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APOLLO 8
ONBOARD VOICE
TRANSCRIPTION

AS RECORDED ON THE SPACECRAFT
ONBOARD RECORDER
(DATA STORAGE EQUIPMENT)

January 1969

GROUP 4
DECLASSIFIED AFTER 3 YEARS
DECLASSIFIED AFTER 11 YEARS

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS
INTRODUCTION

This is the transcription of the Apollo 8 flightcrew communications as recorded onboard the spacecraft data storage equipment (DSE), and subsequently transmitted (dumped) to Manned Space Flight Network stations. Magnetic tapes containing dumped voice and onboard recorded ground elapsed time (GET) were forwarded to the NASA Manned Spacecraft Center, Houston, Texas. Transcription of these tapes was managed by David M. Goldenbaum, Test Division, Apollo Spacecraft Program Office, to whom questions regarding this document should be referred.

The Apollo 8 mission was flown December 21 to 27, 1968.

Communicators in the text are identified as follows:

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

Mission Control Center:
- CC Capsule communicator (CAP COMM)

Remote sites:
- CT Communications technician (COMM TECH)
- AB1 Airboss 1 (Recovery aircraft)
- R1, R2, R3 Recovery 1, 2, 3 (Recovery helicopters)
- YORK USS Yorktown

In the text, a series of three dots (...) is used to designate those portions of the communications which could not be transcribed because of garbling. One dash (-) is used to indicate a speaker's pause or a self-interruption. Two dashes (--) are used to indicate an interruption by another speaker or a point at which a recording was abruptly terminated.
<table>
<thead>
<tr>
<th>Time</th>
<th>User</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>00 00 22 42</td>
<td>CDR</td>
<td>Roger. Thank you, Houston; Apollo 8 ...</td>
</tr>
<tr>
<td>00 00 22 47</td>
<td>CDR</td>
<td>Okay, going to close on A.</td>
</tr>
<tr>
<td>00 00 22 50</td>
<td>CMP</td>
<td>Okay, just give it a real small flip.</td>
</tr>
<tr>
<td>00 00 22 54</td>
<td>LMP</td>
<td>Is that why we've got that MASTER ALARM?</td>
</tr>
<tr>
<td>00 00 22 57</td>
<td>CDR</td>
<td>Okay, I'm --</td>
</tr>
<tr>
<td>00 00 22 59</td>
<td>CC</td>
<td>Apollo 8, Houston. You have the tape recorder, LOW bit rate. Over.</td>
</tr>
<tr>
<td>00 00 23 02</td>
<td>CDR</td>
<td>Thank you.</td>
</tr>
<tr>
<td>00 00 23 04</td>
<td>LMP</td>
<td>Okay, we've got it.</td>
</tr>
<tr>
<td>00 00 23 05</td>
<td>CC</td>
<td>You're welcome.</td>
</tr>
<tr>
<td>00 00 23 06</td>
<td>CMP</td>
<td>Okay, EMERGENCY CABIN PRESSURE number 2 on the ... test.</td>
</tr>
<tr>
<td>00 00 23 10</td>
<td>LMP</td>
<td>Hit it.</td>
</tr>
<tr>
<td>00 00 23 14</td>
<td>CDR</td>
<td>It's ON here.</td>
</tr>
<tr>
<td>00 00 23 15</td>
<td>LMP</td>
<td>Got it. That's good.</td>
</tr>
<tr>
<td>00 00 23 17</td>
<td>CDR</td>
<td>You got it?</td>
</tr>
<tr>
<td>00 00 23 18</td>
<td>LMP</td>
<td>That's good.</td>
</tr>
<tr>
<td>00 00 23 19</td>
<td>CDR</td>
<td>Okay.</td>
</tr>
<tr>
<td>00 00 23 20</td>
<td>LMP</td>
<td>Okay, this is a tape recorder test: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10; 9, 8, 7, 6, 5, 4, 3, 2, 1. And for the record, when we put the radiator to FLOW, the GLYCOL DISCHARGE PRESSURE dropped. Boy, it's way down there now, something's fishy.</td>
</tr>
<tr>
<td>00 00 23 40</td>
<td>CDR</td>
<td>What's wrong?</td>
</tr>
<tr>
<td>00 00 23 44</td>
<td>LMP</td>
<td>Apparently, we're getting the GLYCOL DISCHARGE PRESSURE way down.</td>
</tr>
<tr>
<td>Time</td>
<td>Actor</td>
<td>Message</td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
<td>---------</td>
</tr>
<tr>
<td>00 00 23:51</td>
<td>CDR</td>
<td>Oh? What was wrong?</td>
</tr>
<tr>
<td>00 00 23:52</td>
<td>LMP</td>
<td>Wait awhile; it's the glycol pump.</td>
</tr>
<tr>
<td>00 00 23:53</td>
<td>CDR</td>
<td>Huh?</td>
</tr>
<tr>
<td>00 00 23:58</td>
<td>CDR</td>
<td>You lost the glycol pump?</td>
</tr>
<tr>
<td>00 00 24:00</td>
<td>LMP</td>
<td>Guess so.</td>
</tr>
<tr>
<td>00 00 24:02</td>
<td>CMP</td>
<td>Well, take a look; are we in PRIMARY?</td>
</tr>
<tr>
<td>00 00 24:08</td>
<td>LMP</td>
<td>Discharge pressure?</td>
</tr>
<tr>
<td>00 00 24:10</td>
<td>CDR</td>
<td>Not yet.</td>
</tr>
<tr>
<td>00 00 24:11</td>
<td>CMP</td>
<td>Huh?</td>
</tr>
<tr>
<td>00 00 24:12</td>
<td>LMP</td>
<td>You were - Oh, we're in SECONDARY. That's okay.</td>
</tr>
<tr>
<td>00 00 24:14</td>
<td>CDR</td>
<td>It looks to me like it's picked up here.</td>
</tr>
<tr>
<td>00 00 24:16</td>
<td>LMP</td>
<td>Okay.</td>
</tr>
<tr>
<td>00 00 24:17</td>
<td>LMP</td>
<td>Yes.</td>
</tr>
<tr>
<td>00 00 24:19</td>
<td>CMP</td>
<td>Okay, what else do you want here?</td>
</tr>
<tr>
<td>00 00 24:20</td>
<td>LMP</td>
<td>It's okay.</td>
</tr>
<tr>
<td>00 00 24:24</td>
<td>LMP</td>
<td>Okay, - -</td>
</tr>
<tr>
<td>00 00 24:26</td>
<td>CMP</td>
<td>Secondary radiator leak check?</td>
</tr>
<tr>
<td>00 00 24:27</td>
<td>LMP</td>
<td>I'm ready this time (laughter). It's secondary - - I'm not going over, there.</td>
</tr>
<tr>
<td>00 00 24:38</td>
<td>CMP</td>
<td>Okay, - -</td>
</tr>
<tr>
<td>00 00 24:39</td>
<td>LMP</td>
<td>Okay, Jim.</td>
</tr>
<tr>
<td>00 00 24:40</td>
<td>CMP</td>
<td>- - the pressure's okay?</td>
</tr>
<tr>
<td>00 00 24:42</td>
<td>CMP</td>
<td>What do you want to do? The secondary glycol radiator?</td>
</tr>
<tr>
<td>00 00 24:44</td>
<td>LMP</td>
<td>The second - let her flow.</td>
</tr>
</tbody>
</table>
Well, wait a second; I'm not under the couch yet.
Okay, why don't you get underneath there, Jim, and give Frank a hand when you have a chance?
Well, how about let's take off our gloves and helmets, huh?
Okay.
Yes.
I mean, let's get comfortable. This is going to be a long trip.
You got - have you got the bags?
I'll get them.
I'll get them right now.
Okay, you want to get - CABIN AIR RETURN valve, ON.
Stand by; wait until I get my glove off.
CABIN AIR RETURN valve is OPEN.
Okay?
Okay.
Gentlemen.
Thank you.
Storage.
That's the gloves.
How's the cabin pressure, Bill?
Cabin pressure is holding good, Frank.
Okay.
You want the other bag there, Jim?
CONFIDENTIAL

Day 1

00 00 27 19 CMP
Let me see, I'm missing one bag here.

00 00 27 31 CMP
Wait 1.

00 00 27 48 CDR
Here you are.

00 00 27 52 CDR
Okay, you say you've got the EACPS power verifications in, Bill?

00 00 27 56 LMP
Yes, sir.

00 00 27 57 CDR
ECS monitor check?

00 00 27 59 LMP
Yes.

00 00 28 00 CMP
There is only - Oh, here it is.

00 00 28 07 LMP
Hey, it's like sitting on an ice rink, isn't it?

00 00 28 08 CDR
Yes. SPS, Bill.

00 00 28 11 LMP
SPS is roughly the same as it was. Got that one?

00 00 28 13 CDR
... TLI.

00 00 28 18 CDR
Okay.

00 00 28 32 CMP
Okay, we can breathe a little bit, hear a little bit more, huh?

00 00 28 34 CDR
Yes, that was quite a ride, wasn't it?

00 00 28 36 CMP
Yes.

00 00 28 37 LMP
Man, that felt like that I-C was like an old freight train.

00 00 28 43 CMP
It is an old freight train, pal. It really goes.

00 00 29 31 CDR
What's that noise?

00 00 29 32 CMP
That's me; I'm into the fan area.

00 00 29 42 CDR
Why don't we turn those fans off? We don't need them, do we?

00 00 29 52 CMP
Okay, let's continue on with the checklist.
CONFIDENTIAL

OK, secondary radiator leak check, huh?
Confirmed.
Let me get out my fuel.
Okay, we are in POWER, manual 1; primary water, AUTO - okay.
Is she holding us in the proper attitude?
Yes. I don't have the ORDEAL out yet; I can't tell, but it looks real good.
Okay, notify LMP when ready to commence.
I'm ready.
Secondary glycol to radiator valve, NORMAL.
Okay, just give me a buzz when you're - Yes, you're good.
You got your 278 circuit breaker 1 and 2, OPEN, Bill?
No, I'll go get it.
Good show.
... system coming up.
Huh?
They're OFF.
Okay.
You're doing the radiator leak now, huh?
Okay -
Have you got the radiator's talkback gray? Are you ready, Jim?
All set whenever you are.
00 00 31 03 LMP Okay, hit it. Everything is normal. Don't drop, you mother. Looking good. Hold it for a little while longer.

00 00 31 24 LMP Okay, let's go, Jim.

00 00 31 25 CMP Going to BYPASS.

00 00 31 26 LMP Go back to BYPASS. Good show.

00 00 31 29 CMP Okay. Frank?

00 00 31 30 CDR Yes.

00 00 31 31 CMP You want the ORDEAL?

00 00 31 32 CDR Yes.

00 00 31 36 LMP Okay, troops, I'm switching the other compressors.

00 00 31 39 CMP Here you go.

00 00 31 40 LMP I'm starting the redundant component check.

00 00 31 45 CDR Thank you, Bill.

00 00 31 46 CMP Bill, let me take out the wire; it's easier on it.

00 00 31 49 LMP Alright.

00 00 31 53 CMP Okay.

00 00 31 57 CDR Now, do you want the - What else do you want?

00 00 31 59 CDR Well, you've got to get the camera bracket out for Bill.

00 00 32 04 LMP Can we - let's see, can we - What are you doing, Bill?

00 00 32 16 LMP I just quit checking the compressor. I'm doing the redundant components check.

00 00 32 20 CDR Okay, secondary glycol pump is ON.

00 00 32 20 CDR Can you get that ORDEAL wire in that thing down there, Jim?
Okay, secondary coolant loop's going to EVAP.
How's that?
Oh, you sweet little mother.
Is that okay?
Yes.
Okay.
Secondary EVAP has stabilized.
Camera bracket.
Thank you. That's Frank's.
Huh?
That's the long one.
What are you doing?
Drinking water.
I'm not sure, but it sure looks like the long one.
Just make sure we get the right one.
Well, we'll get the other one.
Jim, where's the other camera bracket?
Well, there's -- I only saw the one in there; I may be wrong ...
Yes, this is yours, Frank. You want to stick it up here?
I don't want mine up here all the time.
00 00 33 33 CMP The water's OFF.
00 00 33 35 CDR Okay.
00 00 33 36 CMP You might try the drinking water before we leave on TLI, too, by the way.
00 00 33 39 LMP We can get it out over Hawaii.
00 00 33 40 CDR Hey, I don't want this thing up here; it's going to just be in my way. You sure this isn't yours?
00 00 33 46 LMP I'll stick it up until we get another one.
00 00 33 48 CMP Should I wait for another one?
00 00 33 50 CDR Yes.
00 00 33 52 CMP Well, is there another camera bracket? How many camera brackets in that - that -?
00 00 33 55 CDR I thought there were two in there.
00 00 33 57 LMP I did, too.
00 00 34 00 CDR That's the best we're going to get.
00 00 34 02 LMP Okay, I'm going to secure the secondary evaporator.
00 00 34 05 CDR Jim, are you - You're not using the computer now, are you?
00 00 34 08 CMP It can go.
00 00 34 09 CDR Can I use a VERB 83?
00 00 34 10 CMP Yes. Yes.
00 00 34 29 CMP Okay.
00 00 34 37 CMP Okay, I want to jettison the covers.
00 00 34 49 CMP Now, I'll unstow the cameras.
00 00 34 51 LMP I keep looking around here; I won't see it again. We've got a Madagascar - What's this coming up? Madagascar or what?
00 00 34 59  CDR  Yes.
00 00 35 03  CDR  Okay.
00 00 35 06  CMP  Buzz has my eye patch.
00 00 35 13  LMP  Okay, EVAP's going OFF.
00 00 35 14  CMP  (Singing)
00 00 35 18  LMP  SECONDARY PUMP, going OFF.
00 00 35 19  CMP  (Singing)
00 00 35 24  LMP  ECS indicator's PRIMARY.
00 00 35 25  CDR  You got the redundant components checked, Bill?
00 00 35 27  LMP  Check, and we passed.
00 00 35 31  CDR  You got the fuel cells purge check?
00 00 35 33  LMP  Huh?
00 00 35 34  CDR  Does the fuel cell purge --
00 00 35 35  LMP  I haven't got that yet.
00 00 35 39  CDR  We should be getting - getting over Tananarive.
00 00 35 54  LMP  You want to check me off here?
00 00 35 55  CDR  Yes, I'd - I'd like to.
00 00 35 57  LMP  Okay, I've done EPS periodic verification.
00 00 36 01  CDR  Good enough. Alright.
00 00 36 04  LMP  ECS monitoring.
00 00 36 06  CDR  Alright.
00 00 36 08  LMP  SPS monitoring.
00 00 36 12  CDR  Okay.
00 00 36 13 IMP ECS redundant components. I'm ready to go on fuel cell purge.
00 00 36 17 CMP (Singing)
00 00 36 18 LMP Purge line heater has been ON. Stand by for a MASTER ALARM. Purging fuel cell 1, H₂.
00 00 36 30 IMP That it?
00 00 36 31 CDR Yes.
00 00 36 32 LMP O₂.
00 00 36 37 IMP Okay.
00 00 36 39 CDR I didn't get a high ... too well ---
00 00 36 41 LMP Probably won't ... H₂, stand by.
00 00 36 45 CDR Yes.
00 00 36 46 LMP Okay. Okay.
00 00 36 51 CMP How's VERB 83 looking?
00 00 36 53 LMP That it?
00 00 36 54 CDR Perfect.
00 00 36 55 LMP Fuel cell 3 ---
00 00 36 56 CMP Ooooh! (Yawn)'
00 00 36 57 LMP --- Stand by.
00 00 37 00 LMP Okay. Okay.
00 00 37 06 CMP Drinking water supply is ON.
00 00 37 08 CC Apollo 8, Houston. Over.
00 00 37 09 CMP I'll unstow the covered cameras here, but first let me get the dust covers jettisoned. Okay?
00 00 37 13 CDR Okay.
00 00 37 14 LMP  Purge - purge check is complete, fuel cell line heaters are OFF.
00 00 37 18 CDR  Houston, Apollo 8. How do you read?
00 00 37 22 CC  Apollo 8, Houston. Reading you weak, but clear. How me?
00 00 37 25 CDR  You're loud and clear, Mike. Everything seems to be going very well.
00 00 37 31 CC  Okay, everything looks real good here on the ground with both vehicles. We still have you 103 by 99 on your orbit from our low-speed data, and everything's looking very good. Over.
00 00 37 41 CDR  Roger. Thank you.
00 00 37 42 CMP  G&N OPTICS POWER, going ON.
00 00 37 45 CDR  Well, do you want me to get out of VERB 83?
00 00 37 47 CMP  No, you are okay.
00 00 37 49 CDR  When are you going to unstow the camera?
00 00 37 51 CMP  As soon as I get this thing done.
00 00 37 53 CMP  Okay, OPTICS COUPLING, DIRECT - DIRECT - The speed is HIGH. Okay, here we go, gentlemen.
00 00 38 02 CMP  I'm not going to look into them for a while.
00 00 38 12 CDR  Okay, 1 minute.
00 00 38 18 CMP  ... I still think it's still kind of chilly in here.
00 00 38 24 LMP  They OFF, Jim?
00 00 38 29 CMP  Yes, I guess so. Oh, I see a whole bunch of stuff - Oh, here we go.
00 00 38 33 LMP  They both OFF?
00 00 38 36 CMP  Yes, I - I guess I was just looking at the -
00 00 38 40 LMP  It's blacker than pitch out there, remember.
00 00 38 43 CMP  Boy, everytime I - Why? Is it dark out?
<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:00</td>
<td>LMP</td>
<td>Yes, you're looking up into pretty much blackness.</td>
</tr>
<tr>
<td>00:02</td>
<td>CMP</td>
<td>Everytime I move the thing, I got a whole bunch of - of sparks, or you know, not sparks, but - -</td>
</tr>
<tr>
<td>00:04</td>
<td>LMP</td>
<td>Did they go?</td>
</tr>
<tr>
<td>00:06</td>
<td>CMP</td>
<td>I guess, I can't see - -</td>
</tr>
<tr>
<td>00:08</td>
<td>LMP</td>
<td>If you can see the glitter, you got - you've got it.</td>
</tr>
<tr>
<td>00:10</td>
<td>LMP</td>
<td>Turn the lights down?</td>
</tr>
<tr>
<td>00:12</td>
<td>CDR</td>
<td>Where's the other camera bracket, I wonder?</td>
</tr>
<tr>
<td>00:14</td>
<td>LMP</td>
<td>I don't know; I've always expected that other one to come out of there.</td>
</tr>
<tr>
<td>00:16</td>
<td>CDR</td>
<td>Listen, don't we have a stowage list in the back of the checklist?</td>
</tr>
<tr>
<td>00:18</td>
<td>LMP</td>
<td>That's what I am looking for, but I can't find it.</td>
</tr>
<tr>
<td>00:20</td>
<td>CMP</td>
<td>Okay, can I go into a 1691?</td>
</tr>
<tr>
<td>00:22</td>
<td>CDR</td>
<td>Yes. Go back to POO first, Jim.</td>
</tr>
<tr>
<td>00:24</td>
<td>CMP</td>
<td>Yes. Yes, I'll just skip that. Proceed.</td>
</tr>
<tr>
<td>00:26</td>
<td>LMP</td>
<td>Do you have Tananarive?</td>
</tr>
<tr>
<td>00:28</td>
<td>CDR</td>
<td>Yes, we had them when we took the film.</td>
</tr>
<tr>
<td>00:30</td>
<td>LMP</td>
<td>Did Jim doublecheck to make sure that wasn't in there?</td>
</tr>
<tr>
<td>00:32</td>
<td>CDR</td>
<td>What's that?</td>
</tr>
<tr>
<td>00:34</td>
<td>LMP</td>
<td>That other camera bracket.</td>
</tr>
<tr>
<td>00:36</td>
<td>CMP</td>
<td>No, I haven't doublechecked yet.</td>
</tr>
<tr>
<td>00:38</td>
<td>CMP</td>
<td>I don't see anything - -</td>
</tr>
<tr>
<td>00:40</td>
<td>LMP</td>
<td>- - We can handle that.</td>
</tr>
<tr>
<td>00:42</td>
<td>CDR</td>
<td>What did you say, Jim?</td>
</tr>
<tr>
<td>Time</td>
<td>Callsign</td>
<td>Text</td>
</tr>
<tr>
<td>-------</td>
<td>----------</td>
<td>------</td>
</tr>
<tr>
<td>00 00 40 12</td>
<td>CMP</td>
<td>I don't see anything in the sextant.</td>
</tr>
<tr>
<td>00 00 40 15</td>
<td>CDR</td>
<td>You don't?</td>
</tr>
<tr>
<td>00 00 40 16</td>
<td>CMP</td>
<td>No.</td>
</tr>
<tr>
<td>00 00 40 22</td>
<td>CMP</td>
<td>Now this thing's all the way.</td>
</tr>
<tr>
<td>00 00 40 27</td>
<td>CMP</td>
<td>I heard something then.</td>
</tr>
<tr>
<td>00 00 40 30</td>
<td>LMP</td>
<td>I'm flipping switches, and -</td>
</tr>
<tr>
<td>00 00 40 40</td>
<td>CMP</td>
<td>I thought I'd see something in the sextant.</td>
</tr>
<tr>
<td>00 00 40 50</td>
<td>CDR</td>
<td>Can you see out of the telescope?</td>
</tr>
<tr>
<td>00 00 40 57</td>
<td>CMP</td>
<td>Yes, yes, yes, I sure do.</td>
</tr>
<tr>
<td>00 00 41 03</td>
<td>LMP</td>
<td>Why don't you see if we can get the camera stuff unstowed before you go into darkness?</td>
</tr>
<tr>
<td>00 00 41 08</td>
<td>CMP</td>
<td>Okay.</td>
</tr>
<tr>
<td>00 00 41 12</td>
<td>LMP</td>
<td>Those cameras and that other junk.</td>
</tr>
<tr>
<td>00 00 41 15</td>
<td>CMP</td>
<td>I—I see something in here. I thought maybe I could maybe get it into the sextant to see better.</td>
</tr>
<tr>
<td>00 00 41 21</td>
<td>LMP</td>
<td>You're going to be doing that alignment, that P52.</td>
</tr>
<tr>
<td>00 00 41 25</td>
<td>CMP</td>
<td>Well, okay. I'm just doublechecking.</td>
</tr>
<tr>
<td>00 00 41 32</td>
<td>CMP</td>
<td>I think I see something floating.</td>
</tr>
<tr>
<td>00 00 41 38</td>
<td>CC</td>
<td>Apollo 8, Houston.</td>
</tr>
<tr>
<td>00 00 41 40</td>
<td>CDR</td>
<td>Go ahead, Houston; Apollo 8.</td>
</tr>
<tr>
<td>00 00 41 42</td>
<td>CC</td>
<td>We have 1 minute to LOS Tananarive. We'll see you again over Carnarvon at 52:09. Over.</td>
</tr>
<tr>
<td>00 00 41 51</td>
<td>CDR</td>
<td>Roger. We do have the optics covers jettisoned. It appears everything seems to be going fine.</td>
</tr>
<tr>
<td>00 00 41 57</td>
<td>CC</td>
<td>Roger; optics cover jettisoned. Thank you.</td>
</tr>
<tr>
<td>00 00 42 01</td>
<td>CMP</td>
<td>Okay. B3 is what I have right here.</td>
</tr>
</tbody>
</table>
Okay. You want the 16-millimeter camera, right?

Yes, here.

Right now; I'll just give you all these little goodies right now.

Okay, if Frank can hold it and hand it up to me -

What do you want?

The 16-millimeter camera and the 18-millimeter lens?

Okay, this is the 16-millimeter camera. You got the right kind of film in there? C-EX, ASA 60 --

C-EX? That right?

Jim, you can head underneath and get that spotmeter.

Okay.

18-millimeter lens, and you need a mirror?

Yes, I guess.

Huh?

Yes, but I don't - I'm not sure it's going to fit on this - on this bracket here. I don't think it will.

Where have we got the spotmeter located here?

Right in here. Can I help you with it?

Way under there?

And is this the 75-millimeter magazine camera you want here?

That's all I can get now.

Do you see it in there, Jim?

No, I'll look for it. I - I might see it if I kind of look for it.
Can you hang on to that one for a second, Frank?
Okay, we've got the -

Yes, here it comes up here.

Alright.

Which way?

This way; to your right. Anything else down here?

We need that other camera bracket. Let's put this one back.

We sure do.

How about going into your - into the stowage list and find out where it is. I haven't - -

I can't seem to find the stowage list, either.

Maybe that's in your section.

It's in the flight plan.

No, this one won't work. We're going to have to use the other one.

What one won't work?

This camera bracket.

Oh.

Maybe you want to put the - This is all you need right here now, isn't it, Bill? You want to put that back? Here, I'll hold your checklist.

I thought we had one of those stowage lists in the back of your checklist.

Okay, I need camera number 2 with a 80-millimeter lens and some C film in it.

You've got it, haven't you?
Camera 2, magazine A, C film; right here.

(Singing)

Coming up on darkness.

(Singing)

Yes, Jim, you'd better start getting ready for the first eclipse.

Okay.

You couldn't check that camera bracket real quick, Jim?

I'll look in here.

Okay.

70-millimeter camera; you got all that. You got the spotmeter too, please, Bill?

I do. I've got everything I need except that bracket. ... This is a good enough place to keep it.

(Singing)

Do you need your checklist, Jim? Here I'll give it back.

Well, I'll be darned. ...

Wait a minute.

Thank you.

Well, it doesn't make it that far for TLI.

Okay, we're right up there.

How are we doing?

We're doing fine. We should be getting there. All we need is that other camera bracket.

I'm warm now. How about you?

I'm hot.
<table>
<thead>
<tr>
<th>Time</th>
<th>LMP</th>
<th>CMP</th>
<th>CDR</th>
<th>MPE</th>
<th>F16</th>
</tr>
</thead>
<tbody>
<tr>
<td>00 46 28</td>
<td>Man, I'm cold still.</td>
<td>00 46 50</td>
<td>Boy, is this ...! Hey, don't let me forget about this camera, when we light off here. It's spread all over the place.</td>
<td>00 46 56</td>
<td>Hey, that's right.</td>
</tr>
<tr>
<td>00 47 18</td>
<td>I hope I can see something out of here soon.</td>
<td>00 47 20</td>
<td>How's the cabin pressure?</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>00 46 56</td>
<td>-</td>
<td>00 46 56</td>
<td>Hey, that's right.</td>
<td>00 47 18</td>
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</tr>
<tr>
<td>00 47 22</td>
<td>It has kind of eased down a little bit.</td>
<td>00 47 27</td>
<td>What are you doing, Jim?</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>00 47 29</td>
<td>I'm okay. I'm just getting this all put together here.</td>
<td>-</td>
<td>-</td>
<td>00 47 33</td>
<td>Do you want me to read off anything to you - from the checklist? Form a checklist, maybe?</td>
</tr>
<tr>
<td>00 47 38</td>
<td>I've got the P52 realign. You might kind of doublecheck me on it; maybe - I'm here and I'm going to turn down the floodlights and get - get my eye adapted here, because I don't see schmatz out there right now.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>00 47 55</td>
<td>Hope it hasn't clouded up ...</td>
<td>00 47 58</td>
<td>Frank, I sure hope you're right.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>00 48 06</td>
<td>Alright, CM - do not key VERB 82. Do you want to go - start right from scratch with P00?</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>00 48 13</td>
<td>Yes, okay. I'm going to bring this optics toward zero.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>00 48 18</td>
<td>CMC, ON; ISS is ON; PSS is - SCS is operating; EMAG's, three, are RATE 2 - G&amp;N POWER OPTICS, ON? Jim?</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>00 48 29</td>
<td>G&amp;N POWER OPTICS are ON.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>00 48 31</td>
<td>CMC is FREE; OPTICS MODE, ZERO.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>00 48 36</td>
<td>Okay, stand by. I am going to go - I'm driving it to zero ...</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Uh - oh, the trunnion won't go any farther than - 45, and -

Need the lights down a little bit, Jim?

Now, it's just SCS. Okay, I can see. Okay, I'm going to go to zero. I don't think - It must be going to zero.

Okay, that looks good. ... Okay, I think I see something out there now.

You got the OPTIC MODE to zero?

Yes.

OPTIC MODE, CMC.

OPTIC MODE, CMC.

What are you doing now?

Okay, I'll go - I'll go to POO right now.

That's what you get with the burn.

Okay.

And by the way, we used VERB 66 at the end of our burn.

We did?

That's affirmative.

Hey, are you going to 52, now?

Well, are we dark or light out there?

Well, you ought to be able to get it even in light. It's getting dark now.

Okay. Well, I want to make sure we got a good one.

Okay, VERB 37, ENTER; 52, ENTER. You want a REFSSMAT option?

VERB 22, ENTER; 3, ENTER - -
There's a couple of nice stars out here.

-- ENTER. Okay. All set, gentlemen?

Yes.

Hey, there's a bunch of stuff flying off this thing.

I know; that's what I was afraid of.

Real bright - I wonder why they're so bright?

The sun's shining.

Are we - We're boiling?

Is the sun shining, really?

Yes, look here, I got sun in it.

Oh Christ (laughter), I thought it was nighttime over here!

I can see a lot of stars over on this side.

What are you doing, Jim?

Well, I'm getting the optics adjusted here.

Yes, they make you --

Okay, 06; 06 is what? 06 is Acamar. Worst star in the world for me to look at! Oh, I'm getting more stars now.

Okay, here we go, gentlemen.

You got a real bright star --

Zero off, right?

Yes.

Real bright star - star like --

Zero off.

CMC; optic mode should be CMC.
CMC? Oh, to C, huh?

Holy cow!

Any luck?

Well, it stopped by a star. The star's out, but I don't know what it is, though.

Can you see it through the telescope?

Yes. It seems to look like - Okay, I'm going to go to RESOLVE - LOW, and MANUAL.

CMC; proceed; Spica's the one I want; proceed; okay; 15, that's Sirius.

We there yet?

Yes, proceeding.

Apollo 8, Houston.

Go ahead, Houston; Apollo 8. You're loud and clear.

Roger; you're loud and clear over Carnarvon. We'd like to take the DSE away from you for a second.

Go.

Roger; go ahead.

Thank you.

Roger; 01:28:13. Thank you.

(Singing)

We are giving the DSE back to you, Apollo 8.

Roger, thank you.

Okay, what I can do is put this camera bracket - How about putting it in your temporary stowage bag, Bill?

Whatever you want. Has anybody seen the - Oh, there it is.
Day 1

Okay, who's got - You got my TLI checklist, don't you, Bill? Or Frank? Oh, I got it. Now, everyone a flight plan out?

Okay, ...

Or do you want to wait until after TLI?

Okay, S-band volume, down. I'm doing - I'm doing the - the - this check.

That booster was quite a ride. I'm still impressed.

I was a little worried at that pogo there on the second stage - something we didn't expect.

(Singing)

Anyone want me down here for anything else?

Well, I'm going to get prepared to get back in.

You going to get that data up?

You want the data now, or do you want to do the TLI checklist?

Data box.

You want the data box now, or do you want to wait to TLI?

... be happy. He didn't have the systems book manual.

We ought to get those cards, too, Jim.

Well, I hate to keep all these hoses around here, ... after TLI.

Okay. A 5-degree difference between -

...

You mean you need it again?

Not unless you want to.

Now, let me see. I don't know whether we need these lights on or not.
Let me have 4-B in the SYSTEMS TEST, will you, Jim?

4-B?

Yes, roughly.

Okay.

You can go ahead and turn it OFF.

You want to hand me that metal box, Jim, as soon as you finish?

It will be a lot more convenient when we can all get undone.

Yes, you want it?

Not really, but ...

Gentlemen.

... BIOMED around me. They've been looking at me all the time.

Would you believe that I think I see little gullies here?

Huh?

Where do we go, to the CENTER or what? Must be somebody else.

Maybe they didn't want the - Where's the ...?

They had me for the whole preflight.

You're not going to be able to write on that dump list, are you?

Well, we'll see.

Hey, you got that metal box?

Coming.

You got a ... down there.
Well, that's a problem. I can't help that.

Don't look at me on that.

You beginning to see a little horizon against the moon there?

... 

Yes, you can see that. It would be good if we had that for retro, wouldn't it? Entry, I mean. The thing is, we ...

You want to make any comments about the boost part, if you get time to do it?

Okay.

Make them good and loud and clear; make sure everything's --

Are we on there now?

Yes.

Alright, the boost --

Metal box.

Stand by.

I can't see where this thing goes in down there. You'll have to help me, Jim. You got a flashlight?

Here you go.

I can't get it, but I think it's supposed to fit the bottom one here. Okay.

Down below?

Yes. Down here. See? I - that thing fits in underneath here and I can't --

I'll put my feet over here.

We'll get those little things to stick in those rings down there. You see what I mean?
I can't get down there, yet. I don't know where I am.
Okay, where are we?
Those little holes in the - those little things that - see the holes into the wall?
Is it over here?
No, no, right -
Oh, it's over here. Okay.
No, it should be right -
I got one. Right here. Twist a little bit.
Okay.
There's one. Now let's get the other one.
Oh, shoot!
What was that?
My lifejacket.
(Laughter) No kidding?
It hooked on the tank here. It flicked up.
Is it blowing up?
It's too early.
Why don't you take it off and give it to me, and I'll try to take it apart while you watch the panel.
Lovell just caught his lifevest on Frank's strut.
It's hard to get off, too.
That's CO in there?
Yes, CO₂.
CO₂?
Yes. I think we ought to just leave the lifevest just the way it is.

Tell you what we'll do: we'll dump it out with the vacuum cleaner over the side there, why don't we.

Put it right back here:

Okay.

Hey, that power looks low.

Yes, turn it off, Jim.

Okay, --

Why don't you put it up in the spout?

I'm afraid I'm going ... damage.

Okay, when we get communications again, we'll ask them what to --

Yes, we - we can live with a little CO₂...

Where are you going, Jim?

Well, you want me to get this box, don't you?

Yes.

Hey, Jim. When I heard that noise, I looked at the CABIN PRESSURE real quick!

Well, I knew what was wrong as soon as it happened! (Laughter)

I'm just kind of thankful, too.

Okay, gentlemen. I think we'll - I don't know - There's one thing I'm worried about: this helmet.

Where is it?

It's right up here -

Can't you stick it right here?
Is there room back there?
I could tie it a little bit.
Can you give me those ..., Jim?
What's that knock?
The clock?
When I raised my head back, I hit it with this.
I think I heard this ... firing over here.
How are we as far as the -
We're in good shape. I'm standing by for the backup COMM check.
Hey, can I put this on the tape about this launch?
Yes, it would be a good time to do it.
Okay, the launch was nominal in almost every respect. It was no difficulty determining lift-off. Vibrations noticed before the thrust came up to - up to - well, before ... commit launch - commit to launch, and then at - when the hold-down arms released, the vibration went away. There was a lot of noise initially in the cabin. It was difficult to communicate. And then as we - The noise died out, we approached MAX q, when it built back up again. There was no pogo noticeable on the I-C stage. The stagings, to be frank, were all nominal. The only off-nominal factor the whole launch worth mentioning was the slight pogo that was recorded in real time on the S-II stage, and the loud - the audio level inside the - inside the cabin during S-IC burn.
Didn't you - didn't you think the thing was still rattling like a freight train before you - as you became clear of the tower? I had the feeling that it was.
No, I thought - when we let go -
Yes, you could tell it let go, but I meant I thought it kept vibrating. You might make a note that that
was at 1 hour and 16 minutes if you ever want to find your tape when you debrief.

Alright.

Well, I guess I could tie it up here. Let's ask him.

Don't tie it on that hatch thing there.

Not the hatch handle. There's a hatch ...

Okay, what's the g; one g?

One (laughter) - one g; are you kidding?

I mean - during the booster period.

Yes, a little over one g.

You want to hand out - Well, I guess we won't need a flight plan. No.

The camera; configured for the backup COMM check; checked my two circuit breakers.

What time is it? We ought to keep track of the time.

Okay.

I got plenty of time to get back in the couch. Okay, where are the --

The primary transponder's going OFF for 4 seconds.

Okay, where are the - the - the headpads?

Secondary transponder's coming ON.

The what, Jim?

You want the headpads, don't you?

Well, not yet. Let's wait until we - Oh, you mean before the boost?

Yes.

