR            Apollo 11, signing off.

07 09 47 48            CMP            Houston, Apollo 11. Do you want to crank up PTC again; do you have some reason to hold its attitude, or what's your pleasure?

07 09 47 57            CC            You can crank up PTC again, Mike, any time you like. And I might add I thought that was a mighty fine TV presentation. There's certainly nothing I can add to it from down here.

07 09 48 10            CMP            Thank you.

07 09 53 27            CC            Apollo 11, this is Houston. Over.



07 09 53 33 CDR Go ahead.

07 09 53 36 CC Okay, ll. I've got a few small items here: one flight plan update and some entry photography information, if you are ready to copy. Over.

07 09 53 49 CDR Go ahead.

07 09 53 51 CC Roger. At 180 hours 50 minutes GET, we should like to delete your oxygen fuel cell purge.

07 09 54 02 CDR Okay.

07 09 54 03 CC And on the entry photography, if you are going to use a fresh magazine of color interior film, we recommend the following exposure settings: f11 at 1/250, six frames per second, focus on 7 feet for the fireball; f2.0, 1/60 of a second, six frames per second, focus on 50 feet when the chutes open. If you are using a magazine, part of which has already been used for interior shots, we recommend f16 at 1/500 of a second, six frames per second, focus on 7 feet for the fireball; f2.8, 1/60 of a second, six frames per second, focus on 50 feet when the parachutes open. And we would like to know the magazine number that you are intending to use if you have a chance. Over.

07 09 55 22 CMP Okay. I think we got those. We will be using a fresh one and it will be color interior. Over.

07 09 55 32 CC Roger. When you get - get it out, we would like to have the number of the magazine and the letter of the magazine relayed down.

07 09 55 42 CDR Okay. And we're thinking that we might want to run some of that at 12 frames per second. And I think we can get everything from 0.5 - 0.5g down; that will only give us about 7.8 minutes and ... frames ... double that. I guess maybe just an occasional burst to 12 frames would be what we want and the rest of it at six. Over.

07 09 56 23 CC This is Houston. That plan sounds fine with us, Neil.

07 09 56 28 CDR Okay.

07 09 56 30 CC And lastly, we would like to know if your stowage configuration for entry is going to conform to

the nominal. The RETRO's down here are anxious to get an accurate c.g. computed for you, and in particular, where the LEVVA's are being stowed. Over.

07 09 56 53 CDR Okay. We think we are going to put the LEVVA's and helmets in the hatch bag, and we'll let you know any other nonstandard stowage locations that we complete this evening.

07 09 57 08 CC This is Houston. Roger. Out.

07 10 06 57 CDR Houston, Apollo 11.

07 10 07 01 CC Go ahead, 11.

07 10 07 03 CDR Roger. The magazine we'll be using for entry tomorrow is magazine M. Over.

07 10 07 10 CC Roger. Understand. Magazine M as in Mike.

07 10 07 14 CDR That's right.

07 10 07 19 CC Thank you. Out.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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07 10 17 38 CC Apollo 11, this is Houston. Your friendly Green Team going off for the night, and going off for the last time. We wish to bid you a good night and Godspeed.

07 10 17 51 CDR Thank you. We appreciate all that fine work done by the Green Team, and we'll be thanking you in person when we get back.

07 10 18 00 CC Roger. We'll see you on the ground.

07 10 18 03 LMP Really enjoyed working with all of you. Thanks very much. Over.

07 10 18 08 CC Roger.

07 10 18 09 CMP As usual, all you Greenies.

07 10 18 11 CC They're all smiles down here, even the trench.

07 10 40 30 CMP Houston, Apollo 11.

07 10 40 35 CC Apollo 11, this is Houston. Over.

07 10 40 39 CMP Roger. How's our thruster firing activity? We're about ready to crank up PTC if you are.

07 10 40 46 CC Roger. Go ahead.

07 10 40 49 CMP Okay. Thank you.

07 10 56 51 CC Apollo 11, this is Houston. Over.

07 10 56 55 CDR Go ahead, Houston.

07 10 56 57 CC 11, we'd like you to shift to an OMNI antenna configuration at the present time. We're requesting the S-band antenna OMNI switch to Bravo and the S-band antenna OMNI switch to OMNI. The high-gain antenna track in MANUAL. Pitch minus 50, yaw 270. Over.

07 10 57 25 LMP Roger. I'll do that right now.

07 10 57 30 CC Roger. And if Mike has a minute, we'd like to do a little bit of troubleshooting. It seems he's either flat-chested or something because we've lost respiration rate on the BICMED telemetry. That is, the ZPN trace down here is flat.

07 10 57 56 LMP He was shaving a little bit ago. He might have just let it slip. Hold on a moment.

07 10 58 06 CMP All the blasted wires are all connected, is all I know.

07 10 58 11 CC Okay, Mike. We had a request that you disconnect the yellow connector from the signal conditioner and verify that it looks okay, reconnect it and then, if you would, check the two electrodes that are placed one on each side of your lower rib cage. Over.

07 10 58 36 CMP I bet you there's a smile on Charlesworth's face.

07 10 58 41 CC Cliff is not on right now. Gene Kranz just relieved him a few minutes ago.

07 10 58 50 CMP Roger that.

07 10 59 56 CMP All those wires and things look normal up here.

07 11 00 00 CC Roger, Mike. We could see variations on our traces. You've connected and disconnected, but the medics still don't have a signal.

07 11 00 16 CC Looks like you're sending us a message of some sort.

07 11 00 29 CMP Well, I promise to let you know if I stop breathing.

07 11 03 23 CC Apollo 11, Apollo 11, this is Houston broadcasting in the blind. Request OMNI Bravo. Request OMNI Bravo. Over.

