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MSC-06803



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

# APOLLO 16 LUNAR MODULE ONBOARD VOICE TRANSCRIPTION

Classification changed to (U)  
By authority of JSC Security Classification Officer  
Date 11/9/73 - 2/9/78 - Sally Yates

RECORDED ON THE DATA STORAGE  
EQUIPMENT ASSEMBLY (DSEA)

MAY 1972

GROUP 4  
Downgraded at 3-year  
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MANNED SPACECRAFT CENTER  
HOUSTON, TEXAS

INDEXING DATA  
DATE 05-03-72 CRB  
MSC

#	T	PGM	SUBJECT	SIGNATOR	LOC
	R	KFD	(S/12)	MSC	080-51

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SECURITY CLASSIFICATION

The material contained herein has been transcribed into a working paper in order to facilitate review by interested MSC elements. This document, or portions thereof, may be declassified subject to the following guidelines:

Portions of this document will be classified CONFIDENTIAL, Group 4, to the extent that they: (1) define quantitative performance characteristics of the Apollo Spacecraft, (2) detail critical performance characteristics of Apollo crew systems and equipment, (3) provide technical details of significant launch vehicle malfunctions in actual flight or reveal actual launch trajectory data, (4) reveal medical data on flight crew members which can be considered privileged data, or (5) reveal other data which can be individually determined to require classification under the authority of the Apollo Program Security Classification Guide, SCG-11, Rev. 1, 1/1/66.

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## INTRODUCTION

This document is the transcription of the Apollo 16 flight crew communications recorded on the lunar module (LM) data storage equipment assembly (DSEA). After the multiplexed voice communications and mission elapsed time had been recorded on board the LM on a single track of the tape, the tape cassettes were transferred to the command module (CM) for the return to Earth. The cassettes were forwarded to NASA Manned Spacecraft Center, Houston, where mission elapsed time was converted to ground elapsed time for this document. Transcription of these tapes was managed by James L. Gibbons, Test Division, Apollo Spacecraft Program Office, to whom inquiries concerning this document should be referred.

The transcript is divided into three columns — time, speaker, and text. The time column consists of four two-digit pairs for days, hours, minutes, and seconds (e.g., 04 22 34 14). The speaker column indicates the source of a transmission; the text column contains the verbatim transcript of the communications.

The time used by Mission Control Center (MCC) and indicated as ground elapsed time (GET) in the Flight Plan was updated to the spacecraft, to MCC computers, and to the telemetry down-link pulse-code-modulated bitstream and other time-recording devices. This GET updating was performed only to correct significant changes in Flight Plan time occurring as the result of delayed lift-off, midcourse corrections, or spacecraft burn-time differences (trajectory dispersions).

Therefore, Apollo elapsed time (AET) (the true mission elapsed time) does not always agree with Flight Plan and MCC times. Users of this transcript are cautioned to apply the appropriate time-update deltas for the updated periods. Dashes in the time column indicate that the time could not be determined because of the use of the VOX mode.

Speakers in the transcript are identified as follows:

CDR	Commander	John W. Young
CM	Command module pilot	Thomas K. (Ken) Mattingly II
LMP	Lunar module pilot	Charles (Charlie) M. Duke, Jr.
SC	Unidentifiable crewmember	
MS	Multiple speakers	
CC	Capsule communicator (CAP COMM)	

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In the text, a series of three dots (...) designates those portions of the communications that could not be transcribed because of garbling. One dash (-) indicates a speaker's pause or a self-interruption. Two dashes (- -) indicate an interruption by another speaker or a point at which a recording was abruptly terminated. A series of three asterisks (\*\*\*) indicates voice clipping caused by use of the voice-actuated (VOX) mode. Words given unusual emphasis by the speaker are underlined. The Apollo 16 mission was flown April 16 to 27, 1972; lift-off occurred at 17:54:00.57 G.m.t. (12:54:00.57 p.m. e.d.t.) on April 16. The CM was designated Casper and the LM was called Orion.

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## LM ACTIVATION

03 21 53 32 LMP How do you read, Ken?

03 21 53 34 CMP Loud and clear.

03 21 53 35 LMP Wow. You're just super also.

03 21 53 38 CMP Well, at least we got one improvement over the simulators.

03 21 53 41 LMP Boy, I'll say.

03 21 53 45 CDR Okay. That's really good.

03 21 53 47 CMP Outstanding.

03 21 53 48 LMP Okay. Go - -

03 21 53 49 CMP ... How about a - you need a 16 65 before I get away from here, John?

03 21 53 56 CDR No, I - no, I - Tell him no.

03 21 53 59 LMP No.

03 21 54 00 CDR I can hear him - I can hear him through your headset.

03 21 54 03 LMP Go B to RECEIVE and - and then VHF A to T/R.

03 21 54 12 CDR Okay. Okay. What's those numbers again?

03 21 54 16 LMP 36673 -

03 21 54 18 CDR That's the LM weight?

03 21 54 19 LMP Yeah. And 39329.

03 21 54 31 CMP ...

03 21 54 33 LMP Yes, sir.

03 21 54 57 LMP Man, this zero gravity is so neat.

03 21 55 00 CMP ...

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03 21 55 02 LMP Yeah. You take the umbilicals onto your side?  
That's new, huh?

03 21 55 08 CMP ...

03 21 55 09 LMP Okay. On my checklist, it says verify them stowed.

03 21 55 23 CMP ...

03 21 55 24 LMP Huh? Okay.

03 21 55 39 LMP It says both electrical umbilicals removed.  
Drogue - Oh, yeah. It does say remove them.

03 21 55 44 CDR Hey, Ken?

03 21 55 45 CMP Huh?

03 21 55 46 CDR If you get into MIN DEAD BAND ATTITUDE hold, I can  
go ahead and do this coarse align.

03 21 55 49 LMP Wait - Wait a - Now, wait a minute. Let - you  
can't do it without his numbers. And he's doing  
the tunnel stuff now.

03 21 56 00 CDR Okay.

03 21 56 02 LMP He wanted you to go - to do the coarse align, but  
let's do the tun - whatever you think's faster.

03 21 56 09 CMP ...

03 21 56 11 LMP Okay. Well, that - this comes - this comes after,  
Ken. The drogue and probe comes after, so why  
don't you get John - after the docked align.

03 21 56 24 CMP ... coarse alignment ...

03 21 56 37 LMP Okay, go ahead. I just didn't see that. Ours  
just has us at - way ahead of that.

03 21 56 39 CMP ...

03 21 56 42 LMP Oh, I see what - Okay, you're right. All I'm sup-  
posed to do is verify this stuff. Let him get  
that end, John. We - we're in Fat City. Man, I'm  
putting a lot of load on this suit in the back - -

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03 21 57 13 CDR It's all zipped.

03 21 57 14 LMP - - when I straighten my legs up.

03 21 57 28 LMP Hey, I don't get much feedback in my mikes. I thought I'd be able to hear myself.

03 21 57 41 CDR You know what we need is some orange juice things over here - drinks.

03 21 57 44 LMP We got some.

03 21 57 46 CDR Do we?

03 21 57 47 LMP Uh-huh.

03 21 58 09 CDR That water's not leaking, is it?

03 21 58 10 LMP No. It's not.

03 21 58 23 CMP ...

03 21 58 47 LMP Looks great.

03 21 59 28 CDR I could do the landing gear deploy. You want to do that?

03 21 59 42 LMP Yeah, that sounds all right to me. They don't have to see that.

03 21 59 46 CDR Okay. Tell Ken we're gonna deploy the landing gear.

03 21 59 51 LMP Hey, Ken. If you hear a thump, we're gonna deploy the landing gear.

03 21 59 59 CDR Okay. Circuit breaker 11 - -

03 22 00 00 LMP What page are you on?

03 22 00 02 CDR It's on page 1 - 3-17.

03 22 00 08 LMP Okay.

03 22 00 09 CDR Circuit breaker 11, ED LANDING GEAR FLAG, close.

03 22 00 16 LMP Okay, LOGIC POWER A, open.

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03 22 00 19 CDR LOGIC POWER A is open.

03 22 00 20 LMP MASTER ARM, ON.

03 22 00 23 CDR MASTER ARM is coming ON. SYSTEM B light.

03 22 00 26 LMP Okay. LANDING GEAR DEPLOY, FIRE.

03 22 00 28 CDR LANDING GEAR DEPLOY, FIRE.

03 22 00 30 LMP There they go.

03 22 00 34 CDR Got a - a -

03 22 00 36 LMP No doubt in my mind. You get a gray?

03 22 00 38 CDR Gray.

03 22 00 39 LMP Okay. ED 11, LOGIC POWER A, close.

03 22 00 41 CDR LOGIC POWER A is closed.

03 22 00 43 LMP SYSTEM A light, on.

03 22 00 44 CDR It is.

03 22 00 45 LMP FIRE again.

03 22 00 48 CDR FIRE again, huh? LANDING GEAR DEPLOY, FIRE again.

03 22 00 52 LMP Hey, it's out, John! I can see the front footpad.

03 22 00 59 CDR Okay, and then what?

03 22 01 00 LMP And then look at the front footpad. MASTER ARM, OFF.

03 22 01 04 CDR Okay.

03 22 01 05 LMP CB (11), ED LOGIC POWER - -

03 22 01 07 CDR LANDING GEAR FLAG, open.

03 22 01 08 LMP Yeah, LANDING GEAR FLAG. Man, have we got the condensation in here. Looks like you're serious about this.

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03 22 01 20 CMP ...

03 22 01 21 LMP Yeah, they look okay.

03 22 01 23 CDR Hey, you - Is this your pair of scissors here, Charlie?

03 22 01 27 LMP In there, yeah.

03 22 01 28 CDR Did you take them out of here?

03 22 01 30 LMP I took them out of the data card kit.

03 22 01 31 CDR Okay.

03 22 01 35 CMP ...

03 22 01 44 LMP ... Man, this - this water cooling is so nice, Ken.

03 22 02 19 CDR Okay, we've done that.

03 22 02 49 CDR Are you in AUTO on the QUADS? No. Okay. Going to AUTO on the QUADS, Charlie.

03 22 02 54 LMP Okay.

03 22 02 56 CDR That was at 94:02 - 02:57.

03 22 03 05 LMP Check the quad temps.

03 22 03 10 CDR Super. They're already up there, ain't they?

03 22 03 13 LMP Yeah, I push - those breakers on your side are - -

03 22 03 16 CDR Man -

03 22 03 17 LMP - - manual. I mean they're - they cycle on and off by themselves.

03 22 03 34 CDR Hey, let's get the AOT reticle thing out and put it on.

03 22 03 40 LMP Oh. I forgot that. That's part of the housekeeping.

03 22 03 42 CDR Yeah.

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03 22 03 52 LMP I wonder how I forgot that?

03 22 03 58 CDR Is it in there?

03 22 03 59 LMP Yeah, here it is.

03 22 04 11 LMP Okay, you got it.

03 22 04 12 CDR What are you, a southpaw?

03 22 04 13 LMP I'd look out the - yeah, I'll look out the other way.

03 22 04 17 CDR Beautiful.

03 22 04 35 LMP What's your problem?

03 22 05 12 CDR Okay, Charlie.

03 22 05 34 LMP It's not in here.

03 22 05 41 CDR What's not?

03 22 05 42 LMP That AOT thing.

03 22 05 43 CDR What AOT thing?

03 22 05 45 LMP During the housekeeping.

03 22 05 49 CDR Don't worry about it, Charlie.

03 22 05 50 LMP I know it. I just wanted to write it down for the 17 guys.

03 22 05 53 CDR Oh.

03 22 06 11 LMP My ears have cleared up, John. I mean my sinuses.

03 22 06 15 CDR Mine, too. You know why?

03 22 06 17 LMP Why?

03 22 06 18 CDR With as much simulator time as we got - - What's the matter, Ken?

03 22 06 35 CMP ...

03 22 06 43 LMP You got three scantime latches.

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03 22 06 44 CMP ...

03 22 06 46 LMP Yeah. And it's tight. I can't budge it. You know, I wish I could cut my microphone off on my left side. That way I wouldn't get this drink bag squa - squirted in my face every time.

03 22 07 12 CDR Pretty exciting, isn't it? ... me another shot of water, Charlie.

03 22 07 21 LMP Okay (laughter).

03 22 07 32 CDR That's good. That's enough.

03 22 07 36 LMP Come on. Let's chill it down a little bit.

03 22 07 37 CDR Oh. Think that's enough?

03 22 07 40 LMP Umm, that feels good.

03 22 07 46 CDR A-choo.

03 22 07 47 LMP Oh, boy.

03 22 08 35 LMP Can't understand why we're down to 91 percent on the descent O<sub>2</sub>. Both tanks.

03 22 08 49 CDR They didn't fill them.

03 22 08 50 LMP You don't think so?

03 22 08 51 CDR Yeah.

03 22 08 54 LMP They never told me they weren't going to.

03 22 09 00 CDR That may be what it reads.

03 22 09 26 LMP 13 minutes to AOS. Or thereabouts.

03 22 09 52 CDR Is Ken pulling latches?

03 22 09 56 LMP Hey, Ken.

03 22 09 57 CMP Yeah.

03 22 09 58 LMP You all finished? I'm gonna close the hatch.

03 22 09 59 CMP Wait a minute.  


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03 22 10 00 LMP Okay.

03 22 10 05 CDR Is he off comm?

03 22 10 09 LMP I don't know.

03 22 10 10 CDR Don't close the hatch until he gets on comm.

03 22 10 21 LMP This zero gravity is so neat.

03 22 10 23 CDR Hey, Ken.

03 22 10 50 CMP ...

03 22 10 52 LMP Okay. I've checked the exterior. The capture latches are engaged and locked. I got three good ones. And from my side, they're removed, the lock lever's engaged and flush; so we're all set.

03 22 11 17 CMP ...

03 22 11 22 LMP Can you hear me on the comm, Ken?

03 22 11 24 CMP Yeah, loud and clear.

03 22 11 25 LMP Okay.

03 22 11 27 CDR Yeah, it is, T.K. If you go to MIN DEADBAND ATTITUDE hold and give me a 06 20, I'd appreciate it.

03 22 11 39 CMP Okay. I'll get with it right now.

03 22 11 42 LMP Okay, Ken. I'm gonna close the hatch. We'll see you in 3 days, babe.

03 22 11 47 CMP Okay.

03 22 11 48 LMP And don't run off and leave us.

03 22 12 04 CDR You want me to check and see if it's sealed? Want me to check the seal and see if there's anything in it before you close it? There was nothing in it, huh?

03 22 12 17 LMP Huh-uh.

03 22 12 32 CDR Got it, huh?

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03 22 12 33 LMP Uh-huh. Going AUTO, PRESS REG A -

03 22 12 40 CMP Okay, John. I'm in MIN DEAD BAND.

03 22 12 43 CDR Okay. And give me an 06 20.

03 22 12 53 CMP Okay. Plus 002.74, plus 109.36, plus 004.57.

03 22 13 12 CDR Okay. Okay. Plus zero - plus 002.74, plus 109.36, plus 004.57.

03 22 13 23 CMP That's affirmative.

03 22 14 01 LMP Did you get the docking angle written down, John?

03 22 14 03 CDR It's minus 3-1/2.

03 22 14 04 LMP Yeah. Just like in the training units. These -

03 22 14 13 CDR What?

03 22 14 14 LMP These helmet - these helmet bags, the plate - the - the snap caved in over here and you can't get it snapped.

03 22 14 37 CDR There. Okay, Charlie. If you got some time, I'd like for you to check me on these angles.

03 22 14 42 LMP Okay, just a minute.

03 22 15 26 CDR ... Hey, Ken. You've got to stay in MIN DEAD BAND ATT hold until I tell you.

03 22 15 31 CMP Yeah, I'm not going anywhere.

03 22 16 03 CDR Charlie, you gonna put your foot on the -

03 22 16 07 LMP The hatch?

03 22 16 08 CDR Yeah. (Laughter)

03 22 16 19 LMP Plus 002.74, huh?

03 22 16 21 CDR Yeah - -

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03 22 16 22 LMP Minus - subtract that. That'll be 6 - that one's correct. 289.36. That one is correct. This is wrong here. 360 minus should be a 370 something.

03 22 16 48 CDR You got 340 - Yeah, that's a minus.

03 22 16 50 LMP 356.

03 22 16 51 CDR 356, yeah. (Laughter) 356 - -

03 22 16 58 LMP No, it's 355.43.

03 22 17 00 CDR 355.43.

03 22 17 03 LMP Now add that up again and make sure it makes 360.

03 22 17 06 CDR Yeah. Seven and 3 is 10; 5 and 4 is 9, 10; 5 and 4 is 9, 10; there we go.

03 22 17 13 LMP Okay. Okay. Closed and secured hatch.

03 22 17 28 CDR Plus 293.76 ENTER, plus 289.36 ENTER, plus 355.43.

03 22 17 47 LMP You did the self-test already, huh, John?

03 22 17 48 CDR Oh, yeah.

03 22 17 49 LMP Okay.

03 22 17 51 CDR Okay. Plus 293.76, plus 289.36, plus 355.43. Go. Go get them, tiger. Okay.

03 22 18 14 LMP Should be 0, 284, and 060.

03 22 18 22 CDR Yeah, you - he - he was out of attitude, wasn't he?

03 22 18 25 LMP Oh, that's right. Yeah.

03 22 18 27 CDR Okay. VERB 40 NOUN 20.

03 22 18 38 LMP Maybe you ought to wait until that NO ATT light goes out.

03 22 18 40 CDR It ain't gonna ever go out.

03 22 18 41 LMP Oh, that's right. You got to release. You're right. Not until you do that, it won't go out.

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03 22 18 51 CDR Now, they said they're gonna change the REFSMMAT, right?

03 22 19 00 LMP Why, what do you want to do?

03 22 19 01 CDR ...

03 22 19 06 LMP You can still set the REFSMMAT flag.

03 22 19 14 CDR Yeah, I don't see why not.

03 22 19 19 LMP Okay. NOUN 07 ENTER.

03 22 19 25 CDR ENTER, 77 ENTER, 10000 ENTER, 1 ENTER.

03 22 19 41 LMP Did you - did you check that REFSMMAT?

03 22 19 46 CDR No. I'll check it in a second.

03 22 19 47 LMP Okay.

03 22 19 57 CDR It's set.

03 22 19 58 LMP Okay.

03 22 20 03 CDR Okay, Ken. I need an 06 20. On my - on my mark.

03 22 20 18 CMP Okay. Standing by.

03 22 20 19 CDR 3, 2, 1 -

03 22 20 21 CDR MARK.

03 22 20 22 LMP Okay. 94:20:20.

03 22 20 24 CMP 002.69, plus 109.31, plus 004.72.

03 22 20 38 CDR Plus 002.69, plus 109.31, plus 004.72.

03 22 20 43 CMP That's affirmative.

03 22 20 50 LMP You read out - read mine to me, John.

03 22 20 53 CDR 294.65, 289.96, 355.02.

03 22 21 03 LMP Okay. I got it. All down in here.

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03 22 21 07 CDR Okay. What time was it, Charlie?

03 22 21 09 LMP 94:20:20.

03 22 21 16 LMP Should have AOS momentarily. You've done the landing gear. Did the DAP.

03 22 21 29 CDR What else can we do, Charlie?

03 22 21 31 LMP Nothing. Let's just wait until we get AOS and get the comm up. Then we do the E-memory dump.

03 22 21 39 CDR Okay.

03 22 21 40 LMP We got to get an up-link. Then we can start into the RCS, after I get the ascent bats checked out.

03 22 22 00 CDR Ken, are we pretty close to being at the undocking attitude?

03 22 22 02 CMP Undocking attitude is 0, 104, 0.

03 22 22 11 LMP Yeah, we're pretty close.

03 22 22 15 CDR Okay.

03 22 22 20 LMP What time did they say AOS was, Ken?

03 22 22 23 CDR The reason I ask, Ken, is for this P52, I need to be close to the right attitude to pick up the stars.

03 22 22 35 CMP It's the same set of time-line procedures we've been using.

03 22 22 40 CDR I know it. It's just that it's further off on the 8-ball than normal.

03 22 22 45 CMP Is that gonna be close enough, John?

03 22 22 49 LMP Yeah. I think - -

03 22 22 50 CDR Oh, let's try it and see what happens.

03 22 22 54 LMP Okay. We just got them.

03 22 22 56 CMP Charlie, ... AOS any second.

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03 22 23 05 LMP Hello, Houston; old Orion. How do you read? Over.

03 22 23 10 CC Orion, this is Houston. Read you loud and clear.

03 22 23 12 LMP Okay, Jim. We're zipping right on through the checklists. We got the PGNS up, the docked coarse align done, the landing gear is deployed, and the only thing we haven't done is really what you need to see. And we're ready to start in on the S-band checks and bring up the steerable. Over.

03 22 23 38 CC Okay, Charlie.

03 22 23 43 LMP Okay. While guidance is - Let me give you some angles. We had a VERB 06 NOUN 20 that was done at 94:20:20. The LM angles were plus 294.65, plus 289.96, plus 355.02. How do you read, Jim?

03 22 24 15 CC Roger. We copy. Copied the LM as plus 294.65, plus 289.96, plus 355.02. Over.

03 22 24 25 LMP That's affirmative. The command module are plus 002.69, plus 109.31, plus 004.72. Over.

03 22 24 40 CC Copy. Plus 002.69, plus 109.31, plus 004.70 [sic]. Over.

03 22 24 47 LMP That's firm. Sounds like we got good comm on PRIMARY S-BAND T/R and SECONDARY POWER AMP. I'm going SECONDARY S-BAND T/R and PRIMARY POWER AMP. Over. I got a lot of - -

03 22 25 03 CC Standing by.

03 22 25 04 LMP Okay. Think it's my switch here, John.

03 22 25 07 CDR Huh? Yeah, it is.

03 22 25 10 LMP Okay.

03 22 25 11 CDR Try your other one.

03 22 25 13 LMP See, it doesn't do it here.

03 22 25 15 CC Casper, this is Houston. We want NARROW on the S-BAND.

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03 22 25 23 CMP You've got it.

03 22 25 27 CDR Okay, Jim. How do you read the old CDR?

03 22 25 30 LMP Wait a minute. Let's get locked up here.

03 22 25 32 CDR Okay.

03 22 25 45 CDR Did that ruin it?

03 22 25 46 LMP Yeah, you - go ahead. You ought have him.

03 22 25 49 CDR Okay, Jim. How do you read? Over.

03 22 26 01 CC Orion, this is Houston. Go ahead.

03 22 26 03 CDR How do you read, Jim? Over.

03 22 26 08 CC I read you, but there's a lot of noise in the background.

03 22 26 15 LMP Okay. We have primary evap activation time is 93:33:30, and we're standing by for the AGS abort constants. Over. Or - let us do the steerable first and get - -

03 22 26 29 CC Roger.

03 22 26 30 LMP - - and get you the down-link. Over - The E-memory dump. Over.

03 22 26 37 CC Okay. We're standing by for the steerable.

03 22 26 46 LMP Okay, PM, SECONDARY, PRIMARY, VOICE - -

03 22 26 49 CC Casper, this is Houston. Will you go AUTO?

03 22 26 55 CMP You're AUTO.

03 22 28 02 CDR What have we got there, Charlie?

03 22 28 04 LMP Bringing up the steerable.

03 22 28 05 CDR Okay. You want me to help you?

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## STATIONKEEPING AND PDI PREPARATION

03 23 32 03 LMP Okay. You've got it. B, DATA. Okay, John. Get out your checklist, and you can start the rendezvous radar check, if you want to. We've got 16 minutes to the -

03 23 32 31 CMP Okay, Orion. I'm gonna turn my rear engines off as soon as it looks like we're stable here and go ahead and proceed with the closeout of the tunnel.

03 23 32 40 LMP Okay.

03 23 32 46 CDR Okay, we got something - we're hung up in some loop here, Charlie.

03 23 32 49 LMP Why - -

03 23 32 50 CDR Do a VERB 96.

03 23 32 51 LMP - - why do you say that?

03 23 32 52 CDR Because the ACTIVITY light is on.

03 23 32 53 LMP Oh.

03 23 32 59 CDR There we go. Okay. Now what?

03 23 33 04 LMP Okay, you can do the rendezvous radar self-test, if you want to. That's all we got to do.

03 23 33 07 CDR Okay. Let's do it.

03 23 33 10 LMP Okay. And I'll do the rate gyro check. 95:26, TRACK MODE, SLEW. S-band ANTENNA, AFT. BIOMED, OFF. LO bit rate. UP-LINK SQUELCH, ENABLE. Okay. Okay, let's get going.

03 23 33 32 CDR Okay.

03 23 33 33 LMP Don't you - I'll read it to you.

03 23 33 34 CDR Okay. Give me the book - give me the boo - -

03 23 33 35 LMP I'll read it to you; I've got nothing else to do.

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03 23 33 37 CDR You don't have nothing to do?

03 23 33 38 LMP No. CB 11, RENDEZVOUS RADAR, two, close.

03 23 33 41 CDR Okay. One, close - -

03 23 33 43 LMP Okay. Ken, can you turn the B3 off, please? We're gonna do a rendezvous radar checkout.

03 23 33 47 CMP Yes, sir; it's been off.

03 23 33 48 LMP Thank you. And verify your TRANSPONDER, OFF. Okay, you released it. CROSSPOINTERS both to HI MULT.

03 23 33 56 CMP Verified.

03 23 33 57 LMP Okay, go to HI MULT.

03 23 33 59 CDR Okay. HI MULT.

03 23 34 01 LMP Okay. Your - RATE/ERROR MONITOR, RENDEZVOUS RADAR. Okay, mine is, yours is.

03 23 34 26 CDR What else we need?

03 23 34 28 LMP Okay. RATE - go to RANGE/RANGE RATE. I got it.

03 23 34 30 CDR RANGE/RANGE RATE.

03 23 34 31 LMP SHAFT/TRUNNION, PLUS OR MINUS 50, you've got. Okay, MCDE to SLEW. Temperature is okay. Select SECONDARY GYROS.

03 23 34 39 CDR Okay.

03 23 34 41 LMP No, no. Just - sl - I'm sorry, this to - this to SLEW. That what's I was - -

03 23 34 46 CDR Yeah, it is.

03 23 34 47 LMP Okay, wait a minute, now; wait a minute. Okay. AC BUS A: RANGE/RANGE RATE ALTITUDE/ALTITUDE RATE, close. On 11, AC BUS A.

03 23 34 56 CDR It's closed.

03 23 34 58 LMP FLIGHT DISPLAYS: RANGE/RANGE RATE ALTITUDE/ALTITUDE RATE, close.

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03 23 35 00 CDR Closed.

03 23 35 02 LMP Okay. SLEW RATE, HI. Okay, we're -

03 23 35 06 CDR SLEW.

03 23 35 07 LMP He's ... the latches. Okay, we've already slewed DOWN. Okay, check the mode I region, LEFT, RIGHT. Okay.

03 23 35 17 CDR I did.

03 23 35 18 LMP Okay. UP and DOWN. Okay, go to LO.

03 23 35 22 CDR LO. Go, Charlie.

03 23 35 24 LMP Okay. Oops, there you go. RIGHT, DOWN, LEFT, and UP. Okay.

03 23 35 32 CDR Okay.

03 23 35 33 LMP Okay, go to AUTO TRACK.

03 23 35 35 CDR Go to AUTO TRACK. RADAR TEST to on?

03 23 35 39 LMP RADAR TEST to RENDEZVOUS.

03 23 35 40 CDR RENDEZVOUS, I mean.

03 23 35 43 LMP Okay, go to 477 and 517. Crosspointers oscillate. FDAI needles vary. Okay, they are.

03 23 35 55 CDR Okay, it's 494. That close enough?

03 23 36 01 LMP Okay. This thing is gonna drive me insane.

03 23 36 24 LMP Okay. TEST MONITOR, AGC: 1.2 to 1.6. Okay, that's great - number. Okay; 1.2 to 1.6. TRANSMITTER: 2.8 to 3.2.

03 23 36 31 CDR 3.7.

03 23 36 32 LMP Great. It is?

03 23 36 34 CDR Yeah.

03 23 36 35 LMP Okay. SHAFT ERROR: 2.2 to 2.6.

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03 23 36 45 CDR 2.2 to 2.6.

03 23 36 46 LMP Wait a minute. How about the TRUNNION ERROR?

03 23 36 49 CDR The same.

03 23 36 50 LMP Okay. Go back to AGC.

03 23 36 53 CDR AGC.

03 23 36 54 LMP Okay. Set NORRMON flag, VERB 25 NOUN 07 ENTER, 101 ENTER, 10 ENTER, 01 ENTER. RENDEZVOUS RADAR mode to LGC.

03 23 37 09 CDR Okay. LGC. What am I doing? Go.

03 23 37 15 LMP Okay. VERBS - NO TRACK and power fail. VERB 6 -

03 23 37 18 CDR VERB 63.

03 23 37 19 LMP Okay. Okay, PRO; TRACKER light on. Should go out after 12 seconds.

03 23 37 31 CDR Yeah.

03 23 37 39 LMP That comm can really screw you up. Well, we're not gonna have TV from the LM, unless we get that high gain up.

03 23 37 49 CDR That's all right.

03 23 37 50 LMP Okay, my lights are out. 72, varying, PRO.

03 23 37 56 CDR There you go. 195.57, 195.57 - -

03 23 38 01 LMP Good.

03 23 38 02 CDR - - minus 049.66.

03 23 38 03 LMP Good.

03 23 38 04 CDR/LMP VERB 34.

03 23 38 05 LMP Okay. RADAR TEST to OFF.

03 23 38 08 CDR RADAR TEST is OFF.

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03 23 38 10 LMP VERB 40 NOUN 72.

03 23 38 11 CDR NOUN 72 ENTER. VERB 41, that right? VERB 40  
NOUN - -

03 23 38 19 LMP No, I just want you to zero the CDUs.

03 23 38 22 CDR - - 72 ENTER. Okay.

03 23 38 33 CDR 31210.

03 23 38 36 LMP Making it overflow. Have to bail out.

03 23 38 46 LMP 1210. Two routines using AOT, IMU, or radar at  
same time.

03 23 38 50 CDR Okay, that's my - that was a procedural error.

03 23 38 53 LMP Okay. I don't know whether I got the right state  
vector there. Let's kill that integration. We'll  
try that state vector in a minute. Okay. Now,  
VERB 40 NOUN 72 ENTER.

03 23 39 15 CDR ENTER.

03 23 39 16 LMP Okay. SHAFT and TRUNNION, PLUS OR MINUS 50.

03 23 39 22 CDR There you go.

03 23 39 23 LMP VERB 41 NOUN 72 ENTER. Load plus 04000. Same  
thing. PRO. VERB 16 72.

03 23 39 49 CDR Okay.

03 23 39 50 LMP It's there. SHAFT and TRUNNION, PLUS OR MINUS 5.

03 23 39 54 CDR Okay.

03 23 39 55 LMP RADAR - go to PRIMARY on the RA - on the - Okay,  
VERB 41 NOUN 72. Okay. Load 356, and plus 3 - go,  
plus 356. Okay. PRO. VERB 16 NOUN 72. Okay,  
it's there. VERB 41 NOUN 72. Load all balls.  
That's good. You don't - plus 283. PRO. 16  
NOUN 72.

03 23 40 46 CDR Hey, I - -

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03 23 40 47 LMP It's there.

03 23 40 48 CDR - - I'm going - -

03 23 40 49 LMP Okay, RENDEZVOUS RADAR, two, open.

03 23 40 51 CDR RADAR, two, coming open, Charlie. VERB 44 ENTER.

03 23 40 59 LMP Okay. Go back to SLEW.

03 23 41 02 CDR SLEW.

03 23 41 03 LMP Okay, Ken. You can turn on B3 and the transponder, as you wish.

03 23 41 08 CDR Let's - let's check that state vector again, Charlie. That's - -

03 23 41 10 LMP Okay. Let's undock first. Let's get all this done.

03 23 41 12 CDR Okay.

03 23 41 14 CMP Okay, I'm putting the hatch in.

03 23 41 16 LMP Okay, we've got to get a pressure integrity check. PGAs.

03 23 41 20 CDR Oh, we do?

03 23 41 21 LMP Yeah.

03 23 41 22 CDR Okay, so we ain't - Is that the only thing we have to do on this side, right?

03 23 41 25 LMP Yeah, we're - then we're 2 minutes ahead on that. We caught up, babe.

03 23 41 33 CDR Well, if that vector's right.

03 23 41 35 LMP Well, that - that won't take me 2 seconds to do that.

03 23 41 38 CDR Okay.

03 23 41 39 CMP Okay, would you verify that your hatch is closed and your vent valve in AUTO.

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03 23 41 44 LMP Tell him yes.

03 23 41 49 CDR That's verified, Ken.

03 23 41 51 CMP All right, sir.

03 23 41 57 LMP Okay. SUIT GAS DIVERTER, PULL-EGRESS. CABIN GAS RETURN to EGRESS.

03 23 42 04 CDR Here, let me read that to you, Charlie.

03 23 42 06 LMP Okay.

03 23 42 09 CDR Okay, SUIT GAS DIVERTER to PULL-EGRESS.

03 23 42 10 LMP Go ahead.

03 23 42 11 CDR CABIN GAS RETURN to EGRESS.

03 23 42 13 LMP Go ahead.

03 23 42 14 CDR SUIT CIRCUIT RELIEF to CLOSE.

03 23 42 15 LMP Go ahead.

03 23 42 16 CDR PRESS REG A to EGRESS.

03 23 42 17 LMP Well, wait a minute, we got a - Okay. Go ahead. Go ahead.

03 23 42 23 CDR Okay, PRESS REG B, DIRECT O<sub>2</sub>.

03 23 42 25 LMP Well, we got to get our helmets and gloves on first.

03 23 42 27 CDR Oh, okay.

03 23 42 52 CDR Charlie, I can't see what I'm doing.

03 23 43 33 LMP Okay, I'm buttoned up.

03 23 43 35 CDR Okay. Me - me - me, too, almost. Okay.

03 23 43 51 CDR SUIT GAS DIVERTER to - to EGRESS.

03 23 43 52 LMP Okay, I'm down to the PRESS REG B to DIRECT O<sub>2</sub>.

03 23 43 54 CDR PRESS REG B to DIRECT O<sub>2</sub>.

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03 23 43 57 LMP Okay.

03 23 43 58 CDR Monitor cuff gage to 3.7 to 4.0.

03 23 44 01 LMP Okay, here we go.

03 23 44 10 LMP Boy, it takes forever, doesn't it?

03 23 44 14 CDR Yep.

03 23 44 57 LMP How are your ears?

03 23 44 59 CDR Fine.

03 23 45 00 LMP Good; mine, too.

03 23 45 01 CMP And, Orion; I understand you're complete with your rendezvous and ... transponder check ...

03 23 45 10 CMP That's affirmative, Ken.

03 23 45 15 CDR What do you have to do on this RCS?

03 23 45 20 LMP We're okay now. We'll use RCS B for a little while.

03 23 45 24 CDR Okay.

03 23 45 25 LMP Okay. I'm going to CABIN-EGRESS.

03 23 45 28 CDR Okay. Should you have system B shutoff valve closed?

03 23 45 33 LMP Right now we do. I'm going to turn it on in a minute. But let's go - Okay.

03 23 45 38 CDR Okay. PRESS REG - REG - REG B to - to DIRECT O<sub>2</sub>.

03 23 45 44 LMP I got that.

03 23 45 46 CDR It says, PRESS REG B to EGRESS. Monitor cuff gage to - Are you at EGRESS?

03 23 45 52 LMP Yeah.

03 23 45 54 CDR Okay. Shouldn't be less than 0.3 in a minute.

03 23 46 00 LMP Okay, we've been there.

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03 23 46 02 CDR Looks good to me, Charlie.

03 23 46 03 LMP Okay, it looks good to me. I'm going SECONDARY CANISTER.

03 23 46 06 CDR Okay.

03 23 46 08 LMP Should have an O<sub>2</sub> light. We do.

03 23 46 11 CDR Pressure dropped a little.

03 23 46 12 LMP Okay. The loop was evacuated.

03 23 46 14 CDR Yeah.

03 23 46 15 LMP Then check it for a minute.

03 23 46 18 CDR Okay.

03 23 46 32 LMP Rock solid.

03 23 46 33 CDR Yeah.

03 23 46 35 LMP Okay, what's next?

03 23 46 36 CDR Okay. CO<sub>2</sub> select to PRIMARY. CO<sub>2</sub> light goes off.

03 23 46 43 LMP Go ahead.

03 23 46 45 CDR SUIT CIRCUIT RELIEF to AUTO.

03 23 46 47 LMP SUIT CIRCUIT RELIEF going AUTO. We'll start back down.

03 23 46 49 CDR PRESS REG A and B to CABIN.

03 23 46 50 LMP Going to CABIN.

03 23 46 55 CDR CABIN GAS RETURN to AUTO.

03 23 46 57 LMP CABIN GAS RETURN is in AUTO.

03 23 46 59 CDR SUIT GAS DIVERTER to PUSH-CABIN. That'll really get us down.