They're in that CO, thing.
They're going to be awful hard to put on; I know that.
I think that's them; I'm not sure.
And also doing a down-voice backup, and up-voice backup.
That's down; that's down.
Life preserver is - just floating.
Well, that's ...
I'm putting tape over these transponder switches.
Sunrise coming up.
How are the fuel cells looking?
Secondary looks okay. It reads a little higher than the rest of them. One, even before launch, shoved a little bit lower $O_2$ flow than $H_2$. Okay.
You going to put your shoulder harness on again?
I never took mine off. Yes, how do you take them off?
Well, just kind of ... I just kind of loosened my belt, there at the fastener.
I don't know what we'll do with that damn lifevest. There's no way we can ...
Yes, you can --
Yes, with the - the thing you blow it up with.
It sure is nice to get that helmet and gloves off.
It sure was.
You're recording ...
Wait a minute. Before you get back to the seat, you're supposed to turn the - You're not back in your seat for good, are you? We got a long time.
Before - Oh, we got 2 hours and 20 minutes now.
00 01 24 04 CDR Yes.
00 01 24 07 CMP Okay, I'll go back down.
00 01 24 16 CMP Gee, this is the best flight I ever had.
00 01 24 26 LMP Because you've got to get those circuit breakers before ... up here.
00 01 24 29 CMP Yes.
00 01 25 04 CMP You know, this is very clean.
00 01 25 22 CMP Here comes the sun.
00 01 25 31 CMP Well, take a look. It crept up on us.
00 01 25 34 LMP I think we'll feel better when we close this. See that?
00 01 25 39 CMP Yes.
00 01 25 44 CMP Although I noticed it was pretty good, whenever we were over -
00 01 25 53 CMP Sunrise at 01:25.
00 01 26 01 CMP Alright now, would you say we lifted off on time, gentlemen?
00 01 26 03 LMP I'd say we did.
00 01 26 10 CMP There for a while though, when we were counting down there for the last seconds, I didn't think she was going to wait.
00 01 26 14 CDR Yes.
00 01 26 16 LMP Are the safety boilers still going?
00 01 26 17 CMP Yes, sir.
00 01 26 20 CDR That's one thing else we should note about the launch. That we didn't hear the noise until about 3 seconds before lift-off, even though ignition commit ... the main ... came on time.
00 01 26 32 CMP And the tower jettison was quite noticeable, although it wasn't the rumble you get in the DCPS.
00 01 26 48  CDR  You want to say anything else, Bill, that you're working at?

00 01 26 51  CDR  Bill - or Jim, how about taking the RCS check?

00 01 27 00  LMP  She has been a little bit lower than normal ...

00 01 27 24  CMP  Well, we could be ...

00 01 27 29  LMP  Yes.

00 01 27 47  CMP  I'm not too in favor of this attitude as far as - Hey, we've been doing an awful lot of upside down flying.

00 01 27 54  LMP  You can't see any other way.

00 01 27 57  CDR  Can't you see the horizon?

00 01 27 59  CMP  Can you see the horizon?

00 01 28 00  LMP  Yes. I just couldn't the other way.

00 01 28 06  CMP  I guess maybe this is not the - No, wait a second, all I see is ...

00 01 28 17  CMP  Yes, there's some dust out there due to the -

00 01 28 23  LMP  Yes, you ought to give them a little blob on the -

00 01 28 25  CDR  Let's give them a window status report as far as contamination.

00 01 28 29  LMP  Okay. We want to keep charts from right to left here.

00 01 28 32  CDR  Alright. Number 1 window is clean and has lint on it, and then toward the upper part, that's plus X on the outside pane, it looks like we're already starting to form bits of frost. There was not any evidence of contamination there during staging. Number 2 rendezvous window is good with some, again, specks of lint hanging off the ...

00 01 28 57  CMP  Number 3 window has some dust on it, and in the lower - in the lower right-hand corner, there is a smudge on - what appears to be the outside pane - I'm not too sure it's not the inside; but the visibility appears to be real good - -
But you're never going to be recording there. You've got to talk real loud.

Oh, he can't?

Okay. There's a little smudge on the lower left-hand portion of the center window, and some dust on both the outside and the inside windows, but the visibility is still very good.

Window number - window number 4 is clear. Window number 5 appears clear, but it's in the shadow at the moment, and it's difficult to tell if there's any frost forming at this point.

Okay, very good.

Okay, now let's check to see if we're receiving good.

This is backup COMM check?

Yes, ...

Houston, Apollo 8. Over.

Apollo 8, this is Houston. Over.

Roger, Houston; Apollo 8. Standing by for GO for the backup COMM check. Over.

Roger. Stand by 1, Bill.

(Singing)

Go ahead; inhibit VHF downlink.

Apollo 8, this is Houston. Go ahead with backup voice check.

Roger. This is Apollo 8 on backup voice: 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. How do you read? Over.

Apollo 8, this is Houston. Go ahead with backup voice check. Over.

Down-voice backup; up-voice backup. S-band is key ON.

Apollo 8, Houston. Go ahead with backup voice check. Over.
Day 1

00 01 31 25 LMP
Roger, Mike. I gave you a count, I'll give you another one. Are you standing by?

00 01 31 30 CC
Roger; standing by.

00 01 31 31 LMP
Roger. This is Apollo 8 with backup voice: 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. Over.

00 01 31 42 CC
Roger, Bill. Reading you weak, but clear.

00 01 31 45 LMP
Roger.

00 01 31 46 CC
Go ahead with normal S-band voice check.

00 01 31 50 LMP
Roger.

00 01 31 52 LMP
Okay, VHF VOL, UP; ... S-band AUX, OFF.

00 01 32 17 LMP
Houston, this is Apollo 8 on normal S-band: 1, 2, 3, 4, 5; 5, 4, 3, 2, 1 - -

00 02 49 47 LMP
Okay. Start your watch ... see what time it says.

00 02 49 50 CMP
Huh?

00 02 49 52 LMP
Call out the time, Frank.

00 02 49 54 CDR
59:17, 18.

00 02 49 56 LMP
Okay, 42 is S-II SEP light, OFF.

00 02 50 01 CDR
42?

00 02 50 03 LMP
Okay, you're in EMS MODE, AUTO?

00 02 50 04 CDR
Yes.

00 02 50 05 LMP
Okay.

00 02 50 13 CC
Apollo 8, coming up on 20 seconds to ignition. Mark it, and you're looking very good.

00 02 50 19 LMP
Okay.

00 02 50 20 CDR
Roger.

00 02 50 21 LMP
Call 42,
CONFIDENTIAL

Day 1

00 02 50 24 CDR We're past 42. That was when our light ---

00 02 50 26 LMP That's 58:42 or -- 59 --

00 02 50 28 CDR 59 - 9, 8, 7 - 4 - 3, 2, light ON. IGNITION.

00 02 50 40 CDR IGNITION.

00 02 50 41 CC IGNITION.

00 02 50 45 CDR Go ahead. Boy, it's going off in you.

00 02 50 51 LMP Okay, the DAP is fine over here.

00 02 50 53 CMP What's your attitude at ...?

00 02 50 54 CDR Fine, 45 ...

00 02 50 55 CMP Okay.

00 02 50 56 LMP Okay, align yourself in attitude, we got plus or minus 5 degrees.

00 02 51 01 LMP And the tank pressures?

00 02 51 03 CDR Tank pressures are good.

00 02 51 04 LMP Okay.

00 02 51 08 CDR Are you watching the DELTA-P ...?

00 02 51 10 LMP Yes.

00 02 51 11 CMP 30 seconds.

00 02 51 14 CMP You got 18 hours to --

00 02 51 16 LMP Don't worry about that.

00 02 51 28 CDR Everything alright?

00 02 51 41 CMP 60 seconds.

00 02 51 44 CMP 20 seconds off.

00 02 51 58 LMP Things are looking good over here.
Apollo 8, Houston. Trajectory and guidance look good. Over.

Roger; Apollo 8. Good here.

Okay, cutoff at 02:55:51. Okay, we're coming up on 28 000.

Apollo 8, Houston. We're predicting cutoff at 02:55:58, and it looks exactly nominal here.

Roger.

02:55:58?

Right.

Apollo 8, Houston. We've predicted cutoff 02:55:52 - 52, and that's exactly as it should be.

02:55:52.

Okay.

Shouldn't have that goddamn high flow rate up there.

Coming up on 29 000. Okay, our yaw should be coming off now a little bit.

3 minutes to go.

You should have about 8 degrees of yaw yet, compared to what - 35? A week 35, now 37. Alright, it was what - 9 degrees?

Hey, that O₂ is pegged high, Bill.

Yes, I know. It's just a little warmer up here. I'd - I'm looking at the DELTA-P here. The surge tank in the tank 1 ... nothing else to worry about.

Apollo 8, Houston. You're looking good here; right down the center line.

Roger; Apollo 8.
Coming up on 31,000.

How's the cabin pressure, Bill?

Holding good.

Coming up on 315.

02:54.

What time ...?

02:54:56.

02:55:52.

1 minute to go.

Apollo 8, Houston. You're looking good. Right down the old center line.

Apollo 8 - -

... 

Stand by.

30 seconds to go. 34,000. You got the card?

Yes.

Did you see the card, Bill?

I got it.

Okay.

35,000. We should have good ...

Alright, 15 coming up here.

Real fine. 10 seconds.

35 - 35.1.

How's your inertial velocity?

Velocity's looking fine.
Okay, we got SECO right on the money.
Roger; understand SECO.
I got a ... light; 2 seconds late on SECO. ... got the tape recorder.
... SECO ... gimbal ...
Jim. Go ahead, Bill.
SECO plus 10 seconds, light OFF. S-IVB goes to attitude hold 20 seconds and begin venting.
Okay.
S-IVB will maneuver to ORB RATE, heads down at 0.3 of a degree per second.
Okay, record v
Give it to me.
I'll give it to you. v was 34 - 35452.
35452. HDOT?
04550.
HPAD.
Plus 01791.
Let's not go out of there. You leave it like it is.
Okay, KEY RELEASE.
I've got to go to my KEY RELEASE ...
16 92 for KEY RELEASE?
Yes.
KEY RELEASE was 16 83?
<table>
<thead>
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<tbody>
<tr>
<td>00 02 56 55</td>
<td>CMP</td>
<td>Okay, 16 83; DELTA-V is 95485.</td>
</tr>
<tr>
<td>00 02 57 02</td>
<td>LMP</td>
<td>Y?</td>
</tr>
<tr>
<td>00 02 57 03</td>
<td>CMP</td>
<td>Minus 16833.</td>
</tr>
<tr>
<td>00 02 57 07</td>
<td>LMP</td>
<td>Z?</td>
</tr>
<tr>
<td>00 02 57 09</td>
<td>CMP</td>
<td>Plus 41124.</td>
</tr>
<tr>
<td>00 02 57 13</td>
<td>LMP</td>
<td>And DELTA-V, Frank?</td>
</tr>
<tr>
<td>00 02 57 15</td>
<td>CMP</td>
<td>What's DELTA-V, Frank?</td>
</tr>
<tr>
<td>00 02 57 16</td>
<td>CDR</td>
<td>Minus 20.6.</td>
</tr>
<tr>
<td>00 02 57 19</td>
<td>CMP</td>
<td>Okay, this - this - -</td>
</tr>
<tr>
<td>00 03 19 57</td>
<td>LMP</td>
<td>The FLIGHT RECORDER is OFF; TAPE RECORDER is stopped - -</td>
</tr>
<tr>
<td>00 03 19 57</td>
<td>LMP</td>
<td>MANUAL ATTITUDE, three, RATE COMMAND.</td>
</tr>
<tr>
<td>00 03 19 58</td>
<td>CDR</td>
<td>RATE COMMAND.</td>
</tr>
<tr>
<td>00 03 20 01</td>
<td>LMP</td>
<td>Okay, turn controller counterclockwise, plus X, and hold at zero.</td>
</tr>
<tr>
<td>00 03 20 03</td>
<td>CMP</td>
<td>Going to zero.</td>
</tr>
<tr>
<td>00 03 20 04</td>
<td>LMP</td>
<td>Turn it clockwise - -</td>
</tr>
<tr>
<td>00 03 20 05</td>
<td>CMP</td>
<td>Now, wait a second. ...</td>
</tr>
<tr>
<td>00 03 20 14</td>
<td>CMP</td>
<td>Yes.</td>
</tr>
<tr>
<td>00 03 20 15</td>
<td>CDR</td>
<td>What, this?</td>
</tr>
<tr>
<td>00 03 20 16</td>
<td>LMP</td>
<td>Let me attempt to turn it OFF. Give me a 10-second warning on the flight recorder.</td>
</tr>
<tr>
<td>00 03 20 20</td>
<td>CMP</td>
<td>Yes. Okay.</td>
</tr>
<tr>
<td>00 03 20 23</td>
<td>LMP</td>
<td>13920 ... - -</td>
</tr>
<tr>
<td>00 03 20 24</td>
<td>CC</td>
<td>Apollo 8, Houston.</td>
</tr>
<tr>
<td>00 03 20 25</td>
<td>LMP</td>
<td>- - 30.</td>
</tr>
</tbody>
</table>
Go ahead, Houston.

We have you about 30 seconds prior to separation, and everything is looking good.

Roger.

Okay, I'm coming up on 15 seconds to SEP.

Alright.

10 seconds to go.

You in AUTO?

Yes, AUTO, AUTO, right.

Okay, at zero, turn HAND CONTROLLER counterclockwise, plus X, and hold.

3 seconds, LAUNCH VEHICLE TANK PRESSURE indicator, zero; CM/LV SEP; TRANSLATIONAL COUNTER, NEUTRAL; plus X, OFF; TVC SERVO POWER 1, OFF.

Alright.

Okay, VERB 62, ENTER.

VERB 62, ENTER.

VERB 49, ENTER.

VERB 49, ENTER.

Okay, desired gimbal angles and proceed.

Roger; proceed, now.

Okay, you're notched up by 30 seconds to a minus X of 2-1/2.

... SEP.

Okay, you put your other - you're not around by 30 seconds, so minus X is your roll.

Why can't you call it yaw?
Because we're not — see, we're not —
There's one panel.
After this camera ...
Man, where's the S-IVB? Anybody see it, now?
There it is!
You found it?
Right in the middle. Right in the middle of my window. There's not a panel around.
It's all up to you!
Give me the camera.
Well, we've got some still pictures we can take —
Could you pitch a little more?
Yes.
We haven't got in here, yet.
f:ll, 1/250th.
f:ll.
We've SEP'd, Houston. We've got the IV-B right in sight.
Could you pitch just a little more or ...
Which way?
Pitch up, pitch up a little more.
How's that?
I don't see the ... Maybe I can get it in a minute.
Easy on the thrusters.
Don't you think that's enough pictures of it?
Houston, how do you read Apollo 8?
CONFIDENTIAL

00 03 22 55 CMP  How far away do you think it is?
00 03 22 59 LMP  ...
00 03 23 00 CDR  How about the S-band, Bill?
00 03 23 02 LMP  Let me switch the antenna here.
00 03 23 07 CDR  I'm not going to fly around the damn thing. I don't think there's any - do you?
00 03 23 12 CMP  No.
00 03 23 23 CDR  You got lockon?
00 03 23 24 LMP  Yes.
00 03 23 25 CDR  Houston, this is Apollo 8 on VHF and S-band. How do you read?
00 03 23 30 CDR  Read you loud and clear. We've SEP'd; looking good.
00 03 23 35 LMP  You read him loud and clear? I don't --
00 03 23 37 CDR  Turn your VHF up and your ...
00 03 23 44 LMP  Okay, let's make sure we've done everything here. Get that FLIGHT RECORDER, OFF.
00 03 23 49 CDR  OFF or ON?
00 03 23 50 LMP  OFF. Okay, about 23:50, I want it OFF.
00 03 23 53 CMP  Okay.
00 03 23 54 LMP  23:50, OFF.
00 03 23 57 LMP  At 35:50, I turn it back ON. ... 23:50 ...
00 03 24 05 CMP  Okay, let me see here.
00 03 24 07 LMP  Okay --
00 03 24 09 CMP  Our EDS POWER is OFF?
00 03 24 10 CDR  EDS POWER is going OFF.
00 03 24 12 LMP  ATT 1/PAGE 2.
00 03 24 14  CDR   ATT 1/RATE 2.
00 03 24 15  LMP   Okay, TAPE RECORDER is stopped —
00 03 28 22  CDR   Houston, Apollo 8. How do you read?
00 03 28 27  CDR   Roger; loud and clear. We are taking pictures of
                   the S-IVB. The postseparation sequence is completed
                   and we seem to have the high gain.
00 03 29 41  CMP   There she is ...
00 03 30 29  CMP   03:36 ... 03:36 ...
00 03 30 39  CDR   Go ahead, Houston; Apollo 8.
00 03 35 22  CDR   Go ahead, Houston; Apollo 8.
00 03 35 32  CDR   We did not.
00 03 35 34  CDR   Do you want us to do that now?
00 03 35 38  CDR   Roger.
00 03 35 44  CDR   We see the earth now, almost as a disk.
00 03 35 51  CDR   We are. Tell Conrad he lost his record.
00 03 35 59  CMP   We have a beautiful view of Florida now. We can
                   see the Cape, just the point.
00 03 36 06  CMP   And at the same time, we can see Africa. West Africa
                   is beautiful. I can also see Gibraltar at the same
                   time I'm looking at Florida.
00 03 36 29  CMP   The center window.
00 03 37 10  CDR   Go ahead, Houston.
00 03 37 34  CDR   Okay. We are listening on VHF Alfa simplex.
00 03 37 45  CDR   We are listening for VHF Alfa simplex.
00 03 38 00  CMP   Roger. Well, Mike, I can see the entire earth out
                   of the center window. I can see Florida, Cuba,
                   Central America, the whole northern half of South
                   America, in fact, all the way down through Argentina
                   and down through Chile.
Stand by. We are going through the separation-maneuver checklist here.

Houston, this is Apollo 8. We've lost sight of the S-IVB here. The separation maneuver may be delayed slightly, or else we will go ahead and make it without having her in sight.

Houston, this is Apollo 8.

When does the S-IVB do that blowdown maneuver?

Go ahead, Houston.

Go ahead.

Boy, it's starting to vent now, blowing down.

The S-IVB is really venting.

05:07:55. That is the nonpropulsive vent, but it's pretty spectacular. It's spewing out from all sides like a huge water sprinkler.

Say again that big vent time, so I can write it down please, Houston.

Roger; thank you.

We're receiving VHF music now, Houston.

I guess we are between 500 to 1000 feet.

Herb Alpert seems pretty good.

Houston, Apollo 8. I ... suggest ... essentially separation maneuver, if it's alright with you.

Houston, Apollo 8.

Roger. I believe we're going to have to vent or thrust away from this thing. We seem to be getting closer.

Go ahead, Houston.

Go ahead, Houston; Apollo 8.
Go ahead, Houston; Apollo 8.

You're loud and clear, Mike. Go ahead.

I don't want to do that. I'll lose sight of the S-IVB.

Go ahead.

Well, I don't know because I can't see the earth now, Mike.

The earth's out here. Can you see it?

Yes.

We can pitch down some. Jim has the earth in the optics, so we could pitch some and get pretty close to one, I guess.

You got the earth focused in?

... Go ahead, Houston; Apollo 8.

181?

Well, then zero would be just as good, wouldn't it?

Well, I can't do that. I'll thrust right square into that S-IVB.

What effect - what will he maneuver to as far as the gimbal angle for this blowdown?

... that S-IV ought ...

Okay.

It's about the same. The trouble is it's pointed at us pretty well.

So -

Has it maneuvered yet?

No.
CONFIDENTIAL

Yes, I understand. I just — as I say, I just can't very well do that now. I don't want to lose sight of this S-IVB.

Okay. As soon as we find the earth, we'll do it.

... would you please pitch outside?

No, the earth is below us, now.

Why don't you roll to your left? That way, you could put the earth out of your ...

Do you see the earth with your sextant, Jim?

No, I don't ... S-IVB ...

Houston, the venting of the S-IVB is terminated.

I think you ought to roll ...

... should be right on the optics.

I'm not getting a zero, ...

Go ahead, Houston; Apollo 8.

No, I'm not even sure we're going to do it yet, Mike. If I can get — we seem to be drifting away from this thing a little bit, although it is still pointing at us quite closer than I'd like.

Okay. Well, right now, our gimbal angles are about — Roll's about 190 and pitch is about 320 and yaw is about 340. We could certainly do it in this position. That would be alright.

And it started to ...

How high are the temperatures, Jim?

Hey, you started to ... there, huh?

... which way it's going to pitch with respect to the earth.

Go ahead, Houston; Apollo 8.
Well, it's as I said before. We can't definitely find the earth. I think that we are in front and a little bit above - a little bit above the - almost in front of the - directly in front of the booster.

Perhaps a little bit horizontally displaced - towards the - Let's see -

The earth should be right over there. Is the earth over there?

Okay, we'll take it to the other side. We don't know ...

Houston, to help you, we are looking right directly above the S-IVB with - the sun is - It's on the right side of the S-IVB and on our - Coming in our left number 1 window.

Oh, here it is. There's the earth over here -

To the right?

Yes, the earth's kind of low. That will be - It's in our plus-Y, plus-Z direction.

The earth is in our plus-Y, plus-Z direction now, Mike.

..., do you want to do a realign?

GDC align, IMU is ...

What did you do? Did you do the P50?

Yes.

Houston, for information, I am looking through the scanning telescope now, and I see millions of stars; most of them - the venting from the S-IVB.

There you are, Frank.

Definitely; we are in sunlight, and it looks like they are all S-IVB, but we don't know. I am going to attempt a P52 realign at this time and see what I can do. Okay.

Let me talk about the ...
Are you through with this?

Jim always falls that way.

Okay, two balls 54. You see, when you read them ... three balls ... minus 00086, plus 00141, ... Okay, ...

Mike, anything more on this separation maneuver you're on?

That's right. Quite a bit to our rear and down below us - off to the right.

... of us and slightly below us.

It sure is staying close to us.

Jim, doesn't it look slightly below us and slightly ...?

Which way does the - Does anyone know which way the S-IVB pitches?

Mike, can you just tell us which way the S-IVB pitches, and how far it will pitch to the slingshot-maneuver attitude?

Okay. Thank you.

Houston, are you ready to copy the IMU align information?

Alright. Star ID is 03, and star 36; star angle difference 0.01; torquing angle: X, minus 00034; Y, minus 0027; Z, plus 00100. Over.

Roger. Three zeros: 00027.

Houston, we are going to have to hold up on the cis-lunar navigation until after this next little maneuver.

What did you say your ... was?

... 00016 ... Go ahead, Mike.

Roger. Stand by.

Okay.
Go ahead, Houston.

Roger. I'm getting the COAS right on it now so it will be accurate.

Okay. With the COAS right on the S-IVB, the roll reads 103, the pitch is 275, and the yaw is about 325.

Roger. That should be 115 for the roll.

Houston, Apollo 8. Over.

Roger. If it will help you any, Mike, the earth is plus Y about 45 degrees in a minus X. I can see it out my side window, and it's a beautiful view with numerous cloud vortex.

Negative. It's 45 degrees in the plus Y, in the XY plane towards minus X. Over.

45 degrees from plus Y to minus X.

It's behind us to the right, if that will help.

I can still see the Cape and isthmus of Central America.

Why do you want to use - do so much, Mike?

Okay.

Why don't you attempt to yaw - Yaw right ... See the earth ...

No, all you got to do is just ... yaw - yaw to the right, and, you'll be ... You'll be over in this direction ...

Mike, do you want me to go ahead and try to do this, or are you going to give me some gimbal angles?

Okay. I don't understand why you want so many feet per second on it, but I think I can - with just a little maneuvering, I can get away from it a lot simpler than th

Okay.

VHF sounds good.
00 04 40 02 CDR Could you yaw about 10 degrees to your - your left?
00 04 41 25 CMP OKNI B.
00 04 42 01 LMP Go ahead, Houston; Apollo 8.
00 04 42 19 LMP Okay.
00 04 42 30 LMP Roger. We are maneuvering to the attitude now.
00 04 43 10 CMP That look pretty good now?
00 04 43 12 CDR Yes.
00 04 43 18 CDR Okay, Houston. I understand you want 8 feet per second burn, is that right?
00 04 43 32 CDR Well, we are as close to being radially upward as we can determine.
00 04 44 07 CMP Roger, Houston. We're putting it in now.
00 04 45 04 CDR We're maneuvering now.
00 04 45 46 LMP Okay, why don't you window, and do that P47?
00 04 45 54 CDR Houston, we made the burn at 7.7 plus X, plus 00001 Y, and Z's are all zeros. The gimbal angles: roll 180, pitch 310, and yaw 020.
00 04 46 19 LMP Okay, Frank, whenever you're ready ...
00 04 46 29 CDR Did you get that information, Houston?
00 04 46 36 CDR Read you loud and clear. Did you get the information?
00 04 46 52 CDR Roger. Did you get that information? The burn was made at - initiated at 04:45.
00 04 47 15 LMP We're in good shape. Roll right. ... back where the earth used to be.
00 04 47 30 CDR Okay. Do you want us to transfer that to the CS - to the LM state vector or just leave it alone?
00 04 47 43 CDR Roger.
00 04 47 45 LMP You got VEHB 66 entered?
00 04 48 59 CDR  You still got it, Bill?
00 04 49 04 LMP  We're going right to it. ...
00 04 49 14 CDR  Can you roll at all?
00 04 49 19 LMP  Huh? I don't want to, now.
00 04 49 44 LMP  It's about - in the XYZ plane, it's about 10 degrees ... Yes, right out here ...
00 04 50 34 CDR  Go ahead, Houston; Apollo 8.
00 04 50 41 CDR  Bill is the only one that can see it. Just a minute.
00 04 50 45 CDR  We're 90 degrees from its X-axis --
00 10 19 38 SC    ... 1, 2, 3, 4, 5; 5, 4, 3, 2, 1.
00 10 19 46 LMP  Well, no. We got to get a DAP load in here to make sure they check first, right? Okay? Okay, it's - You got the DAP to where you want it?
00 10 19 56 CDR  I'm going to get it right now.
00 10 19 59 CDR  Done P30?
00 10 20 01 CMP  We haven't done P30 yet.
00 10 20 02 LMP  That's right.
00 10 20 03 CDR  I know, but don't you want to do - Before you do P30, don't you want to look at the DAP --
00 10 20 07 CMP  No, no, that comes way down along the line.
00 10 20 08 CDR  Alright, alright, excuse me; go ahead.
00 10 20 10 LMP  Okay, P30.
00 10 20 13 CMP  Okay.
00 10 20 14 LMP  VERB 37, ENTER; 30, ENTER.
00 10 20 22 CMP  Okay.
00 10 20 23 CDR  I want GETI.
10:59:58.3. Okay? I like it. Do you like it?

Yes.

Okay, 136, good; minus three balls 45 is good; plus 00202, good. I like it. Proceed.

I can't - I can't even see the DSKY here.

Okay, 1685 ... Okay, I'll - Okay, that's good.

Okay.

Proceed.

Set your clocks.

Okay.

Let's see, might as well have a countdown for this one, huh?

Okay, we don't have too much time. We've got to get a boresight star and all that stuff, too.

Okay, you got your --

Just stand by, I don't - haven't started yet.

Start it on 50, 30 - 7.

37, 42 - 7, 46, 45, 41, 42, 41 -
CONFIDENTIAL

Day 1

00 10 22 17 LMP 1.
00 10 22 18 CDR/LMP START.
00 10 22 19 LMP Right.
00 10 22 20 CDR 37, 38 -
00 10 22 22 LMP Right, right.
00 10 22 23 CDR 37 -
00 10 22 24 LMP Right.
00 10 22 25 CMP Okay, proceed.
00 10 22 26 LMP (Sigh)
00 10 22 27 CMP Proceed!
00 10 22 29 CDR We are asking, Bill.
00 10 22 31 LMP Oh, okay. Proceed, Roger.
00 10 22 35 CMP Okay, we did a P52. Now we go to P00. Is that what we're doing?
00 10 22 43 LMP ... go to P00.
00 10 22 45 CMP Okay, go to 40 now.
00 10 22 49 LMP Okay, P40.
00 10 22 50 CDR You know you ought to go to P00 to maneuver to the burn attitude.
00 10 22 54 LMP Yes, I will; I got it.
00 10 22 57 LMP Okay. Okay.
00 10 22 59 LMP Okay, P30. You got your optics power OFF, by the way? Oh, you're going to be using them, are you?
00 10 23 04 CMP Yes, I got to use them.
00 10 23 05 LMP Okay, CMC, ON.
00 10 23 07 CMP CMC, ON.
ISS, ON. SCS, operating; test the CAUTION/WARNING lights.
Okay, go ahead. Okay.
Okay. EMS MODE, STANDBY.

00 10 23 23 CDR
STANDBY.

00 10 23 24 LMP
EMS function DELTA-V, SET.

00 10 23 25 CDR
DELTA-V, SET.

00 10 23 28 LMP
Set DELTA indicator to 15868.

00 10 23 31 CDR
Right, I'll do that.

00 10 23 39 CDR
You guys can go on; I'll get this.

00 10 23 42 LMP
That's about all there is.

00 10 23 43 CDR
Okay.

00 10 24 09 CDR
Okay, 15868.

00 10 24 11 LMP
Okay. EM MODE - EMS MODE, AUTO.

00 10 24 15 CDR
AUTO.

00 10 24 16 LMP
EMS function DELTA-V, TEST.

00 10 24 18 LMP
SCS - SPS thrust light ON and OFF in 10 seconds.

00 10 24 22 CDR
Okay.

00 10 24 29 CDR
Good, minus 19.5. Good set; it's okay.

00 10 24 32 LMP
EMS MODE, STANDBY.

00 10 24 35. CDR
STANDBY.

00 10 24 36 LMP
DELTA-V, SET.

00 10 24 37 CDR
DELTA-V, SET.

00 10 24 38 LMP
Set DELTA-V<sub>c</sub>.

00 10 24 39 CDR
What is the DELTA-V<sub>c</sub>?
00 10 24 42 CMP  Okay, DELTA-V is - 18.6.
00 10 24 56 LMP  18.6?
00 10 24 57 CMP  18.6.
00 10 25 03 CDR  Alright, set.
00 10 25 05 LMP  Okay, EMS function, DELTA-V.
00 10 25 06 CDR  DELTA-V.
00 10 25 07 LMP  Okay, NONESSENTIAL bus is going to MAIN B.
00 10 25 10 LMP  Okay, cycling the cryo fans.
00 10 25 13 CMP  I guess you can't complain.
00 10 25 25 LMP  Okay, I'll just do this once every minute, now.
00 10 25 30 LMP  Okay, BMAG MODE, three, RATE 2.
00 10 25 34 CDR  BMAG MODE, three, RATE 2 - 2, 3.
00 10 25 37 LMP  DELTA-V CSM.
00 10 25 41 CDR  CSM.
00 10 25 42 LMP  CMC MODE, FREE.
00 10 25 43 CDR  CMC MODE, FREE.
00 10 25 44 LMP  AUTO RCS, sixteen - 16, as required for ullage.
00 10 25 49 CDR  Okay, we have here.
00 10 25 50 LMP  Load the DAP.
00 10 25 52 CMP  Okay, VERB 48, ENTER. Okay, that's good, right?
00 10 25 55 LMP  Yes.
00 10 25 56 CMP  Good. Okay, we'll proceed. Okay, 63295, 635 -
00 10 26 07 CMP  okay, that's wrong.

CONFIDENTIAL
Okay, ROTATIONAL CONTROL POWER, NORMAL, both AC/DC.

NORMAL, AC/DC.

DET is SET. VERB 37, ENTER; 00, ENTER.

VERB 30 — I got it!

I'm glad you're —

SPACECRAFT CONTROL, CMC.

CMC.

CMC MODE, AUTO.

AUTO.

Maneuver to pad burn attitude with VERB 62, ENTER; VERB 49, ENTER.

VERB 62, ENTER; VERB 49, ENTER.

Reset that for zero.

VERB 25, ENTER; and it's 345 - 3, 4, 5 —

No, that's wrong. You've got to have plus.

Alright, plus. Oh. 45, 00, ENTER; plus 188 - 1880, ENTER; plus 343; 00, ENTER. Okay. All set.

Go ahead.

Proceed?

Yes.

Proceed. Proceed!

Proceed.

Wait a minute. Okay, you got SCS AUTO and everything?

Huh?

You're all set, right?

CONFIDENTIAL
00 10 28 02  CDR  Yes, that's all it takes.
00 10 28 05  LMP  EMAG's -
00 10 28 06  CDR  RATE 2, you called that.
00 10 28 07  LMP  Okay then. You don't have any other -
00 10 28 14  LMP  We maneuvering?
00 10 28 16  CDR  Yes.
00 10 28 24  CDR  Are we ever!
00 10 28 45  LMP  Which way you going?
00 10 28 47  CDR  Rolling right, and yawing left.
00 10 29 24  CC  Apollo 8, Houston.
00 10 29 27  CDR  Go ahead, Houston; Apollo 8.
00 10 29 30  CC  Okay, we've got a telescope alignment if you'd like to give it a try. Your sextant star is still good, but if you had problems with that, folks have worked out that if you look through the telescope at 10:35, we have a shaft and trunnion that should point you at center of the earth, if you'd like to give that one a try.
00 10 29 50  CMP  Okay.
00 10 29 51  CDR  Okay.
00 10 29 54  CC  Okay, at 10:35 -
00 10 29 58  CDR  Write that down.
00 10 29 59  CMP  Okay, here, I got it.
00 10 30 00  CC  -- the shaft angle 006.2, trunnion 18.9. Over.
00 10 30 13  CDR  Did you get that, Jim, there?
00 10 30 14  LMP  Roger, 10:35; shaft, 006.2; trunnion, 18.9.
00 10 57 30  CDR  You heard me, didn't you? I ... Not if you just do a real quicky.
Coming up on 2 minutes.

Okay.

Okay, 2 minutes. DELTA-V THRUST A, NORMAL.

MAIN THRUST, NORMAL.

TRANSLATIONAL HAND CONTROLLER, ARMED.

ARMED.

ROTATIONAL HAND CONTROLLER, both, ARMED.

Got yours?

Tape recorder is RECORD, HIGH bit rate, and FORWARD.

Okay, stand by for DSKY - blanking.

Okay.

What happened to EMS, AUTO? Bill?

30 seconds.

30 seconds.

Okay.

I don't see how Wally did this ...

What's that?

Hold these things down.

We hear you.

Stand by for a mark in 1 minute.

Roger; Apollo 8 standing by.

-- 10 seconds.

Yes. Alright, I'll --
CONFIDENTIAL

00 10 58 54 CC 5 seconds. 2, 1 -
00 10 58 59 CC MARK.
00 10 59 00 CC 1 minute.
00 10 59 01 CDR Roger.
00 10 59 06 CMP (Singing)
00 10 59 12 LMP Okay, at 30 seconds, get EMS MODE, AUTO.
00 10 59 13 CDR Right.
00 10 59 18 CMP (Singing)
00 10 59 23 CMP Your DSKY should blank?
00 10 59 24 CDR Blank.
00 10 59 25 LMP EMS MODE, AUTO; average g is ON.
00 10 59 29 LMP Check your PIPA bias.
00 10 59 30 CMP No ullage.
00 10 59 31 CDR No ullage, yes.
00 10 59 36 CMP Counting down.
00 10 59 46 CMP What's that do?
00 10 59 47 LMP FLIGHT RECORDER.
00 10 59 50 CDR 10, 9 -
00 10 59 55 CMP ENABLED.
00 11 00 01 CMP Stop. At 10:02, it has to be OFF.
00 11 00 05 CDR Okay, 10:02.
00 11 00 07 CMP Okay.
00 11 00 08 CDR Like a big spring.
00 11 00 09 LMP Okay, have you gone for - -
Two balls off.
Okay, now.
Okay.
It's holding; let's go, let's go through the checklist.
Okay, okay, you got that; SPS THRUST light, ON, ...
Okay, DELTA-V THRUST A, OFF.
OFF.
Okay, verify THRUST is OFF. I verify it over here.
Right.
SPS PITCH and YAW circuit breakers, CLOSED.
They're CLOSED.
Okay, turn them OFF: GIMBAL MOTORS.
1, OFF.
Got it.
2, OFF.
Got it.
3, OFF.
Got it.
4, OFF.
Got it.
Okay.
TVC SERVO POWER, 1 and 2, OFF.
OFF.
FLIGHT RECORDER's OFF; MAIN BUS ties going OFF.
Okay.
Okay, null residuals.

Okay, proceed. You've got your ...

Proceed.

Got them? Do I null them?

Null residuals.

20.4.

That's an awful lot.

Yes, I know it.

There you are.

Okay - Okay. Null - residuals - residuals are nulled.

Okay, record DELTA-V COUNTER and residuals.

You can turn this OFF before --

I turned it OFF ...

EMS function, OFF.

OFF.

EMS MODE, STANDBY.

STANDBY.

BMAG MODE, three, RATE 2.

RATE 2.

DEADBAND, MAX.

DEADBAND, MAX.

How's that, sports fans? All balls.

As soon as you've got an audience, you do great.

14640.
Time.
17:53:1936, got it.

How many markings for this set is that?

There's two stars and three marks per set.