07 11 10 45 CC Apollo 11, this is Houston. Communication reestablished.

07 11 10 51 SC ...

07 11 11 51 CC Apollo 11, this is Houston. Will you confirm you're in OMNI Bravo? Over.

07 11 12 08 LMP Okay. That ought to give it to you.

07 11 12 12 CC Roger. Out.

07 11 14 51        CC        Apollo 11, this is Houston. Mike, we're still getting a flat trace on you for the impedance pneumograph. Before you turn in this evening, you might try putting some fresh paste in the sensors, and if that doesn't work, the medics have agreed to forget about it. Over.

07 11 15 17        CDR        Mike's off the loop right now. I'll convey that message.

07 11 15 20        CC        Okay. Thank you.

07 11 15 46        CMP        Houston, Apollo 11. Say again.

07 11 15 50        CC        Roger, Mike. The trace on your respiration rate is still flat. If you have time this evening before turning in, we would suggest that you try putting some fresh paste in the two electrodes that go on the side of your lower rib cage; and if that doesn't work, just give up on it.

07 11 16 13        CMP        ...

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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07 12 07 45 SC (Sound of Train)

07 12 08 17 CC Hey, 11, this is Houston. You might tell Buzz not to exercise quite so strenuously. Over.

07 12 08 30 LMP What's the problem?

07 12 08 32 CC Say again.

07 12 08 36 LMP What's the problem?

07 12 08 42 CC Okay. That's one - that's one on us. (Laughter)

07 12 09 19 CC 11, Houston. Seriously, that comment was just aimed at your musical selection.

07 12 09 26 LMP Okay.

07 12 09 39 SC (Sound of train)

07 12 09 59 CMP Come on Neil, not so fast.

07 12 10 05 SC (Sound of train)

07 12 10 19 CMP You have an ergometer up here.

07 12 10 30 CC What was that? Real time exercise?

07 12 10 35 CMP Just trying to be your ergometer.

07 12 10 37 CC Roger.

07 12 21 22 CC Apollo 11, this is Houston. Over.

07 12 21 28 CDR Go ahead, Houston.

07 12 21 30 CC We'd like to know what your plans are as far as turning in this evening. Our - in the flight plan we show you commencing a rest period at about 182 hours, and what are you planning to do on that? We're going to be watching the weather here, and we expect to have an update on the weather, I guess, in about half hour or 45 minutes to pass to you. Over.

07 12 21 57 CDR We're going to probably stick with the flight plan pretty much. We are going to - it - check the lights in the northwest corner of the U.S.

and southwest corner of Canada. If we can see up that high into the northern hemisphere. Other than that, we'll be on the flight plan.

07 12 22 21        CC        Roger. For your information, the laser from McDonald Observatory in West Texas will be up from about 181 hours and 30 minutes, on for 1 hour. You should be able to spot the earth out of the number 1 window every time you pass roll 357 degrees and then, of course, you're in West Texas. Over.

07 12 22 47        CDR        Okay. Thank you.

07 12 23 07        CMP        How about the number 5 window?

07 12 23 16        CC        Stand by a minute.

07 12 23 24        CC        Roger. For the number 5 window. That'll be - every time you pass 230 degrees in roll. Over.

07 12 23 32        CMP        Beautiful. Thank you.

07 12 23 36        CMP        You guys are on your toes down there.

07 12 23 39        CC        Roger. - -

07 12 23 40        CDR        You have a new, new star chart. You must have a new, new star chart. Huh?

07 12 23 45        CC        Oh, we got a fresh, fresh FAO here.

07 12 36 56        CDR        Houston, Apollo 11. How much longer do you want us to keep charging battery B?

07 12 37 17        CC        11, this is Houston. Nominally we're looking for about another hour and a half, but what we'd like to do is continue charging until shortly before you turn in for the night. Over.

07 12 37 30        CDR        That'll be fine. Are you going to want to charge A again at all?

07 12 37 36        CC        Negative, 11.

07 12 37 40        CDR        Okay.

07 12 42 18        CC        11, this is Houston. At about 180 45, we'll be handing over from Goldstone to Honeysuckle, and I'm handing over to Charlie. See you when you get back. Over.

(GOSS NET 1)

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07 12 42 33 CDR Okay, Bruce. Good night. Thank you.  
07 12 42 35 CC Roger. Good night.  
07 12 42 36 CMP Thank you very much, Bruce. It's been a pleasure working with you.  
07 12 42 38 CC Have a nice trip down.

END OF TAPE



APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

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07 13 26 46       CMP       Houston, Apollo 11. Over.

07 13 26 55       CC        Apollo 11, Houston. Go ahead.

07 13 27 02       CMP       Roger, Houston. For RETRO, I have the anticipated location of all the entry stowage, and I suggest you pull out the entry checklist, and we'll go through those maps in the front of it.

07 13 27 19       CC        Apollo 11, Houston. Could you stand by just a few minutes? Charlie and Flight are out getting a weather briefing. They'll be back shortly.

07 13 27 33       CMP       Is this Ken?

07 13 27 35       CC        Say again?

07 13 27 40       CMP       Is this Owen?

07 13 27 42       CC        No, this is Chuck Lewis. Charlie Duke is out with Flight getting a weather briefing right now.

07 13 27 49       CMP       Okay. They're out drinking coffee. I know.

07 13 27 52       CC        (Laughter) They'll be back momentarily.

07 13 35 55       CC        Hello, Apollo 11. Houston. Over.

07 13 36 00       CMP       Roger, Houston. Apollo 11. Did you get the word on the entry checklist?