03 23 47 02 LMP Is that what it says?

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03 23 47 04 CDR Yeah.

03 23 47 05 LMP Okay, here we go. How do you read?

03 23 47 12 CDR Fine.

03 23 47 14 LMP Man, it really brought us down, didn't it?

03 23 47 16 CDR Yeah. I think that was a little too fast, Charlie. My ear didn't clear.

03 23 47 21 LMP Sorry. Let's go back. What else does it say to do?

03 23 47 29 CDR It's clear now.

03 23 47 31 LMP Okay.

03 23 47 33 CDR Okay, it says, "Rate gyro test." Suit circuit - Well, wait a minute.

03 23 47 47 CDR Okay, we're down through there.

03 23 47 48 LMP Yeah, okay - -

03 23 47 49 CDR ... diverter ...

03 23 47 50 LMP Turn the page. That's a regulator - -

03 23 47 51 CDR Regulator check.

03 23 47 52 LMP Okay. I'm going to go to PUSH-CABIN. I don't understand that noise, but - -

03 23 47 58 CDR Well, the suit depresses around you, see?

03 23 48 00 LMP Yeah, uh-huh, okay.

03 23 48 01 CDR Verify CSM tunnel hatch, pressure equalization valve, and tunnel vent valves closed and tunnel vented. The fact is, we're getting no flow.

03 23 48 08 LMP I know it. Okay. Hey, Ken. Is the tunnel vented yet?

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03 23 48 22 CMP It's venting.

03 23 48 23 LMP Okay. We're ready for our regulator check right now, when you get a - if you'll give us a GO on that tunnel vent.

03 23 48 29 CMP Okay. I've got about a half psi to go before I can get - let you have it.

03 23 48 35 LMP Check. Okay.

03 23 48 58 LMP That's crazy. We don't get any flow that way.

03 23 49 05 CDR Well, maybe we're supposed to take our helmets and gloves off.

03 23 49 08 LMP Doesn't say that. Okay, while we're waiting, let's check this state vector.

03 23 49 15 CDR Yeah, okay.

03 23 49 16 LMP Okay, where's the G&N Checklist? Did you - we put it back up? I did, I think. Yeah, here it is.

03 23 49 26 CDR Could you check the other vector, too?

03 23 49 29 LMP Yeah.

03 23 49 40 LMP 1-26; I knew there was some page in there somewhere where you could go.

03 23 49 52 LMP Okay, VERB 01 NOUN 01 ENTER. 17 - 1173 ENTER. 21 ENTER.

03 23 50 06 CDR It's already there.

03 23 50 07 LMP Okay, NOUN 15 ENTER.

03 23 50 15 CDR Okay, should be - -

03 23 50 16 LMP Read them out to me.

03 23 50 17 CDR - - 01501.

03 23 50 19 LMP Go. ENTER.

03 23 50 21 CDR 77775.

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03 23 50 22	LMP	Go.
03 23 50 23	CDR	77776.
03 23 50 24	LMP	Go.
03 23 50 25	CDR	57602.
03 23 50 26	LMP	Go.
03 23 50 27	CDR	00301.
03 23 50 28	LMP	Go.
03 23 50 29	CDR	37450.
03 23 50 31	LMP	Go.
03 23 50 32	CDR	00155.
03 23 50 34	LMP	Go.
03 23 50 35	CDR	20621.
03 23 50 36	LMP	Go.
03 23 50 38	CDR	20111.
03 23 50 40	LMP	Go.
03 23 50 41	CDR	31450.
03 23 50 43	LMP	Go.
03 23 50 44	CDR	00662.
03 23 50 45	LMP	Go.
03 23 50 46	CDR	17260.
03 23 50 48	LMP	Go.
03 23 50 49	CDR	76004.
03 23 50 50	LMP	Go.
03 23 50 52	CDR	55226.

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03 23 50 53 LMP Go.

03 23 50 54 CDR 04076.

03 23 50 55 LMP Go.

03 23 50 56 CDR 17120.

03 23 50 57 LMP Go.

03 23 50 58 CMP I got us about 22-1/2 minutes from undocking, and I'm at 3 psi, looking in the tunnel. Let's wait another minute to get it bled down.

03 23 51 11 LMP Answer him, John.

03 23 51 14 CDR Okay, Ken. That's fine.

03 23 51 19 LMP Let's see what happens here.

03 23 51 22 CMP You guys got any problems over there?

03 23 51 26 CDR Yeah, we can't get our COMPUTER ACTIVITY light to go out. See, it's integrating somewhere. I wonder if it's a - if it's a LM state - CSM state vector. That's what it is - I got the idea.

03 23 51 40 LMP What?

03 23 51 41 CDR How do you transfer the - -

03 23 51 44 CMP Wouldn't you - if we do not undock until the ...

03 23 51 47 CDR No, we undock.

03 23 51 50 LMP Oh, no, we're ready to go.

03 23 51 51 CMP Okay.

03 23 51 52 LMP We just don't have your state vector in, and that's - that's our problem. It's not - it's having trouble bringing your state vector up.

03 23 51 58 CDR I know what we should do. We should do a VERB 66.

03 23 52 00 CMP Okay.

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03 23 52 03 CDR Well, well, wait. Let me look and see if that's what we should do.

03 23 52 06 LMP I'm not sure you can do a VERB 66.

03 23 52 07 CDR I'm not sure you can in here, but they do it in P27.

03 23 52 12 LMP John?

03 23 52 13 CDR Huh?

03 23 52 14 LMP Let me read the book, okay?

03 23 52 15 CDR Okay. I can't - Just look where the verbs are, Charlie.

03 23 52 23 LMP That's what I'm going to do. That's nouns.

03 23 52 36 CMP Okay, I'm doing a routine check on the tunnel.

03 23 52 39 LMP Okay, that's - that's what we need - need.

03 23 52 40 CDR See that? Let's try it.

03 23 52 43 LMP Okay, doing a VERB 96.

03 23 52 45 CMP The ... valve checks.

03 23 52 48 LMP Okay. No, wait a minu - -

03 23 52 52 CMP I'll make this one a 1-minute check.

03 23 52 53 LMP John, you should've done a VERB 96 and stopped that integration first. Okay, now VERB 66. Now call POO.

03 23 53 16 CDR That didn't fix it.

03 23 53 18 LMP That takes awhile. See? Good, we got it.

03 23 53 24 CDR Okay.

03 23 53 25 LMP PRO. Okay, let's look at POO now.

03 23 53 30 CDR We're looking at it.

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03 23 53 32 LMP Okay, we fixed it. Okay, what we need to do is get Ken's - state vector.

03 23 53 43 CDR Well, Ken's state vector is the same as ours, Charlie.

03 23 53 47 LMP How about that? (Laughter) Better be. (Laughter)

03 23 53 50 CDR Yeah.

03 23 53 53 LMP (Laughter) Sorry about that.

03 23 53 58 CDR That's why that's an - I knew that's what it was. What is this pressure you've got to keep lower than, Charlie? Explain that to me.

03 23 54 05 CMP Okay. I've opened the tunnel vent, and I'm gonna bring my roll engines on, and you're clear to check your relief valve.

03 23 54 15 CDR Okay.

03 23 54 16 LMP Okay. Okay, John. Turn the page.

03 23 54 23 CDR Hey, I'll read it to you, Charlie.

03 23 54 31 LMP Regulator check. Here we go. Okay, starting with cabin repress.

03 23 54 36 CDR CABIN REPRESS valve to MANUAL. Verify flow, then AUTO.

03 23 54 37 LMP Okay, go ahead.

03 23 54 40 CDR Verify overhead cabin dump valve to AUTO.

03 23 54 43 LMP Go.

03 23 54 45 CDR Circuit breaker 16, ECS, CABIN REPRESS to open.

03 23 54 47 LMP Okay, go.

03 23 54 48 CDR PRESS REG A and B to EGRESS.

03 23 54 49 LMP Go.

03 23 54 50 CDR SUIT GAS DIVERTER to EGRESS.

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03 23 54 52 LMP Go.

03 23 54 53 CDR CABIN GAS RETURN to EGRESS.

03 23 54 54 LMP Go.

03 23 54 55 CDR Forward cabin dump valve, OPEN, then AUTO at 4-1/2.

03 23 54 59 LMP Okay.

03 23 55 00 CDR Want me to get it?

03 23 55 01 LMP No, I'll get it. Okay, here we go. And it's going down.

03 23 55 11 CDR Okay, AUTO at 4-1/2.

03 23 55 12 LMP Okay, it is.

03 23 55 15 CDR AUTO at 4-1/2. SUIT CIRCUIT RELIEF to OPEN.

03 23 55 18 LMP Okay.

03 23 55 19 CDR Verify suit pressure at 4-1/2, then CLOSE.

03 23 55 26 LMP It is, CLOSE.

03 23 55 28 CDR CLOSE. PRESS REG A to CABIN. Verify suit pressure - -

03 23 55 30 LMP Okay, PRESS REG A's coming to CABIN.

03 23 55 34 CDR Comes up; it's rising, Charlie.

03 23 55 38 LMP It is.

03 23 55 39 CDR Right. Then it says, PRESS REG B to - PRESS REG A to EGRESS.

03 23 55 41 LMP Okay, go.

03 23 55 42 CDR SUIT CIRCUIT RELIEF to OPEN.

03 23 55 44 LMP To OPEN? Okay, go.

03 23 55 46 CDR SUIT CIRCUIT RELIEF, OPEN. Suit pressure goes to 4-1/2.

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03 23 55 53 LMP Okay.

03 23 55 54 CDR Then it says, CLOSE.

03 23 55 56 LMP CLOSE, okay.

03 23 55 58 CDR PRESS REG B to CABIN.

03 23 55 59 LMP Okay, go.

03 23 56 00 CDR Verify suit pressure rises, 4.6 to 5. It is.

03 23 56 04 LMP It is. Go ahead.

03 23 56 08 CDR Okay. SUIT CIRCUIT RELIEF to AUTO.

03 23 56 09 LMP Go ahead.

03 23 56 10 CDR CABIN GAS RETURN to AUTO.

03 23 56 11 LMP CABIN GAS RETURN to AUTO. Go ahead.

03 23 56 12 CDR PRESS REG A to CABIN.

03 23 56 13 LMP Okay.

03 23 56 19 CDR SUIT GAS DIVERTER to PUSH-CABIN.

03 23 56 21 LMP Okay. We don't get any flow when we do that.

03 23 56 27 CDR No, do you know why?

03 23 56 28 LMP Why?

03 23 56 29 CDR I got - have I got my hoses right?

03 23 56 30 LMP Yeah, you got your hoses right. This thing is leaking like a sieve.

03 23 56 40 CDR What's that?

03 23 56 41 LMP My helmet's full of water.

03 23 56 44 CDR Oh.

03 23 56 47 CMP Okay, Orion. I'm going to maneuver to the undocking attitude.

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03 23 56 50 CDR Okay, go to it.

03 23 56 55 LMP Okay, John. What's next? Do the rate gyro check for me.

03 23 56 59 CDR Can't do it while he's maneuvering.

03 23 57 00 LMP Oh, yeah.

03 23 57 13 CDR Man, look at that Moon. We're going to have to get a rag to wipe this thing off with.

03 23 57 20 LMP There's some towels in your -

03 23 57 22 CDR Here.

03 23 58 06 CDR Here you go, Charlie.

03 23 58 08 LMP Okay, just a minute. This thing, I can't get - keep - stay rolled up.

03 23 58 23 CDR There we go. Here you go, Charlie.

03 23 58 25 LMP Just a minute. Okay, give it to me.

03 23 58 43 LMP Okay, John. Here you go.

03 23 58 45 CDR Okay.

03 23 59 05 CDR We don't unsuit until after undocking?

03 23 59 06 LMP Yeah.

03 23 59 07 CDR Is that what it is?

03 23 59 08 LMP Yeah.

03 23 59 09 CDR Oh. When is the undocking?

03 23 59 15 LMP In about 13 minutes.

03 23 59 18 CDR Okay.

03 23 59 28 LMP Can you get the tape out for me, John? I can't get this thing to stay in down here.

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Day 4

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03 23 59 38 CDR

I can't either, Charlie.

03 23 59 57 CDR

We were on DOWN VOICE BACKUP that whole time?

03 23 59 59 IMP

Yeah, uh-huh.

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04 00 00 00 CDR Oh, boy.

04 00 00 01 LMP Oh, boy is right. I had a couple of dadgummits. Okay, John. Let's go. We got some stuff to do here before undocking. ATTITUDE MONITOR, LMP, to PGNS. It is. RENDEZVOUS RADAR MODE to SLEW.

04 00 00 16 CDR It is.

04 00 00 17 LMP DEAD BAND, MIN.

04 00 00 18 CDR MIN.

04 00 00 19 LMP ATTITUDE CONTROL, three, to MODE CONTROL.

04 00 00 20 CDR MODE CONTROL.

04 00 00 21 LMP MODE CONTROL, both, ATT HOLD.

04 00 00 22 CDR ATT HOLD.

04 00 00 23 LMP TTCA, both, to jets.

04 00 00 24 CDR Jets.

04 00 00 25 LMP/CDR Okay.

04 00 00 29 LMP BALANCE COUPLE - Okay, RATE/ERROR MONITOR, LANDING RADAR/COMPUTER.

04 00 00 33 CDR LANDING RADAR/COMPUTER.

04 00 00 42 LMP Okay, ATTITUDE MONITOR, PGNS. GUIDANCE CONTROL, PGNS. Okay?

04 00 00 46 CDR ATTI - GUIDANCE CONTROL is PGNS.

04 00 00 52 LMP Okay. MODE SELECT, LANDING RADAR.

04 00 00 54 CDR LANDING RADAR.

04 00 00 55 LMP RANGE/ALTITUDE MONITOR, RANGE/RANGE RATE.

04 00 00 57 CDR Go.

04 00 00 59 LMP RATE SCALE, 5 DEGREES A SECOND.

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04 00 01 00 CDR RATE SCALE, 5 DEGREES A SECOND.

04 00 01 02 LMP ATT/TRANSLATION of 4 JETS.

04 00 01 04 CDR 4 JETS.

04 00 01 05 LMP BALANCE COUPLE, ON.

04 00 01 06 CDR BALANCE COUPLES are ON.

04 00 01 07 LMP Okay, my monitor. Okay, I got to mount the camera. Don't believe we're going to be able to see anything, though.

04 00 01 13 CDR Yeah, well, don't worry about that.

04 00 01 14 LMP All fogged up. How about turning the window heater on? Want to try a window heater?

04 00 01 19 CDR Want to try yours for a second?

04 00 01 21 LMP Yeah, let's see what happens.

04 00 01 22 CDR You don't want to leave it on too long, Charlie. So don't forget.

04 00 01 26 LMP Okay. Okay, I'm going to open system B, so we'll have two jets, two -

04 00 01 35 CDR Okay, Charlie. Okay, Ken. Are you in undocking attitude now?

04 00 01 39 CMP That's affirmative; 12 minutes.

04 00 01 42 CDR Okay.

04 00 01 52 CDR Okay, Ken. Give me a VERB 06 NOUN 20 on my mark.

04 00 01 53 CMP Okay, ...

04 00 02 06 CMP Okay, say when.

04 00 02 07 CDR 3, 2, 1 -

04 00 02 08 CDR MARK it; 96:02:07.

04 00 02 09 CMP ... Let's do it again.

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04 00 02 13 CDR Okay. VERB 06 NOUN 20; 3, 2, 1 -

04 00 02 23 CDR MARK.

04 00 02 24 LMP 96 - -

04 00 02 25 CMP ... plus - -

04 00 02 26 CDR 96:02:23.

04 00 02 29 LMP What? Hold on, Ken.

04 00 02 30 CMP - - 56, plus 000.45 - -

04 00 02 36 LMP Tell him to start over again.

04 00 02 41 CDR Okay, that was at 96:02:23, Charlie.

04 00 02 45 LMP Yeah - -

04 00 02 46 CDR Read the numbers again, Ken.

04 00 02 47 CMP Plus 000.04, plus 105.56, plus 000.45.

04 00 02 58 CDR Copy.

04 00 03 01 LMP Okay. Copy four balls 4, 105.56 three balls 45.

04 00 03 02 CMP That's affirmative.

04 00 03 04 LMP 296.03 - 03, 28 - -

04 00 03 10 CDR/LMP 5.63.

04 00 03 12 CDR 359.51.

04 00 03 18 LMP 359.51. Okay.

04 00 03 57 CDR How much fuel can we transfer into the ascent tanks before it becomes too full to fly?

04 00 04 01 LMP Well, it's the pressure I think that - that they're worried about - on the ascent tanks.

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04 00 04 11 CMP Okay. This thing may make a small trim maneuver. Looks like it should be less than half a degree. Unless you'd just leave it alone with the ... Either way.

04 00 04 21 CDR Okay. It's up to you.

04 00 04 35 CMP Okay, let's leave it as is.

04 00 04 53 CDR Okay, Charlie. The tape is going back in.

04 00 04 56 LMP Well, I never did get to use it, but that's okay. Go ahead.

04 00 04 59 CDR Okay. What el - what else we got to check here?

04 00 05 07 LMP Wait a minute, wait a minute. Okay, go ahead.

04 00 05 11 CDR Just get the book.

04 00 05 12 LMP Yeah. What's my f-stop for the 16?

04 00 05 14 CDR Be easy to find. There's LM3/DAC/10/CEN [sic] - ULC.

04 00 05 23 LMP Okay.

04 00 05 26 CDR Mount Timeline Book. It's time. Okay, checklist ... check attitude. VERB - VERB 48 ENTER. 21 ENTER. 22012 ENTER. PRO. We got the right weight, huh?

04 00 05 48 LMP Yeah. What's the DAC should be - I mean, there's Hasselblad/DC/60/HEX-A, (f/11, 250, focus).

04 00 06 01 CDR Okay. Configure circuit breakers per unlocking chart, ... - -

04 00 06 04 LMP Okay. Go ahead, and I'll get the camera out.

04 00 06 56 LMP Nothing like a helmet full of water.

04 00 06 58 CDR Is it full, Charlie?

04 00 06 59 LMP Just about.

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04 00 07 05 CDR Here's your ..., Charlie. Wait a minute. Let me check to be sure.

04 00 07 23 LMP John, that window heater's working.

04 00 07 34 LMP Where's your book?

04 00 07 36 CDR I don't know.

04 00 07 57 CDR Charlie, I'm going to pull it open. I don't think we're supposed to leave them run too long.

04 00 08 02 LMP It's okay.

04 00 08 03 CDR It worked, huh?

04 00 08 05 LMP Yeah, it's working. Please close it. Then, up in the - you can just let it close - just a few more minutes, it'll be fine. Okay, why don't you open yours?

04 00 08 11 CDR I did.

04 00 08 12 LMP I mean close yours.

04 00 08 14 CDR I did.

04 00 08 17 LMP Okay.

04 00 08 37 LMP John, can you see - is my thing leaking right now?

04 00 08 41 CDR I can't tell, Charlie. Doesn't look like it. Is it leaking?

04 00 08 48 LMP My whole helmet's full of water. I mean my whole comm carrier. My hair is soaked.

04 00 08 54 CDR You're kidding.

04 00 08 55 LMP Huh-uh.

04 00 08 59 CDR Well, it leaks every time you put your - your thing up against it, that's for sure.

04 00 09 02 LMP Is it leaking now?

04 00 09 04 CDR Yeah. Every time you put it up against there, it leaks.

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04 00 09 08 LMP Like that, huh?

04 00 09 09 CDR Yeah. That makes it squirt out.

04 00 09 11 LMP Okay. That's what's happening.

04 00 09 12 CDR You never had that happen to you before?

04 00 09 14 LMP Yeah, but -

04 00 09 16 CDR It never bothered you in one g.

04 00 09 19 LMP Yeah. Never bothered me in one g.

04 00 09 22 CDR Okay. Now what's undocking time?

04 00 09 23 LMP 96:13, about 4 minutes.

04 00 09 35 CDR Okay, Ken. How much to undocking?

04 00 09 38 CMP Three minutes and a half.

04 00 09 40 CDR Okay. It's gonna undock at 96:13 even?

04 00 09 44 CMP 96:13.31.

04 00 09 46 CDR Okay.

04 00 09 53 LMP We'll stow the Activation Checklist - Oh, I can't. Harnesses are too tight. Do that later.

04 00 10 24 CDR Are we through with the undocking - through the activation books, Charlie? I didn't do the rate gyro test.

04 00 10 31 LMP Are we in attitude now?

04 00 10 33 CDR Yeah.

04 00 10 34 LMP Okay, let's go through this little one.

04 00 10 35 CDR Okay.

04 00 10 50 CDR It looks good to me.

04 00 10 51 LMP Plus or minus 5 - 25 over there? No, that - that one.

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04 00 10 59 CDR That's got it.

04 00 11 04 LMP Okay, it's got it. Let's see, are you hit - does your mike hit your valve? Let me see. Turn around towards me.

04 00 11 13 CDR When it does, I get squirted.

04 00 11 14 LMP You do?

04 00 11 15 CDR Yeah. I had to really be careful.

04 00 11 26 LMP Okay, check attitude. The VERB 48.

04 00 11 30 CDR I did that.

04 00 11 32 LMP Okay, LM weight we got.

04 00 11 33 CDR You got it.

04 00 11 34 LMP Okay, we got the angles.

04 00 11 35 CDR I got the angles.

04 00 11 36 LMP Okay. We can call - -

04 00 11 37 CDR All we need to do is call P47.

04 00 11 38 LMP - - P47. Okay, you can close my window heater - open my window heater. It's clear now. Beautiful. Is yours closed, John?

04 00 11 48 CDR Yeah.

04 00 11 49 LMP Okay. It'll clear it off in a little bit. Takes about 10 minutes or so.

04 00 12 01 LMP John, I'm going to have to pull this water bag out of here, I think.

04 00 12 04 CDR Yeah.

04 00 12 05 LMP I'm - I'm soaked.

04 00 12 20 CDR Okay.

04 00 12 24 CMP Okay, can you read me on VOX, Orion?

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04 00 12 27 LMP Loud and clear, Ken.

04 00 12 35 CMP Orion, do you read on VOX?

04 00 12 37 CDR Loud and clear, Ken.

04 00 12 40 LMP We're reading you 5 by.

04 00 12 42 CMP Okay. We're inside of a minute.

04 00 12 45 LMP Roger. We got P47 coming up.

04 00 12 46 CMP Understand. You're still GO.

04 00 12 47 LMP We're still GO. P47's up.

04 00 12 55 CMP If you're on VOX, you're clipping pretty badly, too.

04 00 12 59 LMP We are not on VOX.

04 00 13 01 CDR We're not on VOX, Ken. Okay, go ahead and undock whenever you want to, and then go ahead and separate.

04 00 13 08 CMP Okay.

04 00 13 21 CMP We're coming up. I'll give you a countdown to the release: 5, 4, 3, 2, 1 -

04 00 13 33 CMP RELEASE.

04 00 13 34 LMP Hey.

04 00 13 37 CMP We didn't go very far. (Laughter) Okay. I'll let it sit here for a second. Okay, we're gonna back off now.

04 00 13 51 CDR Very good.

04 00 13 53 LMP Is he going?

04 00 13 54 CDR Yeah.

04 00 13 55 LMP Didn't get anything out of it.

04 00 13 59 CMP Right on time to the second. This thing is a dream.

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04 00 14 10 LMP Okay, John. P00. I got a - I give you VERB 60.

04 00 14 15 CMP I see you rolling, or yawing, as you guys do it. I see one, two, ought to see four ... Haven't seen them yet.

04 00 14 34 LMP Okay, you can close - Okay. How's your window looking, John?

04 00 14 39 CDR Looks great.

04 00 14 40 LMP Okay, beautiful. Okay, camera's coming on.

04 00 14 45 CDR Sequence camera ...

04 00 14 50 CMP I can see three ... loud and clear. And looks like that one banner up there that we were watching shred is the only one that I see that is shredded. The rest of it's all intact.

04 00 15 05 LMP Okay. Great, Ken. Man, it's great! Boy, when we fire the RCS, it really shakes the whole stack.

04 00 15 21 CMP Oh, not any more!

04 00 15 24 LMP Hey, you're beautiful, babe! You're just beautiful!

04 00 15 31 CMP Yes, indeed. You sure look good.

04 00 15 34 LMP Okay, all your booms are in.

04 00 15 41 CMP I see full view. You've got three ... down. Your ... valve's clean ... clean ... still hanging on. What more can you ask for?

04 00 15 57 LMP You can - you can see your RCS spitting at us.

04 00 16 00 CMP Yeah, yours is doing the same.

04 00 16 06 CDR Okay, Charlie. Helmet and gloves off.

04 00 16 19 CDR Have we got Houston, yet? We ought to have them right now.

04 00 16 22 LMP Not yet.

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04 00 16 23 CDR Okay, let's go through this sequence.

04 00 16 24 LMP Okay, I got enough pictures here.

04 00 16 25 CDR Yeah.

04 00 16 26 LMP That's ten.

04 00 16 31 CDR Boy, Ken, you look great!

04 00 16 32 CMP Well - -

04 00 16 33 LMP You really got a pretty spacecraft!

04 00 16 34 CMP Yours is a ... pretty one, too.

04 00 16 38 LMP Okay, John. Helmets - and cameras to off, VHF ANTENNA is FORWARD - -

04 00 16 46 CMP It'll look even better without your ... peeking down underneath.

04 00 16 53 LMP Sequence camera. Okay, suit gas diverter. Okay, let's get helmets and gloves off.

04 00 16 57 CDR Okay.

04 00 17 06 CC Orion, this is Houston. How do you read?

04 00 17 08 LMP Roger. You're 5 by, Jim, and we're sailing free.

04 00 17 22 LMP Okay, Jim. It was a little rushed, but we got it done. The only thing bad is, I got a hat full of orange juice.

04 00 17 34 CC Okay, we copy, and we'd like you to go through another procedure here to get the S-band locked up if you're ...

04 00 17 41 LMP Tell him to stan - stand by 1.

04 00 17 44 CDR Stand by 1, Jim.

04 00 17 45 LMP Okay, we're on hot mike still, John. VHF B DATA is ON. Okay, tell him go ahead.

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Day 5

04 00 18 06 CDR Okay, Jim; go ahead.

04 00 18 09 CC Roger. We wanted to - you to put the steerable at PITCH, minus 75, and YAW at minus 12. In other words, the stowed position. So TRACK MODE, SLEW, wait 30 seconds, and then go PITCH of plus 63, YAW of minus 32, and antenna S-BAND to SLEW, and proceed with normal acquisition.

04 00 18 38 LMP O - Okay, we copy. Hey, Ken.

04 00 18 50 CC And, Orion; this is Houston. We're - -

04 00 18 51 CMP Go ahead, Orion.

04 00 18 53 LMP Okay, look up over my - our right side, and look at that antenna, the - the steerable, and see how it - it's moving. I'm going to move it in pitch, then in yaw. Over.

04 00 19 01 CMP Okay. On your right side. Okay, I got it, and it's moving in - looks like a combination now. It's moving, though; it's oscillating at this time.

04 00 19 16 LMP Okay, it should be stable - -

04 00 19 17 CC Orion, this is Houston. We'd like to - -

04 00 19 19 CMP Now it's steady.

04 00 19 20 CC - - find out what your RCS configuration is at the present time.

04 00 19 26 LMP Okay, Jim, we've got - -

04 00 19 27 CDR SYSTEM A and B are OPEN, CROSSFEED is CLOSE, and the - the ASCENT FEEDS are terminated.

04 00 19 40 CC We'd like for you to use SYSTEM A just as long as possible. Over.

04 00 19 48 CDR Okay. SYSTEM A is - SYSTEM A is - is now OPEN, and the CROSSFEED is OPEN, and SYSTEM B is CLOSED.

04 00 20 10 CC And, Orion; have you loaded the AGS abort constants yet?

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04 00 20 14 LMP Negative. We don't have - -

04 00 20 15 CDR That's negative. Over.

04 00 20 18 LMP We don't have the AGS - we don't have the AGS up yet, Jim.

04 00 20 20 CC Okay, understand negative.

04 00 20 21 LMP That's affirmative.

04 00 20 23 CC ... because when you do load those constants, we want you to load nominal values from the data card.

04 00 20 30 LMP Okay.

04 00 20 32 CDR STABILIZATION/CONTROL, ENGINE ARM, closed. Okay, we're going ahead with the DPS throttle check, Jim.

04 00 20 45 LMP Okay, you do that while I get the - -

04 00 20 46 CDR Okay.

04 00 20 47 CC And if this S-band procedure doesn't work for us, we're going to ask you to maneuver to an FDAI attitude, where the - the yaw angle will not have to change, and we'll see if we can lock up in that attitude.

04 00 20 59 CDR Roger; understand. Okay, DPS throttle check. What you got to do, Charlie - You are all wet. Here, get the thing back away from you.

04 00 21 11 LMP I'm - -

04 00 21 12 CDR I got - I got it now.

04 00 21 19 LMP Now, give - why don't you get me - get me a towel here.

04 00 21 26 CDR Okay. Charlie?

04 00 21 36 CDR ENGINE ARM to close.

04 00 21 39 LMP Okay, Houston. Houston, how do you read on the steerable?

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Day 5

04 00 21 43 CDR Give the ENGINE ARM.

04 00 21 47 LMP Do what?

04 00 21 48 CDR ENGINE ARM breaker - there you go.

04 00 21 50 LMP Got it. Okay, Houston. Back on the AFT omni.  
How do you read?

04 00 21 59 CDR ENGINE ARM to DESCENT.

04 00 22 06 LMP Hous - Houston, on the AFT omni. How do you read?

04 00 22 09 CDR DESCENT REG light is on. TTCAs to min - -

04 00 22 10 CC Orion, this is Houston. We'd like you to proceed  
now with this attitude maneuver, and I'll give you  
the FDAI angles and the steerable angles.

04 00 22 21 LMP Go ahead.

04 00 22 25 CC Okay, FDAI is ROLL, 000; PITCH, 053; and YAW, 000.  
And the steerable angles: PITCH, plus 26; YAW,  
minus 12. Over.

04 00 22 42 LMP Copy. 000, 053, 000; PITCH, 26; YAW, minus 12.

04 00 22 55 LMP Okay, John.

04 00 22 57 CDR Try them again.

04 00 22 58 LMP Okay.

04 00 22 59 CDR Okay, Houston, we're running through the DPS  
throttle check. I got 12, 51, and 100. Charlie's  
got 13, 51, and 100.

04 00 23 16 LMP Feels good. Looks bad. Darn thing.

04 00 23 30 CDR ENGINE ARM is OFF.

04 00 23 31 LMP Okay, Jim - -

04 00 23 32 CDR Cycle the CWEA - -

04 00 23 33 LMP Wait - wait a minute.

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04 00 23 34 CDR - - DESCENT. Eng stop, reset.

04 00 23 37 CC Orion, the DPS throttle check looks good.

04 00 23 40 LMP Okay, Jim, I have some NOUN 20s for you, if you're ready to copy.

04 00 23 43 CDR ... AUTO and CDR. TTCAs, both, to JETs, Charlie. Get yours to JET.

04 00 23 54 CC Okay, go ahead on the NOUN 20s.

04 00 23 56 LMP Okay; for the lunar module, Ori - Orion. We've got plus 296.03, plus 285.63, plus 359.51. For the command module, Casper, plus 000.04, plus 105.56 - -

04 00 24 23 CC Orion, go FORWARD omni.

04 00 24 26 CDR I get a 75.

04 00 24 28 LMP How do you read FORWARD omni? You got a - Start your pitch maneuver, John.

04 00 24 35 CDR To where?

04 00 24 40 LMP Okay, to 053.

04 00 24 50 LMP Okay, Jim. How do you read now?

04 00 24 56 CC There's still excessive noise down here. Give me the command module numbers again.

04 00 25 08 LMP Okay, we're - How do you read now? We're in a FORWARD omni.

04 00 25 20 CC I can just barely read you, Charlie.

04 00 25 26 LMP Okay, we'll read you out - on the NOUN 20s for the command module. Plus four balls 4, plus 105.56, plus 000.45. That time was at 96:02:20. Over. Okay, we there?

04 00 25 58 CDR No. What do you want? 05 -

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04 00 26 01 LMP 053.

04 00 26 02 CDR Okay.

04 00 26 03 LMP And 00.

04 00 26 04 CDR That 000?

04 00 26 05 LMP Yeah.

04 00 26 07 CDR Okay.

04 00 26 28 CC Orion, this is Houston. We hope you're about in attitude. We would like you to go through an acquisition here.

04 00 26 33 LMP Okay, we're in attitude and we're going to give you the steerable.

04 00 27 06 CDR Give me a shot of cold water, Charlie.

04 00 27 18 CDR That's enough.

04 00 27 22 LMP Okay, Jim. How do you read on the FORWARD omni? Over.

04 00 27 37 CC Charlie, I just barely read you on the FORWARD omni.

04 00 27 40 LMP Okay.

04 00 27 41 CDR You're loud and clear down there, Jim.

04 00 27 44 LMP Be advised, Houston, that when I select - I've got the angles set in: a plus 26; YAW, minus 12. We are in attitude, and when I select S-BAND to SLEW, the signal strength just slowly drifts off. Over.

04 00 28 23 CC Orion, this is Houston. Select PRIMARY TRANSMITTER/RECEIVER.

04 00 28 34 CDR 000, 53, huh, Charlie?

04 00 28 35 LMP Yeah.

04 00 28 36 CDR Okay.

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04 00 28 37 LMP Okay, Jim. How do you read on the PRIMARY TRANSCEIVER?

04 00 28 40 CDR Okay, Houston. Can we go through the DPS throttle check now?

04 00 28 46 LMP Just did that.

04 00 28 48 CDR I mean the DPS pressurization check.

04 00 29 05 LMP Let's let it warm up, John.

04 00 29 11 LMP Okay, Houston. How do you read? Over.

04 00 29 22 LMP Okay, Houston. How do you read on the PRIMARY TRANSCEIVER?

04 00 29 25 CC Orion, this is Houston. How do you read?

04 00 29 27 LMP Loud ... - -

04 00 29 28 CDR Loud and clear. You're loud and - -

04 00 29 36 CC ... just barely hear you, and I have a landing site TCA for you if you're ready to copy.

04 00 29 37 CDR Roger. Can we now do the DPS pressurization checkout? Over.

04 00 29 55 CC Okay, we're ready for DPS press.

04 00 29 56 CDR Okay.

04 00 29 57 LMP And you go ahead with the - with the TCA, Jim.

04 00 30 20 LMP Okay, here we go. PROP TEMP/PRESS MONITOR, DESCENT 1 - -

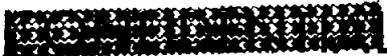
04 00 30 23 CDR 1.

04 00 30 24 LMP - - DESCENT.

04 00 30 25 CDR Yeah, I checked all that, Charlie.

04 00 30 26 LMP Okay.

04 00 30 27 CDR I'm down to right there.



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04 00 30 28 LMP Okay. MASTER ARM, ON.

04 00 30 30 CDR Talkback 1, MASTER ARM's ON. Okay.

04 00 30 35 LMP Okay, you should have two lights.

04 00 30 36 CDR Two lights.

04 00 30 37 LMP Okay.

04 00 30 38 CDR MASTER ARM's ON. Two lights, Houston.

04 00 30 39 LMP DESCENT PROPELLANT ISOL VALVE, FIRE.

04 00 30 42 CDR Okay. The PROP ISOL VALVE is going to FIRE ...

04 00 30 47 LMP HELIUM PRESS DESCENT START, FIRE.

04 00 30 49 CDR HELIUM PRESS DESCENT START is going to FIRE.

04 00 30 50 CC ..., Houston. Go DOWN VOICE BACKUP. Over.

04 00 30 53 LMP We are in DOWN VOICE BACKUP, Jim. Okay, FIRE.

04 00 30 55 CDR Okay. The DPS is pressurizing.

04 00 30 56 LMP 200 to 250, it should be.

04 00 30 57 CDR Okay. It did pressurize, 245 to 245. And the AMBIENT PRESS is 410, the SUPERCRIT PRESS is 1170.

04 00 31 15 LMP Good.

04 00 31 19 CDR 1160.

04 00 31 20 LMP Okay.

04 00 31 21 CDR Okay, the AMBIENT PRESS is down to 390.

04 00 31 23 LMP MASTER ARM, OFF. Did you get that?

04 00 31 24 CDR MASTER ARM is OFF. Two lights off.

04 00 31 28 LMP Okay, I'll get the AGS activation here. Let's just leave this down there so we can both see it. Okay, will you wipe out my helmet, please?

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04 00 31 32 CDR Yeah, sure will, Charlie. (Laughter) Tell you one thing Charlie's not going to get up here, and that's scurvy.

04 00 31 42 CC Orion, BIOMED switch, OFF.

04 00 31 45 LMP The BIOMED is OFF, Jim.

04 00 31 50 CDR I've drifted off in attitude.

04 00 31 58 LMP That's okay.

04 00 31 59 CC Orion, the DPS pressurization checkout looks good.

04 00 32 02 CDR Looks good to us. What is that?