That's three for that second - that's the same star, second set, third set of marks. And then you've got - -

Do I have six marks, total?

You got six marks, total. You need three more on this same star, right?

Yes, okay. There's the third one, there.

Okay.

Okay, I got -

Okay, I go three?

Oh - you on hold?

Yes.

18 and 3, huh?

Yes.

74645.

Okay.

Okay. 17:55:38?

Right.

3.

3.

You in hold?

Hold.
<table>
<thead>
<tr>
<th>Time</th>
<th>Action</th>
<th>Response</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>00 17 58 34</td>
<td>LMP</td>
<td>8 and 1.</td>
<td></td>
</tr>
<tr>
<td>00 17 58 35</td>
<td>CMP</td>
<td>Right.</td>
<td></td>
</tr>
<tr>
<td>00 17 58 36</td>
<td>LMP</td>
<td>Got it.</td>
<td></td>
</tr>
<tr>
<td>00 17 58 43</td>
<td>CMP</td>
<td>74655.</td>
<td></td>
</tr>
<tr>
<td>00 17 58 46</td>
<td>LMP</td>
<td>Got it.</td>
<td></td>
</tr>
<tr>
<td>00 17 58 52</td>
<td>CMP</td>
<td>17:58:19.</td>
<td></td>
</tr>
<tr>
<td>00 17 58 56</td>
<td>LMP</td>
<td>Got it.</td>
<td></td>
</tr>
<tr>
<td>00 17 59 14</td>
<td>CMP</td>
<td>3.</td>
<td></td>
</tr>
<tr>
<td>00 17 59 17</td>
<td>LMP</td>
<td>3.</td>
<td></td>
</tr>
<tr>
<td>00 18 00 35</td>
<td>CMP</td>
<td>Oh, oh.</td>
<td></td>
</tr>
<tr>
<td>00 18 00 47</td>
<td>LMP</td>
<td>Three zeros, okay?</td>
<td></td>
</tr>
<tr>
<td>00 18 00 56</td>
<td>LMP</td>
<td>12662.</td>
<td></td>
</tr>
<tr>
<td>00 18 00 58</td>
<td>CMP</td>
<td>Right.</td>
<td></td>
</tr>
<tr>
<td>00 18 01 01</td>
<td>CMP</td>
<td>Okay.</td>
<td></td>
</tr>
<tr>
<td>00 18 01 06</td>
<td>LMP</td>
<td>It only went down 17. Wait a minute.</td>
<td></td>
</tr>
<tr>
<td>00 18 01 10</td>
<td>CMP</td>
<td>What's that?</td>
<td></td>
</tr>
<tr>
<td>00 18 01 12</td>
<td>LMP</td>
<td>It only went down 17 - 17, 18, 00, 23, 00. Okay?</td>
<td></td>
</tr>
<tr>
<td>00 18 01 23</td>
<td>CMP</td>
<td>Okay.</td>
<td></td>
</tr>
<tr>
<td>00 18 01 25</td>
<td>LMP</td>
<td>Now I get this.</td>
<td></td>
</tr>
<tr>
<td>00 18 01 27</td>
<td>CMP</td>
<td>Proceed.</td>
<td></td>
</tr>
<tr>
<td>00 18 01 30</td>
<td>CMP</td>
<td>Okay, new star?</td>
<td></td>
</tr>
<tr>
<td>00 18 01 31</td>
<td>LMP</td>
<td>New star, number 22.</td>
<td></td>
</tr>
<tr>
<td>00 18 01 35</td>
<td>CMP</td>
<td>Okay, what is it, 22, star - What's the code after it?</td>
<td></td>
</tr>
<tr>
<td>00 18 01 40</td>
<td>LMP</td>
<td>It doesn't say.</td>
<td></td>
</tr>
</tbody>
</table>
Yes, 00120 - 1, 2, 0.

Which way are you going to be going? Far horizon?

Yes, it'll be at the same horizon. Too close to gimbal lock? Yes, 03. It won't be a far move, though. 21 plus 22, ENTER; proceed; that should be a zero.

AUTO?

Let's - No, why don't you proceed? Let's see where it - where it's going to take it.

Okay, we're - Pitch 123, yaw 305 - Oh, we're getting right under it.

Yes. All set?

Okay, CMC and AUTO.

Okay.

Okay -

Okay, we're there.

Okay. How's that? ... zero off.

70645.

What was that, again?

70645. Trunnion?

Okay.

18:04:3472. ... with something right, here.

I got 03. Okay?

Yes.

3.

3.

18 was - Go ahead.
1898, trunnion.

What - what the other ... Is this the third one or the fourth one?

The third one was - 31 - -

Houston, do you read Apollo 8? We've got a lot of noise.

Are we in -

We're in hold, you want to go - What you want, AUTO?

No, no, just ...  

Houston, Apollo 8.

...  

Apollo 8, Houston; go.

Roger; we lost you when you started talking about the - -  

- - 4, 5; 5, 4, 3, 2, 1. Over.

Roger; and give us a comment on the voice quality.

OPTICS POWER going OFF.

Okay, you've already - OPTICS DRIVE, check the star - check boresight star.

I've checked them all.

Okay, VERB 37 - How did you get out of that?

It's all been checked.

Okay, VERB 37, ENTER; 40, ENTER.

Okay.

...  

VERB 37, ENTER - -
02 08 39 44 LMP -- hazy, so we haven't really taken too many pictures on the way out. Every now and then we have taken a shot with the 70-millimeter camera and 80-millimeter lens at f:11, 1/250th, but it's questionable how good these will be, because of the haze on the windows.

02 08 40 14 LMP Another problem has been trying to record the development of the smear on the windows. Seemed to come pretty quick on window number 3. And the technique of - of taking a picture when the sun's 85 degrees incidence is not possible, because the window frames are so thick that you can't get any sun on them with an 85-degree incidence. What pictures have been taken, have been taken about 60 to 70 degrees incidence with various f-stops.

02 08 41 03 LMP Anybody else have anything for the record?

02 08 41 07 CDR No.

02 08 41 08 LMP Jim?

02 08 41 09 CMP Yes, you might mention about this hard thing to open here.

02 08 41 13 LMP One point we might mention is that the foodbox doors are hard to close. Looks like the foodbox has split out a little bit on the left - -

02 08 41 23 CMP The handle's bent.

02 08 41 24 LMP -- left side. And in - looks like we've gotten the handle bent in trying to close the door. We're able to lock it on one side now, on the right side, but not on the left. The food has generally been good, particularly the last meal: butterscotch pudding, beef stew, grapefruit drink, and chicken soup. Notable - -

02 08 41 53 CMP Hot wa - -

02 08 41 55 CDR -- the notable, mainly notable ones were the grapefruit drink and butterscotch pudding.
Well, Bill, you might mention the hot water makes a big improvement, too.

Jim Lovell says the hot water makes a big improvement. The meals I've had have been quite tasty, though none of us have really gone overboard for the little bread cubes and cereal cubes.

Also, I'd like to suggest that if they ever fly one of these TV cameras again, they put a kind of a sight on it. Sort of ridiculous to have a 9-degree field-of-view lens with no way of aiming it except for looking down the side or putting some chewing gum on the top.

Also might tell Doc Frome that his toothpaste tastes pretty good. I don't know what kind of job it does on your teeth, but it's nice for settling your stomach after dinner.

Anything else, Frank?

We used it for frosting on the fruitcake.

Jim Lovell is engaged in an activity which I shan't describe, so I think I'll cut this short and get my oxygen mask.

But that could be improved, also (laughter).

DSKY blanks at minus 35 seconds.

Alright, stand by.

DSKY blank.

Okay.

LIMIT CYCLE, OFF.

LIMIT CYCLE, OFF.

EMS MODE, AUTO.

AUTO.
Okay, at 0/16 85, null \( V_{gx, y, z} \). Null component. Tell me when you're going to burn.

Okay, stand by.

At the flash.

4, 1 —

BURN.

11 seconds.

Burning.

11 seconds.

Should be OFF by now.

... That's good.

Okay, 12 seconds.

12 seconds?

Okay, record DELTA-V COUNTER, residuals; TAPE RECORDER is going to STOP —

Okay, now do VERB 66, ENTER.

VERB 66, ENTER.

Houston, Apollo 8.

Go ahead.

Roger; burn on time, angles nominal —

What's this —

What's that LOS time, Bill?


See if we lose the signal then.

Okay.
What was the seconds? Jim?

I didn't bother with it; wasn't it something like 58:02?

Apollo 8, 10 seconds to go. You're GO all the way.

Roger.

58:04.

Gees.

S-BAND VOLUME, down.

That was great, wasn't it? I wonder if they've turned it OFF.

(Laughing) Chris probably said, "No matter what happens, turn it OFF."

Okay. My S-volume is down.

Alright, let's go ahead with the checklist. Okay, we've got 10 minutes. We want to hold at the 6-minute mark.

Okay. You got the STABILIZATION CONTROL SYSTEM's circuit breakers, panel 8, CLOSED.

Right.

Closed SPS, 12, CLOSED.

Right.

DEADBAND, MINIMUM.

DEADBAND, MINIMUM.

RATES, LOW.

LOW.

LIMIT CYCLE, ON.

LIMIT CYCLE, ON.

MANUAL ATTITUDE, three, RATE COMMAND.
02 20 58 47 CDR RATE COMMAND.
02 20 58 48 LMP BMAG MODE, three, ATT 1/RATE 2.
02 20 58 49 CDR ATT 1/RATE 2.
02 20 58 52 LMP ROTATIONAL CONTROL POWER DIRECT, both, OFF.
02 20 58 54 CDR OFF.
02 20 58 55 LMP SCS TVC, two, RATE COMMAND.
02 20 58 59 CDR RATE COMMAND.
02 20 59 01 LMP TVC GIMBAL DRIVE, PITCH and YAW, AUTO.
02 20 59 03 CDR AUTO.
02 20 59 05 LMP Have you got your GDC aligned?
02 20 59 06 CDR Yes.
02 20 59 11 CDR GDC aligned.
02 20 59 13 LMP CMC and AUTO.
02 20 59 14 CDR CMC and AUTO.
02 20 59 18 LMP DELTA-V - Set in DELTA-V.
02 20 59 22 CDR Up here, you mean?
02 20 59 23 LMP Yes.
02 20 59 24 CDR Yes.
02 20 59 25 LMP Just going back and catching all those things.
02 20 59 38 CDR Is that all?
02 20 59 39 LMP That's it.
02 20 59 41 LMP Waiting to turn on the BUS ties.
02 21 00 23 CDR Okay, 8 minutes.
02 21 01 00 CMP Well, the main thing to be is be cool.
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02 21 01 03  CDR  Gosh, it is cool.
02 21 01 07  CMP  It's up to 80 in the cockpit.
02 21 01 10  LMP  No, I think – just when my clothes touch me, it gets cold, huh?
02 21 01 18  CMP  Well, I'll tell you, gentlemen; that moon is pretty close.
02 21 01 20  CDR  7 minutes.
02 21 01 46  LMP  Pressure should go down to about 1500.
02 21 01 48  CMP  Huh?
02 21 01 50  LMP  Helium pressure will be going down to about 1500.
02 21 01 53  CMP  Will it stay there?
02 21 01 55  CDR  Okay, let's go.
02 21 01 57  CMP  ... minute, Frank.
02 21 02 02  CDR  Come on, Bill; 6 minutes.
02 21 02 06  LMP  Okay. MAIN BUS ties, going ON.
02 21 02 16  LMP  A is ON; B is ON.
02 21 02 22  LMP  TVC SERVO POWER, one, AC 1, MAIN A.
02 21 02 24  CDR  AC 1, MAIN A.
02 21 02 26  LMP  AC 2, MAIN B.
02 21 02 27  CDR  AC 2, MAIN B.
02 21 02 28  LMP  TRANSLATION CONTROL POWER, ON.
02 21 02 29  CDR  ON.
02 21 02 30  LMP  ROTATIONAL CONTROL POWER NORMAL 2, AC.
02 21 02 32  CDR  AC.
02 21 02 33  LMP  ROTATIONAL HAND CONTROLLER number 2, ARMED.
02 21 02 35  CDR  ARMED.
Okay. Stand by for the primary TVC check.

You want PITCH 1, ON?

Not quite.

It's 5 minutes.

69:03:20; we'll just get it at 69:03.

Okay, ready?

Yes.

Okay. Go ahead and start PITCH 1.

Got it.

YAW 1.

Got it.

Okay.

TRANSLATIONAL HAND CONTROLLER, clockwise.

Clockwise.

Verify no MTVC.

No MTVC.

Okay, SCS sec - TV - secondary TVC check.

Alright.

PITCH 2 and YAW 2, ON.

PITCH 2.

Got it.

YAW 2.

Got it.
<table>
<thead>
<tr>
<th>Time</th>
<th>User</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>02 21 03 20</td>
<td>LMP</td>
<td>Set GPI trim.</td>
</tr>
<tr>
<td>02 21 03 22</td>
<td>CMP</td>
<td>Minus 161.</td>
</tr>
<tr>
<td>02 21 03 24</td>
<td>LMP</td>
<td>Got it.</td>
</tr>
<tr>
<td>02 21 03 25</td>
<td>CMP</td>
<td>Plus 129.</td>
</tr>
<tr>
<td>02 21 03 28</td>
<td>LMP</td>
<td>Verify MTVC.</td>
</tr>
<tr>
<td>02 21 03 31</td>
<td>CDR</td>
<td>Verified.</td>
</tr>
<tr>
<td>02 21 03 32</td>
<td>LMP</td>
<td>TRANSLATIONAL HAND CONTROLLER, NEUTRAL.</td>
</tr>
<tr>
<td>02 21 03 34</td>
<td>CDR</td>
<td>NEUTRAL.</td>
</tr>
<tr>
<td>02 21 03 35</td>
<td>LMP</td>
<td>GPI returns to zero.</td>
</tr>
<tr>
<td>02 21 03 36</td>
<td>CDR</td>
<td>Zero.</td>
</tr>
<tr>
<td>02 21 03 37</td>
<td>LMP</td>
<td>ROTATIONAL CONTROL POWER NORMAL 2, AC/DC.</td>
</tr>
<tr>
<td>02 21 03 40</td>
<td>CDR</td>
<td>AC/DC.</td>
</tr>
<tr>
<td>02 21 03 45</td>
<td>LMP</td>
<td>Okay. You want to trim it one more time.</td>
</tr>
<tr>
<td>02 21 03 47</td>
<td>CDR</td>
<td>Okay.</td>
</tr>
<tr>
<td>02 21 03 48</td>
<td>LMP</td>
<td>Okay.</td>
</tr>
<tr>
<td>02 21 03 49</td>
<td>CDR</td>
<td>Ready?</td>
</tr>
<tr>
<td>02 21 03 50</td>
<td>LMP</td>
<td>Negative.</td>
</tr>
<tr>
<td>02 21 03 52</td>
<td>LMP</td>
<td>BMAG MODE, three, RATE 2.</td>
</tr>
<tr>
<td>02 21 03 53</td>
<td>CDR</td>
<td>RATE 2.</td>
</tr>
<tr>
<td>02 21 03 54</td>
<td>LMP</td>
<td>SPACECRAFT CONTROL, CMC.</td>
</tr>
<tr>
<td>02 21 03 56</td>
<td>CDR</td>
<td>CMC.</td>
</tr>
<tr>
<td>02 21 03 58</td>
<td>LMP</td>
<td>CMC MODE, AUTO.</td>
</tr>
<tr>
<td>02 21 03 59</td>
<td>CDR</td>
<td>AUTO.</td>
</tr>
<tr>
<td>02 21 04 00</td>
<td>LMP</td>
<td>PROCEED.</td>
</tr>
</tbody>
</table>
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02 21 04 02 CDR  PROCED. We're right there.
02 21 04 04 LMP  Okay. You ready to bypass?
02 21 04 08 CDR  Yes.
02 21 04 09 LMP  ATT 1/RATE 2.
02 21 04 10 CDR  ATT 1/RATE 2.
02 21 04 11 LMP  ENTER.
02 21 04 13 CDR  ENTER.
02 21 04 14 LMP  Gimbal test option.
02 21 04 15 CDR  Right.
02 21 04 16 LMP  Verify CMC.
02 21 04 18 CDR  Right.
02 21 04 19 LMP  Proceed. Call it out.
02 21 04 24 CDR  Oh, you ENTERED instead of - you ENTERED, Jim. Alright, you would bypass ... --
02 21 04 33 CMP  ... It's okay. Forget them.
02 21 04 35 CDR  Counting down. Okay?
02 21 04 36 LMP  What happened?
02 21 04 37 CDR  He ENTERED --
02 21 04 38 CMP  Should have proceeded. No sweat.
02 21 04 40 CDR  We're just counting down, now.
02 21 04 41 LMP  Okay.
02 21 04 44 CDR  3 minutes and 34 seconds, counting.
02 21 04 52 LMP  Okay, ROTATIONAL CONTROL POWER, DIRECT, both, MAIN A, MAIN B.
02 21 04 56 CDR  MAIN A and MAIN --

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02 21 04 57  LMP  SCS helium valve, AUTO, verify.
02 21 05 02  LMP  LIMIT CYCLE, OFF.
02 21 05 04  CDR  OFF.
02 21 05 05  LMP  FDAI scale, 50/15.
02 21 05 08  CDR  Alright.
02 21 05 10  LMP  Okay, at 2 minutes to go, we'll hit the DELTA-V THRUST A, NORMAL.
02 21 05 15  CDR  Alright.
02 21 05 21  LMP  I'm going to give you a GO ---
02 21 05 22  CDR  At that point there?
02 21 05 23  CMP  Yes.
02 21 05 26  LMP  At 2 minutes to go?
02 21 05 27  CDR  Hey, you know the one thing - The problem is we didn't go to trim.
02 21 05 33  LMP  Yes, I said trim - it goes to trim ---
02 21 05 35  CDR  Okay.
02 21 05 36  LMP  Or zero.
02 21 05 37  LMP  It's to trim!
02 21 05 38  CMP  It is? Okay.
02 21 05 39  LMP  Yes.
02 21 05 41  CDR  On that horizon, boy, I can't see squat out there.
02 21 05 47  LMP  You want us to turn off your lights to check it?
02 21 05 49  CMP  Hey, I got the moon.
02 21 05 51  LMP  Do you?
02 21 05 52  CMP  Right below us.
02 21 05 54 CDR  Okay.
02 21 05 55 LMP  It is below us?
02 21 05 56 CMP  Yes, and it's --
02 21 05 57 LMP  Oh, my God!
02 21 05 58 CDR  What's wrong?
02 21 05 59 LMP  Look at that!
02 21 06 00 CDR  Well, come on - Let's - What's, what's the -
02 21 06 02 CMP  69:06.
02 21 06 04 CDR  Stand by, we're all set.
02 21 06 08 CDR  213, 212.
02 21 06 12 LMP  Okay.  69:06:20.
02 21 06 16 LMP  Okay.  DELTA-V THRUST A, NORMAL.
02 21 06 19 CDR  NORMAL.
02 21 06 20 LMP  TRANSLATIONAL HAND CONTROLLER, ARMED.
02 21 06 22 CDR  ARMED.
02 21 06 23 LMP  ROTATIONAL HAND CONTROLLER, both, ARMED.
02 21 06 24 CDR  ARMED.
02 21 06 25 LMP  TAPE RECORDER's going STOP --
02 21 06 45 LMP  Well, I see two - Look at that - Fantastic!
02 21 06 47 CMP  Yes.
02 21 06 50 LMP  See it?  Fan - fantastic, but you know, I still have trouble telling the holes from the bumps.
02 21 06 55 CDR  Alright, alright, come on.  You're going to look at that for a long time.
02 21 07 07 LMP  20 hours, is that it?
02 21 07 17  CDR  Okay.
02 21 07 19  LMP  Coming up 07:45; DSKY should blank.
02 21 07 22  CDR  1 minute. Come on, Jim, let's watch it real good.
02 21 07 30  CMP  I'm proceeding on 99.
02 21 07 45  CDR  DSKY blank.
02 21 07 46  LMP  Okay. Okay, average g, ON; FLIGHT RECORDER's going to RECORD; EMS MODE, AUTO.
02 21 07 56  CMP  AUTO.
02 21 07 57  LMP  Check FIPA bias.
02 21 07 59  LMP  No ullage required. Standing by for engine ON enable. Proceed when you get it.
02 21 08 07  CMP  Okay.
02 21 08 08  LMP  Start your watch when you get ignition.
02 21 08 12  LMP  Stand by for - DELTA-V, NORMAL, B.
02 21 08 16  CMP  ENABLED.
02 21 08 21  CDR  1 second, 2 seconds; alright, how's every --
02 21 08 24  LMP  We got them. Pressure's holding good.
02 21 08 28  CDR  Alright. Everything's good over here, so far.
02 21 08 30  LMP  Everything is looking good.
02 21 08 37  CDR  15 seconds.
02 21 08 40  LMP  That's four ball valves; everything is great.
02 21 08 42  CDR  Okay.
02 21 08 43  LMP  Pressures are coming up nicely.
02 21 08 45  CDR  Alright.
02 21 08 59  LMP  Everything is great.

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02 21 09 03 CMP  Be the longest 4 - -
02 21 09 04 CDR  Long burn.
02 21 09 17 CMP  She holding good?
02 21 09 19 CDR  Drifting a little bit in roll.
02 21 09 26 LMP  Good shape. P, check?
02 21 09 30 CDR  100.
02 21 09 36 LMP  EMS is counting down.
02 21 10 04 CDR  Jesus, 4 minutes?
02 21 10 20 CDR  2 minutes.
02 21 10 28 CDR  How's it doing, Bill?
02 21 10 30 LMP  Great shape. Pressures are holding. Helium's coming down nicely. All other systems are GO.
02 21 10 48 CDR  Okay.
02 21 10 50 LMP  We're past 2 minutes; we're in mode 30. Free area for flange TEMP. Everything is looking good.
02 21 11 14 CMP  Longest 4 minutes I ever spent.
02 21 11 17 LMP  You know, it seems like about 3g's.
02 21 11 20 LMP  3 minutes.
02 21 11 24 CMP  Okay, you're running a little bit longer on the time on the computer. I got 58:65 - Stand by.
02 21 11 39 LMP  We're looking good, Frank.
02 21 11 40 CMP  48 seconds.
02 21 12 00 CMP  28.
02 21 12 17 CMP  Stand by.
02 21 12 18 CDR  Okay.
02 21 12 20 CMP  It went a little bit over, I think.
02 21 12 24 LMP 5 - -
02 21 12 25 CMP What would - -
02 21 12 26 LMP 4, 3 - -
02 21 12 27 CMP Move it over.
02 21 12 28 LMP 2, 1 -
02 21 12 29 CDR Shutdown.
02 21 12 30 CMP Okay.
02 21 12 31 CDR Okay, go ahead.
02 21 12 32 LMP Okay, DELTA-V THRUST, A and B, OFF.
02 21 12 33 CDR OFF.
02 21 12 34 LMP Verify thrust is OFF; it is OFF; helium valves are okay; pressure is static; FLIGHT RECORDER - okay, SFS, GIMBAL MOTORS, four, OFF, slowly.
02 21 12 46 CMP Okay.
02 21 12 47 CDR 1, OFF.
02 21 12 48 LMP Got it.
02 21 12 49 CDR 2, OFF.
02 21 12 50 LMP Got it.
02 21 12 51 CDR 3, OFF.
02 21 12 52 LMP Got it.
02 21 12 53 CDR 4, OFF.
02 21 12 54 LMP Got it. TVC SERVO POWER, 1 and 2, OFF.
02 21 12 56 CDR 1, OFF; 2, OFF.
02 21 12 57 LMP FLIGHT RECORDER's OFF; MAIN BUS tie's going OFF; A is OFF; B is OFF.
02 21 13 13 LMP Okay, go with it; proceed.
02 21 13 15 CMP Okay, null resid – proceed.
02 21 13 16 CDR Proceed.
02 21 13 17 LMP Null residuals.
02 21 13 19 CDR Hold it a second or we're not going to null any.
02 21 13 23 LMP Okay, RECORD.
02 21 13 25 CMP Okay.
02 21 13 27 LMP Okay, get the DELTA-V_c.
02 21 13 32 CMP Okay, DELTA-V_c.
02 21 13 34 CDR Minus 20.1.
02 21 13 35 LMP Okay. EMS function, OFF.
02 21 13 38 CDR EMS function, OFF.
02 21 13 40 LMP EMS MODE, STANDBY.
02 21 13 41 CDR STANDBY.
02 21 13 43 LMP EMAG MODE, three, RATE 2.
02 21 13 45 CMP Attitude?
02 21 13 46 CDR RATE 2.
02 21 13 47 LMP DEADBAND, MAX.
02 21 13 48 CDR DEADBAND, MAX.
02 21 13 52 CDR Okay.
02 21 13 53 CMP V_{gx} –
02 21 13 55 LMP TRANS CONTROLLER POWER, OFF.
02 21 13 56 CDR OFF.
02 21 13 57 LMP ROTATIONAL CONTROL POWER DIRECT, OFF.
02 21 14 00 CDR OFF.
02 21 14 01 LMP  SPS PITCH 1 and 2, YAW 1 and 2 circuit breakers, OPEN.
02 21 14 05 CDR  YAW 1 and 2, PITCH 1 and 2, OPEN.
02 21 14 09 LMP  Pro - whenever you're ready, proceed.
02 21 14 11 CMP  Proceed.
02 21 14 12 LMP  Okay, VERB 82, ENTER.
02 21 14 14 CMP  VERB 82, ENTER. Check it at zero; I'd better go to zero, now.
02 21 14 22 CDR  You want to put that in the other state vector, too, don't you?
02 21 14 25 CMP  Yes.
02 21 14 26 CDR  Got it.
02 21 14 31 LMP  Congratulations, gentlemen, you're at 00.
02 21 14 33 CDR  Well, now is no time for congratulations yet.
02 21 14 35 CMP  No, we get stuck with that on the carrier. Okay, VERB 82, ENTER.
02 21 14 40 CDR  Right.
02 21 14 43 CMP  Our state vector.
02 21 14 49 LMP  Okay, you got it?
02 21 14 50 CMP  We're at 1691, minus 6005. Roger.
02 21 14 55 LMP  Proceed.
02 21 14 58 CMP  Proceed.
02 21 14 59 LMP  00, EN --
02 21 15 00 CDR  Go back to PO0.
02 21 15 02 LMP  00, ENTER.
02 21 15 03 CDR  Wait - wait a minute. Okay.
02 21 15 04 LMP  We go to 37 and then PO0, though.
02 21 15 11 LMP VERB 66, ENTER.
02 21 15 13 CMP VERB 66, ENTER.
02 21 15 15 CDR That's it. Dig out the flight plan.
02 21 15 17 LMP Whee! Well, we answered it. They're meteorites, aren't they (laughter)?
02 21 15 22 CMP Hey, I don't see a thing. Where are we?
02 21 15 24 LMP It looks like a big - looks like a big beach down there.
02 21 15 28 CDR Let me have the flight plan.
02 21 15 29 CMP Holy cow, it's completely blank here.
02 21 15 31 CDR Okay, Jim, you want to -
02 21 15 35 CMP Have we got all the gimbal motors off and all that sort of thing?
02 21 15 37 LMP Yes, sir.
02 21 15 45 CDR You want to take some pictures, Bill?
02 21 15 47 LMP Let's just go by the - whatever the flight plan says there.
02 21 15 50 CDR Alright.
02 21 15 53 CDR Let's see what it says to do. SPS monitor, you're all through with that? Camera PREP.
02 21 15 59 LMP Okay, Jim has got to get them out or I'll have to - one of us - both of us probably had best get them out.
02 21 16 02 CMP Yes, I'll just take a look here a minute.
02 21 16 11 CMP Which ones are the craters?
02 21 16 15 LMP Don't we - we have a lot of time for looking; let's get those cameras out. Here, do you want to stick those in, Jim? Please, when you go by?
02 21 16 31 LMP GDC aligned and key align to IM3/OR3 RATE.
02 21 16 37 CDR Okay. OR3 RATE, lunar power.
Can I call a VERB 83 here, Jim?
Oh, you're within -
Huh?
Yes, you can do that. You're below 482 miles or whatever it is.

197.
Huh? What are you doing?
What do you need? Who're you talking to, me?
Yes, I thought you said something about VERB 97?
Oh.
You get the camera equipment, and I'll get this stuff out.
Okay, what's our camera configuration, Frank?
Okay, stand by a minute while I get - -
Call them out real loud, because I'm going off the air.
Alright, I'm supposed to - Let's see, 16; 18; new C; exposure, 1/250th; 1 foot per second; one MAG.

Yes, new C.
Check.
Right.
Hey, you know something; it's gray, huh?
Yes.
Okay, I've got to roll right, so watch out.
Go easy on those thrusters.
(Singing)
02 21 18 35 CDR Have you got that thing running, Bill?
02 21 18 37 LMP What's that, Frank?
02 21 18 38 CDR The camera?
02 21 18 43 LMP ... 
02 21 18 48 CMP Yes. Just a minute.
02 21 19 10 LMP ... Frank. You got the cameras ... 
02 21 19 15 CDR 2; 150th; new; B&W; MAG D.
02 21 19 18 LMP ... 
02 21 19 19 CDR 1 - 1; 80; B&W; 1/250th.
02 21 19 27 CMP Okay.
02 21 19 32 LMP Okay, let's get a lens.
02 21 19 35 CMP 2, 150? 
02 21 19 38 CMP 50 millime - -
02 21 19 39 CDR 2; 150; new; black and white; MAG D.
02 21 19 43 LMP I've got MAG D.
02 21 19 45 CMP Okay. Okay, MAG D. What kind of a camera? 70 millimeter?
02 21 19 54 LMP ... number 2 with this lens.
02 21 20 00 CMP Okay. What else? Filters?
02 21 20 06 CDR Doesn't say anything about filters. Oh, yes, red and black filter, U-4.
02 21 20 11 CMP You got that? Okay.
02 21 20 16 CDR Something went flying down when we started burning, didn't it?
02 21 20 27 LMP ... 
02 21 20 28 CDR Huh?
02 21 20 30 LMP ... 
02 21 20 33 CDR No. 
02 21 20 36 CMP Did I write on there that - the orbit we are in? 
02 21 20 40 CDR It was just what they told me, yes - 169.1 by 60.5. 
02 21 20 43 CMP Okay. Okay, when I give the burn status report there, will you - 
02 21 21 17 CMP Say, look at - Can you put these cameras someplace? Stash them against the back of your bulkhead. Stash this back there, too. 
02 21 21 32 CMP Hey, you're maneuvering quite rapidly. 
02 21 21 35 CDR No, I'm not. 
02 21 22 04 CMP Well. 
02 21 22 33 CMP Tape, Bill. Thank you. 
02 21 22 41 LMP ... 
02 21 23 59 CDR Are these cameras all set up right? 
02 21 24 01 CDR Huh? 
02 21 24 03 LMP ... 
02 21 24 08 CDR Huh? 
02 21 24 09 LMP ... 
02 21 24 13 CDR Can I take one? 
02 21 24 15 LMP ... 
02 21 24 30 CDR That's what I thought: it doesn't work. 
02 21 24 38 CDR Well, that - the camera doesn't work. 
02 21 24 40 LMP You want me to try it out? 
02 21 24 42 CDR Yes. 
02 21 24 46 LMP ...
02 21 25 06  CDR  Huh? Does it work now?
02 21 25 09  LMP  ...
02 21 25 10  CDR  We're not that hard up; don't worry about it.
02 21 25 15  CMP  Listen, we're not going to —
02 21 25 18  CDR  I just want to take a picture.
02 21 25 21  CDR  Hey, look; just slow down and take your time. Okay.
02 21 25 28  LMP  f:8.
02 21 25 30  CDR  f:8 at what?
02 21 25 35  LMP  ...
02 21 25 38  CDR  Okay.
02 21 25 44  CDR  Okay. Bill, get me MSFN, will you?
02 21 25 56  LMP  AOS at 69:31.
02 21 25 59  CDR  Oh, is it that late? Okay, I thought it was —
02 21 26 13  CMP  Can you see it? Huh?
02 21 26 15  LMP  Yes, ...
02 21 26 23  CDR  It says I'm supposed to run one MAG here - of
16 millimeter; new color exposure, 1/250th, spot,
1 foot per second.
02 21 26 35  LMP  ... flight plan ...
02 21 26 42  CMP  Wait a second, Bill.
02 21 26 47  CDR  Take your time; go slow.
02 21 26 55  LMP  Did you take your bracket up?
02 21 26 58  CMP  No.
02 21 26 59  LMP  ...
02 21 27 00  CDR  I'll get it.
02 21 27 02 LMP ... 
02 21 27 03 CDR Where is it? 
02 21 27 04 LMP ...
02 21 27 06 CMP Boy, there’re no shadows in those craters down there. Are we near the subsolar point? 
02 21 27 11 CDR Yes. 
02 21 27 12 CMP The subsolar point? 
02 21 27 13 CDR Yes, getting close to it. 
02 21 27 16 CMP What’s our attitude? 
02 21 27 18 CDR Well, we’re pitch down. We’re going around it. 
02 21 27 22 CMP Are we heads up? 
02 21 27 23 CDR Yes. 
02 21 27 26 CMP Jim, have you unstowed the orbital charts? 
02 21 27 28 CMP Yes, I'm in the process right now. I've got part of them unstowed. 
02 21 27 44 LMP ..., Frank. 
02 21 27 48 CDR Okay. 
02 21 27 56 LMP ...
02 21 28 19 CMP Why don't we - Say, why don't we temporarily stow it someplace? You're never going to use this thing at all? I think you're making a big mistake using that 250 millimeter. 
02 21 28 28 LMP No, not on ... because that's ... 
02 21 28 31 CMP Oh. 
02 21 28 56 CMP Well - 
02 21 29 16 CMP Where do we start doing the fan work, Frank?
Well, first of all, we've got to get those cameras set up.

Bill, that's not in the flight plan.

You want me to take some pictures with that 16 millimeter?

Frank, ...

New color exposure, 1/250th, spot, 1 foot per second; one whole magazine they want.

I need the camera.

What are you doing, Jim?

Trying to figure out where we are, Frank.

Alright, it's 11 south, 118 west.

Is that all set?

Okay, we should be -

We're passing over Brand right now.

Brand?

Brand right about now.

Holy cow, there's no resolution whatso - there's no shadows on the craters.

Hey, there we go. There we are.

... Is that Tsiolkovsky?

... Okay, we'll go upside down.

Well, listen, Bill, if this is the way it goes, the way you say, look at that.
You have it all the way in, Frank?

Yes. There's a stop on that thing; it won't go any higher than that.

Gee, you ought to get a picture of Tsiolkovsky.

Hey, how am I going to get any... with this window the way it is?

Frank?

I don't know, Jim.

I'm going to have to use another window.

Okay.

Okay, here we go.

Houston, Apollo 8.

What do you want this on, Bill?

Oh, where's the other flight plan?

Okay, be about... Going to f:8, Frank.

f:8?

And we just passed the subsolar point.

Houston, Apollo 8.

Houston, this is Apollo 8. Over.

You through with the flight plan?

No.

Can I have that other flight plan when you get a chance?