07 13 36 05       CC        Roger, Mike. We sure did. We're ready to talk about it, if you are. Over.

07 13 36 13       CMP       I think the quickest thing is to go through page by page, the first part of the entry checklist where it has a map. Starting on the page with compartment L2 and L3. Are you with me?

07 13 36 25       CC        Roger. With you.

07 13 36 28       CMP       Okay. L2 is as shown. L3 is as shown; there is about half the food remaining in L3.

07 13 36 35       CC        Roger.

07 13 36 36        CMP        Where it says - where it says "And note," the CMP PGA is located in the L-shaped bag with the other two PGA's. The LM shield was jettisoned with the - Correction, the CMP's helmet shield was jettisoned with the LM, and his helmet and gloves, instead of being in the sleep restraint, are in the hatch bags.

07 13 37 06        CC        Okay. Let's see now. Your PGA is in the L-shaped bag with the other two PGA's, and your helmet and gloves are in the L-shaped bag instead of the sleep restraint.

07 13 37 21        CMP        The helmet and gloves are in the hatch bag, the great big bag that's underneath the left-hand couch that you put the hatch in.

07 13 37 30        CC        Roger. I thought I - That's what I copied. Okay. Go ahead.

07 13 37 37        CMP        Okay. The next page is identical except a nit-picking point: out R1 we got the entry checklist. Other than that it is identical, and the third page has got some changes.

07 13 37 49        CC        Go ahead.

07 13 37 50        CMP        In A1 - Are you with me? I'm over there in compartment A1, now.

07 13 37 56        CC        Go ahead, Mike. Over.

07 13 38 04        CMP        In compartment A1, the 16-millimeter magazine will be located in window number 4 instead of 5. Tissue dispensers; there is only one of them left. And compartment U3, the 16-millimeter bracket is on window 4, and the PGA bag - add the CMP's PGA, plus add two LCG's. And compartment A8 delete two LCG's, add one PPK, making a total of four, and add 10 pounds of LM miscellaneous equipment. We told you five the other day. We think ten is probably closer. Over.

07 13 38 57        CC        Copy.

07 13 39 04        CMP        And that's all the changes on that page. Ready for the next page?

07 13 39 07        CC        Roger. Go ahead, Mike.

07 13 39 12       CMP       On your next page, in compartment B1, we estimate about 15 percent of that food is remaining. In B2 we took PPK out of there and put trash in it. In B3, the 16-millimeter cable, the 18-millimeter lens, and the right-angle mirror are on window number 4. And that there brings you all up-to-date.

07 13 39 42       CC       Roger. How about the LEVVA's, Mike? Where did you put those? Over.

07 13 39 53       CMP       They're in the hatch bag.

07 13 39 56       CC       Roger. Stand by. Our only concern, 11, is with the stuff you got in the hatch bag. That's pretty big bulk between you and A8, and we'd like to talk about moving that over to the sleep restraint. If you will stand by, I'll verify that. Over.

07 13 40 16       CMP       Okay.

07 13 41 16       CC       11, Houston. Our recommendation on the gear you got in the helmet bag - correction, hatch bag, would be to remove that stuff and put it in the sleep restraint under the right couch. The reason is that the hatch bag straps are only configured for zero g, and it is a pretty difficult job getting it lashed down. With the gear in the sleep restraint, it's a pretty standard lash-down procedure, and you could also use the Beta cord that you have on board. You concur? Over.

07 13 42 03       CMP       Yes. We'll look at it, Charlie, and let you know.

07 13 42 06       CC       Roger. And I got a couple of other things, Mike. We need to terminate battery B charge at this time, and also, the weather is clobbering in at our targeted landing point due to scattered thunderstorms. We don't want to tangle with one of those, so we are going to move the - your aim point uprange. Correction, it will be downrange, to target for 1500-nautical-mile entry so we can guarantee uplift control. The new coordinates are 13 degrees, 19 minutes north, 169 10 minutes west. The weather in that area is super. We got 2000 scattered, 8000 scattered with 10 miles visibility and 6-foot seas and the Hornet is sitting in great position to get to that targeted position. Over.

07 13 43 21       CMP       Roger.

07 13 51 59       CC       Apollo 11, Houston. Some of the general last minute updates here. On the entry, we had told you on the camera to set it at 50 feet. It turns out the biggest number on the camera is 25 feet, so just set it at infinity. Over.

07 13 52 19       CMP       Roger. Infinity.

07 13 57 42       CC       Hello, Apollo 11. Houston. We're ready to put you to bed and say good night, if you give us your crew status report and verify that you changed out the CO<sub>2</sub> canister a moment ago. Over.

07 13 57 55       CDR       Stand by.

07 14 00 43       CDR       Okay, Charlie. Crew status report follows: CDR 11023, CMP 10025, LMP 09027. Canister change complete.

07 14 01 01       CC       Roger. Thank you very much there.

07 14 01 02       CDR       All men okay.

07 14 01 03       CC       Roger. Thank you. Could you give us an on-board readout, please, sir?

07 14 01 08       CDR       Stand by. Okay. BAT C 37, PYRO BAT A 37, BAT B 37, RCS A 51, B 63, C 62, D 58.

07 14 01 26       CC       Roger. Copy. Thank you much.

07 14 03 47       CC       Apollo 11, Houston. It's good night from the White Team for the last time. We'll be off when you wake up in the morning. It's been a pleasure working with you guys. It was a beautiful show from all three of you. We appreciate it very much, and we'll see you when you get out of the LRL. Over.

07 14 04 04       CDR       Okay, Charlie. Thanks to you and all the White Team for a great job down there all the way through. Thank you.

07 14 04 11       CMP       Outstanding.