04 00 32 09 LMP That's the AOT - that's the filter out of here.

04 00 32 10 CDR Oh, okay.

04 00 32 11 LMP The polarizing coll - -

04 00 32 12 CDR Yeah, that's what it is.

04 00 32 20 LMP Okay, Jim, could you give us our TCA landing site? Okay, AC BUS B, AGS, closed.

04 00 32 27 CDR Okay, the AGS breaker's going closed, Charlie.

04 00 32 31 LMP 96, 32, 28.

04 00 32 32 CDR Okay, I want to pull the HEATER circuit breaker - -

04 00 32 33 LMP Okay, yeah, that's good.

04 00 32 34 CDR - - the ones that's cleared up.

04 00 32 36 CC Okay, Orion. The landing site TCA is 96:46:07. Over.

04 00 32 40 CDR Roger; 96:46:07.

04 00 32 46 LMP AGS STATUS to OPERATE, MASTER ALARM AGS light.

04 00 32 51 CDR Okay, Charlie, I'm going to do the landing radar checkout, too.

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04 00 32 52 LMP Okay. AGS.

04 00 32 57 CDR Need a time first?

04 00 33 01 LMP Yeah. Okay, and I'll set AGS time, 377. Okay, 90 hours have 6; that's 360, 393, 5.

04 00 33 24 CDR 393 5, Charlie.

04 00 33 27 LMP Mm-hmm.

04 00 33 30 LMP MARK it.

04 00 33 32 CDR It looks good to me. Okay, I want to go over this landing radar checkout. LANDING RADAR breaker's in.

04 00 33 41 LMP Okay.

04 00 33 42 CDR TRANSPOINTERS to HI MULT; mode select to LANDING RADAR; H/H-dot; LANDING ANTENNA to AUTO. You bet. RADAR TEST to LANDING.

04 00 33 50 LMP There we go. Got them.

04 00 33 51 CDR Go to LANDING. RADAR TEST to LANDING; power signal light, out.

04 00 34 05 LMP Okay, Jim; Houston on the steerable, I mean - Listen at me - Orion on the steerable. How do you read? Over.

04 00 34 11 CC Orion, we read you much better.

04 00 34 12 LMP Okay, it worked that time, Jim. We got a 4.2 signal strength and the steerable is working. I'm in TRACK MODE, AUTO.

04 00 34 24 CC Very good. I have some words for you on the RCS.

04 00 34 29 LMP Okay, go ahead.

04 00 34 35 CDR Left.

04 00 34 38 CC Let's go normal configuration on your RCS and then we want you to transfer 3 percent more out of system A because we see the pressure going up on A.

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04 00 34 51 LMP Okay, transferring.

04 00 34 55 CC And the caution, of course, not more than 180 on the APS.

04 00 35 04 CDR Okay, the landing radar H-dot is only reading minus 17 right now. The 8000 works okay.

04 00 35 17 CDR Okay, that looks good.

04 00 35 26 CC Orion, will you give us HI bit rate, please.

04 00 35 35 LMP Okay, you got HI bit rate - you got HI bit rate; BIOMED is LEFT. Jim, could we try a pitch maneuver back to the landing-site viewing attitude, so we'll see if this thing tracks?

04 00 35 49 CC Stand by 1.

04 00 35 51 CDR Okay, now that's not reading the right numbers here.

04 00 35 53 CC Okay, just hold it 1. We want to get our up-links in and then you can try that maneuver.

04 00 36 01 LMP Okay. What do you mean?

04 00 36 09 CDR See?

04 00 36 13 CC Okay, Orion, let's go POO and DATA, and we'll send you an up-link.

04 00 36 20 CDR Let's ...

04 00 36 27 LMP Okay, you've got POO and DATA. Okay, we're off hot mike now.

04 00 36 32 CDR Okay, Houston, the landing radar test is not working properly.

04 00 36 39 CC Okay, what's the problem, John?

04 00 36 44 CDR Well, it's not reading the right numbers in altitude rate and it's not reading the right numbers in VERB 63. The ALTITUDE TRANSMITTER is 3.2, and the VELOCITY TRANSMITTER - VELOCITY TRANSMITTER is 3.7.

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04 00 37 07 LMP And, Jim, the AGS is loaded with the data card.

04 00 37 11 CC ... Orion, Houston.

04 00 37 12 LMP Go ahead.

04 00 37 13 CC Okay, we want you to select normal voice.

04 00 37 21 LMP Okay, you have normal voice, and the AGS is loaded with the - with the data card numbers. Over.

04 00 37 25 CC Roger; I copied, Charlie.

04 00 37 48 CC Orion, this is Houston. Are you also showing bad data on the tapemeter for the landing radar?

04 00 37 53 CDR That's affirmative. The H - altitude is reading right at 8000, but the velocity was only reading 15. I'll run it again. Can I run it while P27 is in progress? Yeah, I'm sure I can.

04 00 38 14 CC Stand by on that one.

04 00 38 23 CDR Kind of a problem. LANDING RADAR to H-dot, RADAR TEST to LANDING.

04 00 38 28 CC Hold up on that landing radar check until after the - the up-link.

04 00 38 31 CDR Okay. I'll go off and pull the circuit breaker.

04 00 39 00 LMP I'd like to pitch that back down so we can see the landing site. Jim, we'd like to start a pitch back down so we could see the landing site.

04 00 39 06 CC Stand by. We're still getting the up-link.

04 00 39 57 CC Orion, this is Houston. I have the abort pads whenever y'all are ready.

04 00 40 05 LMP Okay, stand by. Okay, go ahead.

04 00 40 15 CC Okay, beginning. No PDI plus 12. 098:47 all zeros; plus 0102.3, plus all zeros, minus 0050.0; 0138.0, plus 0011.0, 0113.9; 0:35; all zeros, 273; 5927.0; plus 0102.6, plus all zeros, minus 0049.4; 099:35 all zeros; 101:22:15.00.

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Throttle profile 10 percent for 26 seconds, full throttle for remainder; LM weight, 36673. Over.

04 00 41 19 LMP Okay, Jim. That was a little bit too fast, but I think I got it all. 098:47:00.00; plus 0102.3, plus all balls, minus 0050.0; 0138.0, plus 0011.0, 0113.9; 0:35, all balls, 273; 5927.0; 0127.60, plus all balls, minus 0049.4; 099:35 all balls; 101:22:15.00. LM - that's throttle profile is 10 percent for 26 seconds then full throttle. LM weight, 36673. Go ahead.

04 00 42 07 CC Roger. Good readback. Let me just confirm the NOUN 86 DELTA-V<sub>X</sub> plus 0102.6, and we're finished with your computer.

04 00 42 18 CDR Okay, and I'm going into the landing radar check again.

04 00 42 20 CC ... an E-MOD dump for VERB 74.

04 00 42 25 CDR You have it.

04 00 42 26 LMP Okay, read that again, Jim. The - the Delta-V<sub>X</sub>.

04 00 42 31 CC DELTA-V<sub>X</sub>, NOUN 86, is plus 0102.6.

04 00 42 50 CC Charlie, I'm ready on the - the PDI pad.

04 00 42 54 LMP Okay, I was wrong on that. I got it now, 0102.6. And go ahead with the PDI pads.

04 00 42 58 CC Okay. You ready for PDI?

04 00 43 02 LMP You speak.

04 00 43 03 CC Okay, India, 0 - 098:35:04.68; 11:04, plus 0002.6; 002, 114, 340; plus 56997; PDI early, Juliett, 101:22:15.00; Kilo, 103:21 all zeros. Over.

04 00 43 44 LMP Roger, Jim. Could we start a pitch attitude down to see the landing site?

04 00 43 49 CDR Are you done with our E-MOD, Jim?

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04 00 43 56 CC We're finished with the E-MOD dump, but we would just as soon get all these pads up, and we're not concerned about the landing site - down here.

04 00 44 06 LMP Okay, I - -

04 00 44 07 CDR I didn't think you were.

04 00 44 08 LMP Okay, fine. I'm - I'm down through Kilo, and I'll read back starting at India. 098:35:04.68; 11:04, plus 0002.6; 002, 114, 340; plus 56997; 101:22:15.00; 103:21:00.00. Over.

04 00 44 34 CC Okay, that's a good readback, and I have  $T_2$  and  $T_3$  for you.

04 00 44 41 LMP Go ahead.

04 00 44 43 CC Okay.  $T_2$ , Lima, 098:59:29.03; 105:19:45.00;  $T_2$  at PDI, plus 24 plus 25; and  $T_3$ , Nectar, 100:42:42.86. Over.

04 00 45 09 CC Orion, will you verify AUTO on the steerable?

04 00 45 14 LMP It is in AUTO. Okay, and reading back starting with Lima, 098:59:29.03; 105:19:45.00; November, 100:42:42.86. Go ahead with the next one. Over.

04 00 45 38 CC Okay, we're standing by for the - the landing radar checkout, John; and, of course, Charlie, you go that  $T_2$  at PDI at 24 plus 25, and I have an AGS K-factor for you.

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04 00 45 52 LMP Okay, go ahead with the AGS.

04 00 45 55 CC Okay, 00090, all zeros, 00111. Over.

04 00 46 17 LMP Okay, copy 9 - 90, 00, 00111.

04 00 46 29 CDR Okay - okay, there's the data. It's reading all right in H-dot, but it's changing data in - in the next two registers.

04 00 46 47 CC ... down here.

04 00 46 48 CDR And the tapemeter's now - and the tapemeter's now reading 480 opening, and the altitude meter which - first time I did it read 8000, and it's now reading zero.

04 00 47 07 CC Okay, Orion. Let's go LO bit rate. We're losing the steerable.

04 00 47 10 LMP Roger.

04 00 47 12 CDR Is it tracking?

04 00 47 15 LMP No. Jim, I don't think it's tracking in yaw.

04 00 47 24 CDR Get back over here then. Is it losing it?

04 00 47 32 LMP Little bit.

04 00 47 37 CDR I saw our landing site, Charlie.

04 00 47 38 LMP You did?

04 00 47 39 CDR Yeah.

04 00 47 40 LMP What did it look like?

04 00 47 41 CDR It's okay.

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Day 5

04 00 47 44 CC Orion, we'll get back to you on the landing radar.

04 00 47 50 CDR Roger. You can see the data.

04 00 47 52 LMP Okay.

04 00 47 56 CC And, Orion, this is Houston. Just a reminder on - the load 405 and 406 to plus zero.

04 00 48 06 LMP Roger.

04 00 48 08 CC And we're ready for HI bit rate.

04 00 48 18 LMP Okay, you have it.

04 00 48 20 CDR Yep. Okay, I'm going to terminate the landing radar test, if that's okay with y'all.

04 00 48 28 CC Roger.

04 00 48 33 LMP Okay, VERB 47 ENTER.

04 00 48 44 CMP Orion, Casper. Are you ready for a landing radar VHF ...

04 00 48 48 LMP Okay. VERB 25.

04 00 48 50 CDR That's negative. Houston wants them to stay locked on right now.

04 00 48 54 CMP Roger.

04 00 48 57 LMP Wait a minute, John. Turn back.

04 00 49 01 CDR Okay, excuse me, Charlie.

04 00 49 09 LMP Okay. Got to go HI, ENTER, PRO. Did you wipe out my helmet for me?

04 00 49 15 CDR Yeah, I did.

04 00 49 17 LMP Okay, thank you.

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04 00 49 29 CDR Are we still locked up?

04 00 49 30 LMP Yeah.

04 00 49 45 LMP Good signal strength.

04 00 49 56 CC Orion, this is Houston. I have the circ pad if you're ready to copy.

04 00 50 00 LMP Stand by. Go ahead.

04 00 50 12 CC Okay, ignition is 097:40:17.16; NOUN 81, plus 0068.1, minus all zeros, minus 0058.0. Over.

04 00 50 29 LMP Roger; copy. 097:40:17.16, plus 0068.1, minus all balls, minus 0058.0. Okay.

04 00 50 39 CC Good readback.

04 00 50 41 LMP Okay, let's - let's bypass the rendezvous radar. I guess we've got to - -

04 00 50 47 CDR Okay, we'll go ahead and go the - and do the IMU fine align right now, if that's okay with you, Houston.

04 00 50 55 CC Okay, we're standing by, John.

04 00 51 00 LMP Okay, PRO. Okay, PRO. Okay, AOT LAMP, close.

04 00 51 11 CDR It's closed, Charlie.

04 00 51 12 LMP Forward detent. Okay. Nope. ENTER, yeah. Okay, load 226.

04 00 51 15 CC Charlie, will you - at 404, will you put minus 12345.

04 00 51 27 LMP Roger.

04 00 51 29 CDR Okay, Houston, when we do this attitude maneuver for the P52, we're gonna lose high gain. Is that all right?

04 00 51 39 CC Stand by. I think we're all prepared for it.

04 00 51 41 CDR Okay.

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04 00 51 59 CDR Go to it.

04 00 52 00 LMP Okay, you want to close your - your window shade up there?

04 00 52 02 CDR Okay, that's what we're going - -

04 00 52 03 CC Okay, you can go ahead and maneuver, John - -

04 00 52 04 CDR Okay.

04 00 52 05 CC - - and we want you to use RCS SYSTEM A.

04 00 52 07 CDR Okay, we're using SYSTEM A.

04 00 52 12 LMP There we go - PRO.

04 00 52 27 LMP Want to put these back up, John? ... there.

04 00 52 28 CDR Where did they come from?

04 00 52 29 LMP Right over there on your panel.

04 00 52 31 CDR Okay.

04 00 52 45 LMP We ain't got a steerable antenna. Okay, Houston, we have you on the AFT omni. Okay, is zero zero set in up there, John?

04 00 52 55 CDR Yeah.

04 00 52 59 LMP Okay, forward detent.

04 00 53 03 CDR What am I looking at?

04 00 53 05 LMP Probably the - may be the landing radar. You see anything?

04 00 53 07 CDR Why, should I see the landing radar?

04 00 53 08 LMP I don't know. Okay, it says we're there. We're Spica. Yeah.

04 00 53 25 CDR There's something right there. It's - it's the rendezvous radar antenna.

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04 00 53 27 LMP Okay.

04 00 53 29 CC Orion, this is Houston. Go LO bit rate.

04 00 53 34 LMP Got it. You have it.

04 00 53 35 CDR Okay, are we in detent 2?

04 00 53 37 LMP Yeah.

04 00 53 38 CDR Yeah.

04 00 53 39 LMP Okay, let's go. Push your breakers in.

04 00 53 41 CDR Okay, I'll give it 30 seconds, Charlie.

04 00 53 56 LMP Okay. It's probably drifting.

04 00 54 03 CDR Okay.

04 00 54 04 LMP Okay, go to SLEW, DOWN. Going out of the way?

04 00 54 10 CDR It ain't moving.

04 00 54 19 LMP It's not moving?

04 00 54 20 CDR Huh-uh.

04 00 54 21 CMP Let me shoot a SLEW. The AOT is not moving?

04 00 54 32 CDR The AOT moves. The thing that I'm looking at ain't moving.

04 00 54 38 LMP Let me see.

04 00 54 39 CDR There you go. Now you got it. You got it. Whoa.

04 00 54 41 LMP Okay, good. I was slewing the wrong way.

04 00 54 42 CDR Okay.

04 00 54 43 LMP Okay. Pull the breakers.

04 00 54 45 CDR Okay.

04 00 54 52 LMP Okay. Now, turn the lights off. You see a star?

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04 00 54 59 CDR Oh, yeah.

04 00 55 00 LMP Okay, Spica.

04 00 55 02 CDR Okay, give me VERB 76, Charlie.

04 00 55 03 LMP Okay, you're in VERB 76. There you go, and you're clear to mark.

04 00 55 36 LMP Two, three. Okay, now you go to the other axis, so that's four. Okay, that was a reject.

04 00 55 46 CDR Yeah.

04 00 55 47 LMP Okay.

04 00 55 57 CDR Okay.

04 00 55 58 LMP PRO. Okay, VERB 21 - -

04 00 56 03 CDR ENTER.

04 00 56 05 LMP - - ENTER; 233 ENTER; PRO. Okay, PRO. Hey, that thing really takes off, doesn't it? (Laughter)

04 00 56 15 CDR Knows what it's doing.

04 00 56 17 LMP Huh? Man, look at that - Oh, there's old Casper out there. Isn't he pretty?

04 00 56 38 LMP Okay.

04 00 56 39 CDR Okay. ENTER, Charlie.

04 00 56 40 LMP You see anything?

04 00 56 42 CDR Oh, yeah.

04 00 56 43 LMP Okay, ENTER, PRO. Go ahead. You got a VERB 76.

04 00 56 50 CDR What is this one?

04 00 56 52 LMP Antares.

04 00 56 53 CDR Oh, yeah. No doubt about it. See the whole bloody constellation.

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04 00 57 04 LMP Okay, that was the Y, right?

04 00 57 05 CDR Yeah, right.

04 00 57 06 LMP Okay.

04 00 57 14 LMP Okay, that's four.

04 00 57 34 LMP One MARK.

04 00 57 35 CDR Okay.

04 00 57 41 LMP Two MARKS.

04 00 57 59 LMP That's it.

04 00 58 00 CDR Okay.

04 00 58 02 LMP PRO, lights up. Super, John. Okay, minus 00005, PRO. Look at that. Okay, Houston, our torquing angles are minus 0.060, plus 1 - 0.139, minus 0.018.

04 00 58 27 CC All right, we could not read you. Would you go DOWN VOICE BACKUP?

04 00 58 36 LMP Okay, you have DOWN VOICE BACKUP. And our angles were - NOUN 93s were minus 060, plus 139, minus 018, and we PROed at 96:58:40.

04 00 58 52 CDR Okay, we can ENTER on that.

04 00 58 58 CC Go AFT omni.

04 00 59 03 CDR Okay, AFT omni.

04 00 59 05 LMP I got AFT omni. Okay, go to closed and AOT LAMP open, John. Okay. And I think we're getting a little close for Ken to do his - do this rendezvous - -

04 00 59 17 CC Okay, perhaps we can read the torquing angles, if you want to give them again.

04 00 59 21 LMP Okay. Torquing angles are minus 0.060, plus 0.139, minus 0.018 at 96:58:40.

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04 00 59 45 CDR The star angle difference is minus four balls 5.

04 00 59 56 LMP They've already got the up-link in.

04 01 00 01 CDR Okay, we ought to get the radar check out of the way.

04 01 00 04 LMP Well, I think Ken is getting ready for a burn at 90 - in 40 minutes. Ask him if he's ready and can support that.

04 01 00 09 CDR We don't need it.

04 01 00 20 CC Okay, we copied your NOUN 05, but we did not get the torquing angles. I hope y'all have written them down.

04 01 00 28 LMP Roger. Minus 0.060, plus 0.139, minus 0.018. Over.

04 01 00 58 LMP Okay, that looks good. That's great.

04 01 01 13 CC Orion, this is Houston. We'd like to get HI bit rate again and some good voice. We'd like you to go back to that attitude which we gave you of pitch of 053 and set in the steerable angles of PITCH, plus 26; and YAW, minus 12.

04 01 01 30 LMP Okay, we're enroute.

04 01 01 32 CC ... delay the landing radar test until we get some good data.

04 01 01 40 CDR Okay.

04 01 01 52 CDR My guess on that landing radar, when you push the circuit breaker in, it's probably working off the ground or something. Maybe not.

04 01 02 04 LMP Could be.

04 01 02 14 CC Go FORWARD omni, Orion.

04 01 02 22 LMP Okay, Jim, you have FORWARD omni. How do you read?

04 01 02 47 CDR Ought to get there in a hurry.

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04 01 02 49 LMP Yeah. You want me to do a VERB 49?

04 01 02 56 CDR No, we're almost there. What a ...

04 01 03 00 LMP Okay, Jim, how do you read FORWARD omni? Over.

04 01 03 09 CC Okay, Orion, let's go back to LO bit rate until we get the steerable.

04 01 03 14 LMP Okay, we're LO bit rate. How do you read now? 053, John.

04 01 03 24 CDR Okay.

04 01 03 41 LMP Okay, we're there. Okay, Jim - okay, Jim, we have you now on the steerable. How do you read? Over.

04 01 03 56 CC I read you loud and clear. You sound beautiful.

04 01 04 01 LMP Okay, the P52 went super. Our torquing angles were minus 0.060, plus 0.139, minus 0.018. We torqued at 96:58:40. Over.

04 01 04 15 CC Roger; copied. On torquing angles, minus 060, plus 0.139, and minus 0.018 at 96:58:40.

04 01 04 30 LMP That's Roger. The AGS checkout has gone well.

04 01 04 36 CC You can go NORMAL voice.

04 01 04 38 LMP Okay. Okay, the AGS checkout has gone well. We're in - the only thing we haven't done is rendezvous radar checkout and we'll get to that as soon as Ken gets through with his burn.

04 01 04 48 CC Roger; we're recommending that rendezvous radar checkout on the backside.

04 01 04 55 LMP All right. Fine.

04 01 04 57 CC And landing radar checkout is the one we want to go through now.

04 01 05 00 LMP Okay.

04 01 05 02 CDR Okay, we're going now. LANDING RADAR, in.

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04 01 05 03 LMP Okay, CB(11), PGNS LANDING RADAR, closed.

04 01 05 07 CDR Closed.

04 01 05 08 LMP Check temp.

04 01 05 09 CDR Go.

04 01 05 10 LMP 60 to 95. Okay, that's a little high.

04 01 05 12 CDR It's been running, Charlie. I've already done it three times. Go.

04 01 05 16 LMP CROSSPOINTER, HI MULT.

04 01 05 17 CDR HI MULT.

04 01 05 18 LMP MODE SELECT, LANDING RADAR.

04 01 05 19 CDR LANDING RADAR.

04 01 05 20 LMP H/H-dot.

04 01 05 21 CDR H/H-dot.

04 01 05 22 LMP LANDING ANTENNA to AUTO.

04 01 05 23 CDR LANDING ANTENNA to AUTO.

04 01 05 24 LMP Okay. RADAR TEST, LANDING.

04 01 05 25 CDR RADAR TEST to LANDING.

04 01 05 26 LMP Power signal is out. Going out, test monitor - okay, that's on the tapemeter.

04 01 05 31 CDR Okay. Okay, it's up and left like it's supposed to be. You reckon it could have - -

04 01 05 39 CC John, when you get to the NOUN 66 and 67 values, we want you to read us the tapemeter values of H and H-dot.

04 01 05 50 LMP It's right on. It was the - -

04 01 05 52 CDR Okay, it's right on, Houston. It's 8000 at 480 off the H-dot.

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04 01 05 58 LMP It was locked on at the ground, I bet you.

04 01 06 02 CDR Yeah. PRO, Charlie. Wait, I'll have to change this - wait until this one changes.

04 01 06 10 LMP Okay.

04 01 06 12 CDR See, there it goes. Okay now, PRO. Okay, minus 495, plus 1860, plus 1331.

04 01 06 20 LMP Right on.

04 01 06 21 CDR Right on. And the tape reader is up and left and it's reading 8000 at 480. I think it was locked on the ground or something when we came over that low pass, due to our communications angle. That may be wrong, but that - you know - it was sure acting funny.

04 01 06 34 CC Okay, it's looking good to us now.

04 01 06 36 CDR Okay, we got 3.2 on the ALTITUDE TRANSMITTER and 345 on the VELOCITY TRANSMITTER; make that 355. Okay, let's terminate this test.

04 01 06 46 LMP Okay, VERB 34.

04 01 06 48 CC Okay, we copy.

04 01 06 53 LMP Hey, Jim, on those drink bags, I tell you, it's pretty hard to see things when you've got a helmet full of orange juice. This zero gravity's something with that orange juice.

04 01 06 55 CDR LANDING RADAR to - -

04 01 07 03 CC Well, you've got to drink fast.

04 01 07 08 LMP You really do. (Laughter)

04 01 07 09 CDR Tell me what to do there, Charlie.

04 01 07 10 LMP Okay. Eleven - LANDING RADAR breaker, open.

04 01 07 11 CDR Okay.

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04 01 07 14 LMP Okay, we're all set. When do we get the 210 up, Jim?

04 01 07 28 CC Okay, acquisition on your next rev.

04 01 07 30 LMP Okay, pitch down just a little bit. We're losing it. Okay, it's coming great - coming back in. Why don't you go to ATT HOLD when you get there. Okay?

04 01 07 51 CDR All right, I will, Charlie. I never thought about that. What a can of worms!

04 01 08 11 LMP Comm can really kill you, can't it?

04 01 08 13 CDR Wipe you right out.

04 01 08 15 LMP Okay, VERB 77. We've got good signal strength.

04 01 08 30 LMP Hey, Jim, we had to turn on our window heaters for about 10 minutes per side to clear up the windows right aft - right before undocking.

04 01 08 38 CC Roger; we copy.

04 01 08 43 CDR Shoot me another slug - slug of water.

04 01 08 44 LMP (Laughter)

04 01 08 47 CDR We've been using the - we've been using the LCG pump to keep cool in here, and it's really neat.

04 01 08 53 CC We copy.

04 01 08 59 CDR We've been needing something to keep cool, I'll tell you.

04 01 09 02 CC Yeah, we understand completely.

04 01 09 16 LMP Jim, your up-link voice is just beautiful in every antenna we got. Over.

04 01 09 26 CC Okay, I guess that's a good data point. Unfortunately, the down-link is very, very noisy.

04 01 09 36 LMP Okay, I wonder what happened on check - the comm checks we did at 55 hours. Of course, it was closer, but it was real good then, I thought.

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04 01 09 48 CDR What do we need to do here, Charlie?

04 01 09 50 LMP Well, we're going to copy and load gyros -

04 01 09 53 CDR No, scrub those things.

04 01 09 55 LMP Yeah, okay. We'll scrub this.

04 01 09 57 CC Okay, we understand it's a completely different situation, Charlie.

04 01 10 06 LMP Okay. If you'll let me get this camera - -

04 01 10 09 CC Your voice is crystal clear right now.

04 01 10 17 CDR Roger.

04 01 10 21 LMP Okay, John, I'm going to set - see what I have to set this thing at. Turn the page a little bit. I think it's 500.

04 01 11 22 LMP John, I think I ought to take this drink bag out of my suit so I won't have a face full of water.

04 01 11 25 CDR Okay.

04 01 11 26 LMP It'll probably all settle out when I'm - -

04 01 11 28 CDR When you get on the Moon.

04 01 11 29 LMP - - when I get on the Moon and once we get some g on us.

04 01 11 30 CDR Yeah.

04 01 11 31 LMP What do you think?

04 01 11 32 CDR Yeah, I think you're right.

04 01 11 33 LMP Take it out?

04 01 11 35 CDR Well, unless it's really - if it's really not bothering you too bad, leave it in there and drink from it.

04 01 11 43 LMP Well, I'll tell you what. I'll be very careful. Wonder if I could cut that microphone off.

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04 01 11 47 CDR No, I wouldn't do it, but why don't you shape it in like this, pull it in like this. There you go. Then if - then if you pull it up.

04 01 11 55 LMP Okay, that's - that's great.

04 01 11 59 CDR See?

04 01 12 01 LMP Yeah, okay.

04 01 12 17 LMP Okay, let me see a pencil and a - give me those gyro torquing numbers, John.

04 01 12 21 CDR Which ones, Charlie?

04 01 12 24 LMP On the time line where we - the P52 you just did. Back over here.

04 01 12 27 CDR Okay.

04 01 12 28 LMP It was 96:58 - -

04 01 12 29 CDR Yeah, 96:58:40.

04 01 12 30 LMP ... 96:59.

04 01 12 31 CDR Yeah.

04 01 12 32 LMP And the previous torque was - -

04 01 12 34 CDR Minus 060?

04 01 12 35 LMP No, wait a minute. When did we do the dock P52?

04 01 12 37 CDR What are you worried about that for?

04 01 12 39 LMP I want to calculate these gyro drift comps. Give me your checklist out of your purse - Wait a minute.

04 01 12 46 CC Orion, this is Houston with some trajectory information for you.

04 01 12 51 CDR That's the activation one, Charlie.

04 01 12 56 LMP Go ahead. Give me yours. I'll put it up for you.

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04 01 12 57 CC Roger. It looks like you'll be coming in about 10,000 high at PDI, John, which will be about 3 to 4 seconds of hover time - -

04 01 13 08 CDR Understand.

04 01 13 10 CC - - and you'll be 17,000 feet south.

04 01 13 14 CDR Okay, does that mean that we're going to be - at pitchover, we'll be steering from south to north?

04 01 13 21 CC ... affirmative.

04 01 13 25 CDR Yeah - Okay, so at pitchover, we'll be - you'll be targeting us right into the target, but we'll be steering from south to north.

04 01 13 33 CDR Is that based on Ken's tracking?

04 01 13 38 CC No, that's not. Negative on that one.

04 01 13 40 LMP How did he get - -

04 01 13 41 CDR Okay.

04 01 13 42 CC But you'll probably be coming straight in by the time you get down to pitchover.

04 01 13 47 CDR Okay, thank you.

04 01 13 49 LMP How did he do on the landmark tracking? Ask him.

04 01 13 51 CDR How did landmark tracking turn out?

04 01 13 56 CC Stand by.

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04 01 14 00 LMP We didn't even use it.

04 01 14 05 CC Okay, the landmark tracking looked very good, John.

04 01 14 10 CDR Okay.

04 01 14 18 CC Orion, will you give us your ED BAT read-out, please?

04 01 14 25 LMP Same as always, 37 volts.

04 01 14 29 CC Very good.

04 01 14 44 LMP Jim, is guidance going to have any gyro drift for us?

04 01 14 47 CC Stand by. Okay, no update on that. And it looks like your - the attitude for PDI is very close to the one that we'd like for the ... - steerable, so we'll try that when you come around at AOS.

04 01 15 17 CDR Okay.

04 01 15 18 LMP Okay. And, Jim, on this P52, it - that radar is - was - had drifted up into the field of view. But it's no sweat just moving it down in slew.

04 01 15 28 CC Okay, we copy.

04 01 15 39 CDR And one other thing that - when we put those state vectors in there, I guess we didn't have any - LM vector in there - and our COMPUTER ACTIVITY light stayed on all the time. I finally figured out what it was and did a VERB 66, got rid of it. I think - -

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04 01 15 55 CC Roger; copy.

04 01 15 57 CDR - - I think that's what it was.

04 01 16 01 CC Everybody's nodding their head down here - affirmative.

04 01 16 11 LMP How you staying down there so good?

04 01 16 17 CDR Charlie, I'm sitting in one g now.

04 01 16 21 LMP You are?

04 01 16 22 CDR Yeah.

04 01 16 23 LMP Why?

04 01 16 25 CDR Because I'm right on the floor.

04 01 16 27 LMP This Velcro just doesn't work. I just come right up off it.

04 01 16 44 LMP Well, John, it was heck (laughter) for a while, but I think we made it.

04 01 16 50 CDR I think we did, Charlie. But I don't understand what we are going to do about this if that pressure keeps climbing up. Do you?

04 01 16 57 LMP No.

04 01 17 00 CDR Can we fly down - -

04 01 17 06 LMP Houston, 16. What appears to be the problem with SYSTEM A? Is it a reg problem or what?

04 01 17 08 CC Yes, that's affirmative, Charlie, a reg problem.

04 01 17 14 LMP Okay, well, we have a - If we use up fuel - just SYSTEM A for descent, is what you want us to do?

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04 01 17 23 CC Stand by. We'll give you an RCS configuration for PDI when y'all come around the corner.

04 01 17 31 CDR Okay. Well, we'll be back.

04 01 17 40 LMP And I'd like somebody to think about this high APS pressure we have during the lunar stay. Over.

04 01 17 50 CC Okay, we're looking at that one, too, John [sic].

04 01 17 54 CDR He doesn't know the difference between you and me. He keeps calling me you and you me.

04 01 17 57 LMP I know it. That's going to bite us right there.

04 01 18 06 CDR That APS pressure? Yeah, we can't do that, can we? Oh, no, you stay for 3 days - -

04 01 18 14 CC Okay, we are noticing an increase in the RCS pressure there, but we have enough ullage volume now to get the - all the propellant out.

04 01 18 25 CDR Understand. Thank you. That means you're going to let it go to the relief valve.

04 01 18 32 LMP I guess so.

04 01 19 04 LMP You want to apologize for our comments on hot mike during that hectic time period?

04 01 19 10 CDR Yeah. If we were on hot mike - -

04 01 19 12 CC Orion, this is Houston. Have you ever noticed any change in your yaw meter?

04 01 19 14 LMP None. Jim, it's stuck on minus 12.

04 01 19 24 CC Okay, and go ahead, John.

04 01 19 26 CDR I think that - If we were on hot mike when we're talking to each other, I want to apologize right now. It's probably pretty interesting. Probably not, if the comm was as bad as you said it was.

04 01 19 48 CC It was good enough for us to understand you.

04 01 19 51 LMP That's what I was afraid of (laughter).

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04 01 19 52 CDR We were afraid of that.

04 01 20 05 CDR ... these things.

04 01 20 08 CC Okay, Orion. If you see that reg pressure creeping up, you can do a small maneuver, which would help the situation.

04 01 20 15 CDR Understand; we'll do that. How much does it have to be?

04 01 20 20 LMP We'll do a VERB 49 to the AGS cal attitude, Jim.

04 01 20 26 CC Okay. And, Orion, we're coming up on about 2 minutes to LOS.

04 01 20 43 LMP You want to answer him, John?

04 01 20 45 CDR Roger; 2 minutes to LOS. See you around for PDI.

04 01 21 18 CC Orion, this is Houston. For your information, the burst disk pressure is 215 to 220 - the RCS.

04 01 21 25 CDR Roger; understand.

04 01 21 30 LMP Jim, is it both systems you see climbing?

04 01 21 35 CDR No, it's just A.

04 01 21 37 CC Just system A.

04 01 21 39 CDR Just system A, right.

04 01 21 49 CDR Let's load that, Charlie.

04 01 21 51 LMP What, the AGS cal?

04 01 21 52 CDR Yeah.

04 01 21 53 LMP Okay - -

04 01 21 58 CDR What's the AGS cal attitude?

04 01 22 01 LMP Okay. 02250, plus 11250, plus 00250.

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04 01 22 20 CDR Okay. And, Jim, I saw the landing site as we passed over it. We're not going to have any trouble recognizing it from the rays. The rays stand out beautifully.

04 01 22 30 CC Very good. Glad to hear it.

04 01 22 47 LMP Here we go.

04 01 22 55 CDR Now, shall we do it?

04 01 22 59 LMP Oh - -

04 01 23 00 CDR Might as well.

04 01 23 03 LMP Going POO and DATA ...

04 01 23 08 CDR Okay, go ahead.

04 01 23 11 LMP Ken, how do you read? Over.

04 01 23 23 CDR Ken, do you read us on VHF? Over.

04 01 23 27 CMP Yes; loud and clear.

04 01 23 29 CDR You fixing to do the burn, right?

04 01 23 32 CMP Sure am.

04 01 23 33 CDR Okay, when you finish the burn, we'd like to get a radar check. I know that sounds a little late, but we'd sure like to do it. We'll do a P76 after you finish your verb - and a VERB 83 and get a radar lock, if that'd be all right.

04 01 23 56 CMP Okay, we'll see how much I have to maneuver to get there.

04 01 23 58 CDR Okay.

04 01 24 01 LMP Here we go. Gosh! This thing take off.

04 01 24 43 CDR Spares no effort.

04 01 24 45 LMP It sure doesn't.

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04 01 24 47 CDR Now, we wait here about 5 minutes; it'll get the rates down so low I can do a VERB 76 and you can do the whole bit.

04 01 24 53 LMP Okay.

04 01 24 54 CDR Look at the - See we got zero rates. Look at the - look what the pitch rate is, 5 degrees down.

04 01 25 03 LMP Mine says the same thing. Okay, 540 read-out: hasn't changed. 541 read-out: that hasn't changed. 542 read-out: that hasn't changed. 544 read-out: hasn't changed. 545 read-out: it's good. 546 read-out: good. It says go ATTITUDE HOLD, going to damp the rates, too, and ENTER on that. VERB 60, a VERB 76, and VERB 1620.

04 01 26 08 CDR I already got enough to do - -

04 01 26 11 LMP ... we go. Okay, 400, and I stopped the DET. ...

04 01 27 46 LMP Okay, I'm going to cycle the CWEA.

04 01 27 50 CDR All right, Charlie, why don't you cycle the CWEA. It had a quad 1 light on when you did it. Remember we did that before once?

04 01 28 01 LMP Quad 1 light? We had a quad 1 light then?

04 01 28 07 CDR A red light - a red flag when you cycled it. It cycled all of them, as a matter of fact - -

04 01 28 10 LMP Ch.

04 01 28 11 CDR - - It reset them all.

04 01 28 13 LMP Yeah.

04 01 28 51 CDR What do you stay in here for? If they don't have the high gain, there won't be no reason - Well, maybe they'll get us on a 250-foot dish. I've lost my glove - No, there they are. Where's yours? You got your gloves somewhere?

04 01 29 05 LMP ...

04 01 29 06 CDR Aren't you smart. What you going to do with your hat?