Are you hooked on to them, Bill?
02 21 33 46 CC Apollo 8, Houston. Over.
02 21 33 47 CDR Houston, Houston, this is Apollo 8. Over.
02 21 33 50 LMP He's answering you.
02 21 33 51 CMP Go ahead, Houston. This is Apollo 8. Burn complete. Our orbit is 160.9 by 60.5 - 169.1 by 60.5.
02 21 34 14 CDR Are we on the high gain, Jim? Bill?
02 21 34 18 LMP Give me a VERB 64, Frank.
02 21 34 20 CDR What are you doing here? Let's get rid of that.
02 21 34 26 CMP Houston, Apollo 8.
02 21 34 28 CDR VERB 64.
02 21 34 30 CDR I don't think we - -
02 21 34 32 CMP Roger. You are coming in very weak. Our orbit is 169 by 60.5.
02 21 34 38 CDR Give them the whole report there, Jim.
02 21 34 42 CMP I think I'm talking to myself.
02 21 34 44 CDR Why don't you get a Roger for the dump we sent them then?
02 21 34 49 LMP Okay, that's - Let me go into high gain.
02 21 35 31 CDR Can you get them, Bill?
02 21 35 32 LMP We got them.
02 21 35 35 CDR Houston, Apollo 8. How do you read? How do you read Apollo 8, Houston?
02 21 35 37 LMP They've got a ground problem.
02 21 35 43 CMP You taking that at one frame per second?
02 21 35 46 LMP Yes, that's what it says to.
02 21 35 49 CDR Houston, Apollo 8.
02 21 35 54 CDR I hear - They're reading us now.
02 21 35 57 CMP There we go. Houston, Apollo 8. Over.
02 21 36 08 CDR Are we hooked on with the high gain?
02 21 36 10 CMP Yes, sir.
02 21 36 14 CMP They came through at one time, didn't they?
02 21 36 16 CDR Yes.
02 21 36 25 CC Apollo 8, Apollo 8, this is Houston, Houston. Over.
02 21 36 30 CMP Okay.
02 21 36 31 CDR Roger, Houston. We read you loud and clear. How do you read us?
02 21 36 36 CC Apollo 8, this is Houston. Reading you loud and clear now. And verify your EVAPORATOR WATER CONTROL panel switch to the AUTO position. Over.
02 21 36 48 CMP Is it?
02 21 36 49 CDR It is in AUTO.
02 21 36 50 CMP Roger.--
02 21 36 51 CDR Roger. It is in AUTO.
02 21 36 53 CDR Go ahead, Jim, with it.
02 21 36 55 CC Roger.
02 21 36 58 CDR Well, look here - this DSKY is way up.
02 21 36 59 CMP Burn status report as follows: Burn on time, burn time 4 minutes 6-1/2 seconds; $V_x$ minus 1.4; attitude nominal; no trim; $V_y$ was zero; $V_z$ was plus 0.2; $E_y$ was minus 20.2; orbit 169.1 by 60.5.
02 21 37 47 CC Apollo 8, Houston. Roger. The burn on time, burn time was 4:06.5, $V_x$ is minus 1.4.
02 21 38 05 CDR Bill, how come this is so high here now?
02 21 38 08 LMP ...
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02 21 38 10 CDR  Huh?
02 21 38 12 LMP  I'm checking the fan out.
02 21 38 13 CDR  Is it alright?
02 21 38 14 LMP  I'll let you know.
02 21 38 20 CC  Apollo 8, Houston. Verify your EVAP WATER CONTROL on panel 382 in AUTO; your EVAP OUT temperature is high. Over.
02 21 38 31 CDR  Roger; standing by.
02 21 38 38 CDR  Houston, Apollo 8. Roger; PRIMARY EVAP is AUTO; H₂ flow, AUTO. Do you recommend activating the secondary water boiler?
02 21 38 53 CC  Roger; copy, stand by.
02 21 38 57 CDR  Now, Jim, let's get this problem squared away here, or we won't be going anywhere.
02 21 39 03 CDR  We're not boiling, Ji - Bill?
02 21 39 04 LMP  No.
02 21 39 11 CC  Apollo 8, this is Houston. Reverify manual valve on panel 382, EVAPORATOR WATER CONTROL, AUTOMATIC. Over.
02 21 39 20 CDR  Roger; verified.
02 21 39 25 CMP  Any help down here?
02 21 39 26 LMP  Well, you might reverify it again. It's the one next to the secondary one that you had turned on.
02 21 39 32 CMP  Okay.
02 21 39 38 CC  Apollo 8, this is Houston. Recommend you activate your secondary water evaporator.
02 21 39 52 CDR  Secondary EVAP coming on the line.
02 21 39 56 CC  Roger.
02 21 40 01 CMP  Secondary evaporator is in AUTO.
Primary is the main one.
In AUTO.
It dried up.
Can you get water to it?
How's the secondary one - primary one doing - secondary one doing, Bill?
Secondary one is doing great.
It's operating?
Apollo 8, Houston. Turn off your DSE, and we'll go to HIGH bit rate. Over.
Roger.
We completed target 72 strip and target 90 strip and the terminator photography to the south.
Okay, we're going to get updates. And a P52.
Roger.
Can I have the other lunar flight plan there, Jim?
Houston, for your information, --
Yes.
-- we lost radio contact at the exact second we predicted.
Are you sure you didn't turn off the transmitters at that time?
While these other guys all are looking at the moon, I want to make sure we got a good SPS, so how about giving me that report when you can?
And we want a GO for every REV, please. Or otherwise, we're going to - TEI along with every REV.
Are we on high gain, Bill?
Yes.
02 22 04 42 CDR  Well, this is ... see if I can ...
02 22 04 44 LMP  Yes.
02 22 05 04 CMP  Here's the - I'll bet you that's what we're supposed to do.
02 22 05 09 CDR  I wouldn't know.
02 22 05 11 CMP  ...
02 22 05 15 CDR  Have you got the DELTA counter over there, please?
02 22 05 58 LMP  Those two strips and the terminator photography on camera 1
                   were taken on magazine E which is now reading - 29 exposures.
02 22 06 17 CDR  How are you doing, Bill?
02 22 06 18 LMP  Getting it done.
02 22 06 21 CMP  ...
02 22 06 31 CMP  I don't think so. Okay, I'm going out ...
02 22 06 36 LMP  What did you take a picture of, Frank? Do you remember ...
02 22 06 43 LMP  And Frank took a - took a picture on camera 2,
                   magazine A, which is now reading 40.
02 22 07 04 LMP  Now we're going to change - take off magazine A.
02 22 07 10 CDR  Jim, didn't I hand you a magazine over there?
02 22 07 14 CMP  Yes, I ...
02 22 07 18 LMP  Okay, what I meant for you to do ...
02 22 07 27 CDR  Negative.
02 22 07 35 CMP  Okay, we have ...
02 22 07 43 CDR  Negative, we'll have breakfast in a little while here.
02 22 08 18 LMP  We're in the dark now?
02 22 08 23 CMP  Well, it looks - sure looks that way.
02 22 08 33 CMP  13. Capella.
What was it, Bill?

Capella.

Okay.

Have you charged these batteries, Bill?

Never did ...

Okay, I'll ... lights out ... I could just mark them without even --

Earth - earthshine is about as expected, Houston. It's not as much detail, of course, as in the sunlight, but you can see the - the large craters quite distinctly, and you can see the albedo contacts quite distinctly. And also, the - There's a good three-dimensional view of the rims of the larger craters.

... Wait a minute.

I think our high-speed film will be able to pick some of this stuff up quite well.

Oh, right over ...

Have you got your camera ...?

All balls.

Okay. Minus 3077, plus 3017, plus 3065.

Okay, the next thing we put up is my ...

Okay, Jim, go ahead and eat.

Okay, let me see whether I have this ...

... are okay, Frank?

EPS is alright?

... should expect my ... later.

This thing must be ... Oh no, don't tell me the thing dried out.
02 22 11 55  LMP      No, the boiler isn't acting up; it just dried out.
02 22 12 30  CDR   Did you verify all the systems?
02 22 12 33  LMP   Yes. We have sunset at -
02 22 12 35  CDR   Not too long.
02 22 12 42  CDR   Go ahead with your information on the filters, Houston.
02 22 12 49  CMP   Boy, that —
02 22 13 37  CDR   Go ahead.
02 22 14 02  CDR   Go ahead.
02 22 14 25  CDR   We got you.
02 22 14 28  CMP   ... wrong with the TV picture ...
02 22 14 40  LMP   Now don't - Let's not even screw with the telephoto, okay, Frank?
02 22 14 45  CDR   Right.
02 22 14 47  CMP   Well, ought to use that wide angle. Then you could really —
02 22 14 49  LMP   Jim? Have you got time to get that red filter out of there or not?
02 22 14 53  CMP   Out of where?
02 22 14 54  LMP   Out of that other - I'll get it; I'll get it.
02 22 14 58  CMP   Did you see that other map around here someplace?
02 22 15 00  CDR   Yes, the - the flat one?
02 22 15 02  CMP   No, I've got the flat one; the other - folded one.
02 22 15 26  CMP   Well, I'm not worried about these ..., but I am about the other two.
02 22 15 33  CDR   Houston, Apollo 8. Standing by to record TEI 1 and TEI 2.
02 22 15 54  CDR   Roger; understand.
02 22 16 03  CMP   Where is the flight plan?
You're getting that red filter?
Yes, I got it.
Roger; we could feel the chug when we threw in bank B. Not a chug, but we could feel the additional thrust.
Here you go.
Houston, be advised on this red-blue filter technique on the TV that you cannot slide the two filters out of the way with them taped onto the TV cameras, so I suggest you use red-blue, and then take them off.
Did you use 83?
Huh?
Did you use VERB 83?
Roger; you don't want the red filter; you want the blue by itself. Is that correct?
Roger; in work.
Tape, Jim, please.
Tape?
You got enough there?
Now give me an ...
Here - I got ...
Frank, what else have you got, ...?
Go ahead, Houston; Apollo 8.
We will not do that; we're going to stick with the flight plan, and make the best we can here.
As usual, in the real world, the flight plan looks a lot fuller than it did in Florida.
Well, I know we may need it. I got some more for you. ... remember -

Buh?

Did you bring the temporary stowage bag?

... Here it is. Yes. (Laughter) ...

What other crises ... by the board?

I don't need any if you want to know. After what I've got in my pocket, I (laughter) can go anywhere for a while.

Well, how could they ...?

Well, that kind of makes ...

How about just holding that ... tape ... The thing is, the damn thing has 16 moving parts.

Well, I got it, but ... I'll bet - You can just put a piece of tape on it so it stays ...

Okay, what's this coming up ...? ... coming up here.

At 71 hours - exactly - it's 70:21 right now. The realignment has been completed already. It's an eat period for Bill, eat period for myself; prepare to do GDC align to the IMU. Okay, at 70:55 --

Okay, yes, let me ... At 70:55, you're going to pitch up your ORDEAL 180, 250, and 00.

Okay. ... And we're going to have to share a window here, Bill at 71: --

Yes, because - I've got to get out the ...

Orbital photos.

Well, I was real worried about the evaporator.
02 22 22 44 LMP Frank, that's the best I can do for you. If you can just hold it and - like that and take the picture.

02 22 22 52 LMP Okay, now look, can you - could you stick that ... stick it in the holder behind your head. I'll take that film out of your way - get a chance, stow it, that'll be the best thing to do.

02 22 23 30 LMP Okay.

02 22 23 46 LMP Jim, did you get that flight plan?

02 22 23 48 CMP Yes, I got it right down here ...

02 22 23 56 LMP Why don't we keep it right in here, I guess and -

02 22 23 59 CMP Well, listen, how about - now ... Okay, ...

02 22 24 04 LMP We could use Frank on the keypunch for the control point.

02 22 24 07 CMP Yes, either way, it makes no difference because you have that ---

02 22 24 10 CDR I've got a keypunch here. I ...

02 22 24 14 CMP Yes, I think, Frank, ... the attitude.

02 22 24 22 LMP Okay, Frank, you want to configure your 16-millimeter camera as follows: you've got 2/3 of a magazine in there.

02 22 25 05 LMP Okay, we're sticking - magazine J onto the 16-millimeter camera, and removing magazine H. We had magazine H running at one frame per second, and what was the f-stop - you remember? f:8 all the way through the pass; we didn't get around to changing the f-stop.

02 22 25 28 CDR Alright, through the pass.

02 22 25 32 LMP Okay, now it starts at f:2.8, 1/250th of a second. Sorry, but I got the wrong ...

02 22 25 44 CMP ...

02 22 25 45 LMP One - f:2.8, one frame per second.

02 22 25 49 CDR 2.8?

02 22 25 50 CMP Right.
Go ahead?

Yes.

Well, Frank, I'm going to have to give you - Would you remind me to give you new exposures every now and then as on this map? I'll have - I'll have the map right in front of me so I can ... without any trouble. The only thing is you have to remind me.

Okay. Tell them I've got the earth in the sextant.

Okay, Frank? Would you start the 16-millimeter camera when you're coming across the terminator with the pass. Okay?

I'll take the spotmeter readings and be able to tell you what the ... when we're all set for TV, and then ...

I'm ready for a map update.

Man, this is really exciting.

Roger, and we're standing by for a map update.

Houston, Apollo 8. Just for your information, after we completed P52, I have acquired the earth in the sextant. Quite a sight from here.

Okay, O₂ purge set.

How are the system's experts on the SPS coming, Jerry?

Let's put that over there.

Thank you.

... You've been living on emotions ...

... those last two REV's ...

Roger; 5 minutes of HIGH bit — —

Houston, Apollo 8. We're in the process of preparing meal 4, day - correction, day 4, meal A.

... get me the hot water ...
... the sextant ...

How's that flight plan looking ...?

A little bit of - a little bit of - Left yaw - a little bit.

... we'll just have to get one. But you can't for 30 minutes ... Well, you can ...

Who wants hot water, quick?

I do. ...

Houston, Apollo 8. Over.

Are you going to be able to dump that tape prior to LOS?

Thank you.

This is a report of the photography accomplished on REV 1. We got target 68, target 72, target 90, and the terminator photography - near-side terminator, REV 1, south. I had cameras 1 and 2 configured properly. Camera - camera 2 now reads - simply one exposure on MAG G. That's the high speed; we've had zero exposures on MAG G.

Okay, that's up to the right.

Okay, at 70:55, we're going to pass over - ...

We've got to get the TV going here now ...

Okay, MAG D - was on camera 2.

What?

One exposure - two exposures at this time. We had one exposure on MAG A.

MAG E was used for the targets previously mentioned, and is now indicating 30 - 30 exposures; that's MAG Echo.

Go ahead, Houston; Apollo 8.

Thank you.

Magazine - magazine J was on the 16-millimeter camera, run at one frame per second, starting about 10 minutes after LOI -
Okay, this is ...
Thank you.
MAG H - When you're through taking MAG H, I'll ...
MAG H was on the 16-millimeter cam - -
...
- - 16-millimeter camera, run at one frame per second, at - Look at that f-stop.
8.
On f:8 through the entire REV.
We now have MAG - What was that again, J? - MAG J installed for the second pass.
Are you all set with the TV, Bill?
Oh, we've got a long time.
The TV doesn't come until at 30 minutes ...
Next - next AOS?
... the flight plan.
Next AOS is 30.
71:39.
Yes.
71:30 would be ...
... half an hour.
Is that right?
Yes.
Well, I guess we don't do ...
No, we can't do them all at once.
All at once?

... the earth ...

No.

Are you going to ...?

I think you better yaw first ...

What was that time again? 71:30?

You don't have AOS until 71:39 ...

Well, 12.2 is ... 128.

... TV pass is ...

Well, I guess we could get it; you know this S-band is actually just pointing a little - a little more underneath than ...

Okay, Bill, while we're going around here -

How's your time? Sunrise is 71:00.

Holy cow! We're not too far away from ...

... right? Ask Jim.

Okay. Did you see my ...?

... camera ...

What does - what does it say there in the flight plan, Frank?

Hey, Frank, think I should share your ... the next ... because you're going to maintain the position, aren't you?

I should get over there - Could you fly it from over here?

Huh?

Now you've got to maintain a position in the ...
Well, that's just to ... whenever we fly ... with the COAS ...
Trying to get up here.
Well, look here. ...
It doesn't say anything about that.
One frame per second ... terminator.
Let me see if I can get up here ... Yes, I just ...
What do you want me to do?
What do you want to do about this television?
...
Well, you can go on and describe where we are.
Still got that ..., Bill?
I don't see it.
Bill, why don't you just worry about the television as far as ...
You see the terminator yet, Frank?
Yes.
Are you pitched down - to the horizon?
Yes, down.
Okay, I've got the terminator.
Alright, the terminator is just coming over right now.
You want your camera going, Bill?
Start at - just start it a little past the terminator -
Don't start a track until you get the terminator.
Okay, let me ...
Well, I thought we'd better - Bill, you've got - I guess you've got your instrument, right?
What's the crater just before we get the terminator? The big one?

It's America.

No, no, that's the real big one.

It's --

It's the one that's coming up right now.

Von Braun and America.

This one right down here, Bill? Bill? Is that von Braun?

Yes ...

I think this is Freedman coming up.

Have you got the terminator?

Yes.

It might be ...; no, I think it's Freedman.

Just run it whenever you are looking down there.

... take a look at ... the flight plan.

Give me that flight plan there real quick, will you, Frank?

Okay, let's track along the ground and run the camera ... time.

Here - It'll - At the terminator, it will be - 2.8, and it'll stay that way for a good while.

... we're looking good.

Okay, starting on the right now, ...

No, no, no, don't - don't write it down.

Well, you're going to get --

No, it - it - Wait, wait'll it comes up --
Well, why not? Why don't you get it tracking? That thing's just going into the terminator.

Well, I'd wait, or you're never going to make it through the pass. It's the other terminator that's more important. Just take a couple here, Frank.

Alright. We should be over America right now.

Now, we're passing over America.

There she is.

And we're coming up on von Braun.

Okay, we're to the north of our track --

Yes.

-- aren't we? No, we're not! My gosh, we're just about on it!

Now, can you turn up the lights a little bit because we need this thing because we're going to -- turn the light ...

We're coming ... right now ...

You want this thing going now, Bill?

Yes, good.

3.5 still?

Huh?

Yes.

I don't think the angle is the best, though.

... 

Oh, you can see out of this one. Bill, this is good lighting for one of those.

Take those pictures ...

Okay, we got the six pictures of the terminator, south.
That's the north, Jim. Isn't this America sitting right out here - this big one? Or did you --

No, no, we're over - still over America right now. See look at this big picture. I've got the - I've got the photograph on --

Is this von Braun right here, this big --

No, we're right in the middle of America, right now.

You've got two other craters sticking up ...

Right in the middle of it? Are they those --

You still want it at 3.5, Bill? I think I --

I want you to keep it 2.8 until we've gone 7 minutes. ...

Yes, I know. It doesn't work; it goes out.

There is the big ... down below us.

Is that it?

Yes ... down south right now.

Why, the rim of America is very hard to see, isn't it?

Yes.

Okay, you're right, here's von Braun. This must be von Braun, here.

Yes, okay.

Boy, it sure feels like you're running ... Very pretty.

Okay, getting target 10.

Target 10 is MAG D, frame -

You should have a big crater on the side of you there.

Okay.

There it is. Now the target should be just straight ahead. ...

I see it. Right there.
CONFIDENTIAL

DAY 4

03 01 34 25 CMP 42 seconds. 42.
03 01 34 28 LMP Give me a call when the DSKY blanks.
03 01 34 30 CDR Blank!
03 01 34 31 CMP Blank DSKY.
03 01 34 32 LMP Okay. Average g is ON; FLIGHT RECORDER to RECORD; EMS to AUTO.
03 01 34 38 CDR AUTO.
03 01 34 41 LMP Check PIPA bias.
03 01 34 43 CMP Okay.
03 01 34 44 LMP Ullage as required.
03 01 34 46 CMP No ullage.
03 01 34 47 LMP Okay.
03 01 35 01 CMP ENABLED.
03 01 35 06 LMP 1, 2 - -
03 01 35 08 LMP/CMP 3, 4, 5, 6, 7, 8, 9, 10, 11 -
03 01 35 17 CDR Okay?
03 01 35 18 LMP Okay!
03 01 35 20 CDR Cutoff.
03 01 35 21 CMP Okay, cutoff.
03 01 35 22 LMP SPS light, OFF; okay, DELTA-V THRUST A, OFF.
03 01 35 26 CDR OFF.
03 01 35 27 LMP Helium valves are CLOSED.
03 01 35 28 LMP Okay, barber pole; SPS GIMBAL MOTORS, four, OFF, slowly.

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03 01 35 34 IMP: 1, OFF.
03 01 35 25 IMP: On.
03 01 35 30 IMP: 2, OFF.
03 01 35 35 IMP: Got it. Not quite as fast.
03 01 35 40 IMP: Okay, 3, OFF.
03 01 35 45 IMP: Got it.
03 01 35 50 IMP: 4, On.
03 01 35 55 IMP: Got it. Okay, 5, On. Switches 1 and 2, OFF.
03 01 36 00 IMP: OFF - -
03 01 36 05 IMP: Proceed, null residuals and record final residuals.
               Okay? You got it? ...
03 01 36 10 IMP: Okay. All right. On.
03 01 36 15 IMP: OFF.
03 01 36 20 IMP: 60 WAC, OFF.
03 01 36 25 IMP: 60 WAC, three, BATH D.
03 01 36 30 IMP: 60 WAC, OFF.
03 01 36 35 IMP: 60 WAC, OFF.
03 01 36 40 IMP: Okay, CONFIDENTIAL - in OFF.
03 01 36 45 IMP: Technique operation, ON.
03 01 36 50 IMP: 60 CONTROL POWER DIRECT, ON.
03 01 36 55 IMP: 60 WAC, HYD and WAC circuit breakers, OFF.
03 01 37 00 IMP: Are they ON? That GLOCK there.
03 01 37 05 IMP: Okay, proceed.
03 01 37 10 IMP: Turn up WAC 80 and HYD.
03 01 37 15 IMP: WAC 80, OFF.
03 01 37 20 IMP: Got it, ON.

CONFIDENTIAL
CONFIDENTIAL

Day 4 108

03 01 38 12 LMP Proceed, and then line 37: 00, ENTER.

03 01 38 24 LMP ENTER VERB 66.

03 01 39 14 LMP Okay, SPS ...

03 01 46 36 LMP Okay, let's do the - on this DSE again.

03 01 46 48 LMP Now, I think we - I told you earlier what I thought I'd do ... and I discovered that ... I ended up with the high-speed film, in one of the cameras - I believe it was the second REV. And it's my feeling that the target 12 was accomplished. And I believe that targets 10, 14, 16, and 19, and possibly 20 and 21 were taken with high-speed film. What is important is you should know between which craters I changed to the other camera. I believe that ... and possibly Taruntius were taken with the proper film. Also ... probably 31 and 40. Terminator photography was taken at the end of the first REV, properly configured, as indicated previously, ...

03 01 48 49 CMP One was at 26.

03 01 48 56 LMP Okay, terminator photography was accomplished at the morning far-side terminator, ... and I believe we had the high-speed camera. We used the 16-millimeter camera ... with the proper f-stop. It's been rather difficult to - to keep ... on REV 2. ...

03 01 49 53 LMP Magazine U, I have 47 exposures used, and high speed on 40 of them. We are now set up for magazine K for the - training photography, and magazine U, 70 millimeter, ...

03 01 50 25 LMP Houston, Apollo 8. Over.

03 01 50 39 LMP Houston, Apollo 8. Over.

03 01 50 47 LMP Roger; read you loud and clear, and ready for the burn status report.

03 01 50 55 CDR Houston -

03 01 50 56 LMP Roger; the burn was on time; 11 seconds; 0.2 was V\textsubscript{gy}; 1.8 V\textsubscript{gx} - that's minus 1.8; minus 0.2 V\textsubscript{g}\textsubscript{z}. DELTA-V\textsubscript{c} was minus 20.4; VERB 82 gives us an apogee of 62 and a perigee of 60.8.
Roger.

Hey, Bill.

Yes.

Are you looking for one of those...?

... i.e. that's where you put it.

... number 58, magazine - C.

Houston, how are you reading Apollo 8?

You're loud and clear.

Houston, Apollo 8. We're on high gain now if you want to get the high-speed data to look at that burn.

Okay, I think I've made a mistake, on the last ... DSE ... I've gotten confused here. ... Can you hold it for about 5 seconds - about 1 minute?

Okay.

Wait just a second; 58 is not around - starting on frame 61.

Okay, you can dump the data now.

Did you get it?

Have you updated the -

Houston, Apollo 8. ... meal 4, day - day 4, meal ...

Man, that's a charm.

Magazine E showing 95 exposures will be used for far-side terminator south photography for REV 4 and target 10 and 20 series which we believe were shot by the high-speed film on REV 1. We're using magazine I and magazine D to do the vertical stereo. Both of those show zero.

Okay. Frame number 104 was taken into von Braun -

Man, that's a charm.
03 03 22 39 LMP - which showed an interesting little ridge down the middle of it in one of the turtleback stills in one - in the little side crat - in the crater to the east.

03 03 23 06 LMP The next exposure was taken at 75:23:06.

03 03 23 32 LMP Target 19.

03 03 23 39 LMP Exposure 116.

03 03 23 51 LMP And was taken at 1/60th of a second at 5.6 with the terminator. We'll do it at 250th - that's good enough.

03 03 24 13 LMP Spotmeter readings vertically are recorded on the map for lumens -

03 03 24 27 LMP And they're all reading between 160 and 320.

03 03 24 36 LMP Oblique: about 4 in the - between 460 and 320.

03 03 25 39 LMP What time have you got, Frank?

03 03 25 42 CDR ...

03 03 25 45 LMP Okay, going for target number 14, magazine E, frame 116.

03 03 26 22 LMP 116 will be a target-of-opportunity photo showing some mountains on the horizon.

03 03 27 08 LMP Okay, camera number - vertical stereo camera was put to 5.6 from 2.8 at 75:27.

03 03 28 02 LMP Huh?

03 03 28 42 LMP What time have you got, Frank?

03 03 28 46 CDR 75:28.

03 03 29 33 LMP Okay -

03 03 29 39 LMP What's the time?

03 03 29 40 CDR 12:23.

03 03 29 41 LMP Starting at 12:23 on the event timer, we're going across what I think is - is Washington, though it's very hard to tell.
Target 19 was taken with MAG E, about frame 107, series of three.

Make it a series of four.

Okay, we finished - target 19; four exposures on frame 111.

What's your time, Frank?

14:05 ...

We should have put this over in your window. How about - Can you take this in your window?

Now, you want it while it's running?

Yes, go ahead. It's getting in the way of this other one.

I'll count out the exposures for you.

Yes.

Can you call out your time, Frank, please?

15 minutes.

14?

15.

Okay, target number 23; 15 minutes; frame 112.

(Cough)

I've got to use that (yawn) - I've got to roll right.

Time, Frank?

16:55.

Turn it to f:8 if you haven't got it there already.

That's where it was when you handed it to me.

Good.

17:15.
Okay.

Fresh impact crater: MAG E, frame 117, about 18 minutes.

Will you give me a VERB 64, Frank?

I've got a bunch of scraps here - they're to be shot - would you give me the end tape -

Okay.

Okay.

Okay, frame - hope I'm not losing count here.

Okay, definitely frame 114, target of opportunity, extremely fresh impact crater.


You want to rotate in 6 minutes, Bill?

Not now, I'm checking here.

Frame 115, another extremely fresh impact crater taken at 75:41. If the window was a little more clear, I - Looks like it might be up on the top of the hill.

What time do you have, Frank? Is it 20?

25 almost. 24:19 now.

Okay, let's go.

Did they give you a time to rotate?

What?

Did they give you a time to rotate?

... wants me to rotate 75:46.

Yes, we've got a ways to go yet.

3 minutes - No, it's 5 minutes.
Okay, let's go - fill.

What time are you supposed to be pitching up?

I don't pitch up until ...

Okay.

Alright, we're going to roll.

Ready? Set.

The impact crater was at - just prior to subsolar point on the south side, and the floor of it, didn't really get to - There is one dark hole, and I couldn't get a quick enough look at it to see if it might be anything volcanic.

Oh, my God! Look at that picture over there! Here's the earth coming up. Wow, is that pretty!

Hey, don't take that, it's not scheduled.

(Laughter) You got a color film, Jim?

Hand me that roll of color quick, will you --

Oh man, that's great!

-- Hurry. Quick.

Gee.

It's down here?

Just grab me a color. That color exterior.

... 

Hurry up!

Got one?

Yes, I'm looking for one. C 368.

Anything, quick.

Here.
03 03 48 17 LMP Well, I think we missed it.
03 03 48 31 CMP Hey, I got it right here!
03 03 48 33 LMP Let - let me get it out this window. It's a lot clearer.
03 03 48 37 CMP Bill, I got it framed; it's very clear right here. You got it?
03 03 48 41 LMP Yes.
03 03 48 42 CDR Well, take several of them.
03 03 48 43 CMP Take several of them! Here, give it to me.
03 03 48 44 LMP Wait a minute, let's get the right setting, here now; just calm down.
03 03 48 47 CDR Calm down, Lovell.
03 03 48 49 CMP Well, I got it ri - Oh, that's a beautiful shot.
03 03 48 54 CMP 250 at f:ll.
03 03 49 07 LMP Okay.
03 03 49 08 CMP Now vary the - vary the exposure a little bit.
03 03 49 09 LMP I did. I took two of them.
03 03 49 11 CMP You sure we got it now?
03 03 49 12 LMP Yes, we'll get - we'll - It'll come up again, I think.
03 03 49 17 CMP Just take another one, Bill.
03 05 15 20 CMP I tried it. ... a problem. Would you believe the ...?
03 05 16 47 CMP Yes.
03 05 16 57 CMP Okay.
03 05 17 07 CMP That's everything.
03 05 17 09 LMP Pardon?
03 05 17 14 CMP Roll - roll right.

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... okay.

... go back to your residuals. Proceed. ... 2000 ... Okay, we should be 00 now.

00; proceed. Latitude - Okay, this is what you copied down. Let's see, latitude and longitude, ... and attitude ... best points at 239. Write down 239. That's your latitude and longitude and ... attitude.

Okay.

Latitude, minus 06269; longitude over two, minus 78954; attitude, plus 00152.

... okay, that would be the - okay.

... the way you resolved and ...

We're a little bit - We're on the fourth REV? This is the fourth REV, right? You're just a little bit south of ... yes, this ... stuff is really great for this. See, he's trying to get the right attitude, here.

You're 5 degrees up, huh? That's a good attitude.

Okay, I just ...

I wish I hadn't added the time to that.

You looking it up again?

Yes, I am ...

Yes, there's a big probability too there's a ...

1. 2. 3. ... 4, 5. Proceed. Two balls? Two balls.

... I demanded it on that one.

... You haven't got - Do you have the one before Mike, by any chance?
I don't know; I better check. This is what you call 222, friends.

Yes, this has got to be right ... I figured that once and I know I can find it.

Okay. Latitude is minus 09638.

Minus 09638.

Okay, and longitude over two is plus 8169.

...?

Plus 8169.

Latitude is minus four balls 7.

Okay.

Okay, could you read off the latitude and longitude ...?

...?

06?

... Okay, f - f:ll. 250th.

Okay, 27:48. You can go right ... this will give us the ... 37:48 ...

Well, if it's not ...; it'll drop to zero, if it doesn't ... because ... yes.

Okay.

The ... says we have to go about 50 before this should start falling.

We can do nothing at the ... before HIGH bit rate.

Yes, I'm going - Are you positive about that?

Yes.

Give me a 30-second warning when you want to say something. I'll have to stop it, ... that leaves 30 seconds ...
03 05 42 47 CDR Yes.
03 05 43 23 CDR If it would have been LOCK, we've got - got two of them.
03 05 43 46 CMP Bill, ... Do you know I can see the horizon? Can you see the horizon?
03 05 43 59 LMP Pitch up?
03 05 44 00 CMP Yes, pitch up to -
03 05 44 20 CDR Pitch is about 50.
03 05 44 23 CMP Can you pitch up some more?
03 05 45 20 CMP No, that's about right. Let's take pictures of ... You see the ... right there.
03 05 46 37 CDR Houston, Apollo 8. How do you read?
03 05 46 40 CMP You have the ...?
03 05 46 43 LMP Yes, I've got it over here.
03 05 46 45 CMP You've got it?
03 05 46 46 LMP Here you go; I'll pass ...
03 05 47 04 CDR Houston, Apollo 8. Go ahead.
03 05 47 11 CDR Roger. Looks like the evaporator is holding okay; at least it tries to. But it dropped the temperature down to about 32 and now it's picking back up again to stabilize at about 42 degrees.
03 05 48 14 LMP Do you need any more film there, Jim?
03 05 48 30 CDR Okay, if I'm ...
03 05 48 32 CMP Huh? Okay.
03 05 48 40 CDR Houston, Apollo 8.
03 05 48 49 CMP Roger, Houston; this is Apollo 8. What we are doing on the control point tracking - I managed to look for CP 1 at the same time we were trying to do CP 2 on this REV. I picked two marks which are just as
small, but more easily recognizable than the ones
that were given to me. I know that I can repeat the
process and pick the same small point on the next REV.
Now I can try to look for the control points that are
written down, but I think that I have better control
over the ones that we have.

03 05 49 33 CMP Roger. One more point: the control point times
which you have given me are a little bit off, and I can
notice by comparing the maps that these maps are not
too well aligned either.

03 05 49 58 CMP That's affirmative. That's why I picked them.
They're both - they're both very prominent features,
and they are both very small craters about the same
size as the ones we are looking for, but I can pin-
point them on a map.

03 05 50 41 CMP Yes, you need about a 10-degree pitchup from that
attitude. Houston, Apollo 8.

03 05 50 54 CMP Roger. One more comment is just that, what with all
the controversy at data priority meetings, it looks
like 10 degrees pitchup is the best attitude to obtain
the horizon so that you can follow the landmark down
through the scanning telescope. If we pitch down any
more, a full-up trunnion will not gather - get the
horizon, and the horizon is a great help in leading
yourself into the control point.

03 05 52 03 CDR How does that look, Jim? We should be about over PC 3.

03 05 52 08 CMP Well, I just sort of find PC 3 because ... get it ...

03 05 52 30 CMP Let's see, do you have that ... thing? Is that it?

03 05 52 44 CMP Go ahead.

03 05 53 11 CMP Roger, Houston. CP 1: latitude, minus 6 - 06269;
longitude over two, minus 78954; attitude, plus
00152. For CP 2: latitude, minus 09638; longitude
over two, plus 89691; attitude, minus 00007. I tried
to get CP 3 at the - at the same time, but I - I let
it get by to get set up for the first crack at the
landing site.

03 05 54 14 CMP Roger. CP 1: latitude, minus 06269; that's the
latitude. The longitude over two for CP 2: plus 81691.
And it appears that RESOLVE, MEDIUM is a very good combination to use around the ...

Yes.

And it appears so far, Houston, that no spacecraft pitch motion is required to get five marks on the target in plenty of time.

Okay, let's get ready for - Here's a couple of ...

How's the water boiler doing, Frank?

Okay, that would be 78 percent.

Frank, could you just get me ...?

Hey, Frank, why don't you go ahead and get some sleep?

Yes, Frank.

Yes, roll some up there.

Okay, just hold it there, 10 degrees down and - Are you sure you're aligned good? Did you use the landing site? Okay.

I got about a 10-degree yaw, here, Jim, ...

Okay, Jim, what's the other ...?

You going to be turning it off?

... which one was this? Control point sighting? CP number 526?

No, this will be landing mark zero, AUTO OPTICS.

What - what's that? ... pseudo landing site?

I got ... Is that about 10 degrees?

Oh, ... I think that's perfect. The horizon just comes up to the top ... zero optics.

(Singing)

Pitch up there about 7 degrees.
03 06 04 07  CMP  Okay, we'll stop and compute the ... right now.
03 06 04 19  CMP  Go ahead.
03 06 04 20  LMP  Go ahead, Houston.
03 06 04 35  LMP  Okay, ...  
03 06 04 43  LMP  You have some updates here ...  
03 06 04 50  CMP  Okay, now we might get a program alarm.
03 06 04 52  LMP  Okay, I've got the ...  
03 06 05 35  CMP  Okay, what I'm going to do now, is ...  
03 06 06 41  CMP  Okay, I ... a little bit - yaw to the right. You're indicating 50 degrees in pitch and yaw ... Oh, this ... is a piece of cake. It's a real piece of cake.  
03 06 07 21  CMP  ... about 3 minutes fast in ...  
03 06 07 59  CMP  ... yaw ... roll left instead of right ...  
03 06 08 05  LMP  Okay, how's your TEMP?  
03 06 08 40  CMP  For your information, Houston, instead of ... the landing site again, I'm going to give it to AUTO OPTICS, now. ... one ... it's very easy to distinguish ... and I can even pick out the - If I can see ... landing site even though it's still about 60 degrees trunnion.  
03 06 09 05  CMP  Okay, let's --  
03 06 09 07  LMP  Roll right?  
03 06 09 23  LMP  Here we are.  
03 06 09 25  CMP  Okay.  
03 06 09 34  LMP  How far below 10 degrees are you reading, anyway?  
03 06 09 38  CMP  I don't know, just don't worry about it.  
03 06 09 40  LMP  Oh, okay.  
03 06 09 46  LMP  What kind of a pitch are we reading?
Okay.

Which way do you want to roll? Roll left?

Okay.

Yaw up, roll right 180 ... 2 degrees ... 2 degrees ...

Call them ...

Go ahead, Houston.

Roger; I found out it didn't work ... MANUAL OPTICS ...

Houston, Apollo 8. Stand by 1.

Go ahead, Houston.

Roger, or I could use no landmark AUTO OPTICS instead of the code.

Okay, let me ...

Okay. Okay, IMU align, REFESMAT - We've done that.

Yes.

I think it's better.

Okay. Did you finish that camera, or do you want me to do it?

No, I never got around to that.

Apollo 8, Houston. Over.

Go ahead, Houston.

Hey, that thing is so loose it's coming apart.

...

Roger; will do.

Okay, I'm going to go to BLOCK, right?