07 14 04 13       LMP       ... very much, Charlie. Thanks.

07 14 04 16      CC      Thanks to you guys, too.

07 14 04 36      CC      And, 11, Houston. Mike, you get your chance  
at landing tomorrow. No go-around.

07 14 04 44      CMP      Roger. You're going to let me land closer  
to Hawaii, too, aren't you?

07 14 04 47      CC      That's right, sir.

07 14 07 59      CC      11, Houston. We got some word just a moment  
ago that the McDonald Observatory is - said  
they had picked up the spacecraft in their  
telescope. Over.

07 14 08 09      CDR      Outstanding. We have been looking for their  
laser but haven't had much luck yet.

07 14 08 16      CC      Roger. We'll pass it on to them, Neil. Thank  
you.

END OF TAPE

(GOSS NET 1)

Tape 118/1  
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REST PERIOD - NO COMMUNICATIONS

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

Tape 119/1  
Page 605

REST PERIOD - NO COMMUNICATIONS

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

Tape 120/1  
Page 606

REST PERIOD - NO COMMUNICATIONS



APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

Tape 121/1  
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REST PERIOD - NO COMMUNICATIONS

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

Tape 122/1  
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07 21 28 35 CDR Hello, Houston. Apollo 11.

07 21 28 39 CC Apollo 11, Houston. Go.

07 21 28 43 CDR Roger. Good morning. What's the status on mid-course 7?

07 21 28 47 CC Roger. We were going to let you sleep in until about 190 hours. Midcourse 7 is not required.

07 21 28 54 CDR Okay. Thank you.

07 22 19 07 CC Apollo 11. Good morning from Houston. Over.

07 22 19 12 CDR Good morning, 11.

07 22 19 15 CC Roger. We saw you up stirring around, and we thought that you were probably eating your breakfast there. Just in general, we'll probably start coming up with the uplink of the state vectors and the target loads and what have you at about 190 50, somewhere in that area, and get you started to work.

07 22 19 35 CDR Okay.

07 22 19 36 CC And in the meantime, while you're eating your breakfast there, I've got the Maroon Bugle all standing by here to give you the morning news.

07 22 19 45 CDR Glad to hear it.

07 22 19 48 CC Okay. Apollo 11 remains the prime story with the world awaiting your landing today at about 11 49 a.m. Houston time. In Washington, House tax reformers have fashioned a provision which would make it impossible for wealthy individuals to avoid income tax entirely through tax-free investments or special allowances. Under the proposal tentatively adopted by the House Ways and Means Committee, everyone would pay taxes on at least half of their income.

07 22 20 25 CDR Hang on a minute.

07 22 20 30 CC Roger. Standing by.

07 22 22 28 CDR Okay. Okay, Ron. We're ready to go again. Thank you.

07 22 22 36        CC        Roger. Continuing with the Maroon Bugle. President Nixon surprised your wives with a phone call from San Francisco just before he boarded a plane to fly out to meet you. All of them were very touched by your television broadcast. Jan and Pat watched from Mission Control here. The launch of Intelsat from the Cape was postponed for the fourth time last night. The problem was said to be a malfunctioning nitrogen regulator in the second stage of Delta. A new attempt will be made to launch it tonight. The research submarine Ben Franklin, which is studying the Gulf Stream, set a record by drifting 24 hours from 10 to 100 feet above the ocean floor in 1300 feet of water off the Georgia coast. The mission is led by Jacques Picard. Wally Schirra has been elected to a 5-year term on the board of trustees of the Detroit Institute of Technology. He will serve on the Institute's development committee. Air Canada says it has accepted 2300 reservations for flights to the Moon in the past 5 days. It might be noted that more than 100 have been made by men for their mothers-in-law. And finally, it appears that rather than killing romantic songs about the Moon, you have inspired hundreds of song writers. Nashville, Tennessee, which probably houses the largest collection of recording companies and song publishers in the country, now reports it is being flooded by Moon songs. Some will make it. The song at the top of the best sellers list this week is, "In the year 2525." Morning Bugle. Out.

07 22 24 51        CDR        Thank you very much, Ron.

07 22 31 42        CDR        Houston, crew status report: 5.5 7 5.5.

07 22 31 52        CC        Apollo 11, Houston. Roger. We copy. And I have your consumables update, if you're ready to copy.

07 22 32 00        CDR        Go ahead.

07 22 32 01        CC        Roger. GET 189 plus 00: RCS total minus 1 percent; Alfa minus 11; Bravo plus 10; Charlie minus 1; Delta minus 1; H<sub>2</sub> total minus 0.76 pounds; oxygen total plus 17.6 pounds. Over.

07 22 32 41        CDR        Okay. It doesn't look like we're going to be able to get quite back on the flight plan.

07 22 32 46        CC        Not quite; just about though.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

Tape 123/1

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07 22 45 13        CC        Apollo 11, Houston. Request POO and ACCEPT, and we'll send your REFSMMAT, state vector, and entry target load. Over.

07 22 45 23        CDR        You have it.

07 22 45 29        CC        Roger. It'll be coming up.

07 22 48 04        CC        Apollo 11, Houston. Can you tell us where the visor assemblies ended up, there?

07 22 48 12        CDR        We're going to follow your suggestion and stow them under right-hand couch.

07 22 48 17        CC        Roger. Mighty fine. Break. The weather forecast in the landing area right now is 1000 scattered, high scattered, 10 miles. The wind about 080 at 18 knots. You'll have about 3- to 6-foot waves. Your Delta-H is plus 10 feet. And it looks like you'll be landing about 10 minutes before sunrise. Over.

07 22 48 49        CDR        Okay. Sounds good.