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04 01 29 10 LMP I don't know. What's it doing down there?

04 01 29 11 CDR Well, you said wash it out, so I left it there.

04 01 29 12 LMP Oh, okay.

04 01 29 21 CDR Ain't the clearest in the world, but it's the clearest I could do, Charlie. Honest.

04 01 29 27 LMP It's terrible.

04 01 29 30 CDR You want to try it yourself? Just doesn't come off.

04 01 29 34 LMP Have you got another - another towel?

04 01 29 40 CDR Have I got another towel? Yeah, there's a whole thing of them over here.

04 01 29 44 LMP Let me wet this one down a little bit.

04 01 30 15 CDR You start a clock backwards?

04 01 30 17 LMP Yeah.

04 01 30 21 CDR Yeah, I ain't done nothing right since I got out of bed this morning.

04 01 31 02 CDR Okay, we're getting - we're getting behind the time line probably - maybe.

04 01 31 05 LMP No, we aren't. We're okay.

04 01 31 06 CDR Okay, nothing we can do here, huh?

04 01 31 09 LMP Can you give me a tissue - try it on the front.

04 01 31 35 LMP That's better [?].

04 01 31 43 CDR Here you go, Charlie.

04 01 31 44 LMP Okay, could you dry it a little bit for me, some more, while I copy the AGS cal numbers. We're through with this.

04 01 32 47 CDR Here you go, Charlie. Where do you want to keep it?

04 01 32 50 LMP Just Velcro it back up here somewhere.

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04 01 32 57 CDR We'll hit pretty hard.

04 01 33 05 LMP Okay, that's great, John.

04 01 33 12 CDR You know where to Velcro it. How about right there?

04 01 33 16 LMP Where?

04 01 33 17 CDR See there?

04 01 33 18 LMP Yeah, that'll be all right. No, I'll - I'll - -

04 01 33 19 CDR Can you get it?

04 01 33 20 LMP - - knock into.

04 01 33 21 CDR Wait a minute.

04 01 33 22 LMP Wait a minute.

04 01 33 23 CDR How about right - there?

04 01 33 25 LMP Yeah, there's a piece.

04 01 33 26 CDR Okay, it won't go anywhere.

04 01 33 28 LMP Okay, here you go. AGS cal is complete.

04 01 33 43 CDR How's that pressure looking? It's up there, isn't it?

04 01 33 49 LMP It's okay.

04 01 34 30 CDR Charlie, this is fun, by golly. (Laughter) It's really - it's really - it's the worse sim I've ever been in.

04 01 34 39 LMP Yeah.

04 01 34 40 CDR It's ...

04 01 34 44 LMP It's really bad, isn't it?

04 01 35 02 CMP Hey, Orion.

04 01 35 03 CDR You speak. Go ahead, Ken.

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04 01 35 11 CMP I have an unstable yaw gimbal number 2. It ... oscillates in - it oscillates in yaw any time it gets excited.

04 01 35 24 CDR Oh, boy.

04 01 35 27 CMP You got any quick ideas?

04 01 35 33 CDR No, I sure don't.

04 01 35 41 LMP What does your rules say, Ken?

04 01 35 43 CMP It says I have to have four servo loops to do circ.

04 01 35 49 LMP It's what?

04 01 35 51 CMP Every time I put number 2 servo on, it's okay until I disturb it and then it starts to oscillate, and you can feel the spacecraft shaking. It's really doing it.

04 01 36 02 CDR Okay. You have to have four loops to do circ, huh?

04 01 36 12 CMP That's what it says. It's unstable in all SCS modes on secondary servo. I can't believe it, but I'm watching it. Every time I select the secondary YAW GIMBAL, any excursion with the thumbwheel causes it go unstable.

04 01 36 41 CDR Okay. Well, just hold what you got then.

04 01 36 45 LMP Hey, Ken, why don't you just stop it and then start it again.

04 01 36 49 CMP I've done that twice.

04 01 36 50 LMP Oh, okay.

04 01 36 54 CDR Well, let us get pointed at you and do a VERB 83.

04 01 37 04 CMP Okay, gang, I'm sure sorry about this, but that number 2 servo is just oscillating like a wild man.

04 01 37 11 CDR Yeah.

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04 01 37 13 CMP And I've tried it both in manual and TVC and in -  
in the - just thumbwheel, and I get the same  
response. It could be a switch here somewhere,  
but - but I swear, I've checked them all - all I  
can. I guess I'll power them down.

04 01 37 32 CDR Yep, and tell the ground when you go around.

04 01 37 36 CMP Okay. Brother, what a way to start the day, huh?

04 01 37 41 CDR Yeah.

04 01 37 46 CMP Do you suppose there is any - Let me try termin-  
ating 509 and see if that would help maybe. No,  
it was in SCS; that shouldn't have any effect. I  
wonder if we got that relay stuck in there some way?

04 01 37 59 CDR The TVC enable relay?

04 01 38 02 CMP Okay, I'm going to try my gimbal drive check anyhow,  
in the G&N.

04 01 38 06 CDR Okay.

04 01 38 33 LMP Okay, John, I'll give you some needles. Follow  
those needles in AGS and point to him.

04 01 38 42 CMP It's no good in TVC either, in the gimbal drive  
check.

04 01 38 47 CDR Okay. Which way do I go? I have to - -

04 01 38 52 CMP I'm going to back out here and power down.

04 01 38 56 LMP Yaw left, pitch down.

04 01 38 59 CDR Okay. Okay, Ken, some - some you win and some you  
lose. I don't see any - -

04 01 39 10 CMP PITCH 1 is OFF. Servos 1 and 2 are off.

04 01 39 17 CDR Roger.

04 01 39 24 CMP I'm back to POO.

04 01 39 31 LMP No, good in - PGNCs won't do it either?

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04 01 39 37 CDR That's why you don't leave the gimbals running for 20 minutes at a clip.

04 01 39 45 CMP Oxidizer coming off. 1, 2's off. And 3.

04 01 40 20 LMP Just lost one gimbal motor, hasn't he?

04 01 40 23 CDR Lost a servo loop in yaw.

04 01 40 28 LMP Hey, Ken, is it both gimbals oscillate like that?

04 01 40 32 CMP Number 2 only. My burn rules say I've got to have 2 sets of servo loop - two in each ... all four servo loops to go.

04 01 40 39 CDR I think that's right, Ken.

04 01 40 41 CMP I'm sorry, gang. I don't know what to do with the darn thing. It's - it does it both when the CMC drives it and when we drive it. I started it, restarted it, and it's - it's apparently really in the servo loop.

04 01 41 02 CDR Instant sunrise.

04 01 41 03 LMP Um-hmm.

04 01 41 13 CDR You get there before we do or do we get there before you do?

04 01 41 18 CMP I don't know. It's probably a very close race since we're in almost the same orbit. In fact, I guess the next thing you got to do is make sure we don't hit.

04 01 41 26 CDR I'll work on that.

04 01 41 29 CMP Okay.

04 01 42 15 LMP Get a little roll in there, John. I guess - you're coming around okay, though. Roll doesn't really matter.

04 01 42 28 CDR Oh, terrible!

04 01 42 52 CDR Where is it, Charlie?

04 01 42 54 LMP We've got to pitch down.

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04 01 43 03 CDR When's AOS?

04 01 43 05 LMP We've got a little bit to go yet.

04 01 43 39 LMP There he is.

04 01 43 40 CDR You got it?

04 01 43 41 LMP Yeah.

04 01 43 43 CDR How - -

04 01 43 44 CMP I show us at 0.8 miles and 0.8 of a foot per second.

04 01 43 53 CDR You got a lockup?

04 01 43 55 LMP We've got a visual on you.

04 01 43 56 CMP You have?

04 01 43 58 LMP Yes, sir.

04 01 43 59 CMP Okay.

04 01 44 03 LMP See him, John?

04 01 44 04 CDR Yeah.

04 01 44 07 LMP What's that flashing?

04 01 44 10 CDR He's firing thrusters.

04 01 44 11 LMP Oh.

04 01 44 12 CDR His beacon is on.

04 01 44 14 CMP Which way am I pointing compared to you? I should be about 180 degrees away from you, huh?

04 01 44 22 LMP All we can - -

04 01 44 24 CDR There's no way to tell, T. K.

04 01 44 26 CMP Oh, okay. I thought you could see more than that.

04 01 44 31 LMP All we see is your thruster firing.

04 01 44 38 CMP Okay, I've got my rendezvous lights on.

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04 01 45 13 LMP I just don't believe it.

04 01 45 17 CDR We must have done something wrong.

04 01 45 29 CDR Okay, Ken, we're going to lock up the radar on you.

04 01 45 32 CMP Okay, I'm probably going to have to maneuver so you can get a transponder. I doubt that you can get a - a lockup where I am now. Be with you in just a minute.

04 01 45 40 CDR Well, we'll give her a go anyway. You're not very far away. We'll see.

04 01 45 50 LMP Okay, GUIDANCE CONTROL, PGNS.

04 01 45 52 CDR We're there?

04 01 45 54 LMP AC BUS A, RENDEZVOUS RADAR, closed.

04 01 46 00 CDR It's closed. Thirty seconds, Charlie.

04 01 46 20 LMP Okay. SLEW for a manual lock on his ... We're probably going to have to pitch up a little bit.

04 01 46 43 CDR We're only 3 degrees away from him.

04 01 46 49 LMP He just disappeared out the top of my window.

04 01 46 53 CDR I got him.

04 01 46 57 LMP Ch, yeah, there he is.

04 01 47 16 LMP No signal strength yet.

04 01 47 18 CDR Okay, Ken, we must be out of your field of view.

04 01 47 24 CMP Okay. I don't want to call P20 with this - I'm not sure how it reacts with all this other stuff. So I'm trying another way of finding you. I'm going to start a little pitch around and I think I'll pick you up.

04 01 47 34 CDR Well, turn on the tracking light, Charlie. ...

04 01 47 36 LMP Okay.

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04 01 47 53 CDR I knew what the transformation error was.

04 01 49 03 CDR Why isn't it moving? Oh, no.

04 01 49 13 LMP You're in AUTO TRACK.

04 01 49 41 CDR What time do we get AOS?

04 01 49 47 LMP At about 98:08.

04 01 49 49 CDR Okay, I want to be in the right attitude when we get there.

04 01 50 03 CDR You got the sunrise?

04 01 50 05 LMP Looks like it.

04 01 50 09 CDR Okay, Ken, we've had sunrise, and the Sun is behind us. I guess that's the best cue.

04 01 50 15 CMP ... star. I bet that's you.

04 01 50 17 CDR Yeah.

04 01 50 19 CMP I'm almost pointing at you, if that's the case. I don't - That couldn't be. That must be a planet.

04 01 50 26 LMP We got our tracking light on.

04 01 50 35 CDR You ought to be right in the sunrise.

04 01 50 39 CMP Well, I guess you're just a little ahead of me, so you may get AOS first.

04 01 51 18 CDR Is your transponder working?

04 01 51 21 CMP Well, it's checked okay.

04 01 51 23 CDR Okay.

04 01 51 24 CMP I don't show anything on the AGC yet. Power's on. It should work.

04 01 52 08 CDR Want to transfer some more of it to the RCS?

04 01 52 11 LMP Well, we're right on the limit there. ... firing it.

04 01 52 17 CMP You're looking down-Sun at me, right?

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04 01 52 19 CDR Yep.

04 01 52 28 CMP Say there, John, you're looking down-Sun at me?

04 01 52 29 CDR That's affirmative.

04 01 52 31 CMP Okay. I'm coming into the Sun, so I guess I must be coming close.

04 01 53 10 CDR SLEW in LOW, RIGHT?

04 01 53 11 LMP Yeah.

04 01 53 13 CDR We're pointed right at you, Ken.

04 01 53 16 CMP Okay.

04 01 53 27 CMP I'm passing through the Sun right now.

04 01 53 45 CDR That radar.

04 01 54 17 CDR You ought to be looking right at us.

04 01 54 19 CMP Well, what I'm looking at right now is the Sun.

04 01 54 25 CDR That ought to be us.

04 01 54 28 CMP Can you see my attitude yet?

04 01 54 30 CDR No, I can't - I can't see you at all. All I see is the light.

04 01 54 35 CMP Okay. ... you can turn it on, you can turn it off ...

04 01 54 39 CDR Okay.

04 01 54 40 CMP Maybe I can figure out some way to make it useful yet.

04 01 54 41 LMP There you go.

04 01 54 42 CDR Okay, we got signal strength.

04 01 54 49 CMP Roger. I show you locking up.

04 01 54 57 CDR Okay, go ahead and go to AUTO TRACK, Charlie.

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04 01 54 58 LMP Okay.

04 01 55 32 CDR Down and to the - down and to the left, Charlie.  
Three degrees down and right in the middle.

04 01 55 40 LMP Okay, we've got it. That's what the needles say.

04 01 55 42 CDR Okay. Okay.

04 01 55 44 LMP Okay.

04 01 55 47 CDR All right. All right, we've got it.

04 01 55 50 LMP The tapemeter running ... we'll go to LGC, VERB 63.

04 01 55 54 CDR Okay.

04 01 55 55 LMP Wait a minute. ... all this.

04 01 56 07 CDR Okay.

04 01 56 12 LMP ... firing it, John.

04 01 56 15 CDR Okay, we'll let's - let's do this and get out of  
here - -

04 01 56 16 LMP I'm doing it.

04 01 56 17 CDR - - 82 and 46.

04 01 56 18 LMP Okay. I got to wait until it locks up.

04 01 56 19 CDR It's locked up.

04 01 56 20 LMP It ain't.

04 01 56 28 CDR Well, it ain't never going to with me firing these  
jets like this - and not looking at him.

04 01 56 53 CMP Does it look like I'm a little on the top of you,  
John?

04 01 56 56 LMP Yeah.

04 01 56 58 CDR Yeah, I believe so. Sure does.

04 01 57 00 LMP Yeah, you are. Keep pitching, John.

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04 01 57 04 CDR Which way?

04 01 57 05 LMP Up, he's going up.

04 01 57 09 CDR He's going up. He's going down underneath us.

04 01 57 15 LMP That's right, that's right. He should go down underneath us.

04 01 57 27 CDR Okay, you got to PRO on that.

04 01 57 31 LMP It ain't locked up, John.

04 01 57 47 LMP He's off to the left.

04 01 57 59 LMP There was the rendezvous radar light.

04 01 58 02 CDR Huh? Yeah, it's locked - he's locked up. Good enough.

04 01 58 06 LMP The light is not out. It is not locked up unless the light goes out.

04 01 58 10 CDR Okay, but I want to get the PDI attitude.

04 01 58 13 LMP Well, let's go to PDI and forego this.

04 01 58 15 CDR Okay, we're terminating this rendezvous radar test, Ken. We're going to go to PDI attitude. Let's do a VERB 49 to that one.

04 01 58 20 LMP No, it won't work until after you PRO at ... until you get a VERB - -

04 01 58 24 CMP I still don't have a visual on you yet, John.

04 01 58 28 CDR Okay. Well, we're out in front of you and we're - -

04 01 58 35 CMP In front?

04 01 58 36 CDR That's affirmative. We're ahead of you. No, dadgummit.

04 01 58 42 CMP I don't see how that could be.

04 01 58 46 CDR Well, we're - we're upside down and the Sun is over our shoulder and we're looking back at you, and I promise that's the case.

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04 01 59 00 CMP I guess my nav system isn't very good.

04 01 59 03 LMP Okay, Ken, let's just forget this. I think you went down below us, and - we're going to PDI attitude, and why don't you go to your comm attitude.

04 01 59 12 CMP Okay, what I'm trying to do is to keep from hitting you. I'd like to get a visual on you.

04 01 59 22 CDR Well.

04 01 59 34 LMP Why don't you just do a pitch - getting on the belly band and do a pitch around, John.

04 01 59 41 CDR ... let's ... those breakers.

04 01 59 43 LMP He should be below us. We've passed undocking.

04 01 59 46 CDR Yeah.

04 01 59 59 LMP I'll load this.

04 02 00 00 CDR Yeah, load the PDI attitude.

04 02 00 14 CMP My computer display shows that you're - that you're behind me.

04 02 01 07 CDR Okay. Well, there for a while, Ken, we were locked up.

04 02 01 11 CMP ... against the sky or the ground, or did you?

04 02 01 13 CDR You're against the sky about 5 degrees up - 6 degrees up.

04 02 01 18 CMP Okay.

04 02 01 48 CDR Hear the algorithm test?

04 02 01 50 LMP Yeah, that's what I'm doing.

04 02 01 56 CMP I've got you. You were behind me.

04 02 02 02 CDR We are, huh? The Sun's coming over our shoulder, that's all I know.

04 02 02 09 CMP Well, I guess behind is kind of relative.

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04 02 02 13 CDR I think you're right.

04 02 02 16 LMP The clock counts backwards. Well, there you go.

04 02 02 38 LMP Let's go to PDI attitude then.

04 02 02 41 CDR That's where we're going.

04 02 02 42 LMP Okay. Do you want to PRO - we can PRO on this - do an auto maneuver.

04 02 02 49 CDR We're there, Charlie.

04 02 03 03 CDR All we got to do is keep the reg light off, right?

04 02 03 05 LMP Yeah. You can move the COAS to the overhead window.

04 02 03 12 CDR Okay.

04 02 03 21 LMP I know they're not going to let us do PDI, though.

04 02 03 23 CDR Huh?

04 02 03 24 LMP They're not going to let us do it on this rev.

04 02 03 25 CDR Yep, that's right.

04 02 03 33 CMP Looks to me like we're opening again.

04 02 03 37 LMP There you are.

04 02 03 38 CMP I guess we must have passed our one rev.

04 02 03 39 CDR Got it?

04 02 03 41 LMP Yeah, there he is, right out there.

04 02 03 44 CDR How far away?

04 02 03 45 LMP Just yaw right and you got him.

04 02 03 49 CMP Do you still have comm, Orion?

04 02 03 51 CDR Yeah, we do.

04 02 03 52 LMP Roger; we have a visual on you.

04 02 03 53 CMP ... or just let it drift?

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04 02 03 58 CDR Say again.

04 02 04 01 CMP Would you rather I stationkeep or just let it drift?

04 02 04 07 CDR I wouldn't worry about it right now, Ken; we got to get ahold of the ground and see what they want to do.

04 02 04 12 CMP I was just wondering if I'd be in a better posture if I kept stationary. That might make the abort situation on the PDI-2 better. ... ago and one gimbal, we've got it made.

04 02 04 22 CDR We'll see what they say.

04 02 04 30 CMP I guess we aren't going to be that far apart that it'll mess up your ...

04 02 04 37 CDR I don't think so.

04 02 04 41 CMP What time are you supposed to get LO - get AOS?

04 02 04 46 LMP Tell him 98:10.

04 02 04 50 CDR 98:10.

04 02 04 56 CMP Okay.

04 02 04 59 CDR Where is he?

04 02 05 00 LMP Okay; let's start - let's go through this - -

04 02 05 02 CDR Okay.

04 02 05 03 LMP - - We don't have our helmets and gloves on, I guess there's no need to do that.

04 02 05 05 CDR No. VHF ANTENNA, FORWARD.

04 02 05 07 LMP Okay; I got that.

04 02 05 08 CDR CB(11) INVERTER 1, close.

04 02 05 11 LMP Closed.

04 02 05 13 CDR Select to INVERTER 1.

04 02 05 15 LMP Okay, STAB/CONTROL - You want to go through this?

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04 02 05 18 CDR Yeah, man.

04 02 05 20 LMP Okay, STAB/CONTROL (11) AELD, close.

04 02 05 21 CDR Go.

04 02 05 23 LMP Okay. STAB/CONTROL ABORT STAGE, close.

04 02 05 25 CDR Go.

04 02 05 26 LMP Reset engine stop.

04 02 05 27 CDR Engine stop is reset.

04 02 05 29 LMP Set window bars.

04 02 05 31 CDR Set the crash bars.

04 02 05 34 CDR Oh, you!

04 02 05 38 LMP Okay. I'll put the BATS - BATS on.

04 02 05 43 CDR I see why you taped yours down.

04 02 05 46 LMP Yeah.

04 02 06 03 LMP Put your attitude monitor on PGNS, John.

04 02 06 08 CDR Is that - is that the angle that you put them in, Charlie?

04 02 06 11 LMP Those angles, I can't load them - I don't know - Those things have nothing to do with the FDAI.

04 02 06 13 CDR Okay; let me load it.

04 02 06 19 LMP It ain't going to work. You can't read off of that and load NOUN 22 and have it go to that attitude.

04 02 06 31 CDR Yeah, you're right. Well, what was the old nominal PDI attitude? That's close enough.

04 02 06 38 LMP Well, if you call VERB 63 - -

04 02 06 40 CDR No.

04 02 06 41 LMP Okay; just maneuver to 114 PITCH.

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04 02 06 43 CDR 114.

04 02 06 58 LMP 002.

04 02 07 00 CDR 002 ROLL.

04 02 07 04 LMP And 340 YAW.

04 02 07 06 CDR 340 YAW.

04 02 07 46 LMP Well, I'll tell you what. I'm going to turn off these ascent batteries. We don't need those. They ain't going to let us go.

04 02 08 32 CDR Okay.

04 02 08 34 LMP Okay.

04 02 08 42 CDR You got it?

04 02 08 44 LMP Got what?

04 02 08 45 CDR See Ken out there?

04 02 08 46 LMP Yeah, I see Ken.

04 02 08 47 CDR Where is he?

04 02 08 52 CDR Yeah.

04 02 09 02 LMP Is it just - is it just an SCS where the servo loop is out?

04 02 09 07 CDR Yeah, it's in both systems. The G&N won't do it either, Charlie.

04 02 09 12 LMP Hey, Ken, the G&N won't do the gimbal drive right either?

04 02 09 14 CMP No, sir. It goes unstable too.

04 02 09 18 LMP Oh.

04 02 09 19 CMP It's an honest-to-god instability in the servo loop.

04 02 09 32 CDR What should we acquire them on here? Should be - we should be getting them now, Charlie. 98:10.

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04 02 09 39 LMP Well, the Earth's - ain't come up yet.

04 02 09 41 CDR Okay. Let me see the Timeline Book.

04 02 09 45 LMP There you go.

04 02 09 50 CDR Okay. Reset the window bars; AELD, close. THROTTLE CONTROL to AUTO and CDR. That's GO. THROTTLE is MIN.

04 02 10 00 CMP It turns out I got a switch out of place over here. I don't know whether something could come of that, but I'm pretty convinced that it's got to be a hardware-type problem.

04 02 10 12 CDR Yeah, I don't - I don't think a switch can do that to you.

04 02 10 17 CMP I don't think so. I'd like to find the switch right now.

04 02 10 21 CDR Did you try both sets of AC 1 and AC 2 on it?

04 02 10 22 CMP Yes, sir.

04 02 10 24 CDR Yeah, I figured.

04 02 10 38 LMP There it comes. Okay, Ken, we're getting earthrise.

04 02 10 49 CMP Okay; I got my HIGH GAIN set AUTO.

04 02 11 14 CDR Okay; they're locking up on me.

04 02 11 17 CMP Hello, Houston. This is Casper bar [?] now. We did not get a circ. And I'd like to talk about the TVC servo loops.

04 02 11 33 CMP That's affirmative. Presently about a mile ahead of the LM. And, I'd like to talk about a TVC servo loop problem.

04 02 11 54 LMP Okay; yaw around to - yaw to zero.

04 02 11 56 CMP ... tell me as soon as you get ready to - -

04 02 11 58 CDR Yaw - yaw what?

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04 02 12 00 CMP -- dump the DSE so you can take a look at what I'm talking about. And I'll leave you in --

04 02 12 04 LMP Yaw right a little bit.

04 02 12 06 CMP -- MANUAL and WIDE until you do. Okay, the text is that we came up to the burn time and I was going through the --

04 02 12 11 CDR Why?

04 02 12 13 LMP So we can get a better -- better lock on them.

04 02 12 15 CMP ... checked out. I switched to --

04 02 12 18 CDR Loud and clear.

04 02 12 20 CMP -- ... the THC to perform the secondary gimbal check ... normal. I set the pitch trim normally, I went to set the yaw trim; and ... that the trim would not work and I got divergent oscillations on the yaw trim indicator, and you can feel them in the spacecraft. So, I switched to the --

04 02 12 44 CDR Hey, Ken, go off VHF, please.

04 02 12 45 CMP -- the number --

04 02 12 46 LMP All we got to do is --

04 02 12 47 CDR Huh?

04 02 12 49 LMP Turn yours off, man.

04 02 12 51 CDR Huh?

04 02 12 52 LMP Turn it off over there.

04 02 12 56 LMP Houston, Orion. Over.

04 02 13 00 CC Orion, this is Houston. Read you rather weak. How do you read us?

04 02 13 05 LMP Roger. You're 5 by. The command module did not do circ. And we're standing by to -- for y'all's decision with him. Over.

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Day 5

04 02 13 17 CC We understand you're standing by. We want you to stay with the omni, and we'll be requesting high bit rate shortly.

04 02 13 24 LMP Roger. Did you copy? No circ.

04 02 13 28 CC We're ready for high bit rate now. Copied no circ.

04 02 13 32 CDR Okay; you have high bit rate. You hear that noise?

04 02 13 37 CC Okay; I anticipate a waveoff for this one. I'll set you up for the next one.

04 02 13 41 CDR Okay.

04 02 13 46 LMP Yeah, what is that noise? Huh?

04 02 13 50 CDR I don't know either. ENGINE ARM, OFF, MASTER ARM, OFF, POO, LANDING RADAR is off, ASCENT BATS, OFF.

04 02 13 57 LMP They are.

04 02 13 58 CDR PROPELLANT QUANTITY MONITOR, OFF.

04 02 13 59 LMP It is.

04 02 14 00 CDR We never turned it on. AUDIO to PTT.

04 02 14 03 LMP It is.

04 02 14 04 CDR ECS to CABIN mode.

04 02 14 05 LMP It is.

04 02 14 06 CDR Helmet and gloves off, AGS to ATT HOLD.

04 02 14 08 LMP It is.

04 02 14 09 CDR Align IMU, P52, same stars.

04 02 14 19 CDR Okay. And Ken is right out in front of us. Maybe about 600 feet.

04 02 14 25 CMP How about if I just give you the high gain from right here?

04 02 14 27 CDR So we have a visual on him.

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04 02 14 31 CC Okay; we copy.

04 02 14 33 CDR What attitude you want us to go to for best - -

04 02 14 38 LMP I think you can stop it right now.

04 02 14 40 CDR I'm -

04 02 14 43 CC Stay right where you are, John. Your comm - comm's really good.

04 02 14 46 CDR Okay.

04 02 14 51 CC Orion, will you confirm FORWARD omni?

04 02 14 55 CDR Roger. That's what you have, FORWARD omni.

04 02 15 29 CMP Okay; I've got you a solid lock on the high gain.

04 02 15 40 CMP I prefer this attitude, Hank, because I can keep the LM in sight.

04 02 15 52 CDR Let's try that rendezvous radar lockup again, Charlie.

04 02 15 55 LMP Okay.

04 02 15 57 CDR I don't understand why it didn't work. Do you?

04 02 15 58 LMP No.

04 02 16 02 CMP That's affirmative. Servo loop number 2, yaw only.

04 02 16 13 CMP That's affirmative.

04 02 16 18 LMP It's good, John.

04 02 16 21 CDR It got him, hadn't it?

04 02 16 22 LMP Yeah. Go AUTO TRACK.

04 02 16 30 CMP No, sir. No, sir. Primary loop checked out normally. Secondary loop never checked out in yaw servo. The motor started normally, and it's - Go ahead, Hank.

04 02 16 56 CMP That's affirmative. And I tried both AUTO and RATE COMMAND in SCS.

**CONFIDENTIAL**

Day 5

04 02 17 00 CC Orion, this is Houston. We would like you to go back to normal RCS configuration.

04 02 17 07 CDR Roger. Normal RCS config, Charlie; whatever that means.

04 02 17 14 LMP Jim, be advised we had a couple of RCS REG A lights on the back side, and by blipping the system, it - went out.

04 02 17 27 CMP That's affirmative.

04 02 17 30 LMP I think he's probably just about out of mode - mode 1 limits, John.

04 02 17 33 CDR Yeah, I think that's what it is.

04 02 17 34 CC We copied, Charlie.

04 02 17 49 CDR Well, the heck with it.

04 02 17 51 LMP Wait a minute. Let me park the antenna where it should be.

04 02 17 57 CDR Plus all balls? No, you - there you go, plus.

04 02 18 25 CDR Okay.

04 02 18 26 LMP Let me pull the breakers.

04 02 19 12 CDR Houston, How do you read? Over.

04 02 19 19 CMP Okay; I'm prepared to do that right now if you're ready.

04 02 19 20 CC Read you loud and clear.

04 02 19 22 CDR Okay. I don't think we're going to have - a - a - a - a - a - a remeeting problem here. But we're pointed right at him, and as I look at him on my LPD - Ken is out at 46 degrees at about - oh, I'd say 8 - 800 or 900 feet, maybe a thousand.

04 02 19 57 CC Roger. Can you see those booms that had the problem?

04 02 20 01 LMP They're all retracted. Everything's retracted.

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04 02 20 05 CDR Everything's retracted in the SIM bay.

04 02 20 11 CC Okay. We copy.

04 02 20 12 CMP Okay. I'm bringing the bus ties on.

04 02 20 29 CMP Okay. And servo powers 1 and 2 are on in the loop configuration. Are you ready for me to start the gimbals?

04 02 20 50 CMP Okay. Here comes - You just wanted to look at the yaw. Here comes YAW number 2. There it is, and it's oscillating now, and it's damped out, and that's in AUTO. I'll switch it to number 2, and number 2 in AUTO. I'm now going to move the thumbwheels, and it - well, now it's - there it goes - now it's oscillating and divergent, and I'm turning the gimbals off. Okay; YAW GIMBAL number 2 is off. I'll hold this configuration.

04 02 23 12 CDR There's nothing we can do, Charlie. You think?

04 02 23 18 LMP Up to them. Let's see the book.

04 02 24 26 CDR You want - you say you want to go ahead and try it without - without the - without the loops? What do you think?

04 02 24 31 LMP I don't think they do. I bet you they don't.

04 02 26 13 CDR You never can tell, Charlie.

04 02 26 15 LMP What?

04 02 26 16 CDR What they'll do. Sock, me a little water.

04 02 26 24 LMP Okay.

04 02 26 34 CDR That's fine. Thank you.

04 02 27 19 LMP Houston, 16.

04 02 27 24 CC Go ahead, 16.

04 02 27 26 LMP Roger, Jim. You guys working on some more pads and stuff for us?

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04 02 27 32 CC Oh, yeah; we are, Charlie. And when you get a chance we'll take your AGS cal, if you have those.

04 02 27 39 LMP Yeah, sure do. Stand by.

04 02 27 42 CDR We'd like to pitch down to keep Ken in sight. Is that possible?

04 02 27 49 CC Okay. You're - you're cleared.

04 02 27 54 LMP Okay. Starting with 540, minus 008, plus 001, plus 002, plus 006, plus 05 - correction, plus 045, minus 088. And the initial numbers were the same as on the Data Card Book.

04 02 28 17 CC Okay. Beginning - Here's the readback. Beginning at 540, minus 008, plus 001, plus 002, plus 006, plus 045, minus 088; and the initial values were the same as on the cards. Over.

04 02 28 32 LMP That's affirmative.

04 02 28 38 CC Okay. And on your - on the RCS situation, we suspect that the - the burst disk went back side. We'd like to make sure of the system A pressure. When the source pressure in system A gets down to 500 psi, we'd like you to close off system A. Over.

04 02 28 56 CDR Roger. What is it now, Jim?

04 02 29 04 LMP When you say in source pressure, you mean helium?

04 02 29 11 CC Affirmative.

04 02 29 13 LMP Okay, Jim, the helium is holding right up there. It's 2400 and that was where it was before we started getting those RCS lights. The pressure never has gone above about 205, 210 maybe.

04 02 29 27 CC Okay. We copy.

04 02 29 42 LMP But it's RCS problem. The comm problem.

04 02 29 46 CDR The radar problem.

04 02 29 48 LMP/CDR And the gimbal problem.

04 02 29 58 CDR They're liable to shoot us down on numbers alone.

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Day 5

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04 02 30 00 LMP Yeah.

04 02 30 04 CDR Man, I'm ready. I'm ready to go down and land.  
I think that'd really be neat.

04 02 30 47 LMP I bet we dock and come home in about 3 hours.

04 02 31 55 LMP Jim, give me a call when you want us to go to AFT  
omni.

04 02 32 02 CC Yeah, we sure will, Charlie.

04 02 32 13 LMP And have you got a - LOS time for us?

04 02 32 39 CDR 300 hours in the pressure suit.

TIME SKIP

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Day 5

04 03 22 56 CMP ... do you have any problems that are ...?

04 03 23 02 LMP We got a RCS problem, but it's not too bad. And, otherwise, we're okay. We can't get our steerable antenna up.

04 03 23 21 CMP You don't need that one up, do you?

04 03 23 22 LMP No.

04 03 23 23 CMP Can you land on omni?

04 03 23 25 LMP Yeah, we can land on omni. How does that thing look to you, Ken? It it unstable everywhere?

04 03 23 30 CMP Yes, sir. There's no question about it. I - Any - any force at all that moves it up makes it go unstable. Looks like that ... movement ...

04 03 23 41 LMP Is that main B? Is it run off main B?

04 03 23 45 CMP Yeah, but I don't think there's a - It's not likely ..., I wouldn't think. They - they told me after ... that they went back and looked at the ... all the heaters ...

04 03 24 00 LMP Ah so. Well, I never did think it was a good idea to run those gimbal motors that long.

04 03 24 14 CMP Well, I guess they're having some of those kind of thoughts right now, too.

04 03 24 19 LMP Yeah. Those once in a million problems like that coarse align, and everybody gets boresighted on it.

04 03 24 31 CMP Well, I guess we'll be ready to ... .. one of those guys ... through it here ... Maybe ... into position, then the next turn on ..., they could ... probably pretty good by using - just using the proper trim to start the burn.

04 03 24 59 LMP Yeah.

04 03 25 02 CMP Then if you did encounter the - external pressures not moving them, then I don't know what you do. ... think we could use it in ACCEL COMMAND with - just set the proper trim. And if you needed it, go to SCS and ACCEL COMMAND - orbit the right direction.

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Day 5

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04 03 26 18 CDR ... that pulse. ...

04 03 26 25 CDR You sleeping?

04 03 26 27 LMP Was I sleeping? I was almost asleep.

04 03 26 37 CDR I bet my bride is beside herself.

04 03 26 41 LMP Yeah.

04 03 27 12 LMP Well, we'll be two revs late, but we'll do it.

04 03 27 16 CDR I hope you're right.

04 03 27 28 CDR We ain't gonna do any EVA today, either.

04 03 27 30 LMP You don't want to?

04 03 27 32 CDR Not for two revs, Charlie. Let's do it tomorrow and do the full thing.

04 03 27 54 CDR What's it do, bend?

04 03 27 59 LMP Probably the first dish, yeah.

04 03 28 34 LMP He's dropping down out the bottom of the window.

04 03 28 54 CMP We're now passing ... through Scorpio.

04 03 28 58 CDR Yep.

04 03 29 00 CMP I found out that, looking out the window out there, that the - we'd be able to see it a lot better. And I guess with the telescope that they've got that ...

04 03 29 40 CMP What's the limitation of how long you can stay before you can't go down?

04 03 29 45 CDR Five revs.

04 03 29 47 CMP No, I mean, what's the limiting factor? Is it water?

04 03 29 50 CDR No. We got plenty of water.

04 03 29 52 LMP We could - we can land and just do a couple of EVAs.

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04 03 29 57 CMP I was just wondering what - how they turned up with five revs. Is it - is it water, or what - what's the ...?

04 03 30 02 CDR Got no idea.

04 03 30 03 LMP I don't know.

04 03 30 13 LMP Light still on?

04 03 30 16 CDR Yeah, ours is.

04 03 30 18 LMP No, I mean the RCS light.

04 03 30 26 CDR What's the pressure?

04 03 30 29 LMP It's 210.

04 03 30 47 LMP I think we got enough ullage in there, in the tanks to -

04 03 30 55 CDR Just let it go? It's not firing anymore?

04 03 31 02 LMP Well, I don't know.

04 03 31 13 LMP I don't think we ought to fire anymore.

04 03 31 33 LMP It's probably that thermal blanket blew off and caused this thing to overpressurize.

04 03 31 39 CDR Probably right, Charlie.

04 03 31 43 LMP But the temps are good.

04 03 33 21 LMP Is that sunrise?

04 03 33 27 CDR Yep.

04 03 33 30 CMP Did you say you had sunrise, Charlie?

04 03 33 32 LMP It's coming up. We can see it glowing beyond the horizon.

04 03 33 36 CDR It's going to be instant sunrise, you know.

04 03 33 40 CMP Too dark. ... dark as ever.

**CONFIDENTIAL**

**[REDACTED]**

04 03 33 46 LMP It's behind you, Ken.