Yes.
<table>
<thead>
<tr>
<th>Time</th>
<th>LMP</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>03 06 36 57</td>
<td>LMP</td>
<td>Okay.</td>
</tr>
<tr>
<td>03 06 37 00</td>
<td>CMP</td>
<td>That's in the checklist, isn't it - VERB 47 - or the flight plan?</td>
</tr>
<tr>
<td>03 06 37 06</td>
<td>LMP</td>
<td>What's that?</td>
</tr>
<tr>
<td>03 06 37 08</td>
<td>CMP</td>
<td>Transfer of the state vector.</td>
</tr>
<tr>
<td>03 06 37 09</td>
<td>LMP</td>
<td>Yes. You did the IMU alignment? Think the GDC will last for another REV or not?</td>
</tr>
<tr>
<td>03 06 37 21</td>
<td>CMP</td>
<td>That's okay.</td>
</tr>
<tr>
<td>03 06 37 26</td>
<td>LMP</td>
<td>Roll 180 degrees at 2 degrees per second.</td>
</tr>
<tr>
<td>03 06 37 45</td>
<td>LMP</td>
<td>You ready to roll, Jim?</td>
</tr>
<tr>
<td>03 06 37 47</td>
<td>CMP</td>
<td>Yes, you're going back to what now?</td>
</tr>
<tr>
<td>03 06 37 55</td>
<td>CMP</td>
<td>You're just going back to the landmark again.</td>
</tr>
<tr>
<td>03 06 38 00</td>
<td>LMP</td>
<td>Yes.</td>
</tr>
<tr>
<td>03 06 38 01</td>
<td>CMP</td>
<td>Okay. You got - Do you have a map update, Bill?</td>
</tr>
<tr>
<td>03 06 38 07</td>
<td>LMP</td>
<td>Yes.</td>
</tr>
<tr>
<td>03 06 38 19</td>
<td>LMP</td>
<td>I got it.</td>
</tr>
<tr>
<td>03 06 38 20</td>
<td>CMP</td>
<td>Go ahead, Houston.</td>
</tr>
<tr>
<td>03 06 38 23</td>
<td>CC</td>
<td>...</td>
</tr>
<tr>
<td>03 06 38 35</td>
<td>LMP</td>
<td>Yes, he's asking if we didn't have anything to say.</td>
</tr>
<tr>
<td>03 06 38 38</td>
<td>CMP</td>
<td>Yes.</td>
</tr>
<tr>
<td>03 06 38 40</td>
<td>LMP</td>
<td>Roger. We didn't have much to say - We couldn't see out the windows very well, Mike.</td>
</tr>
<tr>
<td>03 06 38 47</td>
<td>LMP</td>
<td>It's really too bad.</td>
</tr>
<tr>
<td>03 06 39 07</td>
<td>CMP</td>
<td>Okay. Here's a piece of camera equipment. Where does this go?</td>
</tr>
<tr>
<td>03 06 39 18</td>
<td>LMP</td>
<td>Stick it down in that box on the left - on your right-hand side - in one of those boxes.</td>
</tr>
</tbody>
</table>
You still got about a quarter of a roll of film left — a little more than that.

Okay, man.

I'll stick it in my pocket.

We might as well use it.

In order to identify it, why don't I just take this one off?

Here's your map, and here's your book, Jim.

Okay. Okay, let me make sure I'm ...

Have you got through reviewing your landmark map?

Okay, now here's what we have to do this time, Bill. I've got two AUTO OPTICS positions in, and — and — I've got to get a third landmark. Okay, let me see. The time would be — —

Go ahead.

Okay. I guess the 60-degree limit does still hold, huh?

Okay. We just don't want to boil our DMU.

No, the — —

Roger, Houston.

No, they just said don't worry about the sixt — No, it's working, but they said if it does act up, don't worry about the — —
Roger, Houston. I'll read the book this time.

--- 60-degree limit, with a secondary loop.

Frank, here's a map floating or - Jim, here's a map floating around.

Oh, it's right there.

You know, that was one of the easiest points I've ever found.

Good.

You didn't need maps or anything to make that ... You saw it, too, didn't you? You didn't have to look at the map but one time?

Yes, out the side window there when we had the TV pass.

I hope you got some good 70-millimeter shots of that area, Bill, because that's - that's it - -

Of what area?

Of our prime landing area, because right now we'll be passing over lighting conditions of our P 2 - -

I haven't, Jim, because we - we always roll about that time when we get TV.

No, I'm still taking pictures. I'm still landmark tracking.

Yes, I can't take - I can't take pictures when you're tracking, because these side windows are shot. They look out the side anyway.

Well, that's why I wanted to get some before when we were doing that tracking, because then - Did you do them when we got that other track?

I tried to.

I think - Probably be our primary landing site.

Why don't you just make it a project just to make sure you get some, because you can recognize it better than I can.
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03 06 43 55 CMP
Oh, yes, but you --

03 06 43 56 IMP
You got --

03 06 43 57 CMP
-- the 16-millimeter through here is lousy.

03 06 43 58 IMP
No, the 16's no good. You've got to -- you've got a
70-millimeter lens? If you have image -- if you -- if
you -- if you track your target, then you've got better
resolution than the other one.

03 06 44 10 CMP
Well, the thing is, it doesn't show enough of what you
want to look for; that's the big thing, too. Yet, in
spite of the place to land, you --

03 06 44 16 IMP
Did you ever see how big it could work?

03 06 44 17 CMP
-- you want the big picture.

03 06 44 18 IMP
Huh? Okay, let me show you how much you get, though.

03 06 44 26 CMP
What -- what I'm trying to show the people is the big
big areas around there, what they can see in the way of
craters and mountains and things. You see, if I just
show them a real fine resolution of a bunch of craters,
they don't know what they are.

03 06 44 43 IMP
Okay.

03 06 44 44 CMP
That's the big point.

03 06 44 48 CMP
That's why that earth-moon shot with a whole big expanse
of -- What have we got?

03 06 44 53 IMP
High gain. Okay. It's behind us and up. Let's try
OMNI B. Okay.

03 06 46 18 IMP
Okay. ... pitch down at 0000.

03 06 46 36 IMP
Rolling over; got to get it back down.

03 06 46 47 IMP
It'll get worse before it gets better.

03 06 46 52 CMP
Okay. Let's see, our first control point is at --

03 06 46 56 IMP
Okay, let's see how much time we got.

03 06 46 57 CMP
-- 78:46. We got all sorts of time. We got 25 minutes.
03 06 47 02 LMP 0.2 of a degree per second.
03 06 47 25 LMP You get - give me the word on the ORDEAL, here, Jim, and - let me know how we're doing. 60 60?
03 06 47 36 CMP Yes.
03 06 47 37 LMP Okay, that sounds good. How about giving me a -
03 06 47 40 CMP Oh, that's our orbit.
03 06 47 44 LMP Yes, how about giving me the high gain?
03 06 47 51 CMP CGC isn't aligned in roll; I've got to do that.
03 06 47 54 LMP Okay, stop your attitude there before you - stop your ...
03 06 47 58 CMP Okay, I'll wait until I get there then.
03 06 49 49 CMP What else does the flight plan say, Bill?
03 06 49 53 LMP I don't see any - There's a 16-millimeter camera, sextant bracket, C-EX, 1 - 1/500th of a second. You been having any at 1/500th of a second?
03 06 50 11 CMP Mine was at 250. They say 1/500th of a second, now?
03 06 50 13 LMP Yes.
03 06 50 16 LMP The other one's 1/250?
03 06 50 17 CMP Take a look, take a look.
03 06 50 20 LMP ... left and then 150th.
03 06 50 28 CMP Okay, 1/500th of a second.
03 06 50 30 LMP Okay. Start it at IP 1, time of closest approach.
03 06 50 33 CMP Okay.
03 06 50 34 IMP That'll be doing spacecraft exterior atmosphere, but, hell, we can't do anything with these windows.
03 06 50 45 CMP Shouldn't it be getting a little more picturesque?
03 06 50 48 LMP Yes, beginning REV 6. It doesn't seem like we've hardly been here that long, does it?
CONFIDENTIAL

93 06 51 47 49
It won't make any difference.

93 06 51 47 49
You know, it might seem odd, but it's really interesting and I think it's important, too. It's the best way.

93 06 51 55 76
In things, but I don't think it matters. They are the same anyway.

93 06 51 56 73
Yes, but you're the one who said we're really interested in learning about the Mayan culture.

93 06 51 56 73
Well, I'm pretty sure it's not really necessary.

93 06 51 56 73
Can't we just do it the way you want to?

93 06 51 56 73
Well, I don't think we can.

93 06 51 56 73
It's just that I think it's important for us to learn.

93 06 51 56 73
I don't know. I think it's better that we learn.

93 06 51 56 73
Go, why? The only thing we'll learn is how to wake up.

93 06 51 56 73
50 in the morning - that's over three hours.

93 06 51 56 73
Well, that's right, isn't it?

93 06 51 56 73
On, oh, you went to bed at midnight, right?

93 06 51 56 73
Okay, I'll set the alarm for 7 o'clock, but we'll just see what this week brings.

93 06 51 56 73
Yes, I can be up at 7 o'clock. Wow, thinking of the wheel in the brain, thinking of the time.

93 06 51 56 73
You're not going to be able to wake up, are you?

93 06 51 56 73
Yes.

93 06 51 56 73
Okay, I'll set the alarm.

93 06 51 56 73
Yes.
03 06 55 48 LMP Pardon me?
03 06 55 50 CDR ...
03 06 55 51 LMP No, I just put it to number 1 - number 1 ball align to GDC.
03 06 55 57 CDR ...
03 06 55 58 CMP Okay, is the COAS -
03 06 56 04 LMP Okay.
03 06 56 06 CMP Getting ready to get align with the number 2 ball?
03 06 56 08 LMP I'm going to align the GDC, right.
03 06 56 14 CMP Okay.
03 06 56 23 CMP ...
03 06 56 27 CMP Okay, now you want this one?
03 06 56 29 LMP Yes, now I'll need that.
03 06 56 33 CMP You got it, looking at you.
03 06 56 36 LMP Okay, that's -
03 06 56 39 CMP That's your pitch.
03 06 56 40 LMP What? Zero? Or 34?
03 06 56 44 CMP 34 degrees.
03 06 56 45 LMP That's good. Good.
03 06 57 17 LMP Coming up on REV 6.
03 06 57 19 CDR ...
03 06 57 21 LMP Yes, you just went down about 5 minutes ago.
03 06 57 23 CDR ...
03 06 57 24 LMP No. (Laughter)
03 06 57 26 CDR ...

CONFIDENTIAL
That's right. (Laughter)

Roger, Houston. We'll give it another try here.

What time is it there? About 2 o'clock?

Are you finished with the computer?

Yes, go ahead.

How are the systems, Bill?

Well, the last time I looked at them, they were pretty good, chief.

All the gages are looking at each other.

If you want to say anything about your tracking pass this time, I - Just let me know and we can go into HIGH bit rate.

Okay.

Okay, how about keeping your eye on these camera settings, too, on the next couple of passes?

You wanted to be 10 degrees, didn't you?

Yes.

Well, overshot, then.

Okay, the first one is 1/500th of a second.

Okay.

All those scientists are saying now, "Ohhh, if we only had a geologist onboard."

Okay, he couldn't see anything. I took that monoclar and tried to eyeball it out the window last time.

Yes?

Nothing but a big blur out there. He'd see enough to make it interesting, but not enough to do anything.
Okay, I'm going to go out of here.

4 minutes.

Okay, when's your first PCA - TCA?

79:10.

Huh?

79:10.

79:10?

Yes, sunrise, it says here.

I can't hear you.

Sunrise is 79:08.

Yes.

We're 3 minutes away; that's 9 degrees.

Oh, boy, I may see the sun; I'd better be careful too. Hey, there is - there's a - there's a glow, you can see the sun come around a little bit.

Is that right?

Yes, I can see the sun come up before it comes up.

Like zodiacal light, a little bit, maybe.

Rim brightening, they call it?

Yes.

Yes, you sure can.

Oh boy!

Can you describe it?

Yes, it's a real bright glow right in one spot, and it fans out all over the horizon. And I'm just trying to move my eye away, because the sun's going to peek over
here any second now, and it's getting brighter and brighter, and it's get — It's an even light.

Bright spot fans out over horizon?

Yes, yes, then it fans up into the air; it's an even light; then all of sudden, it — The sun is peeking out right now.

Whoool!

See it?

Gees, I got a start there. I saw that — some stuff come out of the optics or something; I thought it was a star whirling by.

Alright, now you want to roll to keep that trunnion — —

We wouldn't want — I didn't realize you were that quick. Okay, which way?

Okay, roll — roll left.

Roll left, okay.

I'm yawing — —

Watch her — watch her as she comes down.

I yawed a little left.

Okay.

How are we doing?

Okay.

Is it 10 degrees left?

Yes, right now. You got enough roll? What happened?

I went to MANUAL. I'll get it for you.

You alright? You got your camera on?

I'll put it on, just as soon as we get rid of the sun.
03 07 11 11 CMP ... turn it down now.
03 07 11 16 LMP Wait a minute, you - you want me to - you want me to try to avoid it?
03 07 11 19 CMP Yes, you can pitch down a little bit.
03 07 11 22 LMP Hey, wait a minute, are you - I'm roll - I may roll over 10 degrees.
03 07 11 29 LMP That you that's driving it?
03 07 11 31 CMP No, I'm not driving it now. Well, I'm driving it now, yes. That's enough. That's enough.
03 07 11 38 CMP Let me go back there and try this CMC again.
03 07 11 48 CMP Okay, let's try that one again.
03 07 11 53 LMP Pitch down?
03 07 12 03 LMP We're right smack on 10 degrees.
03 07 12 06 CMP Okay.
03 07 12 12 CMP You can pitch down a little more, if you want to.
03 07 12 14 LMP Okay.
03 07 12 55 CMP Okay, AUTO OPTICS is doing the whole thing for me. Now - get this camera going.
03 07 13 28 CMP AUTO is fairly close.
03 07 13 52 CMP Fantastic pictures here, Bill.
03 07 14 36 CMP Give you a MANUAL OPTICS.
03 07 16 01 CMP Oh my gosh!
03 07 16 02 LMP What?
03 07 16 03 CMP My AUTO OPTICS has put it right on.
03 07 16 05 LMP We going to make that angle, or not?
03 07 16 14 CMP I'm just letting it run here for a little bit before I try to brake it.
03 07 16 17 LMP It's getting kind of small.
03 07 16 19 CMP That's - that's okay. Don't bother using up gas. Okay.
03 07 16 23 LMP Alright. I already bothered, I'm sorry.
03 07 16 30 LMP I haven't loaded this camera, ...
03 07 17 18 CMP Ahhhhh!
03 07 17 19 LMP What? What happened?
03 07 17 24 CMP Oh, that's okay.
03 07 17 26 CMP It's chilly in here - -
03 07 17 28 LMP Don't - don't wake up Frank.
03 07 17 29 CMP Oh, okay. Okay.
03 07 17 37 CMP Yes. Sorry, Frank, I didn't mean to disturb you. Thought I pushed the wrong button.
03 07 18 13 CMP Okay, what's your attitude now?
03 07 18 17 LMP Seems to - oh, about 6 degrees.
03 07 18 18 CMP Above?
03 07 18 19 LMP Yes.
03 07 18 21 CMP Okay, just hold it right there.
03 07 18 56 CMP Okay, we've got another one coming up. Same procedure.
03 07 19 06 CMP This is - Now, where's that book?
03 07 19 14 CMP I've got ... book's over there.
03 07 20 43 LMP Should be coming up on Low right now.
03 07 21 13 CMP Okay, we're tracking the new one.
03 07 21 15 CDR ...
03 07 21 16 LMP Yes?
03 07 21 17 CDR ...
It's still going on, Frank.

Do we have the recorder on?

On LOW bit rate. Do you want to say something?

Yes, well.

You're quite welcome. Okay, why don't you stop it, and put it to HIGH bit rate, and put it forward again?

Okay.

(Whistling) Okay.

Tape recorder is where - RECORD, FORWARD --

Just put it - put it to STOP.

Which one is it, the center?

Yes.

No, no, no, no. Push this forward.

Forward?

Put it this way in the middle.

Yes.

-- several comments on --

Good and loud; they'll never be able to hear you there.

Several comments on landmark tracking. The last time I used AUTO OPTICS, putting in the coordinates, I found the first time in MANUAL OPTICS for CP 1. The G&N system did quite well. It tracked almost as good as I could track manually right on the target, and I tipped it over just at the last moment to take my five marks. There - appears to be very smooth tracking; no problem - with this particular system. I'm now in CP 2; I have it just below the horizon now, and it's tracking down from the horizon automatically.

Okay. Now, what do you want me to do?
The same deal in reverse.
Okay, I'll go to - STOP?
Yes.
Look at that! It is right on!
Are you using this map for anything, Jim?
Got the rate, Jim?
No, this is pretty good, though, I didn't - Maybe that could be the problem. Maybe I could ...
Oh, it's scheduled a little later in the day ...
What is that, Jim?
What was that? ...
Oh, that?
You hear that noise over there?
Yes.
Okay.
How long does this hand controller stay armed?
Hey, Jim.
This hand controller's armed.
This should be ... or ...?
Houston, Apollo 8.
Try them again.
Houston, Apollo 8.
Houston, this is Apollo 8. Over.
Did you see our landing site, Frank?
CONFIDENTIAL

Day 4

03 07 50 11 CDR
Ruh?

03 07 52 03 LMP
Houston, Apollo 8. Over.

03 07 52 54 CMP
Yes, sir. ... down there?

03 07 55 42 CMP
Houston, Apollo 8.

03 07 55 49 CMP
Roger. Houston, a few words on our optics tracking system. I used AUTO OPTICS for control points 1 and 2 on the backside, and they worked beautifully, tracked both targets for me. And I went to the control point 3 as designated in our orbital-control book to see the latitude and longitude that was given to me, and used AUTO OPTICS to track that particular coordinate with it, and it was very close to the actual tracking plot. I picked the mark there where I did a final marking and recorded latitude and longitude. I'm now about to come up on the landing site and using AUTO OPTICS in the coded input to see how that works.

03 07 59 33 CMP
Go ahead.

03 07 59 51 CMP
I ... on the P52 ...

03 08 01 05 LMP
Yes.

03 08 02 48 CMP
Well, you can almost ...

03 08 02 53 CMP
I'll do one thing until I get up there, but ... 'n

03 08 06 25 CMP
You want to take a look at this? ... it's something - I don't know what.

03 08 06 52 CMP
Just wonderful ... right on ...

03 08 07 56 CMP
Mike, Apollo 8.

03 08 08 03 CMP
Roger; I'm in AUTO OPTICS now on the landing site. It would just warm up old Jack Schmidt's heart. This AUTO OPTICS is tracking perfectly on the - target and the two IP's turned out beautifully. I have a beautiful view of it. The first IP's ... through the vertical now and the second one is coming up - it's just a grand view.

03 08 08 45 CMP
For Jack's information, the sun angles that we see now from the first IP, second IP, and the P 1 are just right, I think, for landing conditions. The shadows aren't
too deep for you to get confused, but the land is - has texture to it, and there are enough shadows to make everything stand out.

03 08 09 12 LMP  If Jack's listening, tell him that the optics may be doing alright, but the eyeballs are having a little trouble seeing through all this smear on the windows.

03 08 09 31 LMP  The windows have the same smear to - The rendezvous windows are okay, but they're so small and looking in the wrong direction so far.

03 08 09 41 LMP  I think the vertical stereo will be okay.

03 08 11 09 LMP  It certainly looks like we picked the more interesting part of the moon to land on. The backside looks like a sandpile my kids have been playing in for a long time. It's all beat up, no definition, just a lot of bumps and holes.

03 08 11 25 CDR  I'm looking at IIP 2 right now, Houston, and it's a great spot.

03 08 11 32 LMP  The area we're over right now gives some hint of possible volcanic, though I can't eyeball it at the moment to pin it down. There are some craters and buildups that just definitely suggest volcanic activity.

03 08 12 04 LMP  Yes, that backside doesn't look too good.

03 08 12 13 LMP  That was relatively speaking, of course.

03 08 12 29 CMP  Frank, we're just finishing up the ... here. ...

03 08 14 56 CMP  We've got to copy this ..., too.

03 08 16 55 LMP  ... Frank, the SPS is about ... hours ...

03 08 16 59 CDR  Okay.

03 08 17 06 CMP  Okay.

03 08 17 07 LMP  We got about 4 hours ... It's about 4-1/2 hours.

03 08 17 32 CMP  You know, ... the trash bag, we ought to get out that ... and look it over.

03 08 18 04 LMP  Same set.

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03 08 18 05 CMP Do you need that anymore, Bill?
03 08 18 07 LMP Lan - landing site, landing site. Yes.
03 08 18 13 CMP Do you need that anymore, Bill?
03 08 18 14 LMP Do I need what? No, I don't need anymore.
03 08 18 19 LMP You might as well sleep, or one of us might as well, because it doesn't - doesn't take two guys to do it, and you can't see anything else anyway. The other guy's just sitting around scratching his rear.
03 08 18 43 CMP Have they sent us updates, yet?
03 08 18 45 CDR No.
03 08 18 51 CMP Houston, Apollo 8.
03 08 18 57 CMP Go ahead, Houston.
03 08 19 03 CMP Roger. Get all - the figures?
03 08 19 07 LMP Roger.
03 08 19 08 CMP Okay.
03 08 19 09 LMP It's up to him.
03 08 19 13 CDR Have we lost contact with them?
03 08 29 08 SC I think there's pieces of a ...
03 08 29 10 SC I think I'll just hold onto this thing ...
03 08 39 24 LMP Go ahead, Houston.
03 08 39 30 LMP Roger; how far did you want us to dump that water?
03 08 39 42 LMP Roger; 25 percent.
03 08 39 43 CMP We ought to get that thing set up right now.
03 08 39 45 LMP Okay.
03 08 39 49 CMP Because I can be - we can be tracking while we're dumping, too.
Houston, Apollo 8.

Are you receiving our - our tracking data?

Okay, thank you.

Roger; will do. Now, isn't this ... in the flight plan, some place along the way, there?

Are you getting out, Frank? You getting out?

Wait a minute; pitch up. You ... you pitch down ...

Well, let me see now. That's the right connection; I think so. We got - Where is the filter, Bill?

I think they made a mistake here in the flight plan.

Oh, you have it on here, huh?

Do you have the water - This - URINE HEATER's been ON, right?

If you pitch down, yes -

Okay, we have the hose connected, so we want to go through the procedure.

Okay, WASTE STOWAGE VENT, VENT for 5 seconds.

You want to be --

... I'll show you; just a minute.

Yes, they're OPENED and CLOSED ... here. I'm in 4-A?
Okay, if it's reading 1, I could put WASTE - WASTE TANK's VENT for 5 seconds, huh?

Right, WASTE STOWAGE, VENT, yes, for 5 seconds.

Done.

BATTERY, VENT.

4-A?

Yes. Take her down?

CONFIDENTIAL
Take the BATTERY, VENT, down. It's not down; let it come down.

Well, it's getting real close to it.

Oh, there it goes. Okay, it's down.

It's down?

Okay, CLOSE them both.

Make sure your URINE HEATER's ON.

URINE HEAT's on A.

Okay. And - go ahead and dump the waste.

Okay, we take that over and put it on - where it says, "OPEN/CLOSE, WASTE TANK SERVICING."

Yes.

Put that to OPEN. Leave it go in there.

Okay, now we got to watch the waste tank.

Yes, I'm watching it.

You're watching it? Okay. You got WASTE TANK, ON, then?

Yes.

Okay.

I don't know, Frank.

It's still pretty good. Let's see here ...

Okay, we're dumping the waste tank now, Houston.

You want to get up here now?

Okay, just about even.

You want to get up on one of these seats? You want to get up here?

This is okay over here. Clear.
03 08 46 25 LMP  It'd be a good time to do it, because there's more - Jim's really the only one that's busy, and I can fix his.

03 08 46 45 LMP  Yes.

03 08 46 47 LMP  Yes, it - it'll take a good while.

03 08 46 53 LMP  It's up at 85 percent. Right now, it's 47.

03 08 46 59 CMP  How much film do we have left over, Bill?

03 08 47 02 LMP  Well, I'll tell you, Jim, these windows are so bad, you can just take pictures - say one - We need - we need - Don't get into that interior - interior's for inside stuff; and we need one - 16 millimeter for the convergent stereo, and - oh, about a half of one for that image-motion compensation which - kind of a low-priority thing.

03 08 47 33 CMP  Do you - do you want VERB 83? Did you look for - -

03 08 47 40 LMP  Yes, it's the ... isn't all that bad, but we could try - we are allowed to yaw. We could try VERB 83 for drill.

03 08 47 59 CMP  Okay, I'd better get out the books and - -

03 08 48 00 LMP  This one says 92; I'll crank it around a little bit.

03 08 49 09 CMP  Okay, how's our RCS doing?

03 08 49 11 LMP  Good.

03 08 49 12 CMP  Let's see if - -

03 08 49 14 LMP  Well, it hasn't changed since we started. See, it's still about - 67 percent.

03 08 49 28 LMP  SPS is holding steady.

03 08 49 32 LMP  Did you cycle through the EPS, Jim? ... - -

03 08 49 38 CMP  No, I haven't done that, yet. Okay, and don't forget - -

03 08 49 42 CDR  ...

03 08 49 43 LMP  Yes, well -

03 08 50 02 CMP  Okay, EPS. You're on BAT B charge, you know?
03 08 50 05 LMP Yes, just leave that there, don’t change that.

03 08 50 07 CMP Okay, it’s 39 ... now.

03 08 50 14 CMP Okay, I can cycle this one okay, right?

03 08 50 17 LMP Slip those around those cameras, Jim, and I’ll fix them while you’re shooting that landing site.

03 08 50 30 LMP Okay, we got - let’s see, we got 23 minutes until sunrise, so we’ve got a lot of time.

03 08 50 49 LMP I haven’t seen that water going down any at all.

03 08 50 52 CDR ...

03 08 50 55 CMP Well, ... steam pressure’s --

03 08 50 56 LMP It’s not going down any.

03 08 50 58 CDR Bill.

03 08 50 59 LMP Not going down.

03 08 51 00 CDR What?

03 08 51 01 LMP Not going down.

03 08 51 03 CMP Ask Houston if it’s -

03 08 51 04 LMP Okay, you want to - Let’s see here. Put the purge line - Take that wat - Shut the wa - Well, that off - put the water on, and - put that purge fitting on it.

03 08 51 16 CDR ...

03 08 51 19 LMP Oh!

03 08 51 20 CDR ...

03 08 51 22 CMP That’s one thing you forgot to tell us!

03 08 51 23 LMP (Laughter)

03 08 51 28 CMP Here it goes.

03 08 51 29 LMP Yes, I can see it; it’s dumping.
And we solved another mystery!

We have three problems and one's F. Borman.

... 

Yes, it's going down.

Go ahead, Houston.

Roger.

How much longer do you think we have to go on the battery charge there, Mike?

If you can wake up the EECOM, why don't you have him ask the back room?

(Laughter)

Yes, it is. Yes.

Okay, thank you very much.

... 

Huh?

... water?

60 - 70 - 75 percent, 75 percent.

Yes.

(Singing)

Well, did you guys ever think that one Christmas you'd be orbiting the moon?

I say, one Christmas Eve you'd be orbiting the moon?

Just hope we are not doing it on New Year's.

Hey, hey, don't talk like that, Bill; think positive.

... 

I said, just hope we don't do it on New Year's.
Okay, see you on the other side, Mike.
Me, too.
That was pretty spectacular: never to see the moon until just before braking into - into LOI.
That's kind of a nonchalant approach, you know that (laughter)? Remember Warren North's procedure of eyeball the moon, and whatever we had to do to -
Yes, ...
Would you turn my S-BAND VOLUME down to about 2, Mike - Jim?
The other way (laughter).
How's that?
Great!
You know that venting - that water put a good torque on us.
Well, I'm debating now, - I'm debating whether to use it again or not, Frank.
I can use it for the landing site, I guess, again.
Hey, we were tracking down there real nice. Soon as we started to vent, we went poof!
Is that right?
Yes.
You'd better have - It's a good thing we are venting now, and not on that 10th REV or something like that.
Did you sleep?
We're on the 7th - coming over here - Where are we? We're coming from here.
Yes, we're coming - Actually we are right down here. How's your - There's one I've got to get. Huh?

You all finished with 83, Bill?

Yes, I sure am.

I'll see if our orbit has changed any.

These optics are outstanding.

What?

The optics.

...  

Yes.

Okay, water quantity is 55 percent.

How much?

55.

5th REV.

7 and 8 are the last two that we got. You got TV right down here.

O₂ FLOW HIGH.

Huh?

O₂ high flow; it's from that venting, I guess.

That and - oh, the water - the accumulator just came on. The accumulator just came on.

...  

50 percent.

Are you in position, Bill?

Yes.

81:01, it's coming up on that time, now.
81:09, I got to get this stuff started.

This one calls for pitch down 5 degrees, Jim.

You want to do that, or are you just going to do that 10-degree thing?

No, you can - pitch at least on the horizon for this, because - otherwise, it's going to - This hasn't changed though, I don't think.

Well, it has in the flight plan, whether you - it's up to you, however you want it. Doesn't make any difference --

Huh?

-- I can't see anything out here anyway.

I just don't want to get the sun in my eyes.

You want me to pitch down to the horizon or past?

Yes, you can pitch down a little bit past the horizon.

Give me a moment here, then.

Okay, you want to hop in here, Frank?

Say, you want to get in here?

Okay.

Huh?

Oh, okay.

I can put this ... right there.

Is it?

Okay. That better?

It's about 35, huh, Frank?
03 09 04 11 LMP   Well, I still say 35.
03 09 04 20 LMP   Well, it does. You got to lead it a little bit, because it's - Any time now - It - it always drops a little bit more.
03 09 04 27 CDR   ...
03 09 04 28 LMP   Yes, it would be a good time.
03 09 04 30 LMP   Jim, you want to give him that vacuum vent?
03 09 04 41 LMP   Okay, stick the vacuum thing on there, and vent it for a while.
03 09 04 44 CMP   Here's the vacuum.
03 09 04 45 CDR   ...
03 09 04 46 CMP   What?
03 09 04 47 CDR   ...
03 09 04 49 CMP   Here you go.
03 09 05 22 CMP   We might get a possible program alarm.
03 09 06 15 CMP   What's your attitude, Bill?
03 09 06 17 LMP   I'm about 5 degrees pitch down and 5 degrees roll right.
03 09 06 30 SC    (Blowing nose)
03 09 07 09 CMP   Did you get through?
03 09 07 10 CMP   Okay ...
03 09 07 11 CDR   Okay, Jim.
03 09 07 13 CMP   Well, the sunlight suddenly came in there. It wasn't like the last time I saw it.
03 09 07 20 LMP   I'm pitched down quite a bit this time.
03 09 07 30 CMP   Okay. Keep tracking, Bill. She'll be ready.
03 09 07 38 CMP   I changed the IP, Frank. I thought this had a better symbol to it. I can remember this one better.

CONFIDENTIAL
03 09 07 49 LMP When did you start the first time?
03 09 07 52 CMP Let's see.
02 09 07 55 CDR ...
03 09 07 56 LMP Say again.
03 09 07 58 CMP How's the water doing?
03 09 08 02 CMP 81:09 is -
03 09 08 05 LMP Yes, I do.
03 09 08 06 CMP Yes, I have -
03 09 08 19 CMP We're still throwing away a lot of stuff on that.
03 09 08 56 CMP You want something to hold on to or what?
03 09 09 50 CMP Boy, you ought to see the lunar surface with this 28-power scope!
03 09 10 05 CMP This is fantastic!
03 09 10 13 LMP Can you see anything at all that looks like a volcano?
03 09 10 16 CMP No.
03 09 10 17 LMP Huh?
03 09 10 19 CMP This is utterly fantastic!
03 09 10 27 CMP You should get it when it's just rising - you get it with just the horizon still there; you've got to hurry, though. I've got to take a shot here shortly.
03 09 10 39 CMP She's tracking.
03 09 10 46 CMP I got it right there, big as the mark.
03 09 11 25 CMP Where - How far are you pitched down now, Bill?
03 09 11 27 LMP 10 degrees - 6 degrees.
03 09 11 32 LMP Too much?
I just wanted to know - Yes, 6 degrees is too much; although it's AUTO tracking, I can just barely see the edge. 6 degrees is too much pitchdown.

How's that?

That's it - Whatever you have right now is a good shot.

Okay.

Got 5 degrees.

Okay.

I'm tracking on this - on this telescope, and it's - the sextant, and it's much better.

Yes.

Almost.

You don't get -

You know, even at 60 miles though, it seems like it's still that far away.

There's still things coming off.

There's still stuff coming out.

Well, I wish I could say that we saw a volcano or something, but I'm afraid this is - just an amazing sight.

I haven't seen a thing - seen a thing that looked like a volcano all day long.

I haven't either.

I said I haven't seen a thing that looked like a volcano all day long.

Tsiolkovsky - Tsiolkovsky is the only one that has the distinct appearance to it -

Yes, the filling does.
Yes, please.

...  

Yes, I'll just kind of ease - just - Oh - okay, you coming over here, now?

Sure.

Have you dropped down in attitude?

What's your attitude in pitch, Bill?

I'm going to take a leak, now. I should have told you.

About 8 degrees.

Above?

Below.

Oh, below, yes. That's bad.

Should stay at least at the horizon, if you can.

Well, you liked what I had before; it's only about 2 degrees difference.

Well, when it's tracking far like this, see what the trunnion is? 46 degrees?

Well, maybe it does, maybe it's ...

Tell you what - Why don't I give you that other camera?

You've got color film; why don't you get a picture of the earth as it comes up next time?

(Laughter) Well, that was real good. Okay, you ready?

Have you pitched up at all?

Yes, we're pitching up. Just having a changing of the watch, here.

I'll get that, Frank. Go ahead.

In the back - It's toward me - it's right there. ... lower.
Boy, here's another amazing sight! Watching AUTO tracking with the orange background.

Man, that's an amazing sight!

The landmark line of sight is going by; it's so bright, it's orange! And the star line of sight is white.

Hey, let me swap you cameras there.

It floated off the wall.

Camera.

Here you go.

Bill?

Yes.

Alright.

Still try to get a series, Frank, if you have a - ... you using 70 millimeter?

Yes.

Huh?

Yes, yes, go ahead; I'm just - just waiting for the solution to come up.

I've been using the sextant to mark -

Boy, this tracking is - Yes, it is fairly easy.

You boiling?

Huh?

Do we have LOW bit going? Maybe we ought to discuss what we're seeing here. You have some sort of tape recorder going so that we can discuss what we're seeing?
03 09 32 50 CMP Yes, just something that I could talk for some time without ---

03 09 32 54 CDR Go ahead and ...

03 09 32 55 CMP Okay, anytime.

03 09 33 09 CMP The last two control points I've been tracking with the sextant which gives me much finer control to track the landmark with. I've been using the same landmarks as before. And the sextant magnifies the landmark, and it's very easy to maintain the sextant on the landmark.

03 09 33 29 CMP RESOLVED to MEDIUM were the control modes.

03 09 33 37 CMP On the second control point, the crater which I take, which is in the middle of Gemini, is very easy to see one side has collapsed, the side to the left. And you can see rocks and debris tumbling down. On many of the craters that go by, especially near the one on control point 1, I can see where hard rock had stayed in place around the rim of the crater as the rest of the debris had folded over into a mound down into that crater floor.

03 09 34 56 CMP I'm coming up on the crater - as a matter of fact, the Crater Slayton right now. We're going directly over it.

03 09 35 11 CMP And just beyond that one is the Crater Carr.

03 09 35 22 CMP The newer craters that surround the older ones have sharper ridges - and the - They're more roundly formed like - like cones, funnels, and along the insides are a brighter material than the other craters. And they also don't have the step functions that the bigger craters have. There's one - there's two bright craters just to the west of Slayton that have this particular characteristic.

03 09 37 55 CMP In the vicinity of the Crater Carr, it's very difficult to see the ground now; it's very bright, a uniform brightness, and the craters seem to dim out somewhat.

03 09 38 08 CMP You can still make some of the rilles and hills of the smaller craters and the white material of the newly formed ones, but - it's much more a hazy appearance than craters on either side. That must be near the sub-solar point.
Okay. You can stop it now, if you want to.
Okay.
You got a program alarm, Bill.
What did I do wrong?
Oh, counted 15 seconds from zero.
Yes.
Well, you got a RESTART that time.
Oh, shit!
Don’t worry.