07 22 48 52        CC        Roger.

07 22 50 31        CC        Apollo 11, Houston. All three loads are in. The computer is yours. Over.

07 22 50 38        CDR        Roger.

07 22 50 40        CC        And Mike, if you're on loop there, to extend the range and the constant g reentry, here, I've got a little procedure, if you would like to listen to it.

07 22 50 56        CMP        Stand by one.

07 22 50 57        CC        Roger.

07 22 51 01        CMP        I'm right in the middle of my orange juice. Be with you in about 5 minutes.

07 22 51 04        CC        Sure, no problem, standing by.

07 22 52 24        LMP        Houston, Apollo 11. Hey, Ron, I wonder if you could give us a good Navy explanation for this Delta-H time. Over.

07 22 52 35 CC Roger. Let me think about it, and I'll come back.

07 22 52 38 LMP You too, huh?

07 22 52 41 CC (Laughter) Right.

07 22 52 48 LMP Collins has got one, but I'm not sure I buy it.

07 22 58 16 CC Apollo 11, Houston.

07 22 58 21 LMP Go ahead.

07 22 58 22 CC Roger, 11. We don't have to worry about it any more. The altimeter out there is now standard, 29.92; but basically what it means is that if I give you a plus 10 feet, for instance, that means that you will hit the water with the altimeter reading 10 feet. Over.

07 22 58 41 CMP All right.

07 22 58 43 LMP Ah, Collins was wrong.

07 23 43 31 CC Apollo 11, Houston. I have your entry PAD. Over.

07 23 43 42 LMP Stand by.

07 23 43 46 CC Roger. Standing by.

07 23 43 54 LMP Okay, I'm ready to copy.

07 23 43 57 CC Roger. Entry PAD: area is the mid-Pacific, roll 000, 152, 001, GET 194 46 06, 267, latitude plus 1332, minus 16917, 064, 36194, 649, range to go 14045, 36275, 195 03 06, 00 28, DL max 154, 084, 22400, 18000, DO 400, 02 13, 00 17, 03 51, 09 02, sextant star 45 0189, 277, boresight star, none available, lift vector up. Comments: GDC align, Vega and Deneb, roll 078, pitch 223, yaw 340. Additional comments: Use nonexit EMS pattern, EI minus 30, horizon check GET 194 33 06. Pitch 298. You'll get P65, but no P66. Additional note: Initial bank angle in P67 may not be full lift. Apollo 11, Houston. Read back.

07 23 48 46 LMP Okay, Ron. For MIDPAC: 000, 152, 001, 194, 46 06, 267, plus 1332, minus 16917, 064, 36194, 649, 14045, 36275, 195 03 06, 0028, 154, 084.

2240, 180, 400, 02 13, 00 17, 03 51, 09 02, 45, 0189, 277, none available, lift vector up, GDC align, Vega and Deneb, roll 078, pitch 223, yaw 340. Use nonexit EMS. EI minus 30, horizon check 194 33 06, pitch 298. Initial bank angle in P67 may not be full lift, and we will get P65 but no P66.

07 23 50 30        CC        Apollo 11, Houston. Roger. On your GDC align pitch, it should be 233, 233 in the pitch. Over.

07 23 50 41        LMP        Okay. I've got a 233.

07 23 50 47        CC        Also your DL and MAX and MIN, I'm sure, are 22 400 and 18 000. Over.

07 23 50 56        LMP        Yes. That's right.

07 23 50 58        CC        Okay. If you'll dig out your entry checklist there on page E6-1, I'll update your RETRO times there for the various altitudes. Over.

07 23 51 10        LMP        Okay. Go ahead.

07 23 51 14        CC        Okay. On page E6-1, your RRT is 07 20; your 50K is 08 16; 40K is 08 30; your 24K is 09 02; and your 10K is 09 51. Over.

07 23 52 06        LMP        Okay. RRT, 07 20, 50 000, 08 16. That's - 07 20 is - is the time of steam pressure peg from RRT; and 40 000, 08 30; 24 000, 09 02; 10 000, 09 51.

07 23 52 48        CC        11, Houston. You started out right, and then the numbers you read back were correct; but I didn't get your comment in between there.

07 23 52 58        LMP        I assume that - all I wanted to know is that first time, 07 20, that's the time of steam pressure peg. Right?

07 23 53 04        CC        That's affirmative.

07 23 53 06        LMP        Okay.

07 23 58 05        CMP        Houston, Apollo 11. Ron, I'm ready to copy your message about the constant drag level.

07 23 58 13           CC       Okay, Mike. Of course, this is in the event the G&N and the EMS quits and you have to fly the constant g; and what we're trying to do is extend the constant g range from 1100 to 1500 miles. We've run this procedure in the simulator, and it works fine. Basically, I'll go through it - just go through it, and then if you have any questions come back. But it's the same lift vector up until MAX g, and then lift vector down, and then modulate the lift vector until g dot goes to zero. Okay. This procedure is essentially the same so far. And then hold g dot zero until you pass the RETRO elapsed time of V circular; and then after you pass this RETRO elapsed time of V circular, roll to a gimbal angle of 45 degrees, and then hold this constant bank angle of 45 degrees until you come to the RETRO elapsed time of drogues. Over.

07 23 59 44           CMP       Okay. It sounds straightforward enough. Understand constant g backup backup procedure, lift vector up until MAX g and then lift vector down; then modulate until bank angle until g dot equals zero. Maintain g dot equals zero until subcircular, then roll 45 degrees and hold until drogue time. Over.

08 00 00 07           CC       Okay. That's mighty fine, Mike. That's correct.

END CF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

Tape 124/1  
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08 01 01 57       CMP       This entry time line is my kind of time line.  
Nice and slow.