04 03 33 48 CDR Yeah, it's behind you, boy. When it comes up, we won't be able to see you anymore.

04 03 33 53 CMP Okay. I've got you boresighted.

04 03 33 56 CDR Okay.

04 03 34 16 CDR Be kind of hard to get a radar lock. Oh, no. The Sun'll be up long before it.

04 03 35 24 LMP Yeow!

04 03 35 25 CMP ...

04 03 35 31 CDR (Whistle) It was long before we got there though that we saw it, right?

04 03 35 37 LMP Right. Yeah.

04 03 35 38 CDR Do you reckon light bends?

04 03 35 40 LMP Huh?

04 03 35 41 CDR Reckon the light bends?

04 03 35 44 CMP ... you're looking great.

04 03 35 48 CDR Where'd my glove go?

04 03 37 40 CDR We were GO for PDI there for a while.

04 03 37 43 LMP Yeah.

04 03 37 46 CDR I can't - I can't believe it. I can't believe it (laughter). We'd had no trouble at all picking up the site either.

04 03 37 54 LMP I know; it's beautiful. I guess you can't win them all.

04 03 38 10 CDR I'm not getting any cooling at all, Charlie. Are you?

04 03 38 13 LMP Cooling?

04 03 38 14 CDR Yeah.

**[REDACTED]**

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04 03 38 15 LMP A little bit out of the suit. Not much.

04 03 38 22 CDR Why don't you go to LGC on a - for a second or two?

04 03 38 42 CDR Okay.

04 03 39 13 CDR Charlie, we ought to have an eat period is what we ought to do. You ain't hungry?

04 03 39 20 LMP No.

04 03 39 22 CDR How about something to drink, or something like that?

04 03 39 24 LMP Back there in the food locker.

04 03 39 36 LMP I don't want anything, really.

04 03 39 38 CDR You don't? Okay.

04 03 39 42 LMP Unless they got a sandwich or something back there. I'll eat that.

04 03 39 49 CDR All they got is those drinks, Charlie. Those orange drinks.

04 03 39 57 LMP Wait a minute. Open the top, John.

04 03 40 01 CDR I don't want to get too close to the hatch.

04 03 40 04 LMP Ain't nothing wrong with the hatch. It's okay.

04 03 40 15 LMP Those two on the left come open.

04 03 40 18 CDR Yeah, I know it, if I can get to them.

04 03 40 38 CDR See. Those orange drinks.

04 03 40 50 LMP That's all that's in there, is orange drinks?

04 03 40 52 CDR Well, there's some stuff behind it, but I can't get at it. I'm not - I just can't. I - I could reach it with the moving the orange drinks, but if I do, I don't know what I'm gonna do with them.

04 03 41 06 LMP Put them in the Flight Data File up here. There's plenty of room up here.

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[REDACTED]

04 03 41 47 LMP Oh, oh. Excuse me.

04 03 41 48 CDR Son of a gun, I keep - I keep getting them things.

04 03 41 58 CDR In this one?

04 03 41 59 LMP Yeah. Either one.

04 03 42 03 CDR Don't think there is plenty of room in there. No, there ain't.

04 03 42 19 CDR Man, there is more pieces of metal around this spacecraft! You want a food stick?

04 03 42 28 LMP It won't go in there?

04 03 42 31 CDR Might if I fold them in half.

04 03 42 32 LMP Stick them into the ISA then.

04 03 42 41 CDR There we go.

04 03 42 51 CDR I'd hate for any of that stuff to get loose in zero gravity. It would be a mess.

04 03 43 07 CDR Charlie, you got me almost to PDI there.

04 03 43 11 LMP Well, I tried hard.

04 03 43 12 CDR You did good.

04 03 43 18 LMP But if the gear don't work. Well, maybe they'll come up with something.

04 03 43 27 CDR How about a food stick? Can I have a food stick, Charlie?

04 03 43 30 LMP Sure.

04 03 43 59 CDR Don't know where he is now.

04 03 44 01 LMP Probably down below him. Below us, rather. Hey, Ken, they want you to rendezvous at 100 hours, wherever that is.

04 03 44 11 CMP Yeah, I thought they said that was our closest point of approach, and it sure doesn't look to me

[REDACTED]

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like it's going to make it. Looks like we passed it back there about 20 minutes ago.

04 03 44 19 LMP Yeah, I - I agree with you. They want you to be active.

04 03 44 24 CDR There is no way they can tell what it is on these short things; they don't have any idea where we are, Char - Ken.

04 03 44 39 CMP Charlie, I'm going to try to reacquire ... and make sure I don't have a bad ...

04 03 44 43 LMP Okay, I got 0.68 on the - -

04 03 44 46 CMP I got 52. Let me reacquire and - and try it again.

04 03 44 52 CDR That - What is that? That's not 1678.

04 03 44 55 LMP No, that's - -

04 03 44 56 CMP ... I can acquire ...

04 03 45 16 CMP ... are still out. Going to 5000.

04 03 45 20 CDR Okay.

04 03 45 21 LMP Okay. You can start closing if you want, I guess.

04 03 45 26 CMP Well, I guess I better ... back around any minute.

04 03 45 31 CDR Yeah, just be - Hey, if you want us to give you range and range rate, we'll lock on you. How about that?

04 03 45 37 CMP I'm sorry. I didn't understand what you said, John.

04 03 45 41 CDR We should lock on you and give you range and range rate.

04 03 45 45 CMP No, I thought you were saying that you didn't have your radar. I thought that's ... good sense.

04 03 45 49 LMP No. We got plenty.

04 03 45 50 CDR We got plenty of radar. We're going to do it.

04 03 45 52 CMP I thought you were trying to say ... the amps.

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04 03 45 55 CDR No. No, we got plenty of amps.

04 03 45 58 CMP Okay. Well, that'll help. That's better than this thing.

04 03 46 00 CDR Dang right. Where are - Which way should we pitch to get to you?

04 03 46 06 CMP Beg your pardon?

04 03 46 07 CDR Which way should we pitch to get to you?

04 03 46 10 CMP Oh, let me see. You're all - Oh, boy. It's hard to tell what figures I'm looking at except rate. I think I'm looking at the top of you though.

04 03 46 27 CDR Okay.

04 03 46 29 LMP That's what it says, pitch up.

04 03 46 32 CDR Well, you can't believe that, Charlie. We ain't updated it.

04 03 46 35 LMP Huh?

04 03 46 36 CDR We ain't updated it or nothing.

04 03 46 39 LMP I said - Oh, you mean the radar? Oh. No.

04 03 47 36 CDR Well, I don't see him anywhere.

04 03 47 43 CMP That ... burn. That must be - maybe ... your engine. That's probably it, because I can see the bell here. So your - your ... pitched to 180 with me.

04 03 47 58 LMP That's what I thought. He's been going in under us.

04 03 48 04 CDR Well, why did you say pitch up?

04 03 48 06 LMP I didn't say that. Ken did.

04 03 48 09 CDR (Laughter) You ain't gonna take credit for it, huh? ... I'd have swore I heard you say pitch up.

04 03 48 16 LMP Hmm. Well, that's what the AGS says, but that ain't right.

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Day 5

04 03 48 20 CDR Well, it must have been - You know - -

04 03 48 21 LMP Yeah, yeah.

04 03 48 22 CDR - - you can't - Anything less than a mile, these things ain't no good. Because - Well, AGS is okay. But this thing here measures from the center of the Moon. I don't have the foggiest notion where our boy is.

04 03 49 32 CDR Hear that noise?

04 03 49 35 LMP It's in the comm. Oh, that whooooo? Oh, yeah.

04 03 49 42 CDR That's what I mean.

04 03 49 43 LMP Yeah.

04 03 49 44 CDR We were back here - It's got something to do with the VHF ranging.

04 03 51 02 CDR Boy, I don't see him anywheres.

04 03 51 06 LMP Think we got quite a ways to pitch yet.

04 03 51 08 CDR Oh, shoot. Do it.

04 03 51 16 CDR There he is. Yeah, he's way far away from us. I think what the problem is, Ken - -

04 03 51 21 LMP There he is, dead ahead.

04 03 51 22 CDR - - is you're opening up.

04 03 51 24 LMP Dead ahead.

04 03 51 25 CDR Yeah, I got it.

04 03 51 26 LMP Push the RENDEZVOUS RADAR breakers in.

04 03 51 27 CDR Yeah, that's a good idea.

04 03 51 32 CMP I agree with you.

04 03 51 33 CDR You want to be careful how much velocity you add, because you're too low to add a lot. Or - -

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04 03 51 39 CMP ... I just put in 2 foot per second. But that - that wouldn't - ... closing us yet.

04 03 51 45 CDR Okay.

04 03 51 47 CMP Looks like you're looking at me now.

04 03 51 50 CDR Well, 2 foot a second. You should of took out 2 foot a second on account of you're ahead of us.

04 03 51 56 CMP Oh, say again.

04 03 52 00 CDR Remember Mr. Kepler?

04 03 52 11 CDR Say again, Ken. Either way, 2 foot in or out will do it. That'll make him slow down when he goes up over the top of us.

04 03 52 23 LMP Yeah.

04 03 52 28 CDR I'd rather have - There we go.

04 03 52 58 LMP Hey, we got him. Okay. He's still opening.

04 03 53 03 CMP Okay. What kind of a range do you read now?

04 03 53 05 LMP 0.66 miles and open, and it's 0.6 foot a second.

04 03 53 24 CMP Well, I guess I'd better put in another couple of foot per second then. Hate using all this gas up, but I guess that's all right.

04 03 53 50 CDR Let me get him boresighted and locked up.

04 03 54 08 CDR Well, let me get it like this.

04 03 54 11 LMP Okay. Thought we might have had a side lobe.

04 03 54 16 CDR Yeah.

04 03 54 19 LMP There you go. Go to LGC.

04 03 54 34 LMP Got a side lobe.

04 03 54 35 CMP Tell me when you ...

**CONFIDENTIAL**

Day 5

04 03 54 40 LMP Stand by, Ken. We had a side-lobe block; we're getting the main lobe. That looks like it, John. What - Oh, you want to go to -

04 03 55 01 CDR There we go.

04 03 55 04 LMP Okay; we close. Show 0.68 miles, 0 feet a second.

04 03 55 13 CDR Yeah, you're 4200 out. It says here it -

04 03 55 20 LMP Okay; we show you -

04 03 55 35 LMP Better not add too much.

04 03 55 37 CDR No. I'd just hold what you got, Ken.

04 03 55 40 CMP Okay.

04 03 55 42 LMP He'll drop way down. You know, if he - if he fires this way, it's retrograde; it's going to drop him low - lower his orbit.

04 03 55 51 CDR Yeah. How much did you put in?

04 03 55 58 CMP I put in a total of 3.5.

04 03 56 01 CDR Okay; well, that's going to get you right close to the ground.

04 03 56 06 LMP Not from over here.

04 03 56 11 CMP I'm not going to get very far from you.

04 03 56 29 CMP Am I closing any yet?

04 03 56 32 LMP/CDR No.

04 03 56 33 CDR It'll take half a rev.

04 03 56 37 CMP Okay, I'm not sure - It seems to me I ...

04 03 56 44 CDR Yeah, you know they have no idea where we are.

04 03 56 47 CMP Yeah, but they know where we undocked, and what bearing ... - -

04 03 56 51 CDR No. No, there's no way. Not for short ranges like this.

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04 03 57 24 CMP If you really want to get me within half a rev, I guess it ought to be a radial burn, shouldn't it?

04 03 57 31 LMP Okay; we show you closing slightly now, about a half a foot a second.

04 03 57 36 CMP Okay.

04 03 57 54 CMP Yeah, it shows it took me down to 8.6, but as long as I stick with you, I can't get too far away.

04 03 58 03 CDR Okay, our range-rate meter says you're 4100 foot out.

04 03 58 09 CMP Okay.

04 03 58 20 CMP What do you show for your perilune?

04 03 58 24 LMP The what?

04 03 58 25 CMP What's your perilune?

04 03 58 34 LMP Ours says 11.0, Ken.

04 03 58 42 CMP Okay, I'm reading 8.6.

04 03 59 02 LMP I guess the five revs might have been, John, the - the high gain coverage they got, since our steerable doesn't work. We can go as long as we got the 210.

04 03 59 15 CDR Yeah.

04 03 59 22 LMP It's going to be hard to run - He's going to take a lot of gas to get over here.

04 03 59 27 CDR Should have took it out.

04 03 59 31 LMP Huh?

04 03 59 43 CDR You thrustted toward us 3.5 feet a second. Is that true?

04 03 59 47 CMP I thrustted toward you 3.5. Yeah, that was - looks like both in retrograde.

04 03 59 55 LMP Yeah. Looks like to me you're going to have to go up a little bit now. A couple of feet a second.

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04 04 00 05 CMP Have you got some kind of chart there that could do the gimbals?

04 04 00 07 CDR No, we sure don't.

04 04 00 08 LMP No. But, see, that retrograde burn is going to take you down below us.

04 04 00 16 CMP Roger. I understand that. It really looks like what I want to do is to make a radial burn, you behind me. I really ought to make a radial burn out, shouldn't I?

04 04 00 33 LMP Yeah. Shouldn't he?

04 04 00 35 CMP How about let's do that.

04 04 00 41 LMP Okay.

04 04 00 44 CMP ... my range and range rate now?

04 04 00 47 LMP 0.680 feet a second.

04 04 01 29 CMP It was 0.4 foot per second radial out.

04 04 01 34 LMP Okay.

04 04 02 10 LMP Man, it's really white into zero phase, isn't it?

04 04 02 13 CDR Yeah.

04 04 02 25 CMP Seems to me like I'm opening again.

04 04 02 29 LMP Well, we got you about zero, Ken, maybe closing slightly. I think it's going to take a couple of feet per second radial.

04 04 02 50 CDR He's got to go up like that. But with our mechanics, it may not do anything.

04 04 03 05 CMP I guess I'm getting more or less concerned about that minus-X I put in there.

04 04 03 19 CDR I guess I don't blame you. I'd have thought you'd have put in plus-X and rose over the top of us.

04 04 03 26 CMP I think I'm going to take it back out ... That sound reasonable?

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04 04 03 37 LMP Su - sure does to me, Ken.

04 04 03 57 CMP I can ... your ...

04 04 04 31 CDR Okay; now that shows you're opening at 3 and a - that shows you're opening at 3.

04 04 04 45 LMP Here comes earthrise. You see it?

04 04 04 52 CDR Yeah.

04 04 04 53 LMP Man, that's spectacular.

04 04 04 59 CDR Yeah. Now according to our mechanics, you're bound to end up behind us. And close to us.

04 04 05 07 CMP Okay. That shows we get a 59 by 9.

04 04 05 20 LMP Houston, Orion; how do you read?

04 04 05 24 CC Orion, this is Houston. Read you loud and clear.

04 04 05 27 LMP Roger. Same-o, Jim. We're about 0.7 of a mile out from Casper now.

04 04 05 42 CC Say again, Charlie. We still have excessive noise here.

04 04 05 48 LMP I say our range to Casper is about 0.7 of a mile.

04 04 05 52 CDR And he's opening at 2-1/2. He put in some posigrade velocity to go up and above and come down and get with us.

04 04 06 06 CMP John, I think that total is still slightly retrograde.

04 04 06 13 CDR The total is slightly retrograde?

04 04 06 15 CMP Yeah. I - I'm thinking maybe I ought to ... put some more in there.

04 04 06 19 CDR I think you're probably right. Another - another 2 feet a second.

04 04 06 29 CMP Okay.

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04 04 06 52 CC Okay, 16. This is Houston. We still do not have an answer, but people are working very feverishly.

04 04 07 03 LMP Orion. Roger.

04 04 07 05 CDR Okay; thank you. It'll probably be awhile before we get to stationkeeping anyway. Like about a week.

04 04 07 21 CMP That only shows 9.2. Why don't we get them to get an arc on this? I guess I'd like to know how good my vector was to start with.

04 04 07 33 CDR It's no good this close in, Ken.

04 04 07 36 CMP How's that?

04 04 07 37 CDR It's not any good this close in.

04 04 07 40 CMP Okay. I can't hear you.

04 04 07 43 LMP He said it's not any good this close in.

04 04 07 47 CMP I know, but my ... vector is good. How good is it?

04 04 07 52 CDR Oh, okay.

04 04 07 53 CMP That's what I'd like to know from Houston.

04 04 07 54 CDR You're not locked on them?

04 04 07 57 LMP Ken - Ken, you should be able to get a lock on with them.

04 04 08 01 CMP No, I've been trying that.

04 04 08 22 LMP Houston, Orion.

04 04 08 26 CC Go ahead, Orion.

04 04 08 28 LMP Okay; we got an RCS SYSTEM A REG light. Pressures: HELIUM is looking like 2300 - -

04 04 08 36 CDR Get the B?

04 04 08 37 LMP The PROPELLANT is at 210; the FUEL MANIFOLD at - and OX MANIFOLD is - correction, make it 215 - or 220. And everything else looks pretty good. Pressures are holding up - You think the burst disk is gone?

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04 04 09 02 CC Roger. It looks that way to us, Charlie.

04 04 09 06 LMP Okay.

04 04 09 07 CC Casper, this is Houston. Read you loud and clear.

04 04 09 25 CDR Hey, Ken, why don't you summarize what you did in the way of thrusters to tell them what to expect. Okay?

04 04 09 31 CMP I'm doing that, John.

04 04 09 32 CDR Oh, okay.

04 04 09 33 CMP And - so I took about 3 of that out, and I put in a half foot per second radial at about 100 hours and 5 minutes, and then I put in the rest - took 2 foot per second posigrade at about 100 hours and 6 minutes. And at about 100 hours, I put in 3 - it was about - roughly retrograde. And my computer now shows 16.5 by 9.2. And I had a good state vector when I started, and that's probably a good value, but I want to ... do I show an arc or ...

04 04 10 12 CC We copy, Ken.

04 04 11 00 LMP That ... sound - sounds like all the gears are broken in it.

04 04 11 10 CC Orion, this is Houston. We're wondering where you got the estimate of 0.7 of a nautical mile range?

04 04 11 18 LMP We got the rendezvous radar locked on, if you want us to. Or do you want us to turn it off?

04 04 11 25 CC That's fine.

04 04 11 30 CMP I show us now at about 0.9 of a mile. Is that correct?

04 04 11 33 LMP That's right, Ken.

04 04 11 35 CDR 5500 feet, Ken.

04 04 11 36 CMP Okay. And still opening?

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04 04 11 38 CDR Yeah.

04 04 12 00 LMP Houston, Orion. John and I been talking about - If we get to land this thing, we'd like to - probably ought to think about going to sleep first, and we'd get up and do a full EVA tomorrow.

04 04 12 17 CC Roger. We - we concur down here.

04 04 12 34 CMP Could you tell me if my range - -

04 04 12 36 CC Okay, Casper. This is Houston. We're recommending that you - -

04 04 12 37 CMP Go ahead.

04 04 12 38 CC - - null the line-of-sight rates and fire 5 feet per second toward the LM.

04 04 12 45 CMP Okay. That's still going to be mostly retrograde, it looks like. That's how I got in this place to start with.

04 04 13 04 CC We copy you, Ker.

04 04 13 06 CMP Okay; I'm going to hold. Can you guys get a short arc going on my trajectory?

04 04 13 37 CC Ken, we show you coming up on perilune now, so you'll be affecting your apolune.

04 04 13 46 CMP You show me coming up on perilunes?

04 04 13 50 CC That's affirmative.

04 04 13 52 CMP Roger. My state vector shows 19 miles up, and we're not - I'm just passing Smythii. Is that - does that sound reasonable that we shifted that much in orbital track?

04 04 14 14 CC Okay. That sounds good, Ken.

04 04 14 19 LMP What's going on down there?

04 04 14 25 CDR He ain't - -

04 04 14 26 CMP I guess I'd like for you to - to summarize again where I stand. I'm a little bit confused now, Jim.

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It appears to me I'm just - I'm just passing Smythii.

04 04 14 38 CC We were hoping that -

04 04 14 41 CMP And my altitude according to my computer - Was my state vector a little bit off to start with?

04 04 14 55 CC We think your state vector was fairly accurate, Ken.

04 04 14 59 CMP Okay. Then there's still a discrepancy in - -

04 04 15 01 CC You'll be at perilune in 15 minutes.

04 04 15 03 CMP Okay. That makes more sense.

04 04 15 05 CC All right.

04 04 15 06 CMP Because I'm presently at 19 miles, and I think that's probably a good estimate. If I do - Do you want me to thrust towards the LM now? Is that affirmative?

04 04 15 23 CC That's affirmative.

04 04 15 25 CMP Okay. Now I'm - This is using up a great deal of RCS which is going to violate the next line. Is this preferable to trying to do a regular rendezvous now?

04 04 15 38 CDR Regular what?

04 04 15 46 CMP Because if we still have a chance at landing, then I need to ... to you - -

04 04 15 48 CC Ken, could you give your position relative to the LM?

04 04 15 52 CMP Yes, sir. I'm ahead of him and slightly below, and I show a - a mile on the EMS, and I don't know what John has on the radar.

04 04 16 04 CDR Yeah, he's - he's ahead of us, and I show him about - level and 6500 feet out and opening at 3 feet a second.

04 04 16 26 CC Okay. We copy your position as ahead, below, and about 1 nautical mile.

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04 04 16 30 CMP That's affirmative.

04 04 16 32 CDR And he's opening at 2-1/2 on 1678. And 3 feet a second on the tapemeter. Give me a VERB 83.

04 04 16 50 LMP Can't unless we terminate this.

04 04 16 52 CDR Well, let's terminate it.

04 04 17 03 CDR Can't terminate it, huh? Go to AUTO in TRACK.

04 04 17 07 CMP Okay, Jim. To make sure there's no confusion, I haven't done anything yet.

04 04 17 10 LMP No, you got to -

04 04 17 19 CC Okay; stand by.

04 04 17 32 CDR Okay. On the - on the COAS, I've got him boresighted there, and he's 35559 from local vertical.

04 04 17 46 CC Okay, Ken. This is Houston. We're convinced that we want you to fire directly at the LM about 5 feet per second. We want to get a positive closing rate.

04 04 17 57 CMP Okay. That's in work.

04 04 18 37 CMP Okay. Looks like the DAP isn't stable now. How about if I give it a VERB 46?

04 04 18 47 CC We copy.

04 04 18 49 CMP Good idea?

04 04 18 56 CC We show you in FREE.

04 04 18 59 CMP I am now, but I wasn't.

04 04 20 04 CDR The DAP is unstable!

04 04 20 06 CMP Does that mean I'm clear to do a VERB 46?

04 04 20 09 LMP Yeah, they said okay.

04 04 20 13 CDR They say okay, Ken.

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04 04 20 14 CMP Okay. Oh, it still didn't work. I think maybe I've had one of those transients.

04 04 20 36 CMP For some reason, every time I pick up CMC AUTO, this thing - starts doing maneuvers.

04 04 20 59 LMP Can't believe it.

04 04 21 03 CDR Turn on some water, Charlie.

04 04 21 13 CC Orion, let's go LO bit rate.

04 04 21 18 LMP You have it.

04 04 21 25 CDR Okay.

04 04 21 29 CMP Okay. I got it under control, Jim. I had - It was a bad DAP.

04 04 21 34 CDR Thank God.

04 04 22 00 CMP Okay. You want ... to put 5 foot per second ... at the LM.

04 04 22 10 CDR Didn't mean to do that.

04 04 22 12 LMP What?

04 04 22 14 CDR What he just did.

04 04 22 15 LMP Huh?

04 04 22 16 CDR He didn't mean to do it.

04 04 22 17 LMP He didn't?

04 04 22 18 CDR No. It's going up and over us right now.

04 04 22 28 CDR See? The line-of-sight rate - -

04 04 22 37 CC Casper, Houston. Hold up on that RCS maneuver.

04 04 22 40 CMP Okay. I've put in 3 foot per second.

04 04 22 45 CC Hold up, Ken.

04 04 22 48 CMP Say again, please?

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04 04 22 50 CC Okay. Hold it there.

04 04 22 51 CMP Okay. Holding at 3.

04 04 23 08 LMP You keeping him boresighted?

04 04 23 10 CDR Yeah.

04 04 23 24 LMP Roll's going off a little bit, John. Not that that's going to hurt you any.

04 04 23 50 LMP Say he's drifting down - that says he's drifting down.

04 04 23 54 CDR He's drifting up.

04 04 23 55 LMP Well, look at the needle.

04 04 23 58 CDR Okay, Ken, to - to get us, you're going to have to thrust down to null the needles.

04 04 24 06 CMP Thrust down means towards the Moon or down as you see it?

04 04 24 13 LMP Towards the Moon.

04 04 24 14 CDR Towards the Moon.

04 04 24 18 CMP Okay. I guess I am. Houston, do you want me to go null line of sight all the way in?

04 04 24 27 CC We need a range and range-rate reading now.

04 04 24 30 CDR 7000 feet, closing at 3 feet a second, and we have a line-of-site rate.

04 04 24 44 LMP Okay, Ken. If you can kill that line of sight, you're closing.

04 04 24 47 CC Okay; copy.

04 04 24 48 CMP Roger, Charlie. I'm standing by for instructions for the best ...

04 04 25 01 CC And, Casper; this is Houston. You should null the line-of-sight rate.

04 04 25 11 CDR He'll take - -

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04 04 25 12 CMP Okay. Do you want me to keep them nulled and go all the way in? Is that the idea?

04 04 25 19 CC And keep a positive closing rate.

04 04 25 23 CMP Okay. It's likely to be expensive, but we'll do that. Okay. You're going to have to - Your needles are better than mine. Why don't you tell me what to do there, John.

04 04 25 36 CDR Okay. Thrust down, and I'll tell you which way the needle moves.

04 04 25 41 LMP Towards the Moon, Ken.

04 04 25 42 CDR Towards the Moon.

04 04 25 43 CMP Okay.

04 04 25 46 CDR That's - that's the wrong way, Ken.

04 04 25 50 CMP That's sure towards the Moon.

04 04 25 53 CDR Were you thrusting?

04 04 25 54 CMP That's affirmative.

04 04 25 55 CDR Okay; thrust away from the Moon. That's doing it. A little more.

04 04 26 13 CDR You didn't get it corrected, Ken.

04 04 26 19 CMP How's that now?

04 04 26 21 CDR Oh, it's just not moving very much at all.

04 04 26 24 CMP You think this is a good place to stop.

04 04 26 26 CDR No, you - It's gonna be expensive, Ken, to do this, but you - you're gonna have to thrust up.

04 04 26 32 CMP Okay. I - I just need some gouges to when I get it nulled.

04 04 26 37 CDR Okay. You don't have it nulled.

04 04 26 43 CMP How's that?

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04 04 26 45 CDR That's - you've got 4 milliradians down.

04 04 26 55 CMP Okay. What's my range rate?

04 04 26 57 CDR Three - 3 feet a second, closing.

04 04 27 00 CMP Okay.

04 04 27 01 CDR You're at 6600 feet.

04 04 27 03 CMP Still going down?

04 04 27 05 CDR That's affirmative.

04 04 27 13 CDR You got it to 3 milliradians.

04 04 27 17 CDR You got it to 2 milliradians.

04 04 27 28 CDR You've got it to 2 milliradians. Now you've got it, Ken. You killed it.

04 04 27 32 CMP Okay.

04 04 27 55 CMP Looks to me now like I'm drifting the other way.

04 04 27 59 CDR Not according to my needles.

04 04 28 01 CMP Okay; I'll believe your needles.

04 04 28 07 CDR Better be something right around here.

04 04 28 16 LMP Well, I really don't know.

04 04 28 18 CDR Don't know what, Charlie?

04 04 28 25 CMP Range rate?

04 04 28 29 CDR It's 3-1/2 feet a second, and you're at 6300 feet.

04 04 28 34 CMP Okay.

04 04 29 00 CMP Is the rate starting to build now? I'm trying to calibrate the dead-band activity here so I can tell what the rate - when it's really a rate and when it's just dead banding.

04 04 29 13 CDR Okay. Your rates are nulled essentially.

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04 04 29 16 CMP Okay. Thank you.

04 04 29 21 CDR Turn on some more water, Charlie. I don't know if I can stand this or not.

04 04 29 27 LMP I think I might throw up.

04 04 29 47 LMP Houston, Orion - -

04 04 29 48 CC Orion, request you select the SECONDARY TRANSMITTER/RECEIVER.

04 04 30 07 LMP Ken - Ken, tell them I selected that SECONDARY. It'll be awhile.

04 04 30 12 CMP Okay. Houston, Orion says that they have already selected the SECONDARY.

04 04 30 24 LMP Okay, Houston. How do you read now?

04 04 30 29 CC I read you loud and clear, Orion.

04 04 30 31 LMP Okay; you're 5 by. How's the problem looking?

04 04 30 55 LMP You - you maneuvering, aren't you, John?

04 04 30 56 CC 16, no answers yet. We're still looking at it.

04 04 31 11 LMP You - are you - you're pitching up, aren't you?

04 04 31 13 CDR Yeah.

04 04 31 14 LMP Huh?

04 04 31 15 CDR Yeah.

04 04 31 16 LMP Okay. I just wondered. He looks like to me he's moving on out there some.

04 04 31 21 CDR He is moving out.

04 04 31 40 CDR Okay, Ken. You're at 5600 feet, closing at 4 feet a second.

04 04 31 47 CMP Okay.

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04 04 32 11 CC Okay, Orion. This is Houston. We'd like you to open the PRIMARY POWER AMP circuit breaker on 16.

04 04 32 21 LMP Roger. It's - it's open, Jim.

04 04 32 47 CC Orion, let's go high bit rate.

04 04 32 50 LMP Roger. You have high bit rate.

04 04 33 02 LMP Here comes the landing site.

04 04 33 07 CDR Yeah.

04 04 33 19 CDR Okay, Ken. You're getting a line-of-sight rate. You're gonna have to thrust a little toward the Moon.

04 04 33 29 CMP Okay; I'm gonna try this -

04 04 33 34 CC Okay, we can't hold high bit rate. Request you go back to low bit rate, Orion.

04 04 33 41 CDR Needles didn't move, Ken.

04 04 33 46 LMP That's the right direction.

04 04 33 50 CMP Okay. That's up for me; looks like it ought to be down for you.

04 04 34 00 LMP That sounds pretty good, Ken.

04 04 34 03 CMP Okay.

04 04 34 23 CDR Okay, Ken. You've got it.

04 04 34 26 CC Orion, this is Houston. Could you give us a range and range-rate read-out?

04 04 34 30 CDR Okay. 4900 feet, closing at 5.

04 04 34 37 CC 4900, closing at 5.

04 04 34 51 CDR You got the line-of-sight rates nulled now, Ken.

04 04 34 54 CMP Okay.

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04 04 35 05 CMP ...

04 04 35 14 CDR They wouldn't want to do it the easy way. We're gonna arrive at the same time, in the dark. They've thrust toward us at - at perigee at 100 hours. Man, that's really - I mean, he's thrusting at apogee so it'd take effect at perigee. And that's no good.

04 04 36 16 CMP ...

04 04 36 18 CDR Yes, they're nulled right now.

04 04 36 20 CMP Okay. ... do we have some - some fuel point at which to cut off and switch over to the LM power?

04 04 36 36 CDR How much are you using?

04 04 36 38 CMP Well, that's - that's hard to show ... I don't know how much ... until I see on the way in. I'm reading - Of course, these gages don't tell you exactly how much, but I have - that's 65 percent showing on B. And all this stuff is gonna be in - with the ... plane. Houston, got any thoughts on a cutoff point on RCS?

04 04 37 15 CC Stand by, Ken.

04 04 37 16 CDR Okay. Well, you're at 4000 feet now at 5 feet a second, Ken.

04 04 37 20 CMP Okay - -

04 04 37 21 CDR And - and your line-of-sight rate is starting to build a little in the other direction. You've got it now.

04 04 37 56 CC And, Orion; this is Houston. Is the CSM above you or below you? We hope he's directly ahead.

04 04 38 06 CDR He's at 45 degrees above us.

04 04 38 13 CC Forty-five degrees above.

04 04 38 14 CDR Above the local vertical.

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04 04 38 27 CDR Okay, he's got a 5-foot-a-second closing rate, and his line of sights are nulled on the radar.

04 04 38 41 CMP And they look like they are killed completely on the optics, too. Going to need your tracker light here in a minute. We're just getting a little glinted sunlight now.

04 04 38 55 LMP Okay. It's on now?

04 04 38 58 CMP Okay. Thank you.

04 04 39 03 CDR Which way was he supposed to thrust to null them?

04 04 39 09 LMP The one that was down - When it was up, he was thrusting -

04 04 39 14 CDR Toward the Moon - -

04 04 39 15 LMP Yeah.

04 04 39 16 CDR - - away from the Moon.

04 04 39 17 LMP It was down for him.

04 04 39 18 CDR It was opposite.

04 04 39 19 LMP Yeah. They're just opposite of what we're looking at.

04 04 39 20 CDR Yeah.

04 04 39 28 CMP Boy, those rates look steady at they can be.

04 04 39 33 CDR They really got them killed.

04 04 39 50 CMP Okay; and since we are going to get rendezvoused in the dark, I guess we'll just come up alongside and hold stations.

04 04 40 05 CDR That seems like a fair thing.

04 04 40 07 CMP All right, sir.

04 04 40 41 CDR Would - would it be easier to thrust down now?

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04 04 40 46 LMP Yeah.

04 04 40 49 CDR Okay, Ken. You're gonna have to thrust down a hair.

04 04 40 54 CMP That's down to you, right?

04 04 40 56 LMP It looks - it would be up to us, Ken. I think if we thrust, we'd have to thrust up. I think you have to thrust down a skosh.

04 04 41 05 CMP That's what I mean. You would thrust - you would thrust up.

04 04 41 07 LMP Yeah.

04 04 41 08 CMP Okay. I think I got it killed again.

04 04 41 11 LMP It's looking good.

04 04 41 12 CDR Looks pretty good.

04 04 41 17 CMP What's that closing rate now?

04 04 41 19 CDR Still 5 feet a second - still 3-1/2 feet a second. Now at 3000.

04 04 41 23 CMP Three and a half feet per second.

04 04 41 25 CDR Roger.

04 04 41 26 CMP Okay. All I've got's the tracking light; I've lost the rest of your image.

04 04 41 30 CDR Okay. You've - you're gonna have to thrust a little more to kill that rate the same way. Okay. That got a lot of it, but not all of it. Okay. You got most of it.

04 04 42 00 CC Casper, this is Houston. You might pick up a temperature caution light on your quads, but it's of no consequence.

04 04 42 07 CMP Okay. Yeah, I see B is up high. Is that due to thruster activity? Or is that due to heaters coming on?

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04 04 42 17 CC Affirmative, Ken.

04 04 42 20 CDR Okay.

04 04 42 21 CC ... thruster activity.

04 04 42 22 CMP Roger.

04 04 42 31 CC Orion, this is Houston. Will you give us another range and range rate, John.

04 04 42 34 CDR Up - thirt - 3100 feet at 3-1/2.

04 04 42 42 CC You're 3100 at 3-1/2.

04 04 42 43 CDR Roger. And an angle of 68 degrees to local vertical now.

04 04 42 50 CC Understand; 68 degrees.

04 04 43 23 CDR I can't believe I'm doing this. I can't believe we're doing this. Turn on some more water. Okay, Ken. You got a slight rate going up to the south according to my needles.

04 04 43 49 CDR Whoa, Charlie.

04 04 43 50 LMP Whoa.

04 04 43 51 CMP Okay. Let's watch that for a minute before I start working on it, because we haven't had any plane component before. How's the line-of-sight rate doing now? Holding?

04 04 44 01 CDR It's holding. It's holding - the vertical one is holding right on.

04 04 44 05 CMP Okay. And range rate?

04 04 44 08 CDR You're at 3000 feet at 3 feet a second.

04 04 44 17 CMP Okay.

04 04 44 18 CDR 2800 feet.

04 04 44 21 CMP Well, we must be going in the right direction, then.

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04 04 44 24 CDR Yeah, you're gonna get there.

04 04 44 26 CMP Yeah.

04 04 44 33 CDR You now have 2 milliradians to the south.

04 04 44 35 CMP Okay; I'll take some of that out. That means I go to the south, right?

04 04 44 42 CDR Yes.

04 04 44 48 CMP How's that? Right direction?

04 04 44 51 CDR Yeah, that's got most of it.

04 04 45 20 CDR You still got some more to the south you've got to get. Still 2 milliradians. Okay. That's got it, Ken.

04 04 45 30 CMP Okay.

04 04 46 20 CMP Okay, it looks like I'm picking up a rate in the opposite direction ... in-plane component.

04 04 46 25 CDR No, you're not - you're not. You don't have any rate yet.

04 04 46 29 CMP Okay.

04 04 46 31 CDR According to my needles.

04 04 46 32 CMP All right. John, this is very much like the simulator where, because of the dead band lags, it looks like it takes a long time to pick up one of those rates.

04 04 47 06 CC Orion, this is Houston. We want you to get the rendezvous radar and the tracking light off as soon as it's feasible to conserve power.