(Singing)
VERB 34, huh? Well, you gave me bum dope. Well, I’ll be doggoned!
..., I guess.
It’s not mine.
34, ENTER.
Oh, brother! Look at that!
What was it?
Guess.
Tsiolkovsky?
No, it's the earth coming up.
Oh.
Augh! Quit rocking the boat!
What did you get, another program alarm?
Yes, 1620.
VERB - VERB 37, not permitted.
03 09 43 54 LMF Fine. Okay, Jim, well, it's your time to take a rest.
03 09 43 57 CMP (Laughter)
03 09 44 00 CDR ... reach those two program alarms and the RESTART. And it is your time to take a rest.
03 09 44 04 CMP Okay, just a minute. Let me - VERB 37 - VERB 37, ENTER; 00. Okay, we got one more coming up here.
03 09 44 18 CMP 81:43.
03 09 44 30 CMP VERB -
03 09 44 34 CDR Are you getting MSFN?
03 09 44 44 CMP Huh!
03 09 44 45 CDR Houston, Apollo 8.
03 09 44 50 CC Roger, Frank, good morning. You're loud and clear; how me?
03 09 44 53 CDR Loud and clear.
03 09 44 54 CMP Proceed. VERB 22, ENTER.
03 09 45 00 CC Welcome back.
03 09 45 02 CDR Thank you.
03 09 45 06 CMP ENTER; proceed; VERB 25, ENTER.
03 09 45 21 CMP Minus 89, then plus 48631, ENTER; minus 00253, ENTER; proceed.
03 09 45 54 CDR How's the SPS doing? ...
03 09 46 05 CMP VERB -
03 09 46 16 LMF What do you want, the gun? I'll hand it to you.
03 09 46 32 CMP Yes, would you, please?
03 09 46 39 CDR Where's the update book? Does anybody know?
03 09 46 44 LMF I've been looking for it.
03 09 46 46 CMP
Yes, I got it here in my hand.

03 09 46 53 CC
Apollo 8, Houston.

03 09 46 56 CDR
Go ahead, Houston.

03 09 47 00 CC
Roger; we have a request that Jim space his marks, his five marks out a bit more slowly. If possible, we'd like to get a couple of them past the zenith. We're getting five of them with rather rapid spacing and from the geometry viewpoint, it would be better if you would slow them down a little bit and lengthen them out so as to include a couple of them past the zenith. Over.

03 09 47 27 CDR
Roger; we understand.

03 09 47 36 CMP
Houston, Apollo 8. That last set of marks are invalid, so disregard what came through the last time.

03 09 47 48 CC
Roger; understand the last set of marks are invalid. Over.

03 09 47 52 CMP
Roger, if you'd correlate with - The set I'm about to take is the last set.

03 09 48 04 CC
We've got an awful lot of background noise, Jim. Could you say again, please?

03 09 48 10 CMP
Roger; I'm coming up on control point 3; I tried to take another control point in between 2 and 3, but didn't do it, so I just - to get out of the program, I just marked and got out of the program.

03 09 48 25 CC
Roger; understand you are coming up on 3.

03 09 49 49 CMP
If I got a program alarm, disregard it - it's because I took too many marks.

03 09 51 25 CDR
Huh?

03 09 51 28 CMP
...

03 09 51 35 CDR
What?

03 09 51 40 CDH
This time, it did though, huh?

03 09 52 03 CC
Apollo 8, Houston.

03 09 52 05 CDR
Go ahead, Houston; Apollo 8.
Roger; on Jim's marks, we'd like to get spacing of approximately 30 - 30 seconds between each mark. The last ones we are copying roughly 15 seconds between marks, and we would like to stretch it out even further if that is okay with you.

Okay, tell him ...

Alright.

I'll stretch her out all the way.

You got the hot water on? I can pour some hot water while I'm waiting.

Yes. Here's one for you.

Okay.

Okay, just stand by 1.

Here's one.

Thank you.

I got it.

Thank you.

Let me know if anybody else wants some.

Here it comes, Bill.

...

What's that noise?

What is that noise?

Huh?

Oh.

What was it?

Had his leg against the hose.

There you go.
03 09 59 23  CDR  ... book?
03 09 59 24  CDR  I just gave it to you.
03 09 59 27  CMP  Check Bill's.
03 10 01 16  CDR  The program alarm just blinked.
03 10 01 18  CMP  That's okay. It's below the earth.
03 10 01 45  CMP  It won't drive now until it - If it's below 50.
03 10 01 53  CDR  Until what?
03 10 01 54  CMP  Until that trunnion gets up.
03 10 02 17  CMP  Houston, Apollo 8.
03 10 02 23  CC  Apollo 8, Houston. Over.
03 10 02 25  CMP  Roger, Mike. I find that tracking is much easier using
                  the sextant than the scanning telescope; you have finer
                  control and at these orbital speeds RESOLVED to MEDIUM
                  seemed to be the best combination.
03 10 03 05  CC  Apollo 8, Houston. Do you read?
03 10 03 08  CMP  Roger. Did you copy?
03 10 03 13  CC  Roger; I copy that it's - Tracking is easier using
                  the sextant than the scanning telescope; it gives you finer
                  control, and say again after that. Over.
03 10 03 24  CMP  And the combination of RESOLVED and MEDIUM is perhaps
                  the best combination - the combination of - our speed
                  LOW is too low. You can't catch up with the target.
03 10 03 41  CC  Roger; understand that the best combination is
                  RESOLVED and MEDIUM. LOW is just too low.
03 10 03 48  CMP  Roger.
03 10 03 51  CMP  You can't keep up with the landing site, I should say.
03 10 03 56  CMP  There goes the trunnion now, see, Bill - Frank?
03 10 04 00  CDR  Yes.
It's tracking us beneath the earth.

How do you all feel?

Fine. Why?

I was just curious.

You tired?

Oh, I'm a little tired. I guess we all are.

You're going to be busy right afterwards. Those last two REV's.

I've got a sleep period coming up here, though, I think. Don't I?

Yes, right - right after this.

Let that computer rest.

What do we have on our TV debut?

I got that ...

... You mean on the left there?

Well, it's always here; I haven't started tracking yet.

Do you see it coming up already?

On the left; I'm not sure if that's it or not, though, but it's a triangular-shaped mound.

Oh, here we go, right now.

This isn't computing the right thing, here.

What's your attitude, Frank?

I'm down some. You want me to pitch up?

Yes.

Huh?
03 10 07 50 CMP Yes, it's down now.
03 10 09 06 LMP Got it.
03 10 09 12 CDR What are you doing, Jim?
03 10 09 14 CMP Tracking.
03 10 09 25 CMP I could easily see a LM on here.
03 10 10 10 CMP What's my trunnion and shaft?
03 10 10 13 CDR 20 and four- 15; 203 and 16, 17, 18 - -
03 10 10 18 CMP Okay.
03 10 12 21 CMP I'm through with the landing site right now. Don't touch the computer, though.
03 10 13 10 CDR Let me see - Have you got the update book, Bill?
03 10 13 21 CMP No, I gave it back to you if I recall. Did you look down in here?
03 10 13 28 CDR Huh?
03 10 13 29 CMP I did, I gave it back, because I don't think that -
03 10 13 32 CMP Houston, Apollo 8.
03 10 13 34 CDR I got it.
03 10 13 37 CC Apollo 8, Houston. Over.
03 10 13 39 CMP Roger; I'm not too sure what happened that time, Mike. I was marking on the landing site using the code, and I kept getting a large trunnion for AUTO OPTICS, and I could see that the target - the landing site was coming up, so I just went manually and marked, and yet the - the latitude and longitude was - were quite different from the nominal.
03 10 14 15 CC Roger; we copy that, Jim.
03 10 14 37 CDR Get rolled over here, Jim. Then, you can do a P52.
03 10 14 41 CMP Okay.
03 10 15 37 CDR You might as well start shooting some of this film, Bill, because we're not going to do this converse and stereo because we've got that high TV. And then we're going to get ready for TEI and knock everything else off.

03 10 15 54 CMP Bill, you want to take care of this 16-millimeter camera?

03 10 16 02 LMP What?

03 10 16 11 LMP I need a lens ...

03 10 16 49 CDR We should be able to get them on – on high gain here in a minute, Bill.

03 10 17 24 CDR Go ahead, Houston; Apollo 8.

03 10 17 28 CC Roger; we're checking into Jim's remarks on P22; and in the meantime, I have your maneuver pads and map updates at your convenience. Over.

03 10 17 39 CDR Roger.

03 10 17 42 CDR If we're going to get settled here, you want to do a P52, Jim?

03 10 17 46 CMP Yes, whenever you get settled down.

03 10 17 50 CDR How about right now?

03 10 17 54 CMP Okay. Proceed ... that inertial, and I'll have it in a jiffy.

03 10 18 01 CMP One more REV of this stuff and we're finished. No more experimentation.

03 10 18 11 CDR Go ahead with your data, Mike.

03 10 18 15 CC Okay, and before that, we'd like to take the DSE away from you, please, for a while.

03 10 18 22 CDR Alright? Is that all right, Bill?

03 10 18 26 CDR It's all yours.

03 10 18 30 CC Thank you, and we'd like you to go to FEO and ACCEPT – -

03 10 40 54 LMP Go ahead with ... I'll get ...
03 10 40 57 CDR Are you - are you comfortable?
03 10 40 59 LMP Why?
03 10 41 00 CDR I mean, do you want to sleep?
03 10 41 01 LMP No, I was just asking.
03 10 41 03 CMP ...
03 10 41 06 LMP Come again.
03 10 41 07 CDR I - I ...
03 10 41 11 LMP Go on.
03 10 41 12 CDR No, no. They've - they've got - Jesus Christ, they've got plenty of data. You can tell them almost anything ... everybody - -
03 10 41 16 CMP Okay ...
03 10 41 18 CDR On, I did, you're too tired; you need some sleep, and I want everybody sharp for TEI; that's just like a retro.
03 10 41 24 LMP Why don't - Hey, Frank, how about on this next pass you just point it down to the ground and turn the goddamn cameras on; let them run automatically.
03 10 41 30 CDR Yes, we can do that.
03 10 41 32 LMP Okay.
03 10 41 37 CDR Shit, I just burned this film up.
03 10 41 39 CC Apollo 8, Houston.
03 10 41 41 CDR Go ahead.
03 10 41 44 CC This REV coming up we'd like to clarify whether you intend to scrub control points 1, 2, and 3 only, and do the pseudo landing site or whether you also intend to scrub the pseudo landing site marks. Over.
03 10 41 58 CDR We're scrubbing everything; we'll - I'll stay up and point - Keep the spacecraft vertical, and take some automatic pictures; but I want Jim and Bill to get some rest.
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Roger. Understand.

Unbelievable - the detail these guys study up. A very good try, but just completely unrealistic, stuff like that. I should have --

I'm willing to try it.

I should have warned you. No. You try it, and then we'll make another mistake, like entering instead of proceeding or screwing up somewhere like I did.

... try again?

No, they said they don't want to.

No, no, they said okay.

Yes, really.

What - what would you like me to do?

Go to bed! When we come over it, we'll get that thing going when we get to daylight, and then you guys go sack out for 2 hours.

Shall we - shall we do that detailed thing there, that really --

No.

Okay.

Say, give me that lens back there, will you?

Which one, Bill, this one?

No, the 80.

Camera, you mean?
03 10 44 03  LMP  Yes.
03 10 44 09  SC      (Whistling)
03 10 44 10  CDR    You haven't been in there since we've been in lunar orbit yet, have you?
03 10 44 13  LMP    In where?
03 10 44 14  CDR    Down below. Why don't you - why don't you - go local horizontal, sometime before you turn - We haven't shot a single high-speed picture yet, that's any good; just let me just turn the goddamn thing on prior to - -
03 10 44 30  LMP    Alright.
03 10 44 31  CDR    - - prior to ...
03 10 45 00  LMP    This is the tail end ... this time.
03 10 45 02  CDR    Huh? Are we losing it?
03 10 45 03  LMP    No, I don't want to go to local horizontal yet.
03 10 45 05  CDR    ...
03 10 45 09  CDR    Oh, no, just go to sleep, Jim.
03 10 46 17  LMP    I know how I felt, and I know how you guys do.
03 10 46 30  CDR    Hey, I can see the moon out here ...
03 10 46 32  LMP    Is that earth's turn on here, or what?
03 10 46 33  CDR    Yes, that's what - -
03 10 46 34  LMP    Huh?
03 10 46 36  CDR    I - I - Yes, that's why I want to get the pictures over here.
03 10 47 31  LMP    Okay.
03 10 47 32  CDR    You want to put it on O/SII?
03 10 47 32  CDR    Okay, give me the roll left - Which way are you going to go?
Well, let's see. I can roll to the right, and that'll keep us good, won't it?

Yes.

The only window that's any good - are these rendezvous - You kind of pitch it down, and you get some -

Okay, which way are you headed? Oh, you're going to roll, going to roll -

We're going to roll to the right, so we can get that high gain up. Right window...

Alright, I keep expecting to be seeing the moon.

Yes.

Right.

Well, you're going to have to just yaw towards me a little bit.

...

Would you hit those lights down there with your foot, Fran?

Hell, we're going away from it, huh?

Huh?

We're going away from it, huh?

Oh, yes.

Yes, sure is.

I'm pitching down, but we're going that way.

Are we? We're going this way?

Yes, we're going that way.

Oh, okay.

You know, it kind of gets you down.

I thought we were going - we're going towards the earth.
Why don't you snap a few? Can you see it still in your rendezvous window?

See what? The earth?

No, the - ground.

Oh, I see, yes.

That enough?

Yes. What happened?

Snap that thing on or we end up doing another automatic one.

Apollo 8, Houston; 4 minutes to LOS. You have control of the DSE now, and all your systems are looking good.

Thank you very much, Mike.

You bet.

Lovell's snoring already.

Yes, we can hear him down here.

You going to point at the horizon, Frank?

I pointed it straight down, I thought.

Like when we get ready to go inertial, we get a shot of the horizon as it comes up.

Well, I'm already straight down pointing ... Thought you might ... one of these ... 

No, I did back there.

Apollo 8, Houston.

Go ahead.

We have 1 minute to LOS, Frank. You can terminate stirring up your cryos anytime, and we agree with all your flight plan changes. And have a beautiful backsise; we'll see you the next time around.
Thank you. I'll get those, Bill.

Have you - have you done any of the cryos?

Huh?

Is that thing running now?

Is that thing running already?

Huh? Did you put it on OFF?

Here you go.

We're doing fine; why don't you go to bed? I'll - just tell me what the click - just turn that thing? Look! This thing here? Right over your head?

No, I want you to go to bed. Come on now. You've been up all the time; it's in the flight plan. God damn it, go to bed! To hell with the other stuff! We'll bust our ass for it.

Do I just turn that when the time comes? What do I have to do to start it?

... eighth; it's going to start with me.

... stay 1 more minute.

I know it. Get going! I think this is a closed issue. Get to bed!

I don't care; get to bed!

No, you get to bed; get your ass to bed. You quit wasting one - one - I - I - I - I don't want to talk about it.

Shut up; go to sleep, both of you guys.

I'll just click it on when the time comes.

You should see your eyes; get to bed!

Don't worry about the exposure business, God damn it, Anders; get to bed! Right now! Come on!
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03 11 05 05 CDR
I don't want ... Alright. You want me to take some pictures? Get some sleep now. You've only got a couple hours, Bill, before we're going to have to be fresh again.

03 11 05 20 CDR
Yes. Okay. I'll take care of it all. Alright. I just got up, remember? I slept for 4 hours.

03 11 05 34 CDR
No, I didn't.

03 11 05 40 CMP
...

03 11 05 52 CDR
Yes. Go to sleep.

03 11 05 59 CDR
Houston already came back and said, "Fine."

03 11 06 45 CDR
A quick snooze, and you guys will feel a hell of a lot better tomorrow.

03 11 06 46 CDR
Well, you're tired; it's not cold.

03 11 42 15 CDR
Houston, Apollo 8.

03 11 42 20 CC
Apollo 8, loud and clear.

03 11 42 22 CDR
Roger.

03 11 43 22 CDR
Fine, I'm fine.

03 11 46 47 CDR
Go ahead, Houston; Apollo 8.

03 11 53 50 CC
Roger, Apollo 8. A couple of notes for you. On the P52 that you're coming up to on this REV, we've looked at your state vectors and all your information. The platform looks good, and it appears that it is your option if you would like to bypass this P52; your platform will still be good at the following TEI pass. And we'd like to have your PRD reading, and I guess we are behind the sleep summary. Over.

03 11 54 27 CDR
Okay. Well, Jim and Bill are both resting now, and I rested for about 3 hours or 4 hours during the period earlier today.
03 11 54 40 CC  Roger. Copy.
03 11 54 45 CDR  And this PRD now reads 144.
03 11 54 51 CC  PRD, 144. We have an update ready to go into your computer for the state vector if you want to go to POO and ACCEPT.
03 11 55 05 CDR  POO and ACCEPT.
03 11 59 51 CDR  Now we are standing by to copy this TEI 9 pad.
03 12 00 15 CC  Okay, Apollo 8. We have completed with the computer.
03 12 00 25 CDR  You can use VERB 47 to transfer, and I have the TEI 9 pad.
03 12 01 06 CDR  That's Ken, isn't it? Just a minute and I'll take those.
03 12 01 12 CC  Okay. I went to POO and then VERB 47, and I'm ready to copy.
03 12 01 16 CDR  Okay, do you have it in BLOCK?
03 12 01 20 CC  Say again. It's in BLOCK; Roger.
03 12 01 22 CDR  I say, do you have UP TELEMETRY in BLOCK?
03 12 01 27 CC  Roger.
03 12 05 51 CDR  Okay. This pad is a TEI 9, SPS G&N: 45597, minus 040, plus 157, 087:19:1820, plus 34188, minus 01353, plus 00780, 180, 008, 001, November Alfa, plus 00187, 34223, 313, 34021, 42, 0898, 253, 033, down 131, left 28, plus 0758, minus 16500, 12987, 36277, 14648, 16; primary star, Sirius; secondary, Rigel; 129, 155, 010, four quads, 15-second ullage, horizon on 1.2-degree window line at T minus 3; use high-speed procedure with minus Mike Alfa. After looking at the burn information from your previous SPS burns, it appears that the engine performance should give us a 3-second burn time, longer than what you have on the pad. The pad number should correspond with what you got out of the computer. So we have not factored this into the past data; however, you can anticipate the engine for a normal DELTA-V to give you a 3-second - 3.7-second burn in excess of the computed times. Over.
03 12 06 00 CDR  Roger. Thank you.
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plus 00187, 34223, 313, 34021, 42, 0893, 253, 033, down 131, left 28, plus 0758, minus 16500, 12987, plus 36277, 14648, 16; and that's Sirius and Rigel, 129, 155, 010, four-jet, 15 seconds, 1.2 the gaze on the window at T minus 3, high-speed, minus MA, engines 3.7 seconds longer than given.

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

03 12 07 23 CDR Roger.

03 12 08 04 CDR Okay, you should have it on the high gain now, Houston.

03 12 08 11 CC Roger. Why don't you go ahead and dump the tape?

03 12 08 20 CDR Roger.

03 12 24 35 CC Apollo 8, Houston. The tape recorder is back to you.

03 12 24 42 CDR Thank you.

03 12 25 20 CMP Hey, Bill, ... aspirin.

03 12 25 24 CDR You got a headache?

03 12 25 28 CDR Hey, you don't have to tell them about aspirin. I told Berry ...; just the other two.

03 12 25 39 CDR Yes, you ought to be good and tired, too.

03 12 26 28 CDR There's a magazine floating around. Can you grab that please, Jim?

03 12 26 47 CDR Huh? It's for you to sleep.

03 12 26 51 CDR Hey, this little radiometer that I got is up to 124 now. What's yours reading?

03 12 26 55 CC Apollo 8, Houston.

03 12 26 58 CDR Go ahead.

03 12 27 02 CC We have looked at all your systems and all your trajectory information, and you have a GO for another REV.

03 12 27 12 CDR Oh, thank you.
Houston, Apollo 8. How do you read?
I'm reading you weak, but clear, Frank.
How about this antenna? Is that any better?
It is a little louder.
Okay.
(Whistling)
... align ...?
We didn't have to do one, Jim. No, they said that they'd checked it, and it looked real good, and they'd let you sleep.
Hey, Ken, how'd you pull a duty on Satur - on Christmas Eve? You know, it happens to bachelors every time, doesn't it?
I wouldn't be anywhere else tonight.
Ha, ha.
Ken, how's the MSFN tracking of this lunar orbit coming out?
Okay, Frank. It's looking like it's coming right down the pike. It's doing just what it's supposed to, and apparently all our computer programs have got the right numbers in them because they're predicting where you're going.
Are they covering any of these anomalies due to hard spots?
They're detectable, but they're not changing things enough to be anything more than of interest.
Well, I hope they're as good with the corridor as they were with that LOI. That was beautiful.
It sure was. That's - that is textbook all the way.
Apollo 8, Houston.
Go ahead.
03 12 27 14 CDR  Do what?  Yes.
03 12 27 41 CDR  Understand we're GO for REV 9?
03 12 27 48 CC  Affirmative.
03 12 27 52 CDR  I feel - I - Listen, I'll be the first to tell you I had enough sense; I went down and crapped out before.
03 12 29 01 CDR  How is the weather down there, Ken?
03 12 29 06 CC  Entirely beautiful; loud and clear and just right in temperature.
03 12 29 11 CDR  How about in the recovery area?
03 12 29 15 CC  That's looking real good.
03 12 29 17 CDR  Very good.
03 12 29 25 CC  Yes, they told us that there's a beautiful moon out there.
03 12 29 30 CDR  Yes, I was just saying there's a beautiful earth out there.
03 12 29 36 CC  It depends on your point of view.
03 12 29 38 CDR  Yes.
03 12 29 55 CDR  Almost - -
03 12 29 56 CC  If you're looking for something to do up there, Frank, you might get that BIOMED switch over to the left position.
03 12 30 01 CDR  Okay.
03 12 30 40 CDR  Are you ready?
03 12 30 45 CDR  5, 4, 3 - Say again.
03 12 30 52 CDR  Ken, are you re - -
03 12 30 53 CC  All set.
03 12 30 54 CDR  5, 4, 3, 2, 1 -
03 12 30 58 CDR  MARK.
03 12 33 57 CDR  How do you read me on OMNI A, Ken?
Okay, we're about - inside 10 minutes to LOS; we'll be picking you up again at 85:40. And we'll have all of the TV types' information standing by. In the event that the situation develops again, for pointing accuracy, if I see anything that looks like the terminator or anything of that nature, I'm going to call the dark side of it 12 o'clock, and use that as a reference system, and we'll try that. If that doesn't dope out any problems with camera pointing, why, I may try - call for a plus pitch, and then I'll just correct what I see to account for it.

Roger. We're not going to use that telephoto lens. But I don't believe we'll get - be able to get a picture of the earth. It's going to have to be the - the terminator and the - the lunar surface. I'm looking at the earth right now; we won't see it again during that period.

Okay. Real fine, then. And next time around, why - We'll take an extra special look at all the parameters. We'll have our TEI pad for you, and we'll use the last REV for a real good hack on all systems. I'll give you a rundown by system of all things we see and where they stand.

Okay, fine.

Apollo 8, Houston. We're approaching 4 minutes to LOS; all systems are GO.

Roger. Thank you.

You sick, Jim?

Yes. Fine.

I'll call you all in about 15 minutes for that TV show.

You sick?

We might as well go ahead. We might as well go ahead. Yes, we've got about 15 minutes to get set up.

Huh? Well, we've got to get the TV out now. I don't think we ought to screw around with this.

Huh?

... TV?
03 13 14 37 CDR  Well, let's talk about that; that's what I wanted.
03 13 14 40 CDR  Why don't we do this? Why don't you hold it out the
                window, like you did, and each one of us talk --
03 13 14 47 LMP    ...
03 13 14 48 CDR  Well, they want to hang onto the terminator, but we'll
                go out, and then you talk about what you saw, and Jim
                will talk about what he saw, and I'll say a couple of
                words. And then we'll say something about how this kind
                of reminds you of how it might have started, and then
                you read the first four of those, and Jim reads the next
                four, and I'll read the last two, and we'll say good night.
03 13 15 08 CMP    ...
03 13 15 11 CDR  No, just this one. I don't want to complicate it any
                more than that, because we got the high gain antenna
                problem and everything.
03 13 15 20 CMP  Why don't we ...?
03 13 15 22 CDR  Hey, wait. We've got to do it up right because there
                will be more people listening to this than ever listened
                to any other single person in history.
03 13 15 39 CMP    ... first four ...
03 13 15 41 CDR  Let Bill say the first four, and you say the next four,
                and I'll say the last two. There's no more.
03 13 16 03 CDR  Just put it away; don't you have time to?
03 13 16 08 CDR  Alright.
03 13 16 20 CDR  No, I don't know where the tape is.
03 13 16 23 CDR  Buh? What'd you say, Bill?
03 13 16 38 CDR  Okay?
03 13 17 03 CDR  Then as soon as we go through this, we go into a GI
                party. Everything gets put up, and we'll concentrate
                on TEI. Okay?
03 13 17 17 CMP    ...

CONFIDENTIAL
We've got a lot of time.

Store all the cameras, store everything, because this burn will be a bang. How much do you need? What rate?

... 

Huh?

I can't hear you.

No. Yes, I got it completed.

That long? Here.

Why don't we each talk about one thing that impressed us most out of what we saw and describe it? Okay?

How much do you have? The same?

How ... a change?

We ought to make it perfectly.

Yes, they wanted it to drag on a little bit longer, but we'll cut it off when we feel like it. Okay?

... 

Yes, then we could take all the lunar stuff and put it somewhere; you know, all the maps and things --

Yes, I got ...

-- and we'll put it all in one place and get the whole - Put all the cameras away and get the whole damn thing in shipshape.

Because no. she's going to take us home!

Huh?

Let's only have the stuff out we're going to need to operate with for the burn. Here's some stuff stuck up here. There's cameras floating all over the place. Jim, fix me one of those.
Alright. Here comes a couple of magazines - I don't know what -

What are these?

That doesn't ... - You better put all the camera equipment away in one place.

Here we go.

This one? Huh?

No, put everything away.

Got this big 16-millimeter camera and the camera cord.

Huh?

It's about 10 minutes.

You want to tape that?

Huh?

Where do these brackets go?

Alright.

Man, I wonder how -

Huh? I wonder how in the hell it goes in here. Who took it out?

You sure this one came out of here, too, Bill?

Jim, where did you get this camera bracket out of?

They did?

Who's cutting - Somebody's closing off one of those inlets somewhere.

Is that toothpaste thing of yours going over that one, Bill?
<table>
<thead>
<tr>
<th>Time</th>
<th>CDR</th>
<th>CMP</th>
<th>LMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>03 13 26 09</td>
<td>This one - this compressor started lugging down.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 13 26 15</td>
<td>What?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 13 26 16</td>
<td>I said the compressor started lugging down.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 13 27 16</td>
<td>Get all this junk off here, all the old P30's. There's that monocular, too. Where did it go?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 13 27 53</td>
<td>Huh? Where does that go?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 13 28 17</td>
<td>There's a ...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 13 28 19</td>
<td>No, put them all away.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 13 28 51</td>
<td>I got that one; do you want to put them on?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 13 29 03</td>
<td>...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 13 29 27</td>
<td>I don't know - How - how does this store, Bill? Together or separately?</td>
<td></td>
<td></td>
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<tr>
<td>03 13 29 30</td>
<td>Take ...</td>
<td></td>
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<tr>
<td>03 13 29 40</td>
<td>I guess that 150 - 250 millimeter comes off, and this one goes on.</td>
<td></td>
<td></td>
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<tr>
<td>03 13 30 05</td>
<td>Now, we'll open the ...</td>
<td></td>
<td></td>
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<tr>
<td>03 13 30 07</td>
<td>That goes on that other camera.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 13 30 12</td>
<td>...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 13 30 14</td>
<td>Okay.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 13 30 17</td>
<td>Let's take that clip off that wire there, too, shall we? I don't like that.</td>
<td></td>
<td></td>
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<tr>
<td>03 13 31 54</td>
<td>(Coughing)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 13 32 10</td>
<td>...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 13 32 13</td>
<td>Flight plan.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 13 32 17</td>
<td>That's it.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 13 32 19</td>
<td>R3 is open. I got the tape right here.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Huh?

Bill, can we get through this place?  Oops.

Did you stow the sextant bracket?

Bill?  Want me to hold it?  There it is.

After this ..., I'll store the ORDEAL, too.

That should be -

... send down the update ...

Huh?

Yes.

May I see that blurb - that ... thing?

The what, Bill?

The thing we're supposed to read?

Oh yes, what time is it?  85 something?

85:35.

And then ... complicated.

There you go.  Why don't you get a map, Jim, so we can tell the folks what you're looking at?

Which one do you want - What do you want me to read?

The first four.

Okay.

Okay?

What time is AOS?

I don't know.  It should be any time now.

I can't see it.  There's so much light on here.

It's minus 63 degrees pitch, 350 degrees yaw.
I'm not getting anything. What are you going to try to - What window are you going to do it out of?

Huh?

What are you going to do it out of? This side window here, the terminator, or what?

I can't hear you.

What window are you going to do it out of?

Well, wherever we can get the high gain on. I'll point - -

We're pointed straight up in the air, now.

No, we're not. We're just about horizontal.

Oh. My visual is off.

(Singing)

(Singing)

Probably be best out that rendezvous window there.

Yes. If you'd yaw about 30 degrees this way, you could probably pick the earth coming up over the hill.

To the right?

Yes.

Alright.

Where abouts are we?

Somewhere over the moon.

Here, we'll take it out that window over there - -

We'll have to yaw to the left, wouldn't I?

No, you'll have to yaw to the right, and - to get the rendezvous; maybe pitch up just a little bit.
Okay. It's -

It's on.

Are we getting them?

Well, it's just - The trouble is, I don't think you'd normally get it out the rendezvous window and have the high gain, too, Frank.

You tell me --

The thing to do would be, - if you want to get the earth, to get the yaw - to yaw up and pitch up.

Try to get COMM, will you, Bill?

Okay, well, gee - I don't see it out there anywhere. Do you? The earth? I don't think we've had AOS yet.

You're going down, it says right here.

I'll know when to get them as soon as we get on an OMNI.

You'll have to pitch up, Frank; I can't get them now, on - on the -

Buh?

You'll have to pitch up; I can't get them on the high gain there. Pitch or - or yaw - pitch up or yaw and/or yaw right.

I'll do both.

Okay.

How's that steam pressure, Bill?

Good.

... Frank.

It isn't even boiling yet.

Yes, we just started.

Where's the pad book? Doesn't it have the --
Here it comes!
Okay.
Oh boy!
Get a good shot of her?
Yes, see it?
Well, keep the camera there. Keep the camera.
Here it comes. Here it comes. But you're not on yet.
You got it - you got to do something.
Pitch up or yaw -
Yaw right?
Yaw right.
Oh, Jesus.
Oh, I get it off this camera - window over here.
Okay.
Houston, Apollo 8.
Roll her a little bit. Roll her a little bit to the right.
Here, you want me to fly it just to come a - -
That one's got it, the roll. Yes, yes. It's the roll that's got it. Roll right, if you can.
We're rolling.
Come on, gang.
We're going to radial out. Are we - You got her coming up? You see her, Frank?
Yes, it's beautiful.
You got to roll.
03 13 41 41 CMP It's rolling.
03 13 41 43 CDR Watch the gimbal lock.
03 13 41 45 CMP Yes.
03 13 42 00 LMP You got to roll --
03 13 42 01 CMP Right.
03 13 42 02 LMP -- and yaw.
03 13 42 05 CMP We're over 45 degrees in yaw right now.
03 13 42 10 CMP We're still yawing, and we're still rolling.
03 13 42 12 LMP Where is it, Frank? Point to it.
03 13 42 13 CDR I'm pointing right at it with the camera.
03 13 42 15 LMP Then why in the hell we're not getting it? Okay.
03 13 42 18 CDR Should be getting it.
03 13 42 20 LMP Try again here.
03 13 42 36 CDR Got it?
03 13 42 37 CMP There, you got it; you're on.
03 13 42 46 LMP There you got it. It was in some kind of a gimbal lock-up there.
03 13 42 51 CDR Try - try it - call them.
03 13 42 53 LMP Houston --
03 13 42 54 CMP Houston - Go ahead, go ahead.
03 13 42 56 LMP Houston, Apollo 8. Over.
03 13 42 58 CC Loud and clear and an initial look at your systems are good. Over.
03 13 43 01 LMP Roger. We've got the T --
03 13 43 02 CC We've got a picture, Apollo 8.
03 13 43 03  LMP  Roger, we've got the TV —
03 13 43 04  CMP  Roll — roll left.
03 13 43 05  LMP  Huh?
03 13 43 06  CDR  Roll left a little, can you?
03 13 43 07  CMP  Yes.
03 13 43 11  CDR  Did he say it was a good picture?
03 13 43 12  LMP  How's the picture look, Houston?
03 13 43 17  CC  Loud and clear.
03 13 43 19  LMP  The TV look okay?
03 13 43 24  CC  Looks very good.
03 13 43 26  CMP  Welcome from the moon, Houston —
03 13 43 28  CDR  And the world.
03 13 43 34  CC  Thank you.
03 13 43 40  CMP  Okay, why don't you describe what — Where abouts are we here anyway?
03 13 43 45  CDR  Tell them — this camera's just the thing. Tell them what we're going to do.
03 13 43 54  CMP  You got the — got the thingamajig? Want me to roll a little bit?
03 13 44 00  LMP  Houston, you're seeing a view of the earth, taken over the lunar horizon. We're going to follow the track until the terminator, where we will turn the spacecraft and give you a view of the long shadowed terrain at the terminator, which should come in quite well in the TV.
03 13 44 25  CMP  We don't know whether you can see it from the TV screen, but the moon is nothing but a milky white, completely void.
03 13 44 35  CDR  You're going to have to show it out that picture now; I've lost it.
03 13 44 37  LMP  Okay.
03 13 44 38 CMP We're changing the cameras to the other window now.

03 13 44 41 LMP Can you pitch down now and --

03 13 44 44 CDR Pitch down.

03 13 44 46 LMP -- and let me get out the rendezvous window and yaw, maybe?

03 13 44 50 CMP Which way do you want to yaw?

03 13 44 52 LMP Yaw toward me and away from -- away from the earth.

03 13 44 55 CDR This is Apollo 8, coming to you live from the moon. We've had to switch the TV camera now; we've showed you first a view of earth as we've been watching it for the past 16 hours. Now we're switching so that we can show you the moon that we've been flying over at 60 miles altitude for the last 16 hours. Bill Anders, Jim Lovell, and myself have spent the day before Christmas up here, doing experiments, taking pictures, and firing our spacecraft engines to maneuver around. What we'll do now is follow the trail that we've been following all day, and take you on to a lunar sunset.

03 13 45 43 CDR The moon is a different thing to each one of us. I think that each one of -- each one carries his own impressions of what -- of what he's seen today. I know my own impression is that it's a vast, lonely, forbidding-type existence or expanse of nothing; it looks rather like clouds and clouds of pumice stone.

03 13 46 09 LMP Can't you get it down? I can't see it, Jim.

03 13 46 10 CDR And it certainly would not appear to be a very --

03 13 46 12 LMP ... 30 degrees.

03 13 46 13 CDR -- inviting place to live or work. Jim, what have you thought most about?

03 13 46 21 CMP Well, Frank, my thoughts were very similar; the vast loneliness up here of the moon is awe-inspiring, and it makes you realize just what you have back there on earth. The earth from here is a grand oasis in the big vastness of space.

03 13 46 38 CDR Bill, what do you think?
I think the thing that impressed me the most was the lunar sunrises and sunsets. These, in particular, bring out the stark nature of the terrain, and the long shadows really bring out the relief that is here and hard to see in this very bright surface that we're going over right now.

Describe - That's not color, Bill - Describe some of the physical features of what you're showing the people.

I'm changing to the other window now.

What sea are we coming up to? Smith's Sea?

Yes. Smyth's - Smyth's Sea.

We are now coming onto Smyth's Sea, a small mare region covered with a dark material. There is a fresh bright impact crater on the edge towards us, and a mountain range on the other side.

Pyrenees. Okay, hold it right there. Hold it.

These mountains are the Pyrenees. Is that right?

No, I take that back; it's ...

Apollo 8, we're not receiving modulation on the signals. We do have sync.

Are you reading us, Apollo - Houston? Maybe it's turned OFF, Bill.

Apollo 8, we're reading you loud and clear, but no picture --

Somehow it got OFF again.

What?

Roger. We understand. Take a look now.

It's ON now.