08 01 02 03       CC        Okay, 11. Houston. Roger. It sure is. EECOMM  
is anxiously awaiting his big moment here for  
the logic sequence check whenever you're ready.

08 01 02 14       CDR       Okay. We'll be ready for that in just a flash.

08 01 02 17       CC        Roger.

08 01 02 28       CC        Apollo 11, Houston.

08 01 02 31       CMP       Go ahead, Ron.

08 01 02 32       CC        This is Jim, Mike. Backup crew is still standing  
by. I just want to remind you that the most  
difficult part of your mission is going to be  
after recovery.

08 01 02 42       CMP       Well, we're looking forward to all parts of it.

08 01 02 45       CC        Please don't sneeze.

08 01 02 53       CMP       Keep the mice healthy.

08 01 03 03       CMP       The Earth is really getting bigger up here and,  
of course, we see a crescent.

08 01 03 08       CC        Yes.

08 01 03 12       CMP       We've been taking pictures and we have four ex-  
posures to go, and we'll take those and then  
pack the camera.

08 01 05 18       CMP       Houston, Apollo 11. We're ready for the logic  
check whenever you are. We're standing by to arm  
the logic. We've got ELS logic on, EIS AUTO,  
and all the circuit breakers in.

08 01 05 30       CC        Apollo 11, Houston. Roger. You can press on with  
the SECS logic.

08 01 05 35       CMP       Okay. Logic 1 coming on.

08 01 05 37       CMP       MARK it.

08 01 05 39       CMP       Logic 2 coming on.



08 01 05 40       CMP       MARK it.

08 01 05 50       CC        Apollo 11, Houston. Logic checks good. You're  
GO for PYRO ARM.

08 01 05 56       CMP       Thank you, sir.

08 01 07 09       LMP       Houston, Apollo 11 has got VHF A Simplex on  
whenever you want to make a COMM check.

08 01 07 20       CC        Apollo 11, Houston. Roger. You faded out a  
little bit there, Buzz. I understand you have  
the VHF Simplex A on now. Is that correct?  
Over.

08 01 07 29       LMP       That affirmative. VHF Simplex A and we're TR on  
VHF.

08 01 07 35       CC        Roger. Mighty fine. We'll watch it as you are  
coming on in and let you know when the intelli-  
gibility is up. We'll make a voice check with you  
at that time.

08 01 07 50       CDR       Houston, Apollo 11. I've been holding here in  
SCS control MINIMUM DEADBAND RATE LOW with the  
limit cycle on, just as a matter of curiosity,  
if you guys wanted some fuel numbers from that.

08 01 08 07       CC        11, Houston. Roger. We copy and we've been  
figuring it out.

08 01 08 13       CDR       Okay.

08 01 08 18       CMP       It's a pleasure to be able to waste gas.

08 01 08 23       CC        Roger. That's affirmative.

08 01 16 11       CC        Apollo 11, Houston with a little recovery force  
information. Over.

08 01 16 17       CMP       Go ahead.

08 01 16 18       CC        Roger. The Hornet is on station just far enough  
off the target point to keep from getting hit.  
Recovery 1, or the chopper, is there; they're  
on station. And Hawaii Rescue 1 and 2, the  
C-130's, are within 40 minutes of your target  
point. Over.

08 01 16 50       CMP       Sounds good. Thank you.

08 01 25 08       CC        Apollo 11, Houston.

08 01 25 11       CDR       Go ahead.

08 01 25 13       CC        Roger. Just to get a little downlink here to check out our VHF: I show us about an hour and 37 minutes, approximately, from entry interface. Over.

08 01 25 26       LMP       Okay. That's about right.

08 01 25 28       CC        Okay. Looks like we're together on that, and I guess we're standing by for you to whip into the entry attitude.

08 01 25 37       LMP       Okay. We've just been taking a couple of last minute pictures. We've finished the LMS entry check, primary water EVAP activation.

08 01 25 46       CC        Roger. Mighty fine.

08 01 31 22       CC        Apollo 11, Houston.

08 01 31 26       CMP       Go ahead.

08 01 31 28       CC        Roger, Mike. We recommend the left VHF antenna for VHF.

08 01 31 33       CC        And this is your friendly backup CMP. Have a good trip, and may - remember to come in BEF.

08 01 31 42       CMP       You better believe. Thank you kindly.

08 01 31 48       CMP       We can see the Moon passing by the window and it looks what I considered to be a correct size.

08 01 33 26       LMP       Houston, Apollo 11. Like to switch to 3-band OMNI C. I just did a minute ago, and noticed a loss of signal strength, over.

08 01 33 34       CC        Roger, Apollo 11. Go ahead and try it again now that you're in attitude.

08 01 33 42       LMP       Roger. Going OMNI C.

08 01 37 10       CC        Apollo 11, Houston.

08 01 37 31        CC        Apollo 11, Houston. Recommend antenna Bravo.  
Over.

08 01 41 08        CC        Apollo 11, Houston. Recommend antenna Bravo,  
or at least a better one. Over.

08 01 47 35        CC        Apollo 11, Houston.

08 01 47 39        CDR        Go ahead, Ron.

08 01 47 40        CC        Roger. Faces are red here. We lost data with  
you there for a while. Did you do the P52?  
Over.

08 01 47 47        CDR        That's affirmative, we completed the P52. We'll  
give you the data from it in just a second.  
We passed our sextant star check at entry  
attitude, and right now we're maneuvering to  
our first horizon check pitch attitude of 98  
degrees.

08 01 48 05        CC        Roger. Copy that, 11.