04 04 47 14 CDR Roger. We will. It's not confesible [sic] right now.

04 04 47 21 CC Understand.

04 04 47 35 CMP Okay, it looks like I may need a little more to the south.

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04 04 47 37 CDR Yeah. Just a hair, Ken. Okay. You're at 2400 feet at 2.

04 04 47 45 CMP Okay.

04 04 47 50 LMP He's going to need to thrust towards us a little bit.

04 04 47 51 CDR Yeah.

04 04 48 21 CDR He thrusts the opposite way we do. We're up down.

04 04 48 24 LMP Yeah.

04 04 48 25 CMP How about that rate to the south? It looks like it's building again.

04 04 48 30 CDR My needles don't show it, Ken.

04 04 48 32 LMP To the south?

04 04 48 33 CMP Okay.

04 04 48 34 LMP He never really got it all out.

04 04 48 46 CDR Better start using their -

04 04 48 49 LMP Huh?

04 04 48 50 CDR Somebody better start using their brains and commonsense here.

04 04 48 53 LMP What do you mean?

04 04 48 55 CDR Or it'll blow the whole works.

04 04 49 05 LMP You don't think this is right, what he's doing?

04 04 49 07 CDR Yeah.

04 04 49 15 LMP You want me to stick that card back over there?

04 04 49 16 CMP Okay, I show quite a drift rate now, John. Do you still show no out of plane?

04 04 49 27 CDR Yeah, I don't show any, and I've got you boresighted in that hole. And I don't show any motion there either, Ken.

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04 04 49 35 LMP Where? Our needles say he's drifting south.

04 04 49 40 CDR Just a little south, Ken.

04 04 49 42 CMP Okay. It looks like ... I'm gonna take some of that out.

04 04 50 00 LMP He's going off the bellyband.

04 04 50 01 CMP Can you tell if I'm going - Maybe I put that in the wrong direction, although I'm sure that was right. South is to your left, isn't it?

04 04 50 12 CDR You betcha.

04 04 50 13 CMP Okay. We're going the right way, then.

04 04 50 18 LMP Hey, wait a minute, Ken - -

04 04 50 19 CDR Whoa, Ken. You got it.

04 04 50 26 LMP Okay, Ken. You were drifting south. That's right. You have to thrust north. You got it.

04 04 50 31 CMP We've been going in the right direction all along, then.

04 04 50 32 LMP Okay.

04 04 50 33 CDR Yeah, you have.

04 04 50 34 CMP It appears to be I'm still a little bit out of plane. I guess that's the sensitivity of the rendezvous radar.

04 04 50 37 CDR Yeah, don't worry about it.

04 04 50 55 LMP Down to 1 foot a second. If he'd get a little bit more closing rate in, it'd be less gas.

04 04 51 07 CDR I think it would be too.

04 04 51 08 LMP Huh?

04 04 51 09 CDR Let's call up VERB 63 again. Can we do that?  
No, I don't want to - I don't want to break lock.

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04 04 51 12 CMP Okay; how's my closing rate?

04 04 51 13 CDR We're showing a foot a second on tapemeter. It isn't closing very fast.

04 04 51 15 CMP Well, that's what I was just wondering. There could be a little more plus-X.

04 04 51 30 CDR Okay. Say when and how much.

04 04 51 32 CMP Okay. I'm gonna put in a foot plus-X. Okay? As long as we're using brute force, we might as well.

04 04 51 44 CDR Okay.

04 04 51 55 CMP Okay, that's about a foot.

04 04 51 59 CDR Okay. You're 2000 feet at 2.

04 04 52 20 CDR There you go. It works!

04 04 52 21 CMP How about that.

04 04 52 23 LMP What was that?

04 04 52 24 CDR Tunnel light.

04 04 52 25 LMP Oh.

04 04 52 56 CMP I can see the LM in earthshine now.

04 04 53 03 CDR Okay, fine. You're getting over behind us, Ken. You're gonna have to - to thrust toward us a little more.

04 04 53 15 CMP Okay. What's my range rate now?

04 04 53 21 CDR It's at 2000 feet, but it's hardly closing at all.

04 04 53 23 CMP Okay. Give me another foot. There's another foot per second.

04 04 53 43 CDR Okay. Now you're starting to build a rate to the north.

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04 04 54 02 CMP I don't think those ... are as good as we're using them in here.

04 04 54 05 CDR Yeah. I don't - I don't think they're quite as good.

04 04 54 09 CMP It looks like I need to start reversing my in-plane direction.

04 04 54 11 LMP Yeah.

04 04 54 12 CMP Okay; do I still have a positive closure rate?

04 04 54 13 CDR Yeah. Three feet a second; 2000 feet.

04 04 54 19 CMP Okay.

04 04 54 21 CDR 1800 feet now.

04 04 55 09 LMP Old Antares.

04 04 55 38 CDR Okay, Ken. Now you are moving north, definitely.

04 04 55 41 CMP Okay. I'm getting you centered back up in the COAS.

04 04 55 46 CDR Okay.

04 04 56 01 LMP He's got to put that 05 back in to get - to get his orbit back up.

04 04 56 08 CMP Okay. Do I still have a positive closure rate?

04 04 56 11 CDR Say again?

04 04 56 14 CMP Do I still have a closure rate?

04 04 56 17 CDR That's affirmative. Two feet a second.

04 04 56 19 CMP Okay. Looks like the old EMS is just sort of sitting here looking at itself.

04 04 57 10 CDR Okay, Ken. You do have a line-of-sight rate to north.

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04 04 57 14 CMP Okay. I'm gonna go ahead and use the EMS - I mean the COAS on the sync, because that's working out pretty good in here. Seems to be a more sensitive indicator of out of plane.

04 04 57 23 CDR Okay; you've got 4 milliradians to the north. And you're at 1500 feet now.

04 04 57 42 CMP Okay. Just barely drifting in the COAS. Looks pretty good here.

04 04 58 10 CDR Okay. Well, now you have -

04 04 58 31 CDR Can you see me at all?

04 04 58 33 CMP Yes, sir. In earthshine I can see the whole LM, now.

04 04 58 34 CDR Okay, fine.

04 04 58 35 CMP I'm afraid we're gonna run out of earthshine before we get it completed. How's the closure rate now?

04 04 58 47 CDR Still 2 feet a second, Ken. We're about 1400 feet now.

04 04 58 53 CMP Okay. Man, that Moon in earthshine is really something.

04 04 59 06 CDR Okay; and I show you with 4 milliradians to the north, and I see you drifting slowly across the COAS to the north.

04 04 59 11 CMP Roger. I didn't quite get it stopped.

04 04 59 24 CDR Okay, you're fixing it.

04 04 59 30 CMP That looks to me like that's fixed. You still show some residuals?

04 04 59 34 CDR Yeah, it's still 3 milliradians to the north.

04 04 59 40 CMP Okay.

04 04 59 54 CDR Okay - -

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04 04 59 55 CC Orion, this is Houston. We're showing about 10 minutes to LOS, and I have some words for you on our general plan when it's convenient.

04 05 00 04 CDR Go ahead.

04 05 00 08 CC Okay. When you come off on AOS, on the next rev, rev 15, we'll give you GO or NO GO for another try. And we'd be looking at PDI on rev 16. And at that time, we'd have pads for you and procedures. Over.

04 05 00 26 CDR Okay. Fair enough.

04 05 00 41 CC Casper, this is Houston.

04 05 00 43 CMP Go right ahead.

04 05 00 47 CC Roger. We want you to verify that you're in auto DUMP on the water, that's the PRESSURE RELIEF in the number 2 position - that's vertical. And if you have an opportunity to get away from the controls there, we'd like you to manually dump the water to 10 percent on the back side. That should require about 17 minutes. Over.

04 05 01 08 CMP Roger. I am in auto DUMP and I'll - I'll have to wait until we get in daylight to go down there, I think. I show about full, but I guess it isn't.

04 05 01 21 CC Okay; we copy.

04 05 01 25 CDR Okay, Ken, line-of-sight rate is starting to - You'll have to thrust down a little - or, I mean up a little. That's fixed it.

04 05 01 39 CMP Okay. How's my closing rate?

04 05 01 51 CDR Two feet a second. You're at 1000 feet now, approaching it.

04 05 02 00 CMP How's the out of plane?

04 05 02 02 CDR It's starting to go to the south of here. Don't worry about it right now.

04 05 02 05 CMP All right.

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04 05 02 39 CDR You got it, Ken. When you get in - when you get in - -

04 05 02 51 CC Orion, this is Houston. We'd like you to configure for RCS Bravo only. Over.

04 05 02 58 LMP Roger; we'll open the CROSSFEEDS and close MAIN SOV A. We're configured.

04 05 03 45 CDR Why don't you turn out some lights, Charlie? I don't know -

04 05 03 47 LMP Okay. How's that?

04 05 03 51 CDR Yeah. Okay.

04 05 03 53 LMP Let me turn the numerics down a little bit.

04 05 04 13 CDR Okay, Ken; 990 feet now.

04 05 04 16 CMP All righty.

04 05 04 26 LMP What a time to be closing, pitch black dark.

04 05 04 37 CDR 970. You've got the line-of-sight rates. Okay; can you see me with the spotlight yet?

04 05 04 57 CMP No. That's what I was looking to see, because we're gonna lose earthshine here in just a minute.

04 05 05 27 CDR Okay, Ken. You've got to thrust down just a hair.

04 05 05 36 CDR You get that thrusting down a hair?

04 05 05 38 CMP Yeah, I'm not sure if that was the same down you're talking about.

04 05 05 41 CDR Okay. No. That made it worse. That's making it worse.

04 05 06 01 CMP It's really strange; it was sitting here in the COAS here, right in the middle.

04 05 06 12 CDR You thrust a hair down and a hair to the north.

04 05 06 15 CMP You're upside down compared to me, and when you say down, you mean you're going - you're going down on me. Is that correct?

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04 05 06 23 CDR I'm doing it from the needles. If you don't ro -  
if you haven't rolled from the last way you were  
doing it, we were doing it okay.

04 05 06 35 LMP Yeah. That's right, Ken. We're going down with  
you. We'd have to thrust up, according to the  
needle.

04 05 06 44 CDR Okay; it's 820 feet now.

04 05 06 47 CMP Okay.

04 05 07 00 CMP It still doesn't seem like it does much. Okay;  
I show a line-of-sight rate that's essentially  
killed.

04 05 07 12 LMP That's about right.

04 05 07 13 CDR Yeah. They're about killed for this close in.

04 05 07 18 LMP He looks bigger than 800 feet.

04 05 07 22 CDR Sure does. At night, all cats are black.

04 05 07 42 LMP ... one of those cycle slips of that radar.

04 05 07 54 CDR What's your VHF reading, Ken?

04 05 08 00 CMP 0.14.

04 05 08 02 CDR 0.14?

04 05 08 03 CMP Yes, sir.

04 05 08 04 CDR Okay; we're 750 feet here.

04 05 08 06 CMP How much?

04 05 08 08 CDR 750.

04 05 08 10 CMP Okay; I can see - your image is about 2 degrees,  
now.

04 05 08 30 CC 16, this is Houston. We're showing 2 minutes to  
LOS. And if you give us a range and rate and -  
Ken, perhaps you could repeat it for us.

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04 05 08 38 CDR Okay; 710 feet, closing at 2 feet a second, rates essentially nulled.

04 05 08 42 CMP Did you copy that, Houston? The range is 710 feet, 2 feet per second, rates nulled. Houston, did you copy Casper?

04 05 09 13 CC Roger; we copied down here. Thank you.

04 05 09 15 CMP Okay.

04 05 09 16 CDR Okay, Ken. I can see the whites of your eyes. I can see you every time your light flashes. And every time my light flashes, it flashes off your probe.

04 05 09 33 CMP Uh-huh. Let me turn the spotlight on.

04 05 09 38 CDR You ought to have me now. Does it do you any good?

04 05 09 48 CMP Yeah. I could tell I got you, but it's a poor competitor for earthshine.

04 05 09 56 CDR Well, we ain't got any earthshine, old buddy.

04 05 09 59 CMP Beg your pardon?

04 05 10 00 CDR I say, we're gonna lose earthshine here in a minute.

04 05 10 02 CMP Roger. It will all of a sudden look very night.

04 05 10 24 CMP You can rendezvous under these conditions very nicely, the problem being that you've got to keep referring to that - to the reticle to get some kind of range, because there's just no - you still don't have enough depth perception to tell where you are.

04 05 10 37 CDR Right. You're gonna be docking with - you're just slowly drifting to the north. You got the vertical line-of-sight rate killed.

04 05 10 46 CMP Okay; in order to have good comm - -

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## LIFT-OFF MINUS 18 TO POSTDOCKING

07 07 11 49 CDR What do you need here?

07 07 11 50 LMP I need to get this VERB 47.

07 07 11 53 CDR Okay; but you don't want it until 17 --

07 07 11 55 LMP It's okay; I think the state vector - Well, we can wait 2 minutes, yeah. This helmet's worse than any training helmet I've ever had, man.

07 07 12 21 CDR It's pretty bad (laughter).

07 07 12 22 LMP Isn't it bad?..

07 07 12 23 CDR Yeah. Hey, Houston, are we on mike to you now?

07 07 12 35 CC Orion, this is Houston. Recommending PGNS for the direct rendezvous.

07 07 12 39 CDR Understand PGNS for the direct rendezvous.

07 07 13 03 LMP You know, I feel tired when I'm in here. But outside - I never was tired a bit, outside. Never felt tired.

07 07 13 10 CDR Yeah. That water cooling is what does it. Why don't you - why don't you -

07 07 13 14 LMP Want a shot?

07 07 13 15 CDR Yeah.

07 07 13 17 LMP You know, we could regulate this valve down here.

07 07 13 19 CDR No, don't mess with that. It's no big thing. That - that - that's on - should be on hot; it'd freeze you to death if you did.

07 07 14 05 LMP How many hours and 13 minutes did he say?

07 07 14 08 CDR Twenty hours and something.

07 07 14 11 LMP That ain't bad for two-revs-late landing.

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07 07 14 13 CDR Yeah.

07 07 14 17 LMP Of course, we got our nominal - we got 70 - we had - been on the ground 73 hours.

07 07 14 22 CDR Yeah.

07 07 14 29 LMP We landed at - see, 104 - No, I take it - 71 hours we've been on the ground.

07 07 14 41 CDR Okay, Charlie, here's the VERB 47.

07 07 14 42 LMP Okay, babe. I'm ready. I got to open that water. Whoo!

07 07 14 50 CDR Yeah, open that water. Forget that thing.

07 07 14 52 LMP Okay; 414 plus 1. HI bit rate, got it. Go.

07 07 14 56 CDR ENTER. Wait a minute. We've got to load VERB 25 - -

07 07 15 03 LMP Oh, rats. Yeah.

07 07 15 08 CDR What is that?

07 07 15 10 LMP Okay; load once - VERB 25. Did you ever PRO on that?

07 07 15 12 CDR Yeah, I did. No, I didn't. VERB 25

07 07 15 20 LMP Yeah, ENTER. Plus 170, plus all balls, plus 4.

07 07 15 25 CDR 0004?

07 07 15 27 LMP Yeah, just put a 4 in there and - There you go.

07 07 15 31 CDR That what you want, huh?

07 07 15 32 LMP Yeah, now let me see if I got 414 and a 1. Okay. Go ahead.

07 07 15 42 CDR PRO.

07 07 15 48 LMP Good thinking, John, I forgot - It ought to say "Load the K-factor." We must have missed that somewhere.

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07 07 15 55 CDR May be two or three pages of stuff we missed, Charlie.

07 07 16 07 LMP Okay. I got it.

07 07 16 10 CDR Okay. 308, 305, 302, 299, 296, 293, 289, 4 minutes, 04:30.

07 07 16 29 LMP Okay; 15 minutes, I'm going BATs 2 and 4 - Okay, Houston. Can I take BATs 2 and 4 OFF now?

07 07 16 39 CC Roger. We're ready.

07 07 16 41 LMP Okay, John. You've got - 5 and 6 are looking good.

07 07 16 45 CDR BATs 2 and 4, OFF/RESET.

07 07 16 47 LMP Okay BATs 2 going OFF/RESET.

07 07 16 49 CDR Talkback barber pole, BAT 4, OFF/RESET?

07 07 16 51 LMP It is.

07 07 16 52 CDR DESCENT BAT, DEAD FACE.

07 07 16 54 LMP Okay; dead facing.

07 07 16 55 LMP MARK.

07 07 16 56 CDR Okay.

07 07 16 57 LMP Okay.

07 07 16 58 CDR Talkback barber pole - -

07 07 17 01 LMP Okay.

07 07 17 02 CDR - - circuit breakers, 11 and 16, ECA CONTROLS, open.

07 07 17 03 LMP Okay.

07 07 17 05 CDR And circuit breaker, 11 and 16, ASCENT ECA CONTROLS to open.

07 07 17 11 LMP Okay, don't we open the DESCENT ECA, also?

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07 07 17 12 CDR Yeah. Didn't I tell you? Both of them. DESCENT ECA - -

07 07 17 16 LMP Okay.

07 07 17 17 CDR - - and ECA CONTROL.

07 07 17 18 LMP Okay.

07 07 17 19 CDR ASCENT ECA CONTROL. Verify circuit breakers per launch, check the configuration charts.

07 07 17 26 LMP Okay.

07 07 17 30 CDR Okay. S-BAND ANTENNA is open, AGS, there's FDAI, AC BUS VOLT, AOT LAMP, and - all closed except the THRUST breaker. Okay, urine line HEATER breaker should be open. RENDEZVOUS RADAR - SIGNAL CONDITIONER 1, AEA, ABORT STAGE, ATCA (PGNS), AELD, DIRECT CONTROL, DECA POWER, LOGIC POWER, UTILITY. Okay. SIGNAL STRENGTH DISPLAY; the three of those should all be closed. They are. Two, 3, 4, those are open. One, 2, 3, 4 of those are open. One, 2, 3, 4, 5, 6, 7 of those is open. One of those is open. One, 2, 3, 4, 5, 6, 7. Seven of those is open. Excuse me, Charlie.

07 07 18 43 LMP No sweat. One open, top row, I got it, PQGS. One open, second row: DESCENT ENGINE OVERRIDE. Good. Four open, next row: S-BAND ANTENNA, TV, GLYCOL PUMP, LCG PUMP, CABIN FAN CONTROL. Six open, bottom row: MESA, S-BAND, ASCENT ECA, DESCENT ECA, DESCENT ECA CONTROL, BUS TIES. Okay. Okay; at minus 12 minutes, give me a VERB 83.

07 07 19 31 CC Orion, we'd like CABIN GAS RETURN in EGRESS.

07 07 19 35 LMP It is. Oh, no; it's not.

07 07 19 41 CDR Did I miss that one, Charlie?

07 07 19 42 LMP No, you - That's what - what the procedure says.

07 07 19 46 CDR Huh?

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07 07 19 47 LMP That was correct. Roger. It's in EGRESS. Our procedure said AUTO, but they changed their mind, I guess. Okay, you can PRO. Okay; for an APS leak, we get a 400 plus 1; a 604 ENTER; GUIDANCE CONTROL, AGS; regs, open; MASTER ARM, ON; ENGINE ARM, ASCENT; and ABORT STAGE, push. And we'll (cough) - we'll be right on the way.

07 07 20 23 CDR Okay.

07 07 20 35 LMP Okay, 11 minutes.

07 07 20 49 CDR Shall we do that at lift-off minus 10?

07 07 20 52 LMP Yeah.

07 07 21 09 CDR Why not?

07 07 21 37 LMP Boy, this is gonna be some ride!

07 07 21 42 CDR I hope so, Charlie.

07 07 21 43 LMP Yeah. All right, Jim. How does the tube look? We're ready to pressurize the APS now. Okay, MASTER ARM, ON.

07 07 21 46 CC We're standing by. You have the GO for press.

07 07 21 49 LMP ASCENT HELIUM select, TANK 1.

07 07 21 51 CDR Okay; MASTER ARM is ON. We have two lights; we're going to TANK 1. Okay. Gonna fire TANK 1?

07 07 21 57 LMP Yep. FIRE - ASCENT HELIUM PRESS, FIRE.

07 07 22 00 CDR ASCENT HELIUM PRESS, FIRE, TANK 1.

07 07 22 06 LMP There she comes, pressurized right up. Hardly dropped. Okay, select TANK 2. Wait a minute.

07 07 22 18 CDR How does that look to you, Houston?

07 07 22 22 CC Stand by.

07 07 22 36 CC TANK 1 looks good. GO for TANK 2.

07 07 22 38 CDR Roger.

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07 07 22 41 LMP Okay. Select TANK 2?

07 07 22 43 CDR Go.

07 07 22 44 LMP ASCENT HELIUM PRESS, FIRE.

07 07 22 45 CDR ASCENT HELIUM PRESS, FIRE.

07 07 22 50 CDR Okay; there's TANK 2.

07 07 22 52 LMP MASTER ARM, OFF.

07 07 22 53 CDR MASTER ARM is OFF.

07 07 22 54 LMP The helium went up; 31, 20. Okay? Okay, I'm gonna close MAIN SOV A.

07 07 23 06 CDR Okay.

07 07 23 07 LMP Open the ASCENT FEEDs.

07 07 23 08 CDR Okay.

07 07 23 10 LMP Open the ASCENT FEEDs, close MAIN SOV B.

07 07 23 15 CDR Okay; we're crossfeeding with the new procedure you just gave us, Houston.

07 07 23 18 LMP We're - it's not - it's ascent feed.

07 07 23 21 CDR I mean ascent feeding. I'll get it right one of these days.

07 07 23 30 LMP Okay; standing by for 5 minutes.

07 07 23 33 CDR Roger.

07 07 23 34 LMP Let's check the APS card right now.

07 07 23 36 CDR Okay.

07 07 23 40 LMP Okay. C - DISPLAY/ENGINE OVERRIDE LOGIC is closed.

07 07 23 42 CDR Go.

07 07 23 43 LMP CB (11) and (16) STAB/CONT - -

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07 07 23 44 CC Orion, you're GO for lift-off.

07 07 23 45 LMP -- STAB/CONTROL all closed except --

07 07 23 46 CDR Roger.

07 07 23 47 LMP -- except your AEA DEC - and DECA POWER.

07 07 23 50 CDR AEA and DECA POWER, Charlie.

07 07 23 53 LMP Okay, DESCENT ENGINE OVERRIDE is open. RATE SCALE,  
25 DEGREES A SECOND.

07 07 23 57 CDR 25 DEGREES A SECOND.

07 07 23 58 LMP ATT/TRANSLATION to 4 JETS.

07 07 24 00 CDR 4 JETS.

07 07 24 02 LMP BALANCE COUPLE, ON.

07 07 24 03 CDR BALANCE COUPLE is ON.

07 07 24 04 LMP DEAD BAND is MIN.

07 07 24 05 CDR DEAD BAND, MIN.

07 07 24 06 LMP ABORT, ABORT STAGE, reset.

07 07 24 07 CDR Reset.

07 07 24 08 LMP ATTITUDE CONTROL, three, to MODE CONTROL.

07 07 24 10 CDR ATTITUDE CONTROL, three, to MODE CONTROL.

07 07 24 13 LMP MODE CONTROL, ascent - for ascent, PGNS and AGS  
to AUTO.

07 07 24 16 CDR Okay.

07 07 24 17 LMP Stop pushbutton, reset.

07 07 24 18 CDR They're reset.

07 07 24 19 LMP TTCA, two, to JETS.

07 07 24 20 CDR Two to JETS.

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07 07 24 21 LMP Okay; standing by for 2 minutes.

07 07 24 23 CDR We go to the lift-off book, don't we?

07 07 24 25 LMP But - Yeah, we've got to get the LANDING RADAR AC closed at 5 minutes. I mean the RENDEZVOUS RADAR.

07 07 24 31 CDR Yeah.

07 07 26 31 LMP Okay; RCS, you're looking good. Water's looking good. What's wrong, John?

07 07 26 49 CDR Something's in my eye.

07 07 26 51 LMP Oh.

07 07 26 52 CDR I got it.

07 07 27 00 LMP Okay; RENDEZVOUS RADAR, AC, closed.

07 07 27 06 CDR RENDEZVOUS RADAR, AC, closed.

07 07 27 08 LMP And we go to the Timeline Book.

07 07 27 22 LMP Can you close that behind you, John, here?

07 07 27 24 CDR What's that, Charlie?

07 07 27 25 LMP This data file thing?

07 07 27 26 CDR Sure.

07 07 27 27 LMP Thanks. I couldn't reach it.

07 07 27 31 CDR Get one snap on it.

07 07 27 33 LMP Or that Velcro on the other side if - Okay; 4 minutes.

07 07 28 08 LMP Okay, she looks good to me.

07 07 28 35 CDR (Coughing).

07 07 28 50 LMP How's your eye, John?

07 07 28 51 CDR Okay.

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07 07 28 56 LMP What's wrong?

07 07 28 58 CDR I think it's - I'm sweating.

07 07 29 00 LMP Hmm.

07 07 29 12 CDR It's okay now.

07 07 29 14 LMP Sure?

07 07 29 15 CDR Yeah.

07 07 29 34 LMP Was the Sun shining in it?

07 07 29 35 CDR Yeah.

07 07 29 47 CDR Okay, Charlie; 2 minutes.

07 07 29 48 LMP MASTER ARM, ON.

07 07 29 49 CDR Okay, Houston; MASTER ARM is coming ON. Two lights.

07 07 30 00 LMP Okay; AGS needles are deflected. Alignment looks great.

07 07 30 25 LMP Okay; ICS/PTT; 400 plus 1 is in; we've reset the watch.

07 07 30 31 CDR Okay.

07 07 30 40 LMP Okay; at plus 1 second, if we get an auto ignition, it's the START button.

07 07 30 45 CDR Okay.

07 07 30 50 LMP Okay; 1 minute.

07 07 31 08 LMP Okay; get the guard off the ENGINE ARM.

07 07 31 11 CDR Yeah.

07 07 31 15 LMP DSKY blanks.

07 07 31 16 CDR DSKY blanks, 30 seconds.

07 07 31 21 LMP Camera's started, and it's running. Okay; standing by for 10 seconds.

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07 07 31 27 CDR Okay.

07 07 31 36 LMP Let me get this first.

07 07 31 38 CDR Okay.

07 07 31 39 LMP ABORT STAGE, ENGINE ARM.

07 07 31 42 CDR ENGINE ARM to ASCENT.

07 07 31 44 LMP PRO. She took. Stand by; 3, 2, 1 -

07 07 31 49 LMP LIFT-OFF. There we go!

07 07 31 52 CDR Auto start; engine START pushbutton.

07 07 31 53 LMP Engine START.

07 07 31 55 CDR Seven, 8, 9, 10, pitchover.

07 07 31 59 LMP Pitchover.

07 07 32 00 CDR Pitchover on time.

07 07 32 04 LMP What a r - -

07 07 32 05 CDR Okay; she's right on.

07 07 32 06 LMP What a ride! What a ride! Okay; 18 seconds, John; 30 seconds, looking for 308.

07 07 32 12 CDR Right on; it's right on the H-dot.

07 07 32 19 LMP Lot more wallowing than I thought.

07 07 32 21 CDR Yeah.

07 07 32 22 LMP 308, looks good. 4800, 91, 1800, looking good. AGS is following; KEY RELEASE; coming up on a minute.

07 07 32 42 CDR There we go.

07 07 32 50 CDR One minute, 305.

07 07 32 51 LMP One minute, 305, looks good. 124 on the H-dot, 50 - -

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07 07 32 54 CC Orion, you're GO at 1.

07 07 32 55 LMP Okay, looking good.

07 07 32 57 CDR Roger; looking good here.

07 07 32 58 LMP AGS and PGNS agree.

07 07 33 11 LMP Quite a bump, huh? 01:30, you need 302 on the ball, John.

07 07 33 15 CDR Okay.

07 07 33 20 LMP It's that PHF [?] noise again.

07 07 33 22 CDR Yeah.

07 07 33 23 LMP 302, 4 - 151, out of 9000. Looking great.

07 07 33 25 CDR Okay.

07 07 33 26 LMP AGS and PGNS agree. Hey, we're really going down range. Look how we pitch, can't even see the horizon.

07 07 33 35 CDR Yeah.

07 07 33 37 LMP I can out the overhead window. Coming up 2 minutes.

07 07 33 48 CDR Two minutes and 299; it's right on.

07 07 33 54 LMP ...

07 07 33 55 CDR Looks good.

07 07 33 56 LMP 299, 170, 14,000; looks great. AGS and PGNS are right on, John.

07 07 34 01 CDR Right.

07 07 34 14 LMP 02:30, we're looking for 296.

07 07 34 18 LMP MARK it: 02:30, 183, 19,000; within 400 feet, and 2 feet a second. AGS and PGNS are looking great. Okay, I'll check the targeting. That's a good number.

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Day 8

07 07 34 36 CDR Good.

07 07 34 41 LMP Four minutes, it says.

07 07 34 44 CDR Get that - get those displays out of there, Charlie (laughter).

07 07 34 48 LMP Okay, coming up on 3 minutes -

07 07 34 50 LMP MARK.

07 07 34 51 CC Orion, you're GO at 3.

07 07 34 52 CDR Roger; looking good.

07 07 34 53 LMP 190, 25; looking good. AGS and PGNS tracking right together, Houston.

07 07 35 02 CC Roger.

07 07 35 12 LMP Okay, at 03:30, we're looking at 289.

07 07 35 17 CDR 289, right on.

07 07 35 18 LMP Right on.

07 07 35 21 LMP Okay; 03:30, and we're at 190 H-dot; 30,000, looking great.

07 07 35 24 CDR Okay.

07 07 35 29 LMP This beeby - this baby is flying it right on! AGS and PGNS agreeing. At 4 minutes, John, we're looking for 285.

07 07 35 39 CDR We got it; 285.

07 07 35 40 LMP Okay. ... some RCS.

07 07 35 50 CDR Roger; GO at 4.

07 07 35 51 LMP Four minutes, 184, 36,000; within 300 feet, cameras off. I'm gonna let it run out. No, I better not. I've got to get some of Ken. I forgot about that. Okay. At 04:30, looking for 282.

07 07 36 14 CDR Roger.

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07 07 36 19 LMP Right on; 282. Okay; at 184 - Okay, 04:30 was 173, L1; looking good. Going to 500 on the AGS; 2300 to go, John.

07 07 36 42 CDR Five minutes, 278.

07 07 36 43 LMP Yeah.

07 07 36 44 CDR Right on! Beautiful.

07 07 36 47 CC Orion, you're GO at 5.

07 07 36 50 LMP Mark; 5 minutes. 278, 157; right on! Within 1000 feet; 2000 to go; 05:30, we're looking for 274.

07 07 37 14 CDR Okay.

07 07 37 15 LMP Really picking up speed now;  $V_I$ . Okay, at 05:30, 135, 51,000; looking great. Six minutes, 269.

07 07 37 48 LMP Must be the roll transients he's talking about. Six minutes, 109, 54. Okay; we're right on, John. 1000 to go. Okay; let me slew the - Stick that breaker in over there.

07 07 38 11 CDR Okay.

07 07 38 12 LMP Forgot this. Okay, I won't worry about it now.

07 07 38 16 CDR Okay, Charlie, we're 700 to go.

07 07 38 17 LMP Yep. Okay; 600 to go. Looking good. Okay, ASCENT FEEDs are coming open.

07 07 38 33 CDR Okay.

07 07 38 36 LMP Okay. Ascent - terminated ascent feed, Houston. Okay, stand by for ENGINE ARM, John.

07 07 38 42 CDR Okay.

07 07 38 45 LMP Okay, there's 200. ENGINE ARM, OFF.

07 07 38 47 CDR ENGINE ARM is OFF.

07 07 38 49 LMP Stand by for ABORT STAGE, reset. And stop. See if we get auto shutdown. Stop. Shutdown.

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Day 5

07 07 38 58 CDR Shutdown. PRO, Charlie.

07 07 39 01 LMP PRO. Super, no trim.

07 07 39 04 CDR Okay.

07 07 39 07 LMP Insertion!

07 07 39 08 CDR Insertion, Houston. On time, minus 0.3, minus 1.0, and plus 1.7. Okay, Charlie. Let's get into this book right here.

07 07 39 17 LMP Okay; let me have it. Okay, VERB 82, we don't need that.

07 07 39 21 CDR No.

07 07 39 22 LMP VERB 76?

07 07 39 23 CDR I don't - -

07 07 39 24 LMP AGS MODE CONTROL, ATT HOLD.

07 07 39 26 CDR - - I don't want a VERB 76.

07 07 39 27 LMP Yeah. I know it. Let's go to LGC.

07 07 39 31 CDR Okay.

07 07 39 32 LMP RENDEZVOUS RADAR. Up here; RADAR MONITOR, RENDEZVOUS RADAR.

07 07 39 37 CDR Okay.

07 07 39 38 LMP SHAFT/TRUNNION, PLUS OR MINUS 5; RATE SCALE, 5.

07 07 39 40 CDR Okay.

07 07 39 44 LMP RANGE/ALTITUDE MONITOR, RANGE/RANGE RATE.

07 07 39 46 CDR Okay.

07 07 39 47 LMP Going to FORWARD on the VHF.

07 07 39 56 CC A reminder to hit the stop button, John.

07 07 40 01 CDR Say again? Over.

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07 07 40 03 CC You're okay.

07 07 40 09 LMP Say again, Houston.

07 07 40 14 CC Never mind. You're standing by for tweak. I have the tweak for you.

07 07 40 21 CDR Okay; go ahead.

07 07 40 28 CC 175:54:05, minus 2.0, minus 0, minus 10.0. Over.

07 07 40 39 LMP Copy at 175:54:05, minus 2.0, minus 0, minus 10.0.

07 07 40 50 CC Good readback.

07 07 40 51 CDR Two - 2 back and 10 away from the Moon, right?

07 07 40 53 LMP Ten and - Yeah. Uh-huh. Two down, and 2 back.

07 07 40 59 CDR No, 2 down - -

07 07 41 01 LMP Two back.

07 07 41 02 CDR Yeah, that's what I mean, 2 back.

07 07 41 08 LMP And - and 2 down. To us. Our feet. X, minus X, is 2 down.

07 07 41 13 CDR Two down.

07 07 41 14 LMP Yeah.

07 07 41 15 CDR Two retrograde.

07 07 41 16 LMP That's right.

07 07 41 17 CDR And 10 away from the Moon.

07 07 41 18 LMP Two here, minus 2, and a minus 10.

07 07 41 19 CDR Yeah; I know it.

07 07 41 20 LMP Okay.

07 07 41 22 CDR When is it?

07 07 41 25 LMP At 1 - 54:05. We got another minute.

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07 07 41 28 CDR Okay; what's the - on - rest on the checklist there?

07 07 41 30 LMP I'm getting it now. It's over here on my side. Plus 03979.

07 07 41 57 LMP Okay; stand by to burn.

07 07 42 10 LMP Look at those PIPAs, would you?

07 07 42 12 CDR Yeah. I just re - I just redid them.

07 07 42 14 LMP Oh, you did.

07 07 42 15 CDR Yeah. 01:50 - 01:50 - -

07 07 42 16 LMP Okay; 2 aft, John, now.

07 07 42 30 LMP Look at all that dust. Okay. Minus 10.

07 07 42 50 LMP Little bit more.

07 07 42 52 CDR Okay?

07 07 42 53 LMP Okay. That looks good. Okay?

07 07 42 54 CDR Yeah; let's go.

07 07 42 56 LMP Okay; PRO. Okay. Get me INVERTER - check INVERTER 2 - C - Okay, I got INVERTER 2; you can open INVERTER 1 breaker. LOGIC POWER, open; and CABIN FAN, close. Okay. Tweak's complete, Houston.

07 07 43 25 CC Roger. Copy.

07 07 43 26 LMP Did you get your CABIN FAN?

07 07 43 29 CDR Yeah, we need that one bad, don't we?

07 07 43 31 LMP Okay, John. We get an auto maneuver -

07 07 43 33 CDR Okay. Well, I got to call up P20 again to get it.

07 07 43 39 LMP Okay. I know it. Why don't -

07 07 43 49 CC Orion, we'd like you to use the - B SYSTEM, so open the CROSSFEED and close the MAIN SOV on SYSTEM A.

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07 07 43 59 CDR Roger.

07 07 44 01 LMP Okay, Jim. You got it. We're crossfeeding SYSTEM Bravo. For P20 auto maneuver, pitching up.

07 07 44 15 CDR We'd better leave our helmets and gloves on.

07 07 44 18 LMP I think we better leave our helmets and gloves on. Did you get the CABIN FAN, John?

07 07 44 22 CDR CABIN FAN circuit breaker is in.

07 07 44 23 LMP Okay; good.

07 07 44 26 CMP And, Houston; Casper will need a state vector for a ... to be ready?

07 07 44 35 LMP Okay. It says we're there. ENTER. Check the AGS needles. AGS wants to pitch down to get him.

07 07 44 47 CDR No, he's - he's right out there.

07 07 45 08 CMP Houston, Casper. Roger. I'll need a state vector. How soon do you expect to have one?