How about now, Apollo?
03 13 48 11  LMP  Yaw it if you can.
03 13 48 12  CC   Loud and clear.
03 13 48 13  CDR  Right or left?
03 13 48 15  LMP  Right.
03 13 48 17  CDR  Okay.
03 13 48 18  LMP  Roll.
03 13 48 19  CC   Good picture.
03 13 48 20  CDR  Right.
03 13 48 22  CMP  What you're seeing as we cross Smyth's Sea - are the craters Kastner and Gilbert.
03 13 48 30  CDR  Tell them there's a very bright impact crater now.
03 13 48 32  CMP  And what we have noticed especially that you cannot see from the earth are the small bright impact craters that dominate the lunar surface.
03 13 48 44  CDR  How's that now, Bill?
03 13 48 45  LMP  Yes, the more right roll, the better.
03 13 48 47  CDR  Alright, more right roll.
03 13 48 53  CDR  Can you show the horizon?
03 13 48 54  LMP  That's what I'm on.
03 13 48 57  CDR  Describe the horizon.
03 13 49 01  LMP  The horizon here is very, very stark.
03 13 49 03  CDR  I can't even see it is the trouble.
03 13 49 04  LMP  The sky is pitch black, and the earth, or the moon, rather, excuse me, is quite light, and the contrast between the sky and the moon is a vivid dark line.
03 13 49 18  LMP  Coming into view of the camera now are some interesting old double-ring craters, some interesting features that are quite common in the mare region and have been filled
by some material, the same consistency of the mare and same color; here are three or four of these interesting features. Further on the horizon, you see the Pyr - These are the Pyrenees, aren't they? - -

After the Sea of Fertility; first, we're going over the Sea of Crises.

What are these mountains?

Well, there's the Foaming Sea.

Okay. The mountains coming up now are heavily impacted with numerous craters whose central peaks you can see in many of the larger ones.

Actually, I think the best way to describe this area is a vastness of black and white, absolutely no color.

The sky up here is also a rather forbidding, foreboding expanse of blackness, with no stars visible when we're flying over the ear - over the moon in daylight.

Are we coming up near our - near our target area?

No, I don't think - we've got quite a ways to go.

Do you need this anymore? I'll find out where we are here in a hurry.

You can see by the numerous craters - -

Yes, you better leave it on there.

- - that this planet has been bombarded through the eons with numerous small asteroids and meteoroids, pockmarking the surface every square inch.

And one of the amazing features of the surface is the roundness of most of the craters. It seems that most of them have a round, mound-type appearance instead of sharp, jagged rocks.

Only the very newest features have any sharp definition to them, and eventually they get eroded down by the constant bombardment of small meteorites.

You hope.
Okay, there's two big craters coming up on the right. I don't know which ones they are.

Where? What does it look like here?

How's the picture now, Houston?

Don't tell me we've broken lock.

Houston, are you reading us?

Roger. Reading you loud and clear, and the picture looks real fine.

Good.

Thank you.

Can you see the two large craters to the - just to the right of our track, Houston?

Affirmative.

That might be Küstner and Gilbert, although I'm not too sure. I can't see out.

It's hard to get me and the camera in the window at the same time (laughter).

Could I look out here just a second just to find out where we are? Well, we're still over the - Okay, we're still over the east side. Here comes Smyth's Sea now.

The very bright features you see are the new impact craters, and the longer a crater has been on the surface of the moon, why, the more mottled and subdued it becomes.

Hey, Bill, you're not talking to geologists.

What do you want me to say?

Here's - here's where we are.

Okay. Go ahead -

Smyth's Sea -

You read it off.
Day 4

03 13 53 18 CMP Excuse me a second.
03 13 53 26 CC Apollo 8, we've apparently lost your voice; the picture is still good.
03 13 53 30 LMP Roger.
03 13 53 36 CMP Houston, we're passing over the area that's just to the east of Smyth's Sea now in checking our charts. Smyth's Sea is coming up in a few minutes.
03 13 53 52 LMP ... that gimbal lock back.
03 13 53 56 CMP Yes, watch out for gimbal lock, please.
03 13 54 00 CDR How are you doing, Bill? Can you see it?
03 13 54 02 LMP Yes, that's good. I can't see much out here with this camera in the way.
03 13 54 13 CDR Huh? Bill.
03 13 54 14 CC Apollo 8, if you go to POO and ACCEPT, we'll uplink some information.
03 13 54 20 LMP (Laughter) We're not over Smyth's Sea.
03 13 54 35 CDR Boy, that baby really took some ..., didn't it?
03 13 54 41 LMP We are now coming up towards the terminator, and I hope that soon we'll be able to show you the varying contrasts of light as we go into the darkness.
03 13 54 51 CDR Okay.
03 13 54 53 CMP Well, the terminator's --
03 13 54 54 CDR Houston, we're -- we're in POO, and you have the computer.
03 13 54 56 CMP -- is where we're ending.
03 13 55 02 CDR Don't stop, Bill, (laughter) I didn't mean to cut you off.
03 13 55 05 LMP We'll have another thought soon - there are a lot of holes down there.
We're now approaching a series of small impact craters. There is a dark area between us and them which could possibly - could be a - old lava flow.

We going sideways?
Yes.

Is that crater on the backside called Tchaikovsky - Kil - Kil - Kilkowsky [Tsiolkovsky] or something like that?

It's an old Russian name, isn't it? That's the Goddard of --

Yes.

You can see the large mountains on the horizon now ahead of the spacecraft to the north of our track.

Okay. ... his camera over there ...

Are those the Pyrenees?

I'm checking that. No, we - think maybe - No, there's a bright crater right there.

The intensity of the sun's reflection in this area --

Unless we could have rotated off here.

-- makes it difficult for us to distinguish the features we see on the surface, and I suppose it's even harder on the television, but as we approach the terminator and the shadows become longer, you'll see a marked change.

I don't know where we are now because we yawed off so much.

We're going sideways. Frank's window would be the best one to look - Do you see the terminator coming yet, Frank?

Yes.

I don't know which way it is. I - I didn't look to see which way we were going.

There's a very dark crater in the filling material of this valley in front of us now. It's rather unusual
in that it is sharply defined, yet it's dark all over
its interior walls, whereas most new-looking craters
are a very bright interior.

A small impact crater in front of us now. In a little
mare, well defined and quite new, and another one
approaching. The spacecraft is facing north from our
track. We are going sideways to our left.

What is that mare up there now, that big one?

Straight ahead?

Yes.

North? Okay, let me check it here. Well, there's the
Sea of Crises coming up—Oh, that big one is the Sea
of Crises over there.

We are now—

I made a mistake with the—

--seeing the Sea of Crises coming over the horizon.
What's the name of that crater right between us and it?

Okay, I'll get it for you right now. That's—Condorcet
Crater.

Condorcet?

Let me see just to make sure. Are we under a sea right
now, Smyth's Sea? That's the Condorcet Crater. Condorcet.

And we believe the crater, the large dark crater between
the spacecraft and the Sea of Crises is Condorcet Crater.
The Sea of Crises is amazingly smooth as far as the
horizon, past this rather rough mountainous region in
front of the spacecraft.

How are you doing? ...

...

Apollo 8, we are through with the computer. You can go
back to BLOCK, and it looks like we are getting a lot
of reflection off your window now.
03 13 59 20  CDR  You want me to try it out this window?
03 13 59 21  LMP  Yes, that'll be better. Roger; we'll switch windows.
03 13 59 24  CDR  I'll have to watch out for gimbal lock this way.
03 13 59 29  CDR  Is it still ON, Bill?
03 13 59 31  LMP  Yes. Be careful when you grab that handle, because apparently you can turn it OFF.
03 13 59 35  CDR  Ask him how that is.
03 13 59 38  LMP  How's that look now, Ken?
03 13 59 42  CC  Real fine.
03 13 59 45  LMP  Okay, you'll have to … I can't see where you are, Frank.
03 13 59 58  CDR  I wonder what – Oh, hell.
03 14 00 02  LMP  Okay, what is the problem here? Okay.
03 14 00 11  CDR  Pitch up.
03 14 00 12  CMP  I can't pitch up too much.
03 14 00 13  LMP  Can you roll? Don't pitch up, just roll - You can roll –
03 14 00 18  CMP  Right?
03 14 00 19  LMP  Roll right, and you can yaw - yaw left, - Get your right gimbal off a little bit. Roll right and yaw left.
03 14 00 26  CMP  Okay, I'm doing it.
03 14 00 27  CC  Apollo 8, can you tell us which window you are looking out? And there's a large crater, looks like it is sticking up in the upper right-hand corner of our picture. Can you identify that one?
03 14 00 35  LMP  Alright, you better – We're going to lose it if you don't move over.
03 14 00 41  CDR  Roger, we're just about to lose lock here. That's why we're slowing up a little bit. You're alright.
We see the Sea of Crises in front of us now, and we're looking out the left-hand rendezvous window.

That might be - Firmicus.

What's the name of the crater out in the Sea of Crises? That's probably the one they're talking about.

Picard is right out there on the right-hand - left-hand side of it. We -

How are we going to keep lock now, Bill?

Okay, keep - the thing to do is to - is to roll right - is the best thing to do.

Okay, I'm rolling right. I've got - I'm in there right now -

Well, we're not able - That's their problem.

Their problem?

Tell them that's Picard.

Houston, how you reading us now?

The crater you see on the horizon in the Sea of Crises -

Loud and clear, Apollo 8, and we have a picture that's good.

Roger; we're getting a lot of static. The Sea of Crises is in front of us on the horizon, and the dark crater Picard can be seen in the middle. We're now approaching the moon sunrise or the spacecraft sunset. This is an area that the sun has just recently come up on the moon.

What's this - what sea are we over now, Jim?

This is part of the Sea of -

Don't - don't - You better - you better yaw a little bit to the left. You're going to get the sun on Frank's window now.

Yes, yaw left.
03 14 02 39 CMP  Do you want me to still roll?
03 14 02 40 LMP  See the mare we're over now has a mottled look about it, --
03 14 02 45 CMP  The Sea of Fertility we're on.
03 14 02 46 LMP  -- but not very heavily cratered, so it must be relatively new.
03 14 02 50 CMP  We're over the Sea of Fertility.
03 14 02 51 LMP  This is the Sea of Fertility, and we're coming up on a large crater, the delta-rim variety. It has a strange circular crack pattern around the middle of it.
03 14 03 14 LMP  How many miles across is that crater?
03 14 03 17 CMP  Is that - You're looking at Taruntius?
03 14 03 20 LMP  Yes.
03 14 03 21 CMP  Taruntius, probably.
03 14 03 24 LMP  Yes, how many - Just give me a guess. 20 miles? 30 miles?
03 14 03 29 CMP  Must be 30 or 40 miles.
03 14 03 30 LMP  The crater that you're seeing now is about 30 or 40 miles across.
03 14 03 37 LMP  Ro - You better - You better roll left.
03 14 03 40 CMP  Roll left?
03 14 03 41 LMP  Yes.
03 14 03 44 CDR  Yaw left, too. I see the - Here's earth in our background.
03 14 03 49 CMP  Okay, I'm rolling left.
03 14 03 51 LMP  How's your picture quality, Houston?
03 14 03 56 CC  It's phenomenal.
03 14 03 58 LMP  There's an interesting rille directly in front of the spacecraft now, running along the edge of a small mountain, rather sinuous shape, with right-angle turns.
What - what - Keep rolling - keep rolling - You're - Roll it left, Jim.

Roll left, okay.

This area just to the west of the Sea of Crises is called the Marsh of Sleep, and to the west of that is the Sea of Tranquility.

Can you see the fracture patterns going across the mare in front of us now, Houston?

Now, you better stop the roll.

That doesn't quite stand out.

Yes.

Cut the roll.

Roger; it's a series of cracks, faults across the middle of the mare. They drop down in about three steps to the south. The parallel fault pattern to the north has a drop down in the center. I think you may be going too far now, Jim.

Too far which way?

Yawing a little bit too far left.

Yawing too far left?

Yes, why don't you yaw right a little bit?

Yaw right a little bit.

Yes, we want to -

Yaw right.

Or else, you may just - If you want to keep going, I'll put it out this window now.

That's fine on there - that's fine. Who do you want to give it to?

Now, that crater right out there is - that nice round one is -
03 14 05 39  LMP  Well, they can - Frank is at the other one.
03 14 05 42  CDR  I hope all of you back on earth can see what we mean when we say it's a rather foreboding horizon. A rather --
03 14 05 49  LMP  Stark, maybe.
03 14 05 50  CDR  Stark and unappetizing sort of place --
03 14 05 53  LMP  Is this our landing site we're going over now?
03 14 05 55  CMP  Yes, this is our landing site right down here.
03 14 05 57  LMP  We're now going over our --
03 14 05 58  CMP  Approaching our landing site.
03 14 05 59  LMP  Approaching one of our future landing sites --
03 14 06 00  CMP  Right now.
03 14 06 01  LMP  -- selected in this smooth region to --
03 14 06 05  CMP  Called the Sea of Tranquility.
03 14 06 06  LMP  -- called the Sea of Tranquility, smooth in order to make it easy for the initial landing attempt in order to preclude having to dodge mountains. Now you can see the long shadows of the lunar sun - sunrise.
03 14 06 26  CDR  Hey, why don't we start reading that thing, and that would be a good place to end it.
03 14 06 34  CMP  No, we've got to go into it very nicely. Why don't we - as we go into sunset --
03 14 06 36  LMP  Right.
03 14 06 37  CMP  -- or is it sunrise? This is sunrise, yes. We're approaching lunar sunrise.
03 14 06 39  LMP  We are now approaching lunar sunrise, and for all the people back on earth, the crew of Apollo 8 has a message that we would like to send to you: "In the beginning, God created the heaven and the earth; and the earth was without form and void, and darkness was upon the face of the deep; and the spirit of God moved upon the face of the waters. And God said, 'Let there
be light,' and there was light. And God saw the light, that it was good. And God divided the light from the darkness."

You got it, Frank.

No, it's your ...'

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

Can you hold this camera?

You want to pass it over here, Jim?

No, it's perfect right where it is.

Okay.

"And God said, 'Let the waters under the heaven be gathered together into one place and let the dry land appear,' and it was so. And God called the dry land Earth, and the gathering together of the waters called these Seas. And God saw that it was good." And from the crew of Apollo 8, we close with good night, good luck, a merry Christmas, and God bless all of you, all of you on the good earth.

That's it.

Don't say anymore now.

I just turned it OFF. You want it ON again?

No, leave it OFF. Great! Great!

OFF?

Yes.

Okay.
Camera's OFF?
Yes.
Hey, how can you beat that? Gees, we just went into the terminator right in time.
Okay, let's get the spacecraft back in even keel again. Here, here's this, Frank.
Alright, let's get the flight plan out here.
We've got to get it.
Okay.
Whew! Pretty impressive out there.
Boy, it sure is.
Okay, men.
It's 86 hours.
Houston, how do you read Apollo 8?
Don't tell me they didn't hear us.
Houston, Apollo 8.
Apollo 8, reading you loud and clear.
Roger. Are we off the air now?
Why don't you just roll over to the right, Frank, and then you can —
Did you read everything that we had to say there?
Loud and clear; thank you for a real good show.
Okay. Now, Ken, we'd like to get all squared away for TEI here. Can you give us some good words like you promised?
Yes, sir. I have a maneuver pad. I think we would like to start by dumping the tape. If we can have that, I have your --

You want me to get that, or --

-- TEI 10 maneuver pad, and then we will run through a systems brief.

I understand this is the maneuver pad that we will use for TEI. Is that correct?

And you've got the tape, Houston.

Ready to copy, Ken.

Roger. TEI 10, SPS G&N: 45597, minus 040 --

Thank you.

(Singing)

Do you still have the ...?

I'll get it afterwards, Bill.

That temporary storage bag, Bill, is located - Yes, it's up here.

I got trash in that temporary storage bag I'm leaving there.

Okay.

It stinks to high heaven.

All that urine always stinks real bad, too.

What was the time for the REV before?

85:17.

No, I don't know what day it is. This is day 4. No, hell; eat it - it doesn't matter. Eat any one you want.
03 14 40 12 CDR What?
03 14 40 13 CMP 87:19.
03 14 40 16 CDR Yes. What were the gimbal angles there? 180, 8 - See, it's about the same. And the horizon was what? 1.2?
03 14 40 22 CMP Degrees.
03 14 40 23 CDR Okay, minus 3, right? So, we'll get the ---
03 14 40 24 CMP ---
03 14 40 25 CDR This is the picture it's going to be right now.
03 14 40 26 CMP 52.9.
03 14 40 27 CDR Huh?
03 14 40 29 CMP 52.9.
03 14 40 31 CDR Yes. That's ours - The other one was 1.8.
03 14 40 34 CMP I've got to update this one.
03 14 40 35 CDR Yes, but we'll see - see, what I'm saying is we'll see just as we come around into the - into the sun now, we should see just the way it's going to be. See what I mean?
03 14 41 06 CMP Checking that boresight star is going to be kind of difficult.
03 14 41 08 CDR Yes, you're looking right into the earth's - the earth. And it looks like the sun's going to be right in our face, too.
03 14 41 27 CDR You can probably check your star through the sextant while we're on the other side. Maybe.
03 14 41 35 CMP Well, if you maintain the same position we're burning as we go around ---
03 14 41 38 CDR Unless the platform drifts.
03 14 41 40 CMP --- I'll check it - It was like this. If we get a good enough - well, we won't though, see? We go around like this. I could check it when you're over here. Maybe I can.
We want to make sure that we're burning the way we're going, too. You know?

Okay, now we're on - I think you're supposed to go MANUAL on the other one, first. Yes.

That's D.

I don't think that's any good. That's a good one.

That's C.

C. Houston, how do you read Apollo 8 on OMNI C?

Thank you.

Hey, look it. If you get to this attitude -

Yes?

That's inertial, right?

Yes.

It shouldn't make any difference what REV we're on.

As far as I'm concerned, --

... earth, moon, or what?

No, I mean checking the boresight star.

Buh?

Checking the boresight star.

But it isn't all - This isn't always the same - Yes, you can take the difference --

Oh, oh, oh, you're splitting the difference? Okay.

Yes.

Bill, where are you?

Right under here.
Okay, you're not - Are you under me?

Yes.

Oh, I'm sorry. I didn't want to hurt you. I didn't. Buh? Good.

Look for hardware junk that's floating around.

(Singing)

Yes. Need some help down there?

See, here we are right now, right where it ...

I'll be able to check it back here.

Think so?

Well, if we come up like this.

Yes. Hey, look at that - Earthshine from somewhere. Oh, my gosh, look you can see the - Hey, look right ahead there. There's a star.

I can't tell.

Son of a bitch, we're going backwards.

Yes.

What time is this post burn supposed to be?

You're right. They're coming up this way.

Huh?

If you're looking like that, they're coming up this way.

From underneath.

What? I don't see that.

We're going to burn out this way, I guess, huh?

But on the other side, right?

Yes.
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03 14 43 53  CDR  Okay, you're not - Are you under me?
03 14 43 54  LMF  Yes.
03 14 43 55  CDR  Oh, I'm sorry. I didn't want to hurt you. I didn't. Huh? Good.
03 14 44 11  CMP  Look for hardware junk that's floating around.
03 14 44 42  CMP  (Singing)
03 14 45 08  CMP  Yes. Need some help down there?
03 14 45 47  CDR  See, here we are right now, right where it ...
03 14 45 59  CMP  I'll be able to check it back here.
03 14 46 02  CDR  Think so?
03 14 46 03  CMP  Well, if we come up like this.
03 14 46 05  CDR  Yes. Hey, look at that - Earthshine from somewhere. Oh, my gosh, look you can see the - Hey, look right ahead there. There's a star.
03 14 46 18  CMP  I can't tell.
03 14 46 20  CDR  Son of a bitch, we're going backwards.
03 14 46 25  CMP  Yes.
03 14 46 27  CDR  What time is this post burn supposed to be?
03 14 46 37  CMP  You're right. They're coming up this way.
03 14 46 38  CDR  Huh?
03 14 46 39  CMP  If you're looking like that, they're coming up this way.
03 14 46 42  CDR  From underneath.
03 14 46 49  CDR  What? I don't see that.
03 14 46 59  CDR  We're going to burn out this way, I guess, huh?
03 14 47 02  CMP  But on the other side, right?
03 14 47 04  CDR  Yes.
So it'll be upside down - We'll be upside down, forward. Okay.

What time is that supposed to be? 27 - 87 what?
Yes. Yes, yes, yes, we're alright.

Well, it ought to be 87:19.

87:19, huh?

Roger.

I'm going to take a leak, a little leak would feel good.

... went floating by here.

Huh?

A bunch of crap just went floating by.

Where are you, Bill?

Here's a little piece that got away from somebody.

Okay, we're maneuvering up, Bill - Frank. You see?

You want to leave these suits in the L-shaped bag?

What say? Where? The tape? With the helmet? The helmet?

(Applause)

Apollo 8, everything looks good going over the hill.

Roger, Ken. Thanks a lot. We'll see you around the next pass. Well, just have our TEI update for us ready early, okay?

Roger.

What did you say? 89. However, we have - we're checking an 87 one, because it's going to be almost similar, to see what our attitude's going to be like.
Yes.

Where are you going to put the food after you make it?

I'm not going to make mine until after the burn.

... Oh.

Did you get everybody out a meal, Bill?

I'm going to.

Here - Boy, there's some things in my pocket they don't know about.

I wouldn't say this was too good, would you?

Anybody care to brush their teeth?

We are maneuvering now, aren't we? I mean, you know, with respect to the -

I say, our spacecraft is maneuvering with respect to the -

What did I say that TEI 9 time was?

87:19; that's - 22 minutes from now, 21 minutes from now. That's a TI 9 burn, which is the - one REV before this one - I want to see what our attitude is going to be. Here, you want some toothpaste? Huh?

I'll get them; I'll get them. You might hit the IMU switch.

Here you go, Bill.

87:19.

We're just - Hold on just a second.

Take a look at this - at your window position. We're at about - Let's see, $T_i$ - was it $T_i$ minus 2, that other one? 87:17? 87:17, your $T_i$ position, your window position? Okay, it's in the - it's in the update book. Right up there. Yes?

What's that?
Let me see.

Which is which? The moon is darker than the sky.

So, who turned on the light?

Well, I think we're in the proper position, though.

Why don't you check to make sure we're still ... posigrade?

Supposed to be stars there.

Man, I've got to get that star check early. I'll never get it this way. I have to get that star check early to - you know - I mean I - It can't be too early because the moon will be in the way, but it's got to be early enough so I can see.

Okay. Hey, the DAP load ought to be pretty good, huh? You see if the DAP load changed any.

Huh. ... load the DAP. Huh? You want this display in the ... position? Okay. Want to turn up your display just a little bit? Okay.

How are the boilers working, Bill?

Okay, that's good for four quads. That's C is DAP; A, B, C, D. Right. Okay. Proceed. Zero is - Oh, the second one? The second one is the roll quad ... Okay, 45821, 45597. 45597. Alright, well, it went up two digits. I'll try it here now. That's already been done. 42 is Peacock.

(Singing)

Where are you?

(Yawn) ... 87 - 9 - 19. 87 - 9 - Wait a second, that's - For this time, it's 87:19. Do you have a good horizon? I see horizon right here.

Well, I mean, where - Do you see the horizon at all?

Hey, I don't want to burn into it.

Well, I see something down there.
That's the - You're seeing the terminator, not the horizon. Well - okay, that's the one we're going to burn on; you've got to get clear before we burn.

What do you mean?

Oh. Well, how far up are we - Oh, we've still got 9 minutes to go - 3 degrees per minute. What's the attitude here? 180? Pitch is - Let me read pitch off and then see ... yaw.

You want a 180, though. You want a 180.

Oh, it's - it's - Get - Wait a second. Well, it says 180.

Roll 180.

Oh, oh, oh, pitch 7, yes. Okay. You know what amazed me is that you can see in those shadows.

Yaw zero then?

Yaw is zero. She calls 7 more minutes. And - Let me see here, 1 degree at T_ig minus 3. 1 degree - What's this? Is that - is that it? 87:19, that would be 87:16 - in 4 minutes.

Okay, I see the horizon. Yes.

Right on the edge here - here - We're swinging in like this to it.

It's like doing a loop.

Look at down there, Bill: all those lines in a straight row like sand dunes.

Okay, 2 minutes - minute and a half, about.

I think you're about right.

1.2 degrees? You're wide after T_ig - At T_ig minus 3, at 16. Yes. Should probably be - it's probably going to be the horizon right here, because you're upside down.

Got your checklist, Bill? Okay. No, I just wondered.
That's your logbook.

Now. Let's see. No, wait a second - In 18 seconds. Okay, how's it now?

... Well, you can say it's 1.2 degrees with - at T_{ig} minus 3.

I think that's kind of hard to spot in there; don't you think, Bill? Oh, you're 39; you're just a couple seconds early.

We're going the right way now.

Yes, we're upside down going that way. And we're going with the orbit.

(Singing) Well, you still might be pitched down. It might be that you burn like this. You might be burning before you get to the top.

I don't know, but I'll find out.

I don't think this is a good place for this, Bill. I'm going to put this - in here or some place. Euh? No, this - Did you find it?

Is that yours?

No, I think that's mine; open it up and find out.

That's Jim's there.

Now is burn time - We got - little bit - about 10 - 15 seconds after burn time.

Where's your checklist?

I don't know.

You didn't put it in my seat, did you?

There's part of it - there's volume 1.

Why don't you put that in your mailbox?

I'm going to put this volume 2 away, too.
03 15 21 44 LMP  Why don't you keep up this -
03 15 22 50 CMP  That's the chartbook.
03 15 23 09 CMP  Got any emergency procedures to go over here? What are you going to do? Okay.
03 15 23 32 CMP  Just a minute, Bill; I'll give you a hand. Now, we don't need these two things, right?
03 15 23 43 LMP  No, I got the flight plan out.
03 15 24 50 CMP  I don't think it's down there. That's just full of junk.
03 15 25 20 LMP  Is that it?
03 15 26 46 CMP  (Whistling)
03 15 27 36 CMP  Well, who's got - who's got the Pentels? Anybody got a Pentel?
03 15 27 42 CDR  Here's one.
03 15 27 43 CMP  Okay, we've got two. Okay, I want to - No, wait a minute - I just don't want to - -
03 15 27 50 CDR  Oh, I'm sorry.
03 15 27 51 CMP  I just want to get it when we - tape here.
03 15 27 58 CDR  87:38:42.
03 15 28 46 CMP  Yes.
03 15 28 49 CDR  For God's sake, shift the right thing there, Jim, when we go to arm the thing.
03 15 28 54 CMP  Right. Proceed.
03 15 28 55 CDR  We got a - we've got to ullage. Don't let me forget that: 15-second ullage.
03 15 28 59 CMP  Right.
03 15 29 06 CMP  That's true.
03 15 29 07 CDR  Alright, we're going to get another one.
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Day 4

03 15 29 33 CMP Do you want to do a gimbal drive test?
03 15 29 36 CDR Yes, I think we might as well. Don't you?
03 15 29 40 CMP Okay, I'll ... Just the way we had planned it!
03 15 29 45 CMP Aren't you going to talk to the world?
03 15 29 50 CMP I don't know. That's the one, but it's not the final one.
03 15 29 57 CDR This is our retro burn, young man.
03 15 30 16 CDR Huh?
03 15 30 17 CMP What do you mean? 213 - 215 seconds, that turned out to be.
03 15 30 33 CDR Minus 40 feet on the DELTA-V in 2 seconds.
03 15 31 09 CDR When are you going to stop the water boiling - after the burn?
03 15 31 12 LMP Yes, I think we ought to get away from the ...
03 15 31 14 CDR Okay.
03 15 31 15 LMP We can stop it ...
03 15 31 19 CDR Well, let's just start it after the burn, then, huh?
03 15 31 22 LMP Huh?
03 15 31 23 CDR Stop it after the burn and not before it. Is that right?
03 15 31 25 LMP Yes. ...
03 15 31 32 CMP (Singing, yawn)
03 15 32 14 CDR That TV camera worked pretty well.
03 15 32 20 CMP There's one thing that I'm amazed at, and that is that the communications here are a lot better than I expected.
03 15 32 25 CDR Goes, they're great; knock, knock, knock. Let's not say anything until we're on the carrier, what do you say (laughter)?
03 15 33 58 LMP ... DELTA-V ...

DELTA-V
Huh? I didn't hear you.

29 something - 25 - -

DELTA-V nominal is - -

Just make sure you can get the right one. Go ahead.

3532.

You mean 3522.3.

That's a big kick in the pants, you know it? 2000 miles an hour - You can look at it that way - about - more than that. We should be getting there in 4 minutes.

(Singing)

2 minutes and 18 seconds, and we're going home? Is that what you said?

Yes.

01:38. Takes a long time though, doesn't it?

How does the SPS look, Bill?

Maybe that's what we're doing.

Yes.

Let's see, ... I probably could use ...

You couldn't here.

Huh?

I don't think you could here; you could roll there, though.

How does that look? Huh? Huh? Can you get them on an OMNI with that?

(Whistling)

We're supposed to have him, Bill.

Think you just did.
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03 15 39 01 CDR Houston, Apollo 8. How do you read? We got signal strength, Bill?

03 15 39 12 LMP Yes, it just probably takes them awhile to get squared away down there.

03 15 39 33 LMP Wonder what good it is to have that engine pointing at the moon that way?

03 15 39 37 CMP Pardon.

03 15 39 40 LMP We going to get it too hot?

03 15 39 43 CMP No.

03 15 39 44 CDR Hello, Houston, Apollo 8.

03 15 39 49 CC Go ahead, Apollo 8.

03 15 39 50 CDR Okay, do you want the computer?

03 15 40 04 CMP There won't be any ...

03 15 40 05 CDR Huh?

03 15 40 37 CC Apollo 8, we'd like to have the high gain, and when we get that, well, we'll start a dump, and we will start your updates.

03 15 40 43 CDR Okay, how about reading us the pad, and we'll try to get you the high gain. What do I have to do to get to the high gain, Bill?

03 15 40 49 LMP Give me a VERB 64, will you?

03 15 40 55 CDR Ken, read us off the pad; in case we can't get the dump in, we can still do it. Which way now?

03 15 41 02 CC Roger; I got them right here.

03 15 41 04 LMP Well, let's see; I'm trying to figure it out. Well, roll right for sure.

03 15 41 08 CDR Roll right.

03 15 41 12 LMP That would probably do it, the way you're pointing.

03 15 41 20 CC Okay, Apollo 8. The first pad I have is TRI 10.
Go ahead.
Alright, TEI 10, SPS G&N: 45597, minus 040, plus 157, 089:19:1567, plus 35186, minus 01512, minus 00520 - -
A little yaw - -
Rush!
- - 180, 007, 000, November Alfa, plus 00186, 35223, 318, 35018, 42, 0924, 253; Scorpi Delta, down 069, left 45, plus 0748, minus 16500, 12994, 36300, 146, 5005; primary star, Sirius; secondary, Rigel; 129, 155, 010, four-quads 15-seconds ullage; horizon on 3.2-degree mark at T minus 3; use high-speed procedure with minus Mike Alfa. Over.
How you coming?
Just stand by a second, Jim. Just stand by - just stand by.
Stand by 1 second.
There you go. Turn the LOCK, UP. Got him locked up yet? Okay, you got it.
You got the high gain now, Ken.
Houston, Apollo 8. How do you read?
Loud and clear.
Roger. Maneuver pad, TEI 10.
Apollo 8, we would like to have you go to PO0 and ACCEPT, and we would like to take the recorder at this time. Then I will copy your pad.
Okay. You got it - -
You have PO0 and ACCEPT.
And the recorder.
And you have the recorder.
Apollo 8, Houston. The tape recorder is yours. I have your PTC attitude.
Roger; go ahead.

Okay, PTC attitude will be pitch 10, yaw 45. This begins at 92 hours. Over.

Is that pitch 10 and yaw 45?

Affirmative, and looks like that will go with the entry REFSOMAT; begins at 92 hours.

Thank you. We've got a lot of good things going here. Every time I start to do that, somebody interrupts. You know, we've got to get a new REFSOMAT and the whole bloody works right after we —

Apollo 8, would you put your UP TELEMETRY to BLOCK, please?

In BLOCK.

Okay, AUTO. Time me 10 seconds, somebody —

Okay.

When I say hack: 2, 3, 1 —

HACK.

MARK.

Right on the money.

What is the DELTA-V - Is it in there now? Let's double-check each other.

DELTA-V_c.

3501.

Boy, that sun is bright.

Hot?

Yes. Right in the eye.

You want to put down pitch and yaw attitude, gimbal lock (laughter) for, you know, PTC: 10 and 45. Yaw is 45, Jim.
After 92 hours, though.

Okay, you've got your burn time now there, Bill?

No, I didn't get it. Oh, I got the - I haven't got the updated one yet; what have you got?

We got to add 3.7 seconds to what they gave us because this motor hasn't been performing like it should.

Yes.

What's the pitch?

4 seconds.

10.

So we got a burn time of 322 now?

3 -

It's 318 -

Plus 4.

318 plus 4.

So, we're going to - You still going to ignite on 19:15?

Uh huh.

And it would be 322?

That'd be 19:16.

A second later?

That's what you gave me, wasn't it?

16, because it's 0.67.

Oh, okay.

So it's 67 - 0.57 you mean?

15.67; make it a second.
Okay.
Okay, shutdown will be at 40 then, right?
37: I have 21.
I mean emergency shutdown will be at 40.
Yes, oh.
Yes, okay.
Starting at 89:19:16, burning 322, shutting down at -
2 seconds early. Go ahead.
Okay. Cu the helium tank TEMPs: that's not recorded on LOW bit rate, and looking over our tape dumps, most of this stuff we have on the backside there is LOW bit rate. So we won't be able to give you an exact number, but looking at what we have every time we go out of sight and come back over the hill, it looks like you can expect about 82 to 84 degrees as a nominal temperature.
Thank you.
Shit, we got a lot to do.
Huh?
That's the worst one we've had here.
That's worse?
Well, you know the colder, the better.
They last longer, huh?
Are you going to pull out PITCH 2 and YAW 2 circuit breakers?
Yes.
I'm trying to get in place so you can get some sighting going.
Get some sighting going.
Sighting - you know, for P52.
Oh P52 - Yes, we're going into it. North is down.
Are we? Man, look at that. There you go.
Huh?
Get a P52, will you? Let me have a flight plan.
Do you need the book?
Which way is my optics pointing?
Pointed at the - pretty - should be -
What is our spacecraft weight?
Have you stopped the rate?
Bill, Jim's got it. Yes.
You got it, Jim?
Yes.
45 something, Bill.
45, okay -
45597. Okay, may I -
Yes, ENTER that. You didn't get it?
Oh, you did ENTER it?
Yes, I ENTERED it.
Okay, I'm sorry.
Based on helium pressure, I get 46 - 50.
Based on what?
Helium pressure.
Oh, good.
(Singing)
27. 27 is Alkaid.
31. 31 is Arcturus.

Well, you got two good ones, huh?
Yes.

We would have enough there to blow it down, wouldn't we?
Just a minute, let me add it.
Oh.

All balls; want to record that?
Yes, I've got it.

Proceed. Gimbal angles: minus three zeros 40, plus four zeros 2, plus three zeros 48.
Okay.

Can I torque?
You may. Torque that way.

I'm not sure we can blow it quite all the way. We can blow it for the time to get - I think we can blow it for over - for about 190 seconds down to 70 psi; if you want to go a little lower, you might as well go to chug; why, you can probably do it all the way.
Okay.

It's finished.
Okay.

If we do have - if we do get one tank stuck, I'm going to shut the other one off, and blow them both off together.
What do you mean by that, Bill?

If we get - one tank's not getting pressurized, I'll shut off the other one, so you don't get a big DELTA-P between them.
Alright, good.

Okay, let's go - Start through the checklist. Shall we?

Okay, first of all, the external DELTA-V, right?

I'm getting my little library squared away here.

Want me to go through P30?

(Yawn)

Because then you can start right then with P40. Okay, here's the burn stuff.

Alright, go ahead.

89:19:1567.

Right.

Okay, plus 35186.

Right.

Minus - what was that? - 01512.

Right.

Minus 00520.

Right.

Okay.

Okay, 611 - this is not applicable here, okay?

Yes.

Counting down.

Alright.

If you set it at three counting up, I think you'd have it. Wouldn't you?

Yes.
(Singing)

We've got to get some of that Marine out; my eyes are --

Yes, mine have been bothering me, too.

Okay, try it again.

Okay?

You alright?

Proceed. 87, 00, ENTER.

You want to take a look at this, too?

No, I don't think so; it just keeps you guys from seeing it, doesn't it?

Yes, a little. Let's just - do you ever want it?

No, I don't ever seem to have ever --

It's in my stowage bag if you think you - if you ever want to get it.

Alright, let's check the DAP.

Well, let's --

Oh, is that in the checklist?

Yes.

Alright, then let's go with Bill.

The checklist.

Have you completed P30?

Yes.

Okay, let's go to P40: P30, complete; CMC, ON.