END OF TAPE

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

(GOSS NET 1)

Tape 125/1

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08 01 58 53 CC Apollo 11, Houston. About 4 minutes to 1 hour, and I'll give you a mark at 1 hour. Was a command module preheat necessary? Over.

08 01 59 03 CMP Negative that.

08 01 59 06 CC Roger. Copy. Negative command module preheat.

08 02 02 06 CC Apollo 11, Houston.

08 02 02 09 CMP Go ahead.

08 02 02 11 CC Roger. We don't want to jettison the hydrogen tank that stratified, so could you cycle the fans in tank 2 please? Hydrogen tank 2.

08 02 02 26 CMP You better believe. That old service module has taken good care of us. We want to take good care of it.

08 02 02 30 CC It sure has, hasn't it.

08 02 02 33 CMP It's been a champ.

08 02 04 48 CC 11, Houston. I'll give you a time hack at 58 minutes to go. It's about 15 seconds yet.

08 02 04 57 CMP Thank you.

08 02 05 04 CC Stand by.

08 02 05 07 CC MARK.

08 02 05 08 CC 58 minutes.

08 02 05 13 LMP Roger.

08 02 10 13 CC Apollo 11, Houston.

08 02 10 16 LMP Go ahead, Houston. Apollo 11.

08 02 10 17 CC Roger. We have our update at the state vector out there for you. Request P00 and ACCI'PT. Over.

08 02 10 28 LMP Okay. You've got it.

08 02 10 32 CC Okay. Here it comes.

08 02 11 55        CC        Apollo 11, Houston.

08 02 11 58        LMP        Go ahead.

08 02 12 00        CC        Roger. The computer is yours now. Looks like you're in VHF range, here. So we'll try a VHF check for you. We'll just send VHF up to you. Stand by.

08 02 12 11        LMP        Okay.

08 02 12 25        CC        Apollo 11, Houston. VHF check on Simplex Alfa. Over.

08 02 12 32        LMP        Roger, Houston. Apollo 11, VHF Simplex Alfa, loud and clear. How me? Over.

08 02 12 38        CC        Roger, 11. Houston. You're loud. The standard VHF noise, though, makes you realize that S-band is good.

08 02 12 48        LMP        Roger. Understand. Thank you.

08 02 13 19        CC        Apollo 11, Houston. Backup S-band now, and we're standing by for command module RCS activation.

08 02 13 27        LMP        Okay. We're just about there.

08 02 15 15        CC        Apollo 11, Houston, you're GO for PYRO ARM.

08 02 15 19        CMP        Thank you, Houston.

08 02 16 36        CC        Apollo 11, Houston. Your command module pressurization looks mighty fine to us.

08 02 16 41        LMP        Looks good here, Ron.

08 02 16 46        CC        And 11, Houston, I've got an update for about four items on your entry PAD.

08 02 16 55        LMP        Ready to copy.

08 02 16 57        CC        Roger. Your MAX g, 063; your NOUN 60, your Gamma, at 400K, 648; your range to go on the EMS, 14033; and your RETRO time for V-circular, 02 14. Over.

08 02 17 40        LMP        Roger. Copy MAX g 6.3; R2 at NOUN 60, 6.48; range to go, EMS, 14033; RET V-circular, 02 14. Over.

08 02 17 58 CC Roger. Readback is correct there.

08 02 24 37 LMP Houston, Apollo 11.

08 02 24 39 CC Apollo 11, Houston. GO.

08 02 24 43 LMP Roger. The first horizon check 194 23 06 at a pitch angle of 298 does not quite fall on the 31 7 line. It's just a little high. It's within 5 degrees tolerance.

08 02 24 57 CC Apollo 11, Houston. The horizon check there was supposed to be at 33. Over.

08 02 25 05 LMP Okay. That's fine, sir. Thank you.

08 02 25 07 CC Roger.

08 02 29 00 CC Apollo 11, Houston. Command module RCS looks fine to us.

08 02 29 05 CDR Same here, Ron. Looks very good. Doesn't make as much noise as we thought. Some of them are barely audible.

08 02 29 11 CC Roger.

08 02 29 16 CC And 11, Houston. Weather still holding real fine in the recovery area.

08 02 29 21 CDR Roger.

08 02 29 22 CC Looks like it's about 1500 scattered, high scattered. And it's still 3- to 6-foot waves.

08 02 29 29 CDR Hey, that part of it sounds good.

08 02 29 33 CC Roger.

08 02 30 00 CC 11, Houston, I'll give you another Mark at 33 minutes. Stand by.

08 02 30 07 CC MARK.

08 02 30 10 CMP Roger that.

08 02 32 37 CMP Houston, Apollo 11. Do you have any recommended settings to catch the sunset. Over.

08 02 32 48 CC Roger. Well, the time is 36 41. And stand by for some settings.

08 02 32 59 LMP Okay. I'll probably only be doing it maybe - part of it at six frames a second, some it at one. So I could be changing settings as it goes through.

08 02 33 09 CC Roger. Copy.

08 02 33 19 CMP And the horizon check passes; it's right on the money.

08 02 33 24 CC Hey, mighty fine. Sounds good.

08 02 35 07 CC Apollo 11, Houston. On the shooting at the Sun, f:16th at 1 over 250.

08 02 35 18 LMP Understand f:16 at 1 over 250.

08 02 35 22 CC Roger.

08 02 37 05 CMP And the Sun is going down on schedule. It's getting real dark in here.

08 02 37 11 CC Apollo 11. Houston. Copy.

08 02 48 54 CC Apollo 11, Houston. We see you getting ready for SEP. Everything looks mighty fine down here.

08 02 48 59 CMP Same here, Ron. Thank you.