07 07 45 18 CC Stand by.

07 07 45 21 LMP Look at that signal strength, John.

07 07 45 23 CDR Yeah.

07 07 45 25 LMP Look at that beautiful thing. Okay. We got him.

07 07 45 33 CDR Okay.

07 07 45 34 LMP Down 4 degrees. Okay? I'm gonna accept it.

07 07 45 36 CDR Well, I don't know - I sure don't see - -

07 07 45 37 LMP Well, that was the last maneuver we had, see?

07 07 45 38 CDR Okay.

07 07 45 39 LMP He's holding attitude. It'll give us a new maneuver here.

07 07 45 41 CDR Okay, go. Here's some - -

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07 07 45 48 LMP See. There we go. Now look, look at the radar needles. And the AGS needles are centered too. Right on.

07 07 45 53 CDR Okay.

07 07 45 54 LMP Okay, I see him. He's 12 o'clock, a bright star.

07 07 45 57 CDR You see him, Charlie?

07 07 46 00 LMP Yeah, uh-huh.

07 07 46 03 CDR I got him, too.

07 07 46 06 CDR Okay. There's a data point. That's a 166 miles in the sunset.

07 07 46 08 LMP Yeah. Okay. VERB 80 - P20 auto maneuver, VERB 80.

07 07 46 14 CDR Okay, Casper. We have you visually.

07 07 46 18 LMP Okay, did you get the VERB 80 in?

07 07 46 20 CDR VERB 80 ENTER.

07 07 46 23 LMP Okay. That's a - we - let's do a VERB 32 on that one.

07 07 46 25 CMP Glad to hear that. I don't have you yet.

07 07 46 27 LMP That - that was a good update. We could have taken that one. Okay, 417 plus 10000 ENTER, 411 plus 10000.

07 07 46 41 CMP Houston, Casper is standing by.

07 07 46 45 CC Roger. We're still working on it, Ken.

07 07 46 49 LMP He's gone, now.

07 07 46 51 CDR Yeah, it's sunset.

07 07 46 53 LMP Yeah.

07 07 46 54 CDR I still got him.

07 07 46 55 LMP You do?

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[REDACTED]

07 07 46 56 LMP You do?

07 07 46 57 CDR Yep. I can't see him in the COAS, but I can see him outside of it.

07 07 47 02 LMP Oh, yeah. I see him. Yeah. 411 ENTER, 621 read-out. Okay. We got the AGS and AUTO update, Jim.

07 07 47 21 LMP T minus 38 minutes.

07 07 47 33 CDR Okay. We're gonna accept that, Charlie?

07 07 47 35 LMP Yeah. It was a good update.

07 07 47 56 CC Okay, Ken; if you'll go to ACCEPT, we'll send an up-link for you.

07 07 48 06 CDR Okay. The ENGINE ARM is OFF; stop pushbutton is going to reset.

07 07 48 08 LMP Okay. You don't have to worry about that, really. Okay. Ten, set DET. Look at all that dirt. 303 is 25 degrees, the AGS says, John.

07 07 48 24 CDR Okay.

07 07 48 25 LMP Okay. We got one set of marks already. Okay. I guess we could do a VERB 83 to set the ORDEAL.

07 07 48 32 CDR Let's hold off until we get to the next - -

07 07 48 34 LMP Okay, P -

07 07 48 35 CDR - - mark, Charlie.

07 07 48 37 LMP You could call P34.

07 07 48 39 CDR Yeah. I'll do that, too.

07 07 48 40 LMP Okay. Hope that cabin fan works. Look at that beautiful sunset, would you? Boy, Jim. The sunset is spectacular.

07 07 49 01 CC Bet it is.

07 07 49 06 LMP Okay; we must have it, John. Okay, P34. Okay, load TPI time of 176:37:52.00.

[REDACTED]

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07 07 49 34 CDR What's the AGS say to -

07 07 49 39 LMP What does AGS say - -

07 07 49 40 CC Orion, there will be no PIPA update.

07 07 49 41 CDR Understand. No PIPA update.

07 07 49 43 LMP Well, we got a couple of marks, and I destroyed our solution. None out of plane. 81 - -

07 07 49 51 CC Casper, the computer's yours.

07 07 49 52 LMP - - that's probably a pretty good number. Plus 81 plus 14.

07 07 49 57 CMP Thank you.

07 07 50 02 LMP Oh, marks already. Fantastic!

07 07 50 06 CDR Okay. Charlie, why don't we get a - whatever it is you do to get a VERB 86.

07 07 50 11 CMP And, Orion, I've got about 2.2 volts on the signal - on the radar. Can you give me a better reading?

07 07 50 17 CDR Roger. We're at 113 miles. And I have you visually out the window as a bright star.

07 07 50 35 LMP I see his beacon! It's flashing at us. Down a little bit.

07 07 50 39 CMP Okay. We need to try to reacquire. I'm several miles off from you. We'll reacquire on the A channel.

07 07 51 03 CDR Houston, what time is LOS?

07 07 51 09 CC Stand by.

07 07 51 29 CC We have a 176:23, Charlie [sic].

07 07 51 32 CDR Okay. Thank you. 176:23 for LOS, Charlie.

07 07 51 39 LMP Okay.

07 07 51 40 CDR Twenty minutes.

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07 07 51 42 LMP Five marks in, John. Okay. You can - can I get a VERB 83?

07 07 51 52 CDR You can touch my computer today.

07 07 51 53 LMP Okay.

07 07 51 54 CMP How about another range check when you get a chance to, please?

07 07 51 58 CDR Okay. We're at 106.5 miles on the tapemeter. That could be a couple of miles off, Ken.

07 07 52 06 CMP Okay.

07 07 52 08 LMP We ought to check that.

07 07 52 13 CDR Okay. The VERB 83 says we're at 105.72 miles, with five marks in.

07 07 52 18 LMP Okay; 23 on ORDEAL, John.

07 07 52 22 CDR Okay.

07 07 52 28 LMP That cabin fan is cleaning it out in here.

07 07 52 37 CDR It ain't moving, Charlie.

07 07 52 41 LMP Are you in POWER OFF?

07 07 52 43 CDR No. The power is on LUNAR. It's in SLEW, DOWN. There you go.

07 07 52 50 LMP There we go. Okay, 23. Stop. That's good. That's 24. That's close enough.

07 07 53 02 CDR OPERATE/SLOW.

07 07 53 04 LMP Okay. Got three marks.

07 07 53 07 CDR Okay. Let's see what we're in.

07 07 53 11 LMP Okay. The AGS says 315. It says a 410. (Cough) By 76. That's probably biased with some marks. Okay, Ken. We see your tracker - your light's flashing.

07 07 53 45 CMP Okay, ...

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07 07 53 49 LMP Yeah. 41 by 77. Okay. We need a VERB 48, John. There's some food. Did you get a VERB 32?

07 07 54 19 CDR No, I didn't do a VERB 32. I PROed on that thing. VERB 48 ENTER, 21 ENTER, what?

07 07 54 29 LMP Oh, excuse me. 12012.

07 07 54 37 CDR Okay, PRO. Okay, PRO.

07 07 54 43 LMP Jim, we got 5988 on the weight. Does that look okay?

07 07 55 14 CDR We in darkness?

07 07 55 15 LMP Yeah. Think that must be him, that bright star up there.

07 07 55 22 CDR That's him, Charlie. He'll be at - he'll disappear in a second when he goes into nighttime.

07 07 55 27 LMP Yeah. Okay. Coming up on 30 minutes for my chart R and R-dot.

07 07 55 48 CDR The COAS is doing pretty good, Charlie. I got it right in the middle of the COAS. Look at the needle.

07 07 55 52 LMP Yeah. Fantastic.

07 07 55 54 CDR That's good, isn't it?

07 07 55 56 LMP Super, John.

07 07 56 05 LMP MARK. 365 and 90.5.

07 07 56 22 LMP He disappeared.

07 07 56 23 CDR Yeah.

07 07 56 48 CMP Okay. Do you have your tracking light on ...?

07 07 56 50 LMP Yes, sir. I'll cycle it - cycle it, but it was on. I can't tell whether it's working, though, Ken.

07 07 56 58 CDR I don't see nothing. I don't see any fla - -

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07 07 57 01 LMP I - I could barely see it on the footpad - even on - just on the footpad, the only way I could tell it was working, the - -

07 07 57 06 CMP Tallyho.

07 07 57 07 CDR Okay; he's got us.

07 07 57 08 CMP Tallyho.

07 07 57 09 CDR Good show, Ken.

07 07 57 11 LMP Great. Great, Ken.

07 07 57 22 CC Orion, this is Houston with the TPI solution.

07 07 57 26 CDR Okay. We're all ears.

07 07 57 31 CC Okay. DELTA-V<sub>X</sub>, plus 77.6; DELTA-V<sub>Y</sub>, plus 3.8; DELTA-V<sub>Z</sub>, plus 3.1; for a total of 77.7. TPF is 29. Over.

07 07 57 52 LMP Roger; copy. Plus 77.6, plus 3.8, plus 3.1, TPF is 29.

07 07 58 03 CMP Good readback.

07 07 58 21 LMP Man, that lift-off was something, wasn't it?

07 07 58 23 CDR That was neat.

07 07 58 25 LMP For a while there, I did - I did - I thought we - I heard it go poop and it sort of - it sort of sat. Before it lifted off.

07 07 58 38 CDR It's a sweet little flying machine.

07 07 58 39 LMP Yeah.

07 07 58 43 CDR ... all that stuff.

07 07 58 45 LMP Scissors floated out. Hmm.

07 07 58 54 CDR See how much dirt has disappeared so far?

07 07 58 56 LMP Yeah.

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07 07 59 26 LMP Okay. I'm going to break out the -

07 07 59 29 CDR Okay, we VERB 32 it right here somewhere.

07 07 59 31 LMP Fifteen marks it says, John, but -

07 07 59 34 CDR I don't need that. VERB 32 it.

07 07 59 35 LMP Okay.

07 07 59 36 CDR ... many minutes. VERB 32 ENTER. Okay, Houston. We're VERB 32, and we ought to have pretty good numbers.

07 07 59 55 CC Roger. We copy.

07 08 00 00 CDR Ah, this is a sweet flying machine, I'll tell you.

07 08 00 15 CC We'll read it down here, John. We can't read you very well. It's just excessive noise on the loop.

07 08 00 19 CDR Okay.

07 08 00 24 LMP (Cough) Okay, there it is; 30.6, John.

07 08 00 29 CDR Okay.

07 08 00 36 LMP PRO. NOUN 58 coming up. Okay; 40.2, 78.1, 27.7. NOUN 81s, plus 78.0, plus 2.7, minus 0.2.

07 08 00 56 CDR What's the ground say?

07 08 00 58 LMP Huh?

07 08 00 59 CDR What did the ground say?

07 08 01 01 LMP The ground says minus 77.6 - plus 77.6, plus 3.8 - -

07 08 01 08 CC Okay, we copied them, John.

07 08 01 12 LMP - - plus 3.1.

07 08 01 14 CDR Okay.

07 08 01 19 LMP And the AGS says plus 70 - 78.4, plus 2.0 plus 2.6. It's got a good solution also, John.

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07 08 01 41 CDR It's closer to the ground than we are.

07 08 01 43 LMP Yeah.

07 08 01 54 LMP Okay, Ken. We did a recycle. We're looking at 78.0, plus 2.7, a minus 0.2 on the PGNS.

07 08 02 07 CDR Okay, Charlie. Tell me again what - -

07 08 02 08 CC We copy.

07 08 02 09 CDR Tell me again what the AGS - AGS says in regards to the ground.

07 08 02 12 LMP It's - the AGS says 78.4 versus 77.6. It says 2.0 versus 3 point - 8, and it says 2.6 versus 3.1.

07 08 02 29 CDR Understand.

07 08 02 40 LMP Seventy miles out, John. Get on the chart at 25 degrees. Seventy miles and 25 degrees. We're right on the line. Golly, what is that? Want some tears?

07 08 03 01 CDR No, thank you, Charlie.

07 08 03 02 LMP (Laughter)

07 08 03 12 LMP You notice our 40-g [?] bags didn't come out with two snaps on them?

07 08 03 22 CDR Great.

07 08 03 35 LMP What a sweet machine.

07 08 04 33 LMP Got you some lunar dust.

07 08 04 36 CDR ...

07 08 04 40 LMP (Laughter) How's your eye?

07 08 04 41 CDR Fine.

07 08 04 42 LMP Okay.

07 08 04 43 CDR It's the sunshine.

07 08 04 45 LMP Oh.

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Day 8

07 08 04 47 CDR It's all in one eye. That doesn't bother you?

07 08 04 49 LMP Yeah. I had to close it. Uh-huh.

07 08 05 03 CDR What a heck of a time for something like that to happen to you.

07 08 05 06 LMP I know it. I see his tracking light, John. Flashing. 12 o'clock. Hope that wasn't a dadgum - Oh, that might have been a little particle.

07 08 05 30 CDR Yeah, that's a particle floating by us that we're lighting with our -

07 08 05 32 LMP Yeah. Yeah, right.

07 08 05 34 CDR With our - we're lighting it with our strobe [?].

07 08 05 38 LMP Yeah.

07 08 05 40 CDR Matter of fact, I think that's what we were tracking the other day when we first saw Ken.

07 08 05 57 LMP Hey, Houston; Orion. How do we look for APS TPI?

07 08 06 09 CC Roger; GO for an APS TPI.

07 08 06 13 LMP All right. What's your estimate of burn time?

07 08 06 20 CDR Four seconds.

07 08 06 25 LMP Okay. Check the RCS. Looking good. EPS is looking good.

07 08 06 42 CC Orion, are you requesting burn time? Over.

07 08 06 45 LMP That's affirmative.

07 08 06 50 CC Stand by.

07 08 07 04 LMP That - John, that fan's giving a lot of circulation. Look at - Watch this.

07 08 07 09 CDR Yeah. It was supposed to have cleaned the place out. Man, we already done more work today than I do in a month normally, Charlie. I can't believe it.

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07 08 07 25 LMP How you feeling?

07 08 07 27 CDR I feel great.

07 08 07 28 LMP Yeah, me too.

07 08 07 29 CDR That's really an exhilarat - -

07 08 07 30 CC Burn time for TPI should be about 2.5 seconds.

07 08 07 38 LMP Roger. Thank you, 2.5.

07 08 07 41 CDR Trouble is my eyes was tearing so bad I couldn't look out and watch it. Dadgummit!

07 08 07 45 LMP Oh, that was a - that was some lift-off. There was a piece of the MESA blanket went out there about 300 meters. I'm glad we put the ALSEP over where we did. That thing would have - could have wiped it out. And it hit the ground with a big - ton of bricks.

07 08 08 02 CDR I didn't even see the ALSEP.

07 08 08 25 CDR Okay, ascent.

07 08 08 42 LMP (Laughter) We're going to have lots of marks.

07 08 08 46 CDR I'm not so sure I shouldn't VERB 93 it.

07 08 08 50 LMP Okay, give them - That might be a good idea.

07 08 08 54 CDR Hey, Houston, with 21 marks at 17 minutes, you want to just keep marking as opposed to VERB 93ing, right?

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07 08 09 08 CC That's right.

07 08 09 10 CDR The answer to that, Jim, was yes, I'm sure. Just want to make sure somebody thunked [sic] about it.

07 08 09 24 CC Okay, just continue marking them, John.

07 08 09 25 CDR Understand.

07 08 09 34 CC Okay, you're coming up on 2 minutes to LOS, and you're looking good.

07 08 09 39 CDR Sure are, man.

07 08 09 42 CC All solutions have converged.

07 08 09 54 LMP We used about - we haven't used hardly any RCS.

07 08 10 03 CDR I'm just trying to keep your needles close enough to get good marks, Charlie.

07 08 10 07 LMP That's great, John; thank you. Okay; 50 miles at 28 degrees.

07 08 10 22 LMP Okay; riding slightly inside, but not much. Excuse me.

07 08 10 32 CDR Sure.

07 08 10 33 CC Orion, you could do your final comp at 10 instead of 8. Your preference.

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07 08 10 41 LMP That might be a good idea.

07 08 10 44 CDR Okay.

07 08 10 45 LMP (Coughing)

07 08 10 52 MS ...

07 08 10 53 LMP We're probably gonna break lock. With all of this Z.

07 08 10 58 CDR Yeah, we are gonna break lock.

07 08 11 00 LMP All this X and no Z.

07 08 11 02 CDR Yeah.

07 08 11 11 LMP Okay, my comm is set. There they go.

07 08 11 20 CDR Hey, Ken, how are you doing?

07 08 11 31 CMP Orion, this is Casper on Victor Hotel. How do you read?

07 08 11 34 CDR Read you loud and clear, Ken. Boy, it'll be nice to see you.

07 08 11 38 CMP Hey, this stuff is working pretty good today, isn't it?

07 08 11 40 CDR It really is. The ground - MSFN says all solutions are converging.

07 08 11 46 CMP Man, I could see that thing - light of yours at 70 miles on the telescope, even.

07 08 11 52 CDR Yeah, I could see you visually right after lift-off, when we were supposed to be like 150 miles away.

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07 08 11 58 CMP ...

07 08 12 01 CDR Charlie and I both saw you. That's a good data point. We been asking and nobody has the answer. You can't see it through the COAS, but you can if you look around the side.

07 08 12 10 CMP Well, you got to be in the - ... down ... here; that'll ... it up.

07 08 12 14 CDR Yeah, that's right. That's the answer.

07 08 12 22 CMP John, why don't you give me a mark at 12 minutes to go or something. ...

07 08 12 27 CDR Okay.

07 08 12 30 LMP Man, Ken, we got a load of rocks.

07 08 12 33 CMP Well, that's fine. We got lots of room for them.

07 08 12 35 CDR Why? What did you do?

07 08 12 38 CMP Man, we got the world's two biggest trash cans you've ever seen.

07 08 12 41 CDR I bet.

07 08 12 44 LMP Well, you ought to see the two pig pens over here. You ain't gonna let us in!

07 08 12 48 CMP (Laughter) ... you guys really did get ...

07 08 12 55 CDR It was - it was - Geez, it's a lot of fun, Ken.

07 08 13 00 LMP I never had so much fun in all my life, Ken. And old FDO put us right on the spot. Did you ever see the LM - tracking?

07 08 13 14 CMP I never had a tracking pass on you.

07 08 13 16 LMP Oh, that's too bad.

07 08 13 17 CMP I saw - I saw a glint off the - the LM once, and I saw a glint off the Rover when you were over on Stone Mountain - with the binoculars.

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07 08 13 26 LMP They told us that once.

07 08 13 31 CDR Okay, Ken, we got 12:30, 3, 2, 1 -

07 08 13 33 CDR MARK it - -

07 08 13 34 CMP ... I'm right with you - -

07 08 13 35 CDR - - MARK.

07 08 13 38 CMP ... I don't know whether it's this - this VHF comm or the ...

07 08 13 41 CDR Yeah.

07 08 13 43 LMP Yeah, you're a little garbled over here, but I think it's our receiver.

07 08 13 46 CDR 44 at 30 degrees. Well, you know, you've had one rendezvous, now we need one.

07 08 13 55 CMP Okay. I just ... you do this one.

07 08 13 58 CDR Yeah.

07 08 14 00 LMP How's your RCS looking, babe?

07 08 14 05 CMP (Laughter) Well, after we got through with that first fiasco, we've been - rather meager - meager in our usage.

07 08 14 11 CDR I bet.

07 08 14 13 CMP ... in town.

07 08 14 27 CDR This is like Gemini X. A dual orbit - a dual - no, I don't want to talk about it.

07 08 15 03 LMP Okay; 11 minutes.

07 08 15 22 LMP You want to PRO at 10, John?

07 08 15 24 CDR ...

07 08 15 29 LMP I don't think we're going to need a chart solution, but I'll take the numbers down anyway.

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07 08 15 31 CMP Standby numbers are the same as the ground numbers.

07 08 15 38 CDR Okay. Okay, Ken, we're gonna break lock here when we pitch around, because of this - all of this Z we got. I mean X.

07 08 15 53 CMP Okay; ... pressure numbers?

07 08 15 57 CDR Right.

07 08 15 58 LMP We haven't recycled yet.

07 08 15 59 CDR We haven't recycled yet.

07 08 16 01 CMP Okay, why don't you just copy my finals?

07 08 16 02 CDR Okay.

07 08 16 04 CMP Minus 78.4 - -

07 08 16 06 CDR Okay - -

07 08 16 07 CMP - - Minus 2.4, plus 3.8.

07 08 16 12 CDR Okay.

07 08 16 16 CMP And I got a control mode ... so I'm going to set my computer now.

07 08 16 21 CDR Okay - -

07 08 16 22 CMP Can you afford that?

07 08 16 23 CDR Yeah; oh, yeah.

07 08 16 24 CMP In other words, you got plenty of marks. All righty.

07 08 16 25 CDR We got plenty. We're gonna - we're gonna start ours, too.

07 08 16 29 LMP Want to PRO?

07 08 16 30 CDR Yeah, PRO at 09:30, Charlie.

07 08 16 32 LMP Okay. Okay, I'll stop updating on the AGS.

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07 08 16 38 CDR Okay.

07 08 16 41 LMP The AGS says 78.1. It's 30 46. PRO.

07 08 17 02 LMP Okay; 40.2, 78.0, 27, 0.7. That hadn't changed a bit. Okay, NOUN 81's a plus 78.0, plus 2.7, plus 0.7. Okay, there's a PRO.

07 08 17 47 LMP Okay, John. The only one we're off on is in Z. Minus - that'd be plus -

07 08 18 04 CDR How much are we off?

07 08 18 08 LMP About 2 feet a second. And you're about 3 - about 2.5 feet a second from the ground. And the Z comparison is 9 feet a second, so AGS and PGNS are both good.

07 08 18 20 CDR Okay. Well, we're righter than they are, I'm sure of that.

07 08 18 25 LMP Yeah. Well, the AGS says - the only one we're really bad on is - the AGS is minus 3.7.

07 08 18 35 CDR What's the PGNS?

07 08 18 36 LMP Okay, I'll -

07 08 18 40 CDR Z is not important.

07 08 18 42 LMP Yeah.

07 08 18 43 CDR How are we on X?

07 08 18 45 LMP X is right on.

07 08 18 47 CDR Okay.

07 08 18 48 LMP Okay, Ken, we're gonna burn the PGNS solution; we're within a foot a second.

07 08 18 52 CMP Okay.

07 08 18 54 LMP We didn't break lock. We haven't pitched.

07 08 18 56 CDR We ain't maneuvered to the attitude, Charlie.

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07 08 18 58 LMP Oh, that's why, huh? Okay, 404 is going to 0.

07 08 19 16 CDR We may not break it as it is. Are you ready for this maneuver, Charlie?

07 08 19 21 LMP Yes, sir.

07 08 19 23 CDR Yeah, we're gonna break it.

07 08 19 41 LMP We're not either. Look at that!

07 08 19 51 CDR Well, we might. We're right on the ragged edge, I think.

07 08 20 14 CDR Tried that before. It worked on the ground. You know something?

07 08 20 21 LMP What?

07 08 20 22 CDR I feel like we're still in one-sixth gravity with these restraints.

07 08 20 26 LMP I know it.

07 08 20 27 LMP Okay, John, I'm set up over here. We got NOUN 86, let's see, check NOUN 86 - 410 plus 5, and I'm not gonna load the DELTA-Vs.

07 08 20 57 CDR You gonna check NOUN 86?

07 08 20 58 LMP No, they're all right. It's just - see, they want me to keep my solution independent here. See how it does. 35, 104; it's pretty close. Is that okay with you? Or you want me to load NOUN 86?

07 08 21 11 CDR No, that's all right.

07 08 21 12 LMP Huh?

07 08 21 13 CDR That's okay, we can burn anyway. Who want - who wanted you to do that? Are you doing this for Jerry Thomas?

07 08 21 20 LMP No. It's just in the procedures. It's been that way. They said that - that if the solutions agree close enough to pass the test, to keep them independent.

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07 08 21 30 CDR Oh, okay.

07 08 21 46 LMP How about a little shot of agua?

07 08 21 49 CDR Man, that's the best idea I ever heard of.

07 08 21 54 CMP Did they tell you that they changed our schedule a little bit?

07 08 21 58 CDR Yeah, we get to keep the lunar module.

07 08 22 04 CMP Yeah, they also said we're going home a day early.

07 08 22 07 LMP They didn't tell us that.

07 08 22 09 CMP Well, I didn't get any answers as to why. I just got this cryptic "No ... P62." No - no shaping burn and come home a day early.

07 08 22 24 LMP Okay, see a little gitchy.

07 08 22 26 CMP I - I thought they ... to do something about it, but I guess there's ... been any reason to talk to anybody about it.

07 08 22 32 LMP We ought to PRO, John, get on to the - -

07 08 22 33 CDR Okay.

07 08 22 42 LMP Okay, Ken -

07 08 22 43 LMP MARK. 03:30 until the burn.

07 08 22 45 CMP Okay, I ... you. ... and I'm all set.

07 08 22 49 LMP Okay. Okay, at 1 minute, John, we go to AGS MODE CONTROL to AUTO -

07 08 22 52 CDR All righty.

07 08 22 54 LMP At 30 seconds, ABORT STAGE.

07 08 22 55 CDR Okay.

07 08 22 56 LMP Then you manual ullage.

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07 08 22 57 CDR 10 seconds' worth.

07 08 22 59 LMP 10; uh-uh. And I'll get the PRO. (Cough) about a 2-1/2, one-potato, two-potato, shutdown-type thing.

07 08 23 08 CDR Okay.

07 08 23 38 CDR Make sure that's in there. I'm trimming the residuals.

07 08 24 05 LMP That means we're leaving tomorrow.

07 08 24 07 CDR No, we - -

07 08 24 09 CMP ... the day after.

07 08 24 11 LMP Huh?

07 08 24 16 CMP I think it's the day after.

07 08 24 17 CDR The day after tomorrow? Is that a day early?

07 08 24 18 CMP I think so.

07 08 24 19 LMP Tuesday's not -

07 08 24 20 CMP Let's - we'll worry about it later.

07 08 24 21 LMP Yeah, okay.

07 08 24 23 CMP ...

07 08 24 39 CDR Super.

07 08 24 54 CDR Is that your orb rate, Charlie?

07 08 24 57 LMP Yeah.

07 08 24 58 CDR Okay - without the angle. That's right on.

07 08 25 02 LMP Yeah. Local horizontal.

07 08 25 08 CDR What was ours? PGNS solution? I forgot - -

07 08 25 12 LMP PGNS was 78.0, 2.7; point - plus 0.7; AGS was 78.3, 2.9, minus 3.7.

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07 08 25 22 CDR Okay.

07 08 25 23 LMP Okay, 50 seconds AGS MODE CONTROL is going to AUTO; stand by on ABORT STAGE.

07 08 25 32 CDR Okay, I'll get the manual ullage; then you PRO.

07 08 25 33 LMP Okay. And I get the PRO. Okay?

07 08 25 35 CDR Yeah.

07 08 25 37 LMP Well, we (cough) we've only been at it 14 hours. (Cough) Okay, ABORT STAGE. Stand by for 10 seconds.

07 08 25 43 LMP MARK, 20 seconds, Ken.

07 08 25 45 CMP All set.

07 08 25 47 LMP We look in good shape.

07 08 25 52 CDR This is what gets me.

07 08 25 54 LMP Okay. Ullage.

07 08 25 55 CDR 10, 9, 8, 7, 6 - -

07 08 25 56 LMP Broke lock.

07 08 25 57 CDR 5, 4 - -

07 08 25 58 LMP/CDR PRO.

07 08 25 59 CDR 3, 2 - -

07 08 26 00 LMP Stand by.

07 08 26 01 CDR 1 -

07 08 26 02 LMP Engine ignite.

07 08 26 03 CDR 1, 2, 3 ... - -

07 08 26 10 LMP Shut - Wow! Burn complete, Ken. PRO. Okay, we're trimming. Great, John!

07 08 26 25 CDR Shoot, look at it!

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07 08 26 27 LMP It's fast, isn't it?

07 08 26 39 LMP Dadgum. Okay, great. That thing really - that's great, John.

07 08 26 46 CDR Okay.

07 08 26 47 LMP Minus 2, minus 0, minus 0.2.

07 08 26 51 CDR Okay.

07 08 26 52 LMP Okay, we can PRO out of there. AGS has got minus 0.3 - minus 4 - plus 39. That's right. Okay. Stop that. Turn the page. Okay. AGS MODE CONTROL, ATT HOLD. P37 - Max NOUN 49's a 0.8 and 0.5 - and 5.0. Okay, do you want to do a VERB 67?

07 08 27 39 CDR Do I want to do a VERB 67?

07 08 27 41 LMP Yeah. For 2002, change the W-matrix.

07 08 27 45 CDR I will in a second, hear?

07 08 27 47 LMP Okay.

07 08 27 50 CMP Okay, can I reacquire ... ?

07 08 27 54 CDR Wait until we get pointed at you, Ken; it'll be 2 seconds.

07 08 27 57 CMP Okay.

07 08 27 59 CDR Okay, we're about there, go ahead.

07 08 28 00 CMP All right. And I'll tell you when I've got it.

07 08 28 20 CMP Okay, I got you at 27 miles.

07 08 28 29 CDR ... - -

07 08 28 30 LMP Okay, we haven't got a lockon yet.

07 08 29 06 CDR Come on, radar. There it goes.

07 08 29 08 LMP There she comes.

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07 08 29 09 CDR It was taking a long time to designate.

07 08 29 15 LMP/CDR Agh!

07 08 29 29 LMP Okay, 2000.

07 08 29 56 LMP Okay, Ken, we read 25 miles.

07 08 29 59 LMP MARK.

07 08 30 01 CMP Okay.

07 08 30 05 CDR Okay.

07 08 30 23 LMP Wonder what that noise is? That sounds like the evil winds blowing.

07 08 30 29 CMP I thought that was just on this side.

07 08 30 31 LMP No, it's terrible over here.

07 08 30 35 CMP It comes in - it must be the VHF ...

07 08 30 48 CMP It probably picked up when you ... lock.

07 08 31 15 LMP Twenty-four miles and 37 degrees.

07 08 31 31 CDR Hey, look up in the G&N Dictionary, how to enter that thing.

07 08 31 35 LMP VERB 67, and just load it and enter.

07 08 31 37 CDR Yeah, that's what I did. Then I had to PRO out of it.

07 08 31 41 LMP That's right.

07 08 31 43 CDR I never had to PRO out of it before.

07 08 31 44 LMP Okay, wait a minute; let me look.

07 08 31 47 CDR It'll tell you right there.

07 08 31 49 LMP Yeah. "VERB 67 LOAD." That's all it says.

07 08 31 53 CDR I don't think it's loaded.

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07 08 31 57 LMP I - -

07 08 31 58 CMP ... again with the ... values in there. And then after that ... zero on it, I think.

07 08 32 14 CDR Yeah, we got them.

07 08 32 16 LMP You ought to VERB 34 on that.

07 08 32 17 CDR What do you do on that? VERB 34?

07 08 32 18 LMP Yeah.

07 08 32 19 CMP ... too many zeros, or do you have another one?

07 08 32 21 CDR We have another register.

07 08 32 22 CMP Okay.

07 08 32 24 CDR VERB 34?

07 08 32 28 LMP Yeah. That'll kill it.

07 08 32 56 CDR I see him.

07 08 32 57 LMP You see him?

07 08 32 58 CDR Yeah.

07 08 33 00 LMP Yeah, there he is.

07 08 33 01 CDR We got your light, Ken.

07 08 33 04 CMP Okay.

07 08 33 15 LMP Boy, this is neat. That APS is a pretty big boot, isn't it?

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07 08 33 28 CDR Sure is.

07 08 33 46 LMP Okay; at 9 minutes, I need a theta.

07 08 35 18 CDR 43 6.

07 08 35 48 LMP Ken, you should have seen old Percy Precision, here, plant this beauty down! I'm tellin' you!

07 08 35 58 CMP ... by Double Spot?

07 08 36 00 LMP About 100 meters off - 200 meters, maybe.

07 08 36 09 CDR I do one precision at a time. See if you really got -

07 08 36 19 LMP Really got what?

07 08 36 21 CDR Trying to see if I really got drift up there.

07 08 36 25 LMP I see him out there.

07 08 36 27 CDR I do, too.

07 08 36 28 LMP That - that spot's been in the same place flashing. Is that what you said?

07 08 36 30 CDR Yeah.

07 08 36 31 LMP Yeah.

07 08 36 34 CDR I - some milliradians there.

07 08 36 38 LMP Yeah.

07 08 36 41 CDR Wish that cabin fan would suck all this dirt out of here.

07 08 36 42 LMP It's doing a pretty good job.

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07 08 36 46 CDR . But what happened when we lit the engine?

07 08 36 47 LMP I know it. It came all off the floor; that's the Velcro down.

07 08 36 52 CDR Ken, we're gonna need that vacuum cleaner something bad.

07 08 36 55 CMP Oh, okay.

07 08 36 58 LMP You won't even want to put on these OPSs, Ken.

07 08 37 01 CDR That's right.

07 08 37 09 LMP I only fell down six times.

07 08 37 12 CDR Charlie - Charlie was laying down more than he was standing up.

07 08 37 18 LMP Okay, coming up on - final comp.

07 08 37 20 CDR Okay.

07 08 37 22 LMP Okay, we'll give you a mark countdown of final comp, Ken.

07 08 37 24 CMP Okay.

07 08 37 25 LMP Okay, about 45, 40 seconds - 50 seconds.

07 08 37 37 LMP Can you imagine that, 18 li - more hours of consumables with three revs of high power?

07 08 37 39 CMP You could have gone 18 more hours?

07 08 37 41 LMP On the electrical.

07 08 37 42 CDR On the electrical.

07 08 37 54 CMP How long was your EVA today?

07 08 37 57 CDR/LMP 5 -

07 08 37 58 CDR 05:30. They wouldn't let us do a full one.

07 08 37 59 LMP 05:31.

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07 08 38 03 CDR For some reason.

07 08 38 04 LMP We - Okay. Stand by, Ken.

07 08 38 06 CMP All set.

07 08 38 09 LMP 3, 2, 1 -

07 08 38 12 LMP PRO.

07 08 38 14 CMP Okay. ...! And that's - minus 0.2, minus 0.1, and minus 0.4.

07 08 38 30 CDR That's funny. We got minus 0.3, minus 0.1, and plus 0.9. Let's see.

07 08 38 40 CMP What did you get, Ken?

07 08 38 43 CMP Minus 0.2, minus 0.1, minus 0.4.

07 08 38 49 LMP Okay, AGS is - -

07 08 38 50 CDR Three milliradians at 12 minutes.

07 08 38 53 LMP AGS is 0, plus 0.9, plus 0.8.

07 08 39 06 CDR Well, if we don't get more than one axis, it'll - in - in P41, we won't do it. If that doesn't root something, square up to 1 something -

07 08 39 15 LMP (Cough) No. It doesn't.

07 08 39 16 CDR Huh?

07 08 39 17 LMP No, it does not. Whenev - you know - We gonna burn?

07 08 39 23 CDR Not unless that makes more than 1.

07 08 39 25 LMP It doesn't.

07 08 39 27 CDR Maybe we ought to do the 0.9, Charlie.

07 08 39 29 LMP Okay.

07 08 39 32 CMP Which one do you put the 0.9 in?

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07 08 39 34 LMP Z. Well -

07 08 39 38 CMP Okay.

07 08 39 49 LMP Okay, you want to call?

07 08 39 50 CDR Yeah.

07 08 40 32 CDR I guess I'm going with that. What you got on the AGS?

07 08 40 35 LMP The same thing. In Z, we had almost the same number, John; AGS had 0.8 and 0.9.

07 08 40 42 CDR Okay.

07 08 40 45 LMP But I had a little out of plane, which I think is probably wrong. Okay; 20 seconds, Ken.

07 08 40 48 CMP Okay.

07 08 41 19 LMP Okay. Go ahead, John.

07 08 41 29 LMP (Cough) You know, there's no doubt when you have a thruster struck on in the real world, is there?

07 08 41 35 CDR Nope.

07 08 41 36 LMP Okay, Ken, our residuals are minus 0, plus 0, minus 0.1.

07 08 41 41 CMP Okay; what was it you put in?

07 08 41 44 LMP Z of plus 0.9.

07 08 41 47 CMP Okay.

07 08 41 59 LMP Okay, a VERB 93 here, John - Yeah.

07 08 42 32 CDR What was our transfer angle, Charlie?

07 08 42 35 LMP 30 degrees.

07 08 42 37 CDR That's what I figured. So a 30-degree transfer angle - at 15 minutes, we should have 2 milliradians - -

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07 08 42 56 LMP Man, you're in the Sun, Ken, and you're the brightest thing I've ever seen in my life!

07 08 43 04 CDR This thing is right on. We've got a 1-milliradian bias, and it says it's 2-1/2 milliradians, and it should be 2 milliradians.

07 08 43 13 LMP Instant sunrise!

07 08 43 19 CDR Absolutely spectacular!