08 02 50 42 CC Apollo 11, Houston. You're still looking mighty fine from here. You're cleared for landing.

08 02 50 47 CDR We appreciate that, Ron. Thank you.

08 02 50 49 CMP Roger. Gears down and locked.

08 02 50 52 CC Roger.

08 02 50 54 CMP Thank you.

08 02 54 40 LMP Houston, we got the service module going by. A little high and a little bit to the right.

08 02 54 49 CC Roger. Thank you.

08 02 54 53 CMP And it's rotating just like it should be. Thrusters are firing.

08 02 55 05 CC Good. It's got a lot of gas there to burn out, too.

08 02 55 07 LMP It's coming across now from right to left.

08 02 55 13 CC Houston. Roger.

08 02 57 07 LMP Houston, Apollo 11. You going to turn on the tape recorder shortly?

08 02 57 19 CC 11, Houston. You can go ahead and turn it on.

08 02 57 24 LMP Okay. I'll have to go to command reset to do that.

08 02 57 34 CC 11, Houston. That's negative. All you have to do is turn it on. That'll be fine.

08 02 57 44 LMP I guess I don't know how to turn it on, then. I got PCM, ANTILOG RECORD, FORWARD; high bit rate, and barber pole.

08 02 58 03 CC 11, Houston. We'll send the ON command from down here, see if it works.

08 02 58 07 LMP Okay.

08 02 58 56 LMP Got our friend the Moon whipping by the field of view right now.

08 02 59 01 CC Roger. Copy.

08 03 00 32 CC 11, Houston. We'll have you for about 3 or 4 minutes through Redstone and then pick you up after blackout through ARIA.

08 03 00 41 LMP Roger.

08 03 01 48 LMP Houston, Apollo 11. I'm going to go to COMMAND RESET and turn the tape on.

08 03 01 54 CC ...

08 03 02 00 CC 11, Houston. Recommend negative on that. That will put us in low bit rate.

08 03 02 12 LMP Okay. I already put it to COMMAND RESET, but I still have barber pole on the tape. And now my switch is high bit rate.

08 03 02 22 CC Okay. That will be fine. On 225, there, if you can reach it, Buzz, the last two circuit breakers in the second row from the bottom, punch those in.



08 03 02 42       CC       And 11, Houston, don't mess around with that  
225 there.

08 03 02 48       LMP       Okay.

08 03 03 01       CC       And 11, Houston. You're going over the hill  
there shortly. You're looking mighty fine to  
us.

08 03 03 06       CDR       See you later.

08 03 07 15       CC       Apollo 11, Houston through ARIA.

08 03 07 37       CC       Apollo 11, Houston through ARIA.

08 03 08 10       CC       Apollo 11, Houston through ARIA 4.

08 03 09 08       CC       Apollo 11, Houston through ARIA. Standing by.  
Over.

08 03 09 45       CC       Apollo 11, Houston in the blind. AIR 30SS has  
visual contact.

08 03 11 18       CC       Apollo 11, Houston. Standing by for your DSKY  
reading. Over.

08 03 11 49       CC       Apollo 11, Houston. Stand by for your miss  
distance. Over.

08 03 12 04       CC       Apollo 11, Houston. Standing by for your DSKY  
reading. Over.

08 03 12 09       CC       DROGUES.

08 03 12 22       CC       Apollo 11, Houston. Your DSKY reading, please.  
Over.

08 03 12 31       CDR       Roger. We were \*\*\* right on ... 169, 17.

08 03 12 53       CDR       Reading 1330, 1069, 15.

08 03 15 03       HORNET    Apollo 11, Apollo 11. This is Hornet. Hornet.  
Over.

08 03 15 07       CDR       Hello, Hornet. This is Apollo 11 reading you  
loud and clear. Our position 1330, 16915.

08 03 15 19       HORNET    11, Hornet. Copy 1330, 1675. Any further data?  
Over.

\*\*\* Three asterisks denote clipping of word or phrases.

08 03 15 24 CDR 330, 169, 15.

08 03 15 31 HORNET Do you have an error?

08 03 15 39 HORNET We have that. And what is condition of the crew?

08 03 15 45 HORNET 11, this is Hornet. What's your error of splashdown and condition of crew? Over.

08 03 15 52 CDR The condition of crew \*\*\* 4000 - 3500 feet, on the way down.

08 03 16 00 HORNET 11, this is Hornet. Copy. 11, Hornet. What's your splashdown error? Over.

08 03 16 06 SC Okay. Our splashdown error is by latitude, longitude, 1330 16 \*\*\* 15. That's \*\*\*

08 03 16 19 HORNET Hornet. Roger, out.

08 03 16 44 CDR Okay, Hornet. Apollo 11 is out.

08 03 16 48 HORNET Roger. 2500 on chutes.

08 03 17 00 SWIM 1 SWIM 1 has ... contact 150, holding ... 190.

08 03 17 13 HORNET Hornet. Roger. Out.

08 03 17 19 SWIM 1 ... bearing 200.

08 03 17 24 CDR Apollo 11 at 1500 feet.

08 03 17 27 HORNET Hornet. Roger. Copy. Out.

08 03 17 32 SWIM 1 Swim 1. Have a visual dead ahead about a mile?  
...

08 03 17 42 HORNET Hornet. Roger.

08 03 17 44 ... ... spacecraft.

08 03 17 48 SWIM 1 Roger. This is SWIM 1, Apollo 11.

08 03 17 54 CDR ... 300 feet.

08 03 17 56 SWIM 1 Roger. You're looking real good.

08 03 18 18 SWIM 1 SPLASHDOWN!

\*\*\* Three asterisks denote clipping of word or phrases.

END OF TAPE