07 08 43 22 LMP Okay; my tracking light's off, Ken.

07 08 43 30 CMP You make a pretty good-size star.

07 08 43 36 LMP You're bri - -

07 08 43 37 CMP By golly, in the sextant, I can even tell what you are.

07 08 43 44 CDR Okay. We're at 60 degrees, huh, Charlie?

07 08 43 48 LMP Yeah.

07 08 44 01 CDR I hope we get there before this lunar dust eats us alive.

07 08 44 09 LMP Me, too.

07 08 44 30 CDR What a heck of a thing to have happen to you at lift-off.

07 08 44 32 LMP What? Yeah, I know it.

07 08 44 34 CDR I mean, I couldn't see out of it.

07 08 44 35 LMP I was worried.

07 08 44 37 CDR Well, there's noth - no need to worry. I was going - I was going to ... - -

07 08 44 40 LMP 277, 62 degrees, and we've got 60,000 feet.

07 08 45 05 LMP Just about right on the line, John. Okay. You - we got you 59,000 feet, Ken; 72 feet a second.

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07 08 45 13 CDR Look at this thing. It hasn't fired a thruster in 3 minutes, Charlie.

07 08 45 16 LMP I know it.

07 08 45 18 CDR Fantastic. If you'll hold still, it won't fire any, once it figures out where the c.g. is. What a machine.

07 08 45 34 CDR ... - -

07 08 45 35 CMP You've still got some particles dangling along with you.

07 08 45 40 CDR Man, I wouldn't be surprised! Wait until you open the hatch.

07 08 45 44 LMP (Laughter)

07 08 45 52 CDR Yeah, this is sort of a traveling dog and pony show.

07 08 45 59 LMP You ought to have seen old A. J. Foyt and Barney Oldfield all rolled into one on that Rover, Ken. I mean he really put it through its paces.

07 08 46 09 CDR You ought to see that flat - lands out there.

07 08 46 13 LMP Whoever called that the Cayley Plains was an idiot.

07 08 46 17 CDR Yeah, man. There isn't a flat spot in the whole place!

07 08 46 19 CMP (Laughter)

07 08 46 22 LMP There were - there were some deep sinkholes out there, Ken, that must have been 70, 80 meters deep, and they weren't even on the maps.

07 08 46 28 CMP I believe that. Yeah.

07 08 46 31 CDR You saw them?

07 08 46 32 CMP No, but I just - that sounds like what you'd - about - how close we could come on a ...

07 08 46 44 LMP And old deadeye, here, picked the only flat spot within 2 kilometers to land on.

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07 08 46 50 CDR That was luck, I think, more than anything else.

07 08 46 54 LMP Fifty meters in any direction, John, and we'd have had a 10-degree tilt.

07 08 46 59 CDR Yeah, we would have.

07 08 47 00 LMP No, well, maybe 5, but -

07 08 47 04 CDR Heck, 50 meters backwards and we'd have been a lot worse than that.

07 08 47 09 LMP We'd have been in deep trouble. Ken, 10 - 10 feet behind the aft footpad was about a 12-foot-deep crater about 20 feet across.

07 08 47 22 CMP (Laughter) Could you see it on the approach?

07 08 47 27 CDR Yeah.

07 08 47 28 CMP Yeah.

07 08 47 29 LMP He says he did.

07 08 47 31 CDR Yeah, I did. I inched over it. I saw the dang - I saw the - I saw - I saw the ground all the way to touchdown, Ken. These guys have been saying they can't see the ground. I saw it.

07 08 47 43 LMP I - Yeah.

07 08 47 44 CDR I didn't have any trouble nulling the velocity.

07 08 47 46 LMP I was amazed, John, that - really that - that we -

07 08 47 51 CDR Did you see it?

07 08 47 52 LMP Yeah, I did. But there wasn't - that there was not as much dust because of the soft regolith there. It was really spongy.

07 08 48 00 CDR ... - -

07 08 48 01 LMP Okay, 46,000 at 72 - 46.

07 08 48 18 CDR Hey, listen, they reported some data that Izzy got; said the - said that the Cayley Plains was

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salithic [?] but not as much as the eastern highlands that you guys got. And they said that your gear was working good except for the laser altimeter, which was doing something.

07 08 48 35 CMP Yeah. That's when we'd been rewriting the Flight Plan.

07 08 48 40 CDR Yeah, I know it.

07 08 48 42 LMP I can imagine.

07 08 48 43 CDR You should have seen what the heck's been going on - Well, I'm sure you know.

07 08 48 48 LMP Okay, we got 43,000 feet, Ken.

07 08 48 51 CMP Okay.

07 08 48 56 LMP You are really bright, babe.

07 08 49 08 CMP ... against the lunar surface.

~~07 08 49 13 LMP~~ ~~What?~~

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07 08 49 14 CMP You really look pretty against the lunar surface.

07 08 49 16 LMP Oh.

07 08 49 18 CMP You got the little split imagery in through there.

07 08 49 21 CDR You do? The red against the - the star against a red background?

07 08 49 22 CMP Yeah.

07 08 49 23 CDR When I first saw that on Apollo 10, I thought I was in 2001. I couldn't figure out what was happening, because the - the guys I was tracking were up above me at the time, for some reason.

07 08 49 39 CMP Now we've moved ... Now I'm seeing the - the Moon through the ... behind you, I think. It's not red anymore, anyhow ... looks like cartoon characters someone would draw.

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07 08 50 03 CDR I really think we ought to let that all get out of here before we try to take our helmets and gloves off, if we can - if we can possibly help it. Golly, what an approach angle; 68 degrees at -

07 08 50 16 LMP We're right - almost right on the line.

07 08 50 18 CDR Yeah.

07 08 50 30 CDR Listen, I don't care if they're bringing us home, because we got a ... or what - you know, if that's what the reason is. If it's for some other reason, then I am mad.

07 08 50 36 CMP I think it's for some other reason.

07 08 50 38 LMP Such as that gimbal motor.

07 08 50 41 CMP I'm sure of it.

07 08 50 42 CDR It's probably - it's probably starting to grind on the manager.

07 08 50 44 CMP Yep. ... go home. ... could say that.

07 08 50 59 CDR It ain't - you didn't make the dang gimbal motor. You did the right thing. Boy, and - if - if it had been me up there, I probably would have aborted the whole bloody thing. I don't care what they'd have said.

07 08 51 10 LMP Okay, 2 minutes to go, Ken.

07 08 51 11 CMP Okay. Man, this tracking's so much fun, let's do it all over again.

07 08 51 14 CDR Yeah.

07 08 51 15 CMP ... pretty.

07 08 51 16 CDR First time you ever got a set that worked, huh?

07 08 51 17 CMP Yeah (laughter).

07 08 51 18 CDR (Laughter)

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07 08 51 19 CMP I haven't had a red light now in so long, I don't know what it means.

07 08 51 20 CDR Yeah. You know, these optics are beautiful. This AOT in here is just like - just fantastic.

07 08 51 36 CMP Good. I'd never believe that this ... could be so nice.

07 08 51 38 CDR Yeah. What time's AOS? I never asked.

07 08 51 45 CMP (Laughter) I never did, either.

07 08 51 47 LMP We get rendezvoused before we get AOS.

07 08 51 48 CDR Do we?

07 08 51 49 LMP Yeah. We're not docked, but we're rendezvoused.

07 08 51 50 CDR Hopefully.

07 08 51 51 CMP ..., or did they scrub that?

07 08 51 54 CDR They didn't say scrub it. I'm going to take them until they say scrub it. Nobody told me.

07 08 51 58 LMP We got the film.

07 08 52 00 CMP All righty.

07 08 52 02 LMP I saved you some on this roll. It's - -

07 08 52 04 CMP Okay, how about taking a good look at that dude right up - right up there on top of that ...

07 08 52 10 CDR Okay. And I'll tell you what we'll do, Ken. We'll - When we come to dock, we'll go to the docking attitude. Once we get lined up, go to the docking attitude, and I'll try to maneuver in to where it's - All you got to do is translate forward. Would that be all right? Save you some RCS?

07 08 52 26 CMP Well, at this point, the RCS isn't that ...

07 08 52 30 CDR Okay - okay, well, however - -

07 08 52 34 CMP ...

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07 08 52 35 CDR Yeah, but, you know, RCS is midcourse fuel.

07 08 52 39 CMP Yeah, I know.

07 08 52 42 CDR And this thing has got a barrelful of it.

07 08 52 44 LMP Okay; 20 seconds, Ken.

07 08 52 45 CMP Okay.

07 08 52 59 LMP You bas - you crummy thing.

07 08 53 00 CDR What did it do?

07 08 53 05 LMP PRO. I thought I had a stuck key, but it came out.

07 08 53 12 CDR Okay, did you get that PRO, Ken?

07 08 53 16 CMP Yes, sir.

07 08 53 17 CDR Okay.

07 08 53 29 LMP Okay; plus 0.5, plus 0.2, plus 0.7.

07 08 53 32 CDR Well, I don't know. The last one was so good, I might as well do this one, too.

07 08 53 34 LMP Yeah.

07 08 53 35 CMP I've got plus 0.5, minus 0.5 and plus 2.2.

07 08 53 37 CDR Oh, yeah?

07 08 53 39 LMP Okay, we'll burn this.

07 08 53 40 CMP Okay.

07 08 53 44 LMP We're going to burn plus 0.5, plus 0.2, plus 0.7.

07 08 53 48 CMP All righty.

07 08 54 11 LMP 90 degrees at 26.5. We're coming right in there, John. Perfect. You want a lunar rock as a souvenir? They'd never miss it.

07 08 54 17 CDR I'll give it to Ken. No, I don't - I don't know what to do with it at this point. Oh, first igneous rock I've seen.

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07 08 54 24 LMP Man, we've got some nice crystalline rocks.

07 08 54 26 CDR Hope so. Here we go, Charlie.

07 08 54 27 LMP Okay.

07 08 54 29 CDR One minute to go, Ken.

07 08 54 30 CMP Okay.

07 08 54 32 CDR And he said 29 foot a second on the braking, which sounds about right. What'd it say?

07 08 54 36 LMP PGNS said 27.

07 08 54 39 CDR Okay, we'll take it.

07 08 54 40 LMP Ground said 29.

07 08 54 49 CMP Well, in case you don't have enough ..., I'll give you ...

07 08 54 53 CDR Okay.

07 08 54 59 LMP Okay, average g is on.

07 08 55 22 LMP This is some flying machine, boy.

07 08 55 24 CDR Isn't it?

07 08 55 30 LMP Okay, John, it's flashing at you.

07 08 55 32 CDR Okay, 0.4.

07 08 55 33 LMP Up, up.

07 08 55 37 CDR Minus 0.8.

07 08 55 38 LMP Yeah.

07 08 55 48 LMP Okay, Ken, there they are; minus 0, minus 0.1, minus 0.

07 08 55 52 CMP Okay.

07 08 55 56 LMP Okay, John, go to P00. VERB 48, when that gets up.

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07 08 56 09 CDR Okay.

07 08 56 29 LMP Okay, 11002. Okay. Okay, PRO and a P47. And a VERB 63.

07 08 56 55 CDR Okay.

07 08 56 57 LMP Want me to key that for you?

07 08 56 58 CDR Yeah.

07 08 57 06 LMP Okay, we're at 3.15 miles, Ken; 33 feet a second.

07 08 57 10 CMP Okay.

07 08 57 14 LMP Okay, the AGS is set. Hey, here comes the AO - AOS. Good show. I was wrong on that.

07 08 57 39 LMP Hello, Houston; Orion. Over.

07 08 57 43 CC Orion, this is Houston. Go ahead.

07 08 57 44 LMP Okay, Jim. We're 3 miles out, closing. We did a TPI of plus 78.0, plus 2.7, plus 0.7, and we burned two midcourses of minus 0.3, minus 0.1, plus 0.9, plus 0.5, plus 0.2, plus 0.7, and we got a visual.

07 08 58 34 CC Roger. Copied all that.

07 08 58 40 LMP I guess we don't need to tell you, but this is a sweet machine.

07 08 58 46 CC You're so right.

07 08 58 47 LMP Look at that bright spot up there, will you. Okay, John, I'll get the - you got the burn report? UP-LINK SQUELCH is coming OFF, PCM is HI, bit rate is LEFT [sic]. Okay, set up the camera. I'll just hold it in my hand.

07 08 59 08 CDR Okay.

07 08 59 30 CMP Orion, you're just a little tiny black dot to the unaided eye.

07 08 59 38 LMP Well, you look brighter than any star or planet I've ever seen. Against that black sky.

07 08 59 53 CDR Either that or we're rendezvousing with Venus.

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07 08 59 55 LMP Yeah, we're coming to Venus. (Laughter)

07 09 00 03 CDR Okay; 15,000 feet, 2.42 miles, and 31 feet a second. And the line-of-sight rates are essentially nulled.

07 09 00 23 LMP You lost a screw, John. I guess that - I guess they left them out on purpose.

07 09 00 27 CDR Probably had this panel off and back on so many times, they didn't know what else to do.

07 09 00 30 LMP Yeah.

07 09 00 32 CDR I want that sign.

07 09 00 33 LMP Okay, I'll - we'll remember - -

07 09 00 34 CDR If there's any way. I don't know how to get it.

07 09 00 36 LMP Well, we can peel - it'll peel off of there. It's just a piece of tape. Okay, get - I'll put it on your good side.

07 09 01 15 LMP Two miles, Ken.

07 09 01 18 CMP Okay.

07 09 01 35 CDR We may have to not do any line-of-sight corrections.

07 09 01 37 LMP I don't think there's going to be a bit. Isn't that amazing?

07 09 02 06 CDR He is right in the middle of the COAS and he is not moving one iota.

07 09 02 12 CMP Okay, I've got you at 28 foot per second.

07 09 02 15 CDR That's what we've got us at 28.3.

07 09 02 32 CDR You might - When he starts to grow - He's growing now.

07 09 02 42 LMP Yeah. You can make out an outline now, Ken.

07 09 02 50 CMP ... still reading 28 foot per second at a mile and a half.

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07 09 02 55 LMP Okay.

07 09 03 36 CDR Look at that white rock coming at us.

07 09 03 38 LMP Yeah.

07 09 03 39 CDR There you go, Charlie; there's a white rock for you.

07 09 03 41 LMP Seen lots of them.

07 09 03 45 CDR Okay, 8000 feet; 27 feet a second.

07 09 04 24 CDR Charlie, don't cover up my DSKY.

07 09 04 27 LMP I was just looking at that dirt on that hatch down there.

07 09 04 34 CMP Okay, I see you; you are a little white dot.

07 09 04 37 LMP/CDR Yeah.

07 09 04 38 CDR Show me ...

07 09 04 40 LMP It's on the needle.

07 09 04 42 CDR Up down ... about out of plane. Here, Charlie, you'll need this for your ...

07 09 04 47 LMP That's what I was looking for. I dropped that beauty.

07 09 04 51 CDR Okay, Ken, we're approaching ..., and we're going to brake to 20.

07 09 04 55 LMP No, 30 at a mile, 20 at 3.

07 09 04 59 CDR Okay, I'm going to get this vertical out.

07 09 05 03 LMP Okay. We got a little - Radar says a little to the left, John.

07 09 05 11 CDR Okay, just hold it a little.

07 09 05 15 CMP I think that's right; you need to go to your - you need to go to your ...

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07 09 05 25 LMP Be north. Okay, 5000 feet. 5000 out, Houston.

07 09 06 03 CMP Looks like it could be a little more to the north.

07 09 06 10 CDR Hey, listen, who's vectoring who around here?

07 09 06 14 CMP I thought the idea was we took turns.

07 09 06 16 CDR Oh, okay.

07 09 06 19 LMP Okay; 4000 feet, Ken, and we got 7 feet to kill off.

07 09 06 25 CMP Okay.

07 09 06 45 LMP Twenty at 3, John?

07 09 06 46 CDR Yeah.

07 09 07 05 LMP Okay, 3000 at 21, Ken.

07 09 07 11 CMP Okay.

07 09 07 36 LMP Okay, John. We want 10 at 1500.

07 09 07 40 CDR Okay. And you're getting big, Ken.

07 09 07 45 LMP Sure is. Growing like a -

07 09 07 50 CDR Okay, we got 2000 feet now, Ken.

07 09 07 51 CMP Okay. Man, that looks good.

07 09 08 02 CDR What a beautiful machine.

07 09 08 05 LMP Okay, we need to take 10 off, John.

07 09 08 08 CDR Okay, we'll take 10 off, Charlie.

07 09 08 24 LMP Okay, 0.2 at 9.4, Ken.

07 09 08 39 LMP At 600 feet, we want 5, John.

07 09 08 40 CDR Okay.

07 09 08 57 LMP Boy, you are beautiful, Ken.

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07 09 09 00 CMP That's the nicest thing anyone's said.

07 09 09 01 LMP Casper - -

07 09 09 02 CDR What a rendezvous machine this is.

07 09 09 07 LMP Casper is really beautiful. Okay, we're at 800 feet at 10 feet per second, John.

07 09 09 13 CDR Okay.

07 09 09 33 LMP 650 at 10.

07 09 09 36 CDR Okay, going to 5, Charlie.

07 09 09 37 LMP Okay. Okay, we're at 5, Ken, at 600 feet. Make it 540 feet.

07 09 09 56 CMP You look a lot smaller in the daytime. It's really great.

07 09 10 04 CDR What a flying machine this is, Ken. Okay, 400 feet; we're going to 4.

07 09 10 23 CMP My, you look good. Your forward firing thrusters look like little flashlights when they fire.

07 09 10 30 LMP Ken, you're clean. You don't have a boom out.

07 09 10 33 CMP Okay, wait until you get back around there and take a look. We know they aren't out that far, but we want to look at the covers.

07 09 10 39 LMP Okay. We're 240 feet.

07 09 10 44 CMP Good.

07 09 10 45 LMP 280 feet, it says. Sure looks like we're closer than that to me.

07 09 10 53 CDR No.

07 09 11 01 LMP Man, that big dish looks great. I couldn't get mine to work in yaw.

07 09 11 16 LMP Okay, 200 feet, John?

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07 09 11 18 CDR Yep.

07 09 11 19 LMP Give you a little cooling. How's that? Closing at about 4.

07 09 11 27 CDR More like about 2, Charlie.

07 09 11 29 LMP Yeah, probably. I was just looking at the radar. Okay, John, I'm going to go to POO.

07 09 11 39 CMP (Laughter) ... these cartoons in the real world.

07 09 11 50 CDR Isn't it something?

07 09 11 53 LMP Okay, I'll go to dock.

07 09 12 05 CMP Okay, I'm ready to go to attitude whenever you are.

07 09 12 09 CDR Okay, wait until I get this thing where I want it, Char - Ken.

07 09 12 12 CC Orion, this is Houston. When you're stationkeeping, let me know. We have some words for you.

07 09 12 17 CDR Okay, we're stationkeeping.

07 09 12 22 CC Okay, John. Looking at the pictures of the lift-off, and it appears that something might have come loose from the skin on the back of the vehicle, so for that reason, we want Ken to take some pictures of the LM. So we have a slight modification ... the Flight Plan and ask you to do a yaw 360 after Ken does his VERB - VERB 49 to the docking attitude.

07 09 12 51 CDR Roger. I - I - a yaw 360 after Ken does a VERB 49 to the docking attitude. Okay, now (laughter) -

07 09 13 07 CMP Okay, right here I've got good lighting, if - if you want me to get some pictures, if John could just do a ... - -

07 09 13 14 CC - - we can't hear you very well, but - -

07 09 13 16 CDR Let me pitch up 90, Ken, and you hold station. Can you do that?

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07 09 13 20 CMP Stand by. Let me get my camera out and ready, and I'll take it - see if I can -

07 09 13 25 CDR Hey, Houston - -

07 09 13 26 CC 16, this is Houston. Let me just recap here, the procedure.

07 09 13 31 CDR Okay. Okay, Houston. We're in perfect position to get - -

07 09 13 34 CC We want you to do - Ken, do the VERB 49 maneuver, attempt a attitude ... per the Flight Plan, and then do the 360-degree roll, and of course following that, you do the VERB 49 maneuver into the docking attitude. And then I have a change for the Flight Plan, whenever you're ready to copy.

07 09 13 56 CMP Okay. We're in perfect position to take pictures of the LM right now. All we've got to do is to pitch. You'll prepare us to go to the other sequence, is that correct?

07 09 14 11 CC Okay, if you're in position to take pictures of the LM, we wanted the LM to do a 360-degree yaw, and you're to take pictures of the - the minus-B portion of the ascent stage, using the same camera settings that you have on the - the DAC and the EL, except for focus on the EL should be changed to infinity. Over.

07 09 14 36 CMP Okay, 1/250 is that setting, and I'll take pictures of the ... Let's see, that's ...

07 09 14 46 LMP That's the back part, Ken.

07 09 14 49 CC Okay, Ken, it's the back side of the LM.

07 09 14 53 CMP Roger. I - I'm with you. And I'll turn the DAC on, and I'll - and I'll take an EL. And I have stationkeeping now.

07 09 15 04 CDR Okay.

07 09 15 10 CC Ken, if you observe anything there, will you please relay your observations?

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07 09 15 14 CMP Yes, sir; certainly will.

07 09 15 24 LMP Houston, on lift-off, one of the MESA blankets flew out in front of the LM and hit the ground about 200 meters in front of the LM. Over.

07 09 15 40 CC And a portion of the MESA blanket is still on the front?

07 09 15 45 LMP Yeah, that might have been what you saw. It came pretty high in the air and went straight out to the west. Look at that crater down there, would you?

07 09 15 55 CC We copy.

07 09 15 57 CMP Okay, everything on the LM back side looks clean, just the surfaces of the - are flaked with the paint that are ...

07 09 16 08 LMP Look at that maria out there, John. In that highland.

07 09 16 10 CDR Yeah.

07 09 16 18 CMP Okay, on the - on the back side - -

07 09 16 20 CDR Get the pictures - -

07 09 16 23 CMP - - it looks like some of the - -

07 09 16 24 CC Orion, will you go FORWARD omni.

07 09 16 26 CDR FORWARD omni, Charlie.

07 09 16 28 LMP Okay.

07 09 16 35 CMP Looks like some of the thermal blanket around the descent engine on the back end there is - well, pretty badly chewed up. Some of the stuff is torn, a couple of panels are torn off, and some of the stripping in between looks like it was struck by something. It looks like all the Mylar blankets underneath are still in tact.

07 09 17 05 CDR These guys are crazy (laughter).

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07 09 17 06 LMP They are. Well, that's - that's a data point.

07 09 17 11 CDR Yeah, they have a ... doing 360-degree yaws. Ken's going to do one.

07 09 17 16 LMP (Laughter)

07 09 17 19 CDR I don't know. I don't know. When we first got in this program - -

07 09 17 27 CMP We got the ... on the underside of the ... side of the - -

07 09 17 31 CC Ken, can you observe whether it's possible for sunlight to directly impinge on portions of the spacecraft equipment?

07 09 17 39 CMP No, sir, it's not possible when you're docked. I can't tell you about the bottom, but on the back side, the - the Mylar blankets are still intact. It's only that outer covering that's broken.

07 09 17 56 CDR I tell - -

07 09 17 57 CC We copy.

07 09 17 58 CDR I tell you, this thing really flies beautifully.

07 09 18 05 CC Orion, AFT omni.

07 09 18 07 CDR Okay.

07 09 18 10 CMP ... big thing. This is easy.

07 09 18 12 CDR You better believe.

07 09 18 14 LMP There's old - What's the big crater down there? It looks like Theophilus.

07 09 18 23 CMP What's your range? I'm ready to go to ... attitude.

07 09 18 26 CC Okay. We'll be pressing on with the Flight Plan.

07 09 18 31 CDR Roger. We're pressing.

07 09 18 33 CMP Okay, John, are you ready for me to go to my attitude?

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07 09 18 37 CDR That's a - Wait a second until we get in position.

07 09 18 40 CMP Okay. I'm just going to do a little with the roll and the pitch, be my pitch down - -

07 09 18 48 CC Orion, will you go NORMAL voice?

07 09 18 51 CDR Okay.

07 09 18 54 CMP ... Are you all set?

07 09 18 59 CDR Wait until we get up here.

07 09 19 01 LMP Okay, you got us NORMAL voice, Houston? You got Orion?

07 09 19 04 CDR Are you ready, Charlie?

07 09 19 05 LMP Yeah, I'm ready.

07 09 19 06 CDR Okay, go to it, Ken.

07 09 19 07 CMP Okay, you have stationkeeping. I'm maneuvering.

07 09 19 09 CDR Shoot, I thought I had the stationkeeping long before this.

07 09 19 24 CC Casper, will you read ...?

07 09 19 27 CMP You got it.

07 09 19 31 CC You're ...

07 09 19 35 CDR Okay, I'm gonna keep him - keep him in the middle, Charlie.

07 09 19 41 LMP What is it - what are we going to see with him rolling like that?

07 09 19 46 CDR He's maneuvering to some attitude - he's maneuvering - he's doing a three-axis maneuver to the SIM bay attitude.

07 09 19 52 LMP Oh. Well, I got a peek at the SIM bay as we came up under it; clean.

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07 09 20 03 CDR Now, Charlie, you want me to maneuver and get a little closer to him?

07 09 20 06 CMP Hey, Charlie, have you got a ...?

07 09 20 10 LMP Yeah, I'm on it.

07 09 20 12 CMP Okay. The thing I'd like you to look at is up around the aft shelf of the SIM bay; there's two booms back there.

07 09 20 20 LMP Yeah.

07 09 20 21 CMP One of my ... mass spec has got a white cover, and it's kind of a rectangular-shaped cover. The one on the left - or it's really at about the middle, ... thermal cover, and that's the ... Would you take a look and see if either of those covers are not quite closed, because we have indications that the base ... are not closed. We have indications that ...

07 09 20 48 LMP Okay.

07 09 20 57 CDR Are you maneuvering, Ken?

07 09 20 59 CMP Yes, sir.

07 09 21 00 CDR Oh.

07 09 21 04 CMP This is one of the fastest maneuvers I've made in a long time.

07 09 21 06 LMP Are you gonna sit - are you gonna pitch some more, so we can see the SIM bay?

07 09 21 12 CMP Well, I'm not there yet, Charlie.

07 09 21 14 LMP Okay.

07 09 21 15 CMP I'll tell you when I get there.

07 09 21 31 CMP Got about 20 degrees of pitch and about 30 degrees of roll.

07 09 21 43 LMP Okay, what do you do after that?

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07 09 21 45 CMP Well, then I wait for you to take a look. And then after you do that, why, we'll do a 360-degree rotation about the X-axis while you take pictures of the thermal coatings.

07 09 21 57 LMP Okay, I can see around the - the thrusters now that it's blistered and peeled. They want OM - they want - -

07 09 22 08 CMP Did you call Casper?

07 09 22 09 LMP - - OMNI Delta.

07 09 22 12 CC OMNI Delta.

07 09 22 14 CDR They want your OMNI Delta, Ken.

07 09 22 16 CMP Okay, thank you.

07 09 22 20 CDR Well, you'd probably be blistered and peeled, too, if you were as hot as they are.

07 09 22 25 LMP Okay, Ken, at the aft end, down next to the engine bell, there's a black cover that appears to be partially opened.

07 09 22 37 CMP Could you tell me which side of the SIM bay?

07 09 22 40 LMP Okay, it's on the side away from the hatch.

07 09 22 45 CMP Okay, and it's dark beneath the thermal covering?

07 09 22 49 LMP Yeah.

07 09 22 50 CMP Okay. And it's partially open?

07 09 22 51 LMP Looks like it to me.

07 09 22 52 CMP Okay. Okay, you don't see anything white sticking out from under it?

07 09 22 56 LMP No.

07 09 22 57 CMP Okay, there may be a little shield on the mass spec is - the black. Okay, do you see the gamma ray door?

07 09 23 04 LMP Yeah. That's silver, isn't it?

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07 09 23 05 CDR Let's go on up there, Charlie.

07 09 23 06 LMP It's closed.

07 09 23 08 CMP Okay.

07 09 23 10 CDR Are you there yet, Ken?

07 09 23 12 CMP (Laughter) No, no. I'll - I'll tell you.

07 09 23 15 LMP Are we there yet, daddy?

07 09 23 18 CMP (Laughter)

07 09 23 27 LMP I think f/8 is too bright; I think we need f/11.

07 09 23 30 CDR Yeah, the Sun is shining on it. This is a lousy attitude for picturetaking. Are you taking pictures now?

07 09 23 36 LMP Yeah.

07 09 23 48 LMP Ain't gonna be doing any good with the Sun shining on it like that though, John.

07 09 23 56 CC Orion, you have 32 minutes to ...

07 09 24 03 CMP Okay.

07 09 24 07 LMP Okay, start - Okay, Ken, the paint is blistered on the quad above the SIM bay, too, pretty badly.

07 09 24 23 CMP On the quad above the SIM bay? You mean A quad?

07 09 24 27 LMP Not A quad, I mean the paneling above the SIM bay. You know, as you come out the hatch, you grab the handles and walk down to the two handles on the SIM bay?

07 09 24 37 CMP Yep.

07 09 24 38 LMP Okay, that along the wide - those - that silver paint in there is really badly - -

07 09 24 45 CDR Here's a door that's not closed there back there in the back end.

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07 09 24 48 LMP Yeah, that's what I said. Yeah, that's the one - Okay, you - The - the mass - the gamma ray door is partially open, Ken.

07 09 24 59 CMP Okay, good. Can you get some pictures of those, too?

07 09 25 02 LMP Yeah.

07 09 25 03 CMP Okay, and I'm ready to start my 360 roll when you get the pictures of those things.

07 09 25 06 LMP We got them; go ahead.

07 09 25 09 CMP Okay. I'm gonna roll left.

07 09 25 11 CDR Okay. I'm gonna back up here. I don't want to run into high gain, Charlie.

07 09 25 18 LMP Yeah. You're zapping the - the SIM bay, too, with the thrusters. John, I can't see my - Okay, there we go. Looks good.

07 09 25 53 CMP You guys are pretty fast ... outside up there. It was nice and clean until you came back.

07 09 26 00 CDR Yeah.

07 09 26 04 LMP Part of the "United States" has peeled off, Ken.

07 09 26 05 CDR What are you doing to your high gain there, Ken?

07 09 26 08 CMP I'm ...

07 09 26 10 CDR Oh.

07 09 26 12 CMP ...?

07 09 26 13 CDR Yeah.

07 09 26 17 CMP I'll pick it up.

07 09 26 18 LMP Okay, Ken, the umbilical thing is really - I don't see how you get any thrust out of that thruster that's pointed right at that umbilical thing. Shoot, it fires right on it.

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07 09 26 30 CDR That make you a little nervous, Charlie?

07 09 26 32 LMP, Yeah.

07 09 26 33 CDR Me, too.

07 09 26 43 CDR Is this close enough, Charlie, or do you want to be closer?

07 09 26 44 LMP No, that's fine, John. I don't believe I could get it all in the field of view if you were any closer.

07 09 26 53 CDR Okay, Ken, I can - as soon as we get around here, we better go dock, because we got 32 minutes to darkness, and I don't want to have another one of them night dockings.

07 09 27 02 CMP Okay. Well, we're almost there. The next event on our schedule is for me to go to the docking attitude.

07 09 27 11 CDR Okay.

07 09 27 14 CMP And then, I guess you can slide around in front of me. ... inspect the engine.

07 09 27 24 CDR Okay, go to it. What is - Your attitude and my attitude dockingwise is compatible? It's the same - -

07 09 27 34 CMP They had been in the simulator, and I'm sure they will be today.

07 09 27 38 CDR I'd be surprised. The only thing nominal so far is the rendezvous. I hope the rest of it turns out that way.

07 09 27 49 LMP We want to go to 180, 282, 300 on the ball, John.

07 09 27 53 CDR Okay.

07 09 28 05 LMP Okay, Ken, the a - Out your - your window, off behind you on the high gain side, it's real nice and clean; on the other side of the spacecraft, the - the 180 opposite that, starting at about

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the middle of the hatch around, is pretty badly blistered and peeled. Not peeled, but blistered; around about the umbilicals.

07 09 28 39 CMP Okay.

07 09 28 50 CDR Okay, what? Maneuvering to - -

07 09 28 54 CMP Okay, I'm getting ready to go over to a ... attitude.

07 09 29 01 CDR Well - -

07 09 29 02 CMP - - the attitude we came up in.

07 09 29 03 CDR Okay.

07 09 29 04 CMP All set?

07 09 29 05 CDR All set.

07 09 29 08 LMP That's enough pictures. I'm getting tired of holding that button.

07 09 29 18 CDR What were you shooting at? One frame a second?

07 09 29 20 LMP Well, I don't mean holding the button, I mean holding the camera.

07 09 29 32 CDR I'm not used to this zero g.

07 09 29 34 LMP I know it. (Laughter)

07 09 29 35 CDR It raises Cain with us.

07 09 29 46 LMP Hey, that is some crater, right down there.

07 09 29 50 CDR Are you going to undocking now, Ken?

07 09 29 53 CMP I beg your pardon, John?

07 09 29 55 CDR Are you at the undocking attitude now?

07 09 29 57 CMP Yes, sir; I'm in the undocking attitude. It's almost identical to my rendezvous attitude.

07 09 30 03 CDR Okay. We go to 180 what?

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07 09 30 11 LMP 180 roll, 282 pitch, and 300 yaw.

07 09 30 19 CDR, Okay.

07 09 30 41 LMP Okay. There we go. Now I'm zero gravity, took my -

07 09 30 47 CDR Oh, man!

07 09 31 00 LMP John, this place still looks like a pig sty.

07 09 31 04 CC ... go OMNI Delta.

07 09 31 07 LMP Hey, Ken, are you - are you about there now?

07 09 31 11 CMP Well, I got 90 degrees of roll to go.

07 09 31 13 CDR Okay. But your pitch is okay, huh?

07 09 31 17 CMP Well, I got about 10 degrees of pitch.

07 09 31 19 CDR That's what I thought. It looks pretty good.

07 09 31 28 CMP Houston, did you get me on logic GO and the omni?

07 09 31 38 CDR Houston, Casper wants a logic GO and a omni.

07 09 31 46 CC Okay. You're GO.

07 09 31 49 CDR Okay. They gave you a GO, Ken.

07 09 31 53 CMP Okay.

07 09 32 00 CC Casper, OMNI Alfa.

07 09 32 07 CMP Okay, the LOGIC is on.

07 09 32 17 CC Let's hold up on the PYRO ARM.

07 09 32 20 LMP Hold on the PYRO ARM, Ken.

07 09 32 25 CDR Don't tell me.

07 09 32 34 LMP You copy that, Ken?

07 09 32 35 CMP Yes, sir.

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07 09 32 36 LMP Okay.

07 09 32 37 CMP I thought they gave me a GO, but I guess not.

07 09 32 51 CC ... take the LOGICs, OFF, and ... again.

07 09 32 55 LMP Oh, no.

07 09 32 56 CMP LOGIC's OFF.

07 09 33 00 CC Stand by.

07 09 33 13 CDR I can't believe it.

07 09 33 14 CC ... GO for PYRO ARM ... LOGICs on.

07 09 33 18 CMP Okay. The LOGICs are coming on. There goes number one. There goes number two.

07 09 33 33 CC Casper, you're GO for PYRO ARM.

07 09 33 36 CMP Okay. PYRO ARM's coming on. One. There's two.

07 09 33 50 LMP Okay, John, you want to pull the RENDEZVOUS RADAR breakers?

07 09 33 59 CDR Okay, Ken. You there?

07 09 34 01 CMP I'm about 5 degrees from it. You can go ahead and ...

07 09 34 07 CDR Okay, you have it. 282.

07 09 34 38 CDR And yaw 300, Charlie?

07 09 34 39 LMP Yeah.

07 09 34 49 CDR And yaw, 300, which is over there.

07 09 35 31 CMP Okay, I'm approaching. Your attitude looks good. I'll tell you when we have capture.

07 09 36 38 CDR What is this thing lined up with? Whew!

07 09 36 47 LMP How's he look?

07 09 37 04 CDR I never got the true picture of this before today.

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07 09 37 08 LMP (Laughter)

07 09 37 13 CDR He's right on, about a degree off. There's no way you can see it, Charlie.

07 09 37 19 LMP No, I can't see him.

07 09 37 21 CDR I want - I - I just want to be able to do something intelligent, like shut the thrusters off when we get capture.

07 09 37 32 LMP It's only 09:30, John; we've been up since - 15 hours. Not bad.

07 09 37 42 CDR Ken, you look beautiful to me.

07 09 37 45 CMP Say again.

07 09 37 46 CDR You look right on to me. My optical sight is coming right into your docking window.

07 09 38 05 CDR Don't hit my arm, Charlie.

07 09 38 07 LMP I'm sorry.

07 09 38 08 CDR ...

07 09 38 35 CDR How would you like to do a EVA transfer?

07 09 38 39 LMP How would you like a kick in the behind?

07 09 38 42 CDR Hot mike to Houston. (Laughter)

07 09 38 48 LMP No, we're normal voice. But we got our tape recorder running. (Laughter).

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