CMC is ON.
ISS, ON; spacecraft - SCS, operating.
Right.
Test the CAUTION/WARNING lamp; EMS MODE, STANDBY.
Yes.
FUNCTION, DELTA-V set.
Right.
And have you set 1586.8?
Right.
Okay, EMS MODE, STANDBY; DELTA-V set; set DELTA-V_c.
3501.8.
I'll check: 3501.8.
Okay.
EMS FUNCTION, DELTA-V; NONESSENTIAL BUS, MAIN B; cycling cryo fans - good a time to do it as any.
BMAG MODE, three, RATE 2.
RATE 2.
DELTA-V_c, CSM.
CSM.
CMC MODE, FREE.
FREE.
AUTO RCS select, 16, as required for ullage.
Okay, we only need 12, I think. Right?
12?
We don't need the Y thrusters.
Four-jet ullage?
(Yawn)

You've got all - We got all we need.

Okay. Load the DAP.

Load the DAP. Okay, four jets: one, two, three, four jets. Okay?

Right.

Okay. Load the DAP. Okay, four jets: one, two, three, four jets. Okay?

Right.

Just going over Copernicus.

Okay, four jets: one, two, three, four jets. Okay?

Right.

I don't know - Is that right?

Yes.

Okay, DAP is loaded.

Okay, ROTATIONAL CONTROL POWER NORMAL, both, AC/DC.

NORMAL, AC/DC.

Got your DET set?

Set and counting.

VERB 37, ENTER; 00, ENTER.

Yes, we have that.

Spacecraft control, CMC and AUTO.

CMC and AUTO.

VERB 62, ENTER.

VERB 62, ENTER.

VERB 49, ENTER.
VERB 49, ENTER.

6 22: load desired maneuver pad gimbal angle.

180.

Plus 1800.

Pitch is plus 7 --

Zero, zero.

-- 007, right?

Okay.

LMP Pitch is plus 7 --

- - 007, right?

Okay.

CMF Plus 1800.

LMP Pitch is plus 7 --

- - 007, right?

Okay.

CMF Plus 1800.

CMF Plus 1800.

Okay.

CMF Plus 1800.

Okay.

CMF Plus 1800.

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CMF Plus 1800.

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CMF Plus 1800.

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CMF Plus 1800.

Okay.

CMF Plus 1800.

Okay.
Okay.
You know, this kitchen down here's a pretty good deal.
Yes, ...
Brings sort of homey atmosphere here.
Yes. How do you like your cryo, medium or well?
Let me know when you get there.
It takes a long time to get there.
Okay.
I'll tell you what, I'll hurry it up so Jim can check the boresight star while we're in the dark.
No, don't forget I got the earth - or the moon. If you're going back again, will you make a meal?
That's a pretty good checklist now, isn't it?
Yes.
Can you still see the earth over there?
Yes, very distinct - half the earth.
I thought someone told me we weren't going to have any when we - hardly any of the earth when we came back.
Well, we won't I don't think, because we're going to be way out --
Apollo 8, we would like to have the tape recorder for about 5 minutes for one last look.
Roger, Houston. You're getting it.
Does that mean they need the high gain?
Yes.
Well, I'll stop right here then.
Well, you're getting --
03 16 28 44  CC  Thank you. And I guess we still have a cryo stir ahead of us, and we've checked your PIPA bias, and there's no change.

03 16 28 51  CDR  Roger; and we're stirring the cry --

03 16 31 48  LMP  Well, now they're moving again.

03 16 31 56  LMP  Can y'all hear those --

03 16 31 57  CC  Apollo 8, the tape recorder is yours. We have your double-umbra update --

03 16 32 04  CDR  Okay (laughter).

03 16 32 05  CDR  I'll get it.

03 16 32 06  CC  -- 89:07:15.67.

03 16 32 08  CDR  Roger; copy.

03 16 32 12  CMP  What's a double umbra?

03 16 32 13  CC  Roger; and no change on your AOS time.

03 16 32 20  CDP  Say that again, will you, Ken?

03 16 32 21  LMP  Can't believe it.

03 16 32 24  CC  There's no change on your AOS time.

03 16 32 29  CDR  Yes, what was it?

03 16 32 32  CMP  Oh, I got it. I got it.

03 16 32 35  LMP  It was in the flight plan. I read it --

03 16 32 36  CC  Okay, with TEI: 89:28:39.


03 16 32 40  CDR  Thank you.

03 16 32 50  CMP  Yes, they might as well not build simulators any other way than they've been doing it. You're laying on your back in this thing no matter what you do.

03 16 32 57  LMP  Think so? I feel like I'm sitting straight up.
Do you?
Yes.
You do?
I feel like I've been in the whole time like I've been here in the simulator.
Yes, that's right; me too.
I've been lying on my --
The only difference is that this is --
I feel like I'm in the DCPS.
Oh, really?
Yes.
Okay --
... little bit.
I'm giving these an extra little whack here just so there won't be any surprises.
(Singing)
42 is a pretty small star, too: Peacock.
Why don't you let the old DAP take it from here?
I'm going to. As soon as we get in close, I'm going to give it to the DAP. It's going faster than the DAP can take ... roll ... it's going the way we want it to go.
You going to align the GDC here? (Yawn)
Yes. I left it this way so we can tell where we're pointing.
Oh.
I left her in ORB RATE.
Where's the earth; can you see it?
No. Oh, it's out here, Bill - up this way.

Okay. Getting the right antenna.

Okay, so what we are going to do is pitch down this way, huh?

We've got an earthset picture for Life magazine!

We're there!

Okay, are you there?

Yes.

Okay, you want AUTO trim?

Yes, a little AUTO trim.

Okay, CMC and AUTO.

Right.

Proceed.

Right.

Boresight and sextant star check.

Okay.

You're kind of in deep trouble for doing that. It's impossible.

You're looking right at the moon.

Yes, you have to wait awhile.

Gee, that's a pretty interesting view, isn't it? That earthshine is bright.

Let me take a look.

When the earth sets, then we'll have enough --

Look down here.

Ruh!
See it?
Oh, yes, I see it quite well.
Oh, I might be able to get a star up there, though. What was the - what was my star?
Your star was Scorpia Delti - Delta.
And which way was it?
Okay, it was down 06.9 -
Yes.
And left 4.5.
Oh, you'll never get that.
Well, how in the hell would you ever get it?
Well, there are some stars up here, see, that just -
Yes.
Yes. But Scorpio is -
You're not going to be able to get it until damn near just prior to ignition.
That's an inertial star.
Yes, but you've got an inertial moon in your way.
Well, if it - if the COAS - if you set the COAS and it doesn't hit the moon, then it's okay.
That's right. It's kind of hard not to hit it though (laughter), looking down at it like this.
I think you're looking at Saturn.
Well, I can't even see ... I'm not getting in your way, am I?
(Laughter) You guys - really bad!
Alright, I'm going to put this thing INERTIAL - INERTIAL POWER, OFF; lighting, OFF; select one - IMU.
I could - I guess I could get out the optics and set the thing all the way up. All I'd have to do is wait until we get there.

You guys could go ahead with the checklist without me in case I don't pick it up right away.

Look at that red star going down there.

I was trying to figure out what that was, too, Bill.

It might be Antares.

Boy, they set in a hurry, don't they?

They sure do.

Well, it's Scorpio, maybe it was - Yes?

That wouldn't be setting now, would it?

Yes, it would be. If it's going to be part of the boresight star, it's got to be near the horizon - near the plus-X axis.

Okay, Bill, that should complete it.

Okay.

I won't be able to get a boresight star because we'll be in the daylight.

What about Jim?

Well, I don't know; I hope he can.

Are you going to do that before we press on, Jim?

When we get - when we get - -

Why don't I just set - -

-- your double umbra, why, you can do it then.

What's this double umbra?

Double shadow. When the earth sets, then you will be able to - you'll be looking at 90 degrees back and you can look right down on it.
03 16 39 25  CMP  When the earth sets?
03 16 39 26  LMP  Yes, the umbra is the shadow.
03 16 39 27  CMP  Oh, yes, okay.
03 16 39 30  LMP  So we're in the shadow of the sun; that's the umbra of the moon, and when we're in the shadow of the earth, that's the umbra. You should be able to get a boresight star pretty soon, because we're going to come to the end of the -
03 16 39 41  CMP  Are we? Okay, I'll go down there and set it up.
03 16 39 43  LMP  Wait a minute. Where in the hell are we?
03 16 39 45  CDR  Confusing.
03 16 39 48  CMP  We're pitching down this way.
03 16 39 51  LMP  We aren't doing anything - are we? Are we maneuvering?
03 16 39 54  CMP  No, we're not. We're holding steady, but -
03 16 39 55  CDR  Here, let me show you -
03 16 39 56  LMP  Yes, that's right; we're not 90 degrees from our burn - from our burn place yet. If we're 90 degrees from our burn place, we'll be looking straight at the moon -
03 16 40 03  CMP  We're over here.
03 16 40 07  LMP  We're coming this way.
03 16 40 08  CMP  Yes, I know. And we're not upside down like that. We're - Well - You have - Your optics are up.
03 16 40 18  LMP  Optics are posigrade. They'll go to up.
03 16 40 28  CDR  We're going right through here.
03 16 40 58  CMP  Okay, Bill, when do you start reading the 6-minute checklist?
03 16 41 03  LMP  6 minutes.
03 16 41 04  CMP  What's that time in GET?
Well, let's see here. 89:19 we'll call it; let's make it 89:13, okay? And the 5 one will be at 89:14, and the 2 will be at 89:17 - 35 -

I'm just looking where the PITCH 2 and YAW 2 circuit breakers are. I want to make sure you pull the right one.

YAW 2 and PITCH 2.

Okay.

I'm really screwed up. It looks to me we ought to be going the other way.

Yes, I know.

Huh? Yes, well, look. Well, here we are right here.

Oh boy!

What's wrong?

I should have got down here a long time ago.

Here's where we're going to be when we burn, right?

Yes, and we're right here now. See? And we're looking straight down at the moon, and the earth is over here.

Are you doing your star check?

Yes, right in a crater!

Okay, you're not going to be able to do it until we get past this --

Now, if I can't do it until real late, go - Start without me.

You'll be able to do it - You're 15 minutes - 20 minutes out of the burn.

I wonder if the moon is made out of basically the same material as the earth is.

I don't know.

Probably is.
Anders is going to tell you when he alights from the first LM - Pick up all the gold.

I think he doesn't have to; he knows it all right now. Didn't you hear him? Ye geologists of the world: I see a few grabens, a few slipped discs.

There's a strange light down there.

Is it a bonfire?

It might be campfires.

How does it look?

I think you're going to be able to see it pretty soon.

Well, I'll put it in and wait for it.

Okay.

Do I have the computer?

Yes, ENTER the -

Are you going to read this off to me?

Yes, what is it?

Bill?

Okay, I'm getting the timer.

Oh boy, we're going to get that damned thing to 10 again.

Okay. Have that time -

You got a star, Jim?

No, he needs it read off to him.

Okay, OPTIC MODE, CMC.

Okay.

In zero OFF.

Zero OFF.
Okay, we're going to lose them here pretty soon.

Okay. The shaft is 09240, plus --

You want me to write - to log this?

09240. Okay. ENTER. And the trunnion is plus 25300. Plus 25300. ENTER.

There's no trouble reading by earthshine.

Oh, I don't have anything yet.

Have you got the earth - the moon, I mean?

I can't see either.

I think I'm still on the earth - or the moon.

What is your - what's your shaft and trunnion? Jim?

Shaft is 02940.

02940, yes.

Left 25.3 degrees trunnion.

Oh, well, you're looking down at its eye. You've got to wait until you get down past the 90-degree point.

I think I see it coming up.

Apollo 8, Apollo 8, Houston; 3 minutes LOS; all systems are GO. Over.

Roger. Thank you, Houston; Apollo 8.

I see the limb, and I see the stars coming up.

Have you got optics power, zero - Oh, you haven't done that yet, huh?

No, I'm waiting until I - until I see the star.

Yes.

How much time do we have?
03 16 49 30 CDR  Half an hour.
03 16 49 49 CMP  There's our friend out there.
03 16 49 51 LMP  You can really see Australia or something down there on
                  the earth. ... I get earthset here in just a second.
03 16 50 08 CDR  Any luck, Jim?
03 16 50 11 CMP  It's coming up, but I think I can almost verify it right
                  now because I have Gruis, and Peacock is in line with
                  the bottom parts of Gruis, and this optics --
03 16 50 18 CDR  We're not in any hurry.
03 16 50 19 CMP  -- is exactly in line with it. I know, I was just
                  saying that we can almost verify it right now.
03 16 50 56 LMP  This is a pretty --
03 16 50 57 CC   All systems are GO, Apollo 8.
03 16 50 58 LMP  Look at that, look at that, Frank.
03 16 50 59 CDR  Thank you.
03 16 51 00 LMP  Look at the earth.
03 16 51 03 CDR  Yes.
03 16 51 04 CMP  Setting?
03 16 51 05 CDR  Yes.
03 16 51 06 LMP  Yes, we're down in Carnarvon.
03 16 51 10 CMP  Huh?
03 16 51 11 LMP  Yes, we're down in Honeysuckle; that was Australia.
03 16 51 20 LMP  You don't see that very often, do you?
03 16 51 47 CDR  Okay?
03 16 51 50 CMP  No, the moon's still there. I see it coming up. Stars
                  are coming up, but the moon is still there. Now, if you
                  guys want to go on a little further, go ahead without me.
Oh, we got a lot of time.

I should see Peacock rise over that. I'm just amazed how this thing operates.

It's been a pretty fantastic week, hasn't it?

It's going to get better.

Yes.

This is utterly fantastic, though. This pawl line is lined up exactly with Gruis.

You know what I think made me sick that night?

What?

That damned pill I took.

What pill did you take?

Seconal - one of the big ones.

Oh, is that right?

I didn't know you had small ones. I'd have taken one of those.

Maybe you just had the flu.

Maybe I did, I don't know, but it seems like you guys would have gotten it.

Well, I think that basically your stomach was just upset - because you can get it very easily - There's nothing wrong, you know.

Yes, I know, but I never had it before, not even in zero-G airplane, which is a - a real -

I hope this baby holds out for another 2-1/2 days. It sure has performed admirably, hasn't it?

Yes.

Gentlemen, Peacock should be rising above the moon right now.
And there it is. Just a minute, and I'll verify it.

Okay, I confirm Peacock.

Okay, Bill, checklist.

Okay.

You can leave that off - Looks like we're going to be burning in the daylight anyway.

Okay. Drive trunnion if less than 5 degrees.

Okay. Optics, zero, zero.

And G&N POWER OPTICS, OFF.

Optics, zero. Don't hit the IMU switch; OPTICS, OFF.

Okay, why don't you - Frank, you can have your lights up, I guess - Unless you wanted to check your star.

Too late, I'm not checking --

Frank, let me come down the other side.

I doubt if I'll be able to.

No, I mean around the other side.

I guess you probably won't; you'll be pitched into the moon, won't you?

Yes, that's the trouble, I - I just barely get - and then when I do see it, I see a lit horizon.

Okay, VERB 37, ENTER; 40, ENTER.

BMAG MODE, three, RATE 2.

Just a minute.

BMAG, RATE 2.

SPACECRAFT CONTROL, CMC.

CMC.
CMC MODE, AUTO.

AUTO.

Proceed.

Okay.

Okay, align spacecraft roll to GDC. You got -

Okay.

16 minutes. Do you want to wait awhile to do this?

Well, it's already aligned. I'll do it now, Bill - I don't think I'll have to do much - Put in a little bit of yaw that way.

Okay, align spacecraft roll and GDC aligned. We'll trim it again here - before the burn.

STABILITY CONTROL SYSTEM's circuit breakers, panel 8, CLOSED.

Alright. Now, let's watch this, Jim.

Direct ullage -

Don't want to leave that out.

I'm going to check mine over here, too.

They're all CLOSED.

Okay, SPS circuit breakers CLOSED except for gaging.

Gaging OPEN, okay; PITCH 1, YAW - 2, PITCH - YAW 1, YAW 2. They're in.

They're in - okay.

Okay.

I'm just checking all mine here.

Don't push on them when you've got ...

I'll get them.
03 16 58 26 LMP Okay, DEADBAND, MIN.
03 16 58 29 CDR DEADBAND going to MINIMUM - MINIMUM!
03 16 58 31 IMP RATE, LOW.
03 16 58 32 CDR LOW.
03 16 58 33 IMP LIMIT CYCLE, ON.
03 16 58 34 CDR ON.
03 16 58 36 LMP MANUAL ATTITUDE, three, RATE COMMAND.
03 16 58 37 CDR RATE COMMAND.
03 16 58 39 IMP EMAG MODE, three; ATT 1/RATE 2.
03 16 58 42 CDR ATT 1/RATE 2.
03 16 58 44 IMP ROTATIONAL CONTROL POWER DIRECT, both, OFF.
03 16 58 47 CDR DIRECT. Okay, that's OFF.
03 16 58 50 LMP SCS TVC, two, RATE COMMAND.
03 16 58 53 CDR SCS TVC, two, RATE COMMAND.
03 16 58 56 LMP TVC GIMBAL DRIVE: PITCH and YAW, AUTO.
03 16 58 59 CDR AUTO.
03 16 59 00 LMP And here's where we stop -
03 16 59 01 CDR Alright.
03 16 59 02 LMP For 13 minutes.
03 16 59 27 LMP Boy, it's blacker than pitch out here.
03 16 59 29 CDR Yes, I know it.
03 16 59 37 CMP Okay, (yawn) you're going to burn with the lights on anyway, aren't you, because you've got to get sunlight.
03 16 59 40 CDR Probably will, yes.
Yes, I watched the sun - I watched that star rise, and I could just see the black horizon - the moon fade away and the star come up and - right on it.

Okay, if we get a MAIN A or an AC 1 failure, you change gimbal drives, right?

Okay.

You get a MAIN B or an AC 2 failure, don't change gimbal drives or do anything, except put your gimbals to - from AUTO to 1.

(Singing)

Do you see anything hanging around that could come down?

I hope not.

Tell you one thing these flights are good for: an old fatty like me, I bet I've lost a lot of weight. I didn't eat much those first two days, and I didn't - didn't even get much to eat today.

When is the ignition, 89:19, huh?

Yes.

Pretty sunrise.

Yes.

I'm doing a P23 right after we leave this place, huh?

Yes.

Is it boiling, Bill?

No, I hope not. It looks low. It's just cold in there.

It does look a little low. When did I say I had the star?

What time?

Huh?

Because we still have 60 degrees to go then, if we want to be parallel - perpendicular - horizontal to the horizon.
Perpendicular (laughter)! ... The horizontal, because I was 60 degrees down and I - I just saw the - -

We're still looking at the moon - flat at the moon.

Well, not really.

Not flat at it.

I hope not.

Oh, no, not flat at it, but - Boy, it's black out there.

If you don't get G&N ignition, what are you going to do?

Go right to SPS.

Wouldn't it be smart to take it around again?

Why? If we didn't get it this time, why would we get it better the next time?

The burn ... - -

There's a 10-degree excursion on this thing.

Make sure you hit the corridor.

You're right. It would be smart to take it around again.

Get set up to do an SPS burn, huh?

AUTO SPS.

I haven't looked at your G - you might still be able to get - -

Wait a second; let me check it.

-- to get G&N errors.

(Singing, whistling)

Now, you should see something - Yes, there it comes.

Where do you see it?
6 minutes to recheck.

Oh, yes, it ... 

I see it off the side of the terminator from sunrise.

I wonder if that - that sort of a zodiacal light was a glare off the optics, or something.

... You ought to draw a little picture of it, and people could tell you what it was.

You got the gimbal thing handy right off the bat?

Yes, why don't we write that down?

Minus 0 --

-- 40 plus 157.

Is it 157? Not 151?

I'll check on the 11 pad. 157.

Okay.

... in there.

I bet we had the - The weight hadn't - the trim hadn't changed any since the last time. (Laughter) Getting worried there for a minute.

We've been eating a lot of food.

Let's see now, that's 2 - 2 minutes and 13 seconds, is that what we said? 2:18.

138 seconds.

2:18 must give you a slow return home.

Yes, ...

You got your strut in?

Yes, it's in.
03 17 07 44  LMP  Probably, one of the things we've been hearing is these oxygen masks snapping up and down.

03 17 08 02  LMP  Boy, it took three acts of Congress to get those little strings.

03 17 08 07  LMP  Oh, that - that's peculiar, isn't it?

03 17 08 12  CDR  Yes, looks to me like we're going right at it. Doesn't it look like that to you?

03 17 08 19  CMP  Why is it we do all these burns upside down?

03 17 08 21  CDR  So you can see.

03 17 08 23  CMP  (Laughter) You want to look at that?

03 17 08 25  CMP/CDR  (Laughter)

03 17 08 28  LMP  If it makes you feel bad, look out the side windows.

03 17 08 31  CDR  Yes, I think it would look better.

03 17 08 39  CDR  I've got - coming up on 10 minutes.

03 17 10 12  CDR  Okay, 9 minutes, right now on -

03 17 10 17  CDR  MARK.

03 17 10 27  CMP  (Singing)

03 17 10 42  LMP  Hey, don't forget your ullage.

03 17 10 43  CDR  Yes, gees, don't let me forget that!

03 17 10 45  LMP  How many seconds do you need?

03 17 10 47  CDR  15 seconds.

03 17 10 48  CMP  Four-jet ullage.

03 17 10 49  LMP  Okay, we better write that down.

03 17 10 55  LMP  Ullage will be at 89:19:01. Okay?

03 17 11 02  CDR  Yes. You're going to call it off, right?

03 17 11 07  LMP  Well, I'll try to remember - Got it in here.
Oh, yes.

Yes, "ullage as required" down there, I got. You'll see the 15 seconds right on here.

15 seconds.

Yes.

All it does is let you see whether it is there or not; then if it is, it doesn't do anything.

Yes, I know, but it drifts off a little. The deadband affects it, I guess.

Oh.

Boy, you think you're going to burn right into the water - I mean, right into the sand.

Did you have trouble scooping up those type of rocks? You said you went up to West Texas for that.

7 minutes, coming up on 6 minutes.

Okay.

Let's go ahead and start.

Okay, MAIN BUS ties are coming ON.

Okay.

A is ON; B is ON.

Okay. SPS, TVC, two, RATE COMMAND; and TVC GIMBAL DRIVE, PITCH and YAW in AUTO. Recheck them.

RATE COMMAND and AUTO.

Okay, TVC SERVO POWER 1, AC 1, MAIN A.

AC 1, MAIN A.

2, AC 2, MAIN B.
03 17 13 09 CDR Right.
03 17 13 10 LMP TRANSLATIONAL CONTROL POWER, ON.
03 17 13 12 CDR TRANSLATIONAL CONTROL POWER, ON.
03 17 13 14 LMP ROTATIONAL CONTROL POWER NORMAL 2, AC.
03 17 13 17 CDR AC.
03 17 13 18 LMP ROTATIONAL HAND CONTROLLER number 2, ARMED.
03 17 13 22 CDR ARMED.
03 17 13 28 LMP Stand by to start the GIMBAL MOTORS.
03 17 13 30 CDR Okay.
03 17 13 34 CDR Should I pull the circuit breakers?
03 17 13 35 LMP No, not yet!
03 17 13 37 CDR Okay, just checking.
03 17 13 46 LMP Okay, let's start PITCH 1 and YAW 1.
03 17 13 48 CDR Alright, ready; PITCH 1.
03 17 13 50 LMP Got it.
03 17 13 51 CDR YAW 1.
03 17 13 52 LMP Got it.
03 17 13 53 CDR Okay.
03 17 13 54 LMP Okay, clockwise.
03 17 13 55 CDR Clockwise.
03 17 13 56 LMP Verify no MTVC.
03 17 13 57 CDR No MTVC.
03 17 14 00 LMP Okay. Start PITCH 2 and YAW 2.
03 17 14 03 CDR PITCH 2.
03 17 14 04 LMP Got it.
03 17 14 06 CDR YAW 2.
03 17 14 07 LMP Got it.
03 17 14 09 CDR Okay.
03 17 14 10 LMP Set GPI trim.
03 17 14 11 CMP Okay, minus 40, plus 157.
03 17 14 16 LMP Got it.
03 17 14 18 LMP Verify MTVC.
03 17 14 20 CDR MTVC.
03 17 14 21 LMP TRANSLATIONAL HAND CONTROLLER, NEUTRAL.
03 17 14 23 CDR NEUTRAL.
03 17 14 25 LMP GPI returns to zero.
03 17 14 27 CDR Zero.
03 17 14 28 LMP ROT CONTROL POWER NORMAL 2, AC/DC.
03 17 14 31 CDR AC/DC.
03 17 14 32 LMP Want to trim? Yes.
03 17 14 34 CDR Yes.
03 17 14 35 LMP Okay. BMAG MODE, three, RATE 2.
03 17 14 37 CDR RATE 2.
03 17 14 38 LMP S - SPACECRAFT CONTROL, CMC and AUTO.
03 17 14 40 CDR Right.
03 17 14 41 LMP Proceed.
03 17 14 42 CMP Proceed.
03 17 14 45 CDR Okay.
03 17 14 47  LMP  Okay, RMAG MODE, three, ATT 1/RATE 2.
03 17 14 50  CDR  ATT 1/RATE 2.
03 17 14 51  LMP  ENTER.
03 17 14 52  CMP  ENTER.
03 17 14 54  LMP  Okay. Gimbal test option, ACCEPT; SPACECRAFT CONTROL, CMC; verify.
03 17 15 00  CDR  Proceed, huh?
03 17 15 01  LMP  Proceed.
03 17 15 02  CDR  Right.
03 17 15 03  CMP  Proceed.
03 17 15 04  LMP  Call them out.
03 17 15 05  CDR  Alright. 20, minus 20, 00, 02, 0 minus 2, 00.
03 17 15 20  CMP  Whew!
03 17 15 21  LMP  60 40; check your clock.
03 17 15 24  CDR  60 40; clock is good.
03 17 15 26  LMP  RCT CONTROL POWER DIRECT, both, MAIN A, MAIN B.
03 17 15 29  CDR  MAIN A, MAIN B.
03 17 15 30  LMP  SPS HELIUM VALVES, both, AUTO.
03 17 15 32  CDR  Verified.
03 17 15 34  LMP  LIMIT CYCLE, OFF.
03 17 15 36  CDR  LIMIT CYCLE, OFF.
03 17 15 37  LMP  FDAI scale, 50/15.
03 17 15 39  CDR  50/15.
03 17 15 40  LMP  Pull PITCH 2 and YAW 2.
03 17 15 42  CDR  Alright, watch this.
03 17 15 43 CDR
PITCH 2; YAW 2.

03 17 15 47 LMP
Stand by for 2 minutes.

03 17 15 50 CDR
Okay.

03 17 15 51 LMP
How's your boresight star?

03 17 15 54 CDR
Hey, listen. It looks to me like I'm going to burn right into the ground. Oh! There's the horizon. Hurray! We're going the right way.

03 17 16 02 LMP
Boy, you sure can't tell when you're - -

03 17 16 03 CMP
3.2 degrees at T<sub>ig</sub> minus 3.

03 17 16 07 CDR
What is it?

03 17 16 08 CMP
3.2 degrees at T<sub>ig</sub> minus 3 - right about now.

03 17 16 11 CDR
Okay, I can - It looks good.

03 17 16 18 CDR
We've got to arm this TRANSLATIONAL HAND CONTROLLER. Did you tell me to do that?

03 17 16 24 CDR
Then, we've got to ullage.

03 17 16 25 LMP
Yes.

03 17 16 40 CDR
Okay, coming up on 2-1/2 minutes.

03 17 16 47 LMP
Okay, 5 seconds after you start, get DELTA-V THRUST B, ON, okay?

03 17 16 52 CDR
Okay, yes. Then I'm all set.

03 17 16 56 LMP
Don't forget to start your watch, Jim. Reset it now.

03 17 16 59 CMP
Yes, it's all reset.

03 17 17 03 LMP
Okay, DELTA-V THRUST A, NORMAL.

03 17 17 06 CDR
NORMAL.

03 17 17 07 LMP
TRANSLATIONAL HAND CONTROLLER, ARMED.

03 17 17 09 CDR
ARMED.
03 17 17 10  LMP  ROTATIONAL HAND CONTROLLER, both, ARMED.
03 17 17 12  CDR  ARMED.
03 17 17 14  LMP  TAPE RECORDER. - -
03 17 17 24  CDR  Okay.
03 17 17 39  LMP  How's it look?
03 17 17 40  CDR  Good.
03 17 17 43  LMP  I'm going forward (laughter).
03 17 17 46  LMP  Well, ... - -
03 17 17 48  CDR  ... a hell of a kick in the pants now, I'll tell you that.
03 17 17 54  CDR  The DSKY blanks at 35 seconds, right?
03 17 17 56  LMP  Right, it comes back on at 30; 15 seconds later you give it the ullage.
03 17 18 05  CDR  What'll I have?
03 17 18 07  LMP  TRANSLATION CONTROL.
03 17 18 16  LMP  You got one DELTA-V THRUST, ON?
03 17 18 17  CDR  One ON, one ON.
03 17 18 18  LMP  Okay.
03 17 18 19  LMP  A, ON.
03 17 18 20  CDR  A is ON.
03 17 18 25  LMP  Don't forget the -
03 17 18 27  CDR  5 seconds.
03 17 18 28  LMP  2 to 5 seconds.
03 17 18 29  CMP  Right.
03 17 18 41  CDR  Okay, she blanked.
03 17 18 42  CMP  She blanked.

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03 17 18 43 CDR Okay.
03 17 18 45 LMP EMS MODE, AUTO.
03 17 18 46 CDR AUTO.
03 17 18 47 LMP FLIGHT RECORDER going to RECORD.
03 17 18 48 CMP Stand by to start ullage.
03 17 18 50 LMP Proceed.
03 17 18 51 CMP Proceed.
03 17 18 55 LMP I'll give you a mark for ullage.
03 17 18 56 CDR Okay.
03 17 18 58 CMP He's got it right here.
03 17 19 00 LMP 17, 16 -
03 17 19 02 CMP MARK.
03 17 19 03 LMP Ullage!
03 17 19 06 LMP Proceed when you need to.
03 17 19 12 CMP Proceed.
03 17 19 13 CDR I'm proceeding.
03 17 19 16 LMP Two valves. Good shape --
03 17 19 21 CDR Two valves.
03 17 19 22 LMP Four valves.
03 17 19 32 CMP Pressure's holding.
03 17 19 43 LMP It's looking real good.
03 17 19 45 CDR Pressure ... 
03 17 20 16 LMP Burned for 1 minute.
03 17 20 18 CDR Okay.
03 17 23 02 CDR 1, OFF.
03 17 23 03 LMP Got it.
03 17 23 04 CDR 2, OFF.
03 17 23 05 LMP Got it.
03 17 23 06 CDR 3, OFF.
03 17 23 07 LMP Got it.
03 17 23 08 CDR 4, OFF.
03 17 23 09 LMP Got it.
03 17 23 10 CDR Okay.
03 17 23 11 LMP TVC SERVO POWER, 1 and 2, OFF.
03 17 23 13 CDR OFF.
03 17 23 14 LMP FLIGHT RECORDER's OFF; MAIN BUS ties, going OFF; A is OFF —
03 17 23 20 CMP There we go.
03 17 23 22 LMP — B is OFF.
03 17 23 23 LMP Proceed.
03 17 23 24 CDR Wait a minute. Did you get all this, Jim?
03 17 23 26 CMP Yes.
03 17 23 28 LMP You ready to proceed?
03 17 23 29 CMP Proceed. I'll get these —
03 17 23 31 LMP Okay, null residuals. Record DELTA-V —
03 17 23 33 CMP Minus 54 —
03 17 23 34 CDR That 0.5?
03 17 23 36 CMP Yes, 0.5.
03 17 23 37 LMP You don't have to do a thing to that.
03 17 23 39 CDR       Just record it.
03 17 23 41 LMP       Record $\Delta V_e$.
03 17 23 43 CDR       Minus - that's up here - minus 26.4.
03 17 23 49 CMP       I got 26.4, and the burn time was --
03 17 23 52 CDR       Minus 26.4.
03 17 23 53 CMP       -- I have it; burn time was 2 minutes (cough) and 23 seconds.
03 17 23 58 CDR       Okay, can we proceed out of here, then? You got all this?
03 17 24 01 CMP       I have all that.
03 17 24 02 CDR       Proceed.
03 17 24 03 LMP       EMS - just a minute, EMS FUNCTION, OFF.
03 17 24 06 CDR       OFF.
03 17 24 07 LMP       EMS MODE, STANDBY.
03 17 24 08 CDR       STANDBY.
03 17 24 09 LMP       BMAG MODE, three, RATE 2.
03 17 24 10 CDR       RATE 2.
03 17 24 11 LMP       DEADBAND, MAX.
03 17 24 12 CDR       DEADBAND, MAX.
03 17 24 13 LMP       TAPE RECORDER's going to STOP --
<table>
<thead>
<tr>
<th>Time</th>
<th>LMP</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>06 02 36 53</td>
<td>LMP</td>
<td>ROT CONTROL POWER DIRECT, both, MAIN A/MAIN B.</td>
</tr>
<tr>
<td>06 02 36 55</td>
<td>CMP</td>
<td>TAPE RECORDER, you got that?</td>
</tr>
<tr>
<td>06 02 36 56</td>
<td>LMP</td>
<td>Roger. Horizon check.</td>
</tr>
<tr>
<td>06 02 36 58</td>
<td>CMP</td>
<td>He's doing that now.</td>
</tr>
<tr>
<td>06 02 37 00</td>
<td>LMP</td>
<td>Pitch needle error goes toward zero, approaching zero at 0.5g time.</td>
</tr>
<tr>
<td>06 02 37 03</td>
<td>CDR</td>
<td>Okay.</td>
</tr>
<tr>
<td>06 02 37 04</td>
<td>CMP</td>
<td>Okay.</td>
</tr>
<tr>
<td>06 02 37 05</td>
<td>LMP</td>
<td>Don't forget MANUAL ATTITUDE, three, to RATE COMMAND.</td>
</tr>
<tr>
<td>06 02 37 07</td>
<td>CMP</td>
<td>-MAND, that's right.</td>
</tr>
<tr>
<td>06 02 37 08</td>
<td>CDR</td>
<td>Yes. Okay, but tell me that later, okay?</td>
</tr>
<tr>
<td>06 02 37 09</td>
<td>LMP</td>
<td>Yes, right. Don't forget it.</td>
</tr>
<tr>
<td>06 02 37 10</td>
<td>CMP</td>
<td>You've got to do it in checklist ... as we go.</td>
</tr>
<tr>
<td>06 02 37 11</td>
<td>CDR</td>
<td>I've got to have that; just tell me later, okay?</td>
</tr>
<tr>
<td>06 02 37 13</td>
<td>CMP</td>
<td>We're stopped right there.</td>
</tr>
<tr>
<td>06 02 37 14</td>
<td>CDR</td>
<td>How's your evaporator?</td>
</tr>
<tr>
<td>06 02 37 15</td>
<td>LMP</td>
<td>It's - it seems to be hanging in there, but it's awfully low steam pressure. I'll - I'll manually feed it if I have to</td>
</tr>
<tr>
<td>06 02 37 20</td>
<td>CDR</td>
<td>Alright.</td>
</tr>
<tr>
<td>06 02 37 28</td>
<td>CDR</td>
<td>See where this baby wants me to fly? The pitch is way up.</td>
</tr>
<tr>
<td>06 02 37 33</td>
<td>CMP</td>
<td>See if ... of the alpha meter.</td>
</tr>
<tr>
<td>06 02 37 35</td>
<td>CDR</td>
<td>Now, as we come close to the horizon - we're going to ...</td>
</tr>
<tr>
<td>06 02 37 38</td>
<td>CMP</td>
<td>...</td>
</tr>
<tr>
<td>06 02 37 40</td>
<td>CDR</td>
<td>As we come closer to the - -</td>
</tr>
</tbody>
</table>
Yes. Well, this thing came in long before I thought it was going to at 45 degrees, where 152 is the nominal entry attitude.

Boy, it did come in wrong, didn't it?

Sure. See, I was waiting for that thing to come in. I didn't think it would come in until about 200 degrees.

How come we come in so soon?

I don't know.

Okay, evaporator's GO.

Good.

I'm pretty sure.

I keep wanting to yaw off the right here; it must be because we're boiling.

We're really boiling.

Okay, all - We're standing by now - You've got MANUAL ATTITUDE, three, RATE COMMAND when you get time. That's - We're down to there, and we are going to have a CMC GO or NO-GO check. We've got two things to do: either the DAP's NO-GO, which we'll find out when he flies it; if the CMC is NO-GO, he'll fly the EVS.

You got the 0.05g and EMS ROLL, ON.

And that's an 0.05 change.

That's right.

Okay, it looks like we got the evaporator.

How's that needle doing?

Fine.

The horizon hard to find?

No.

I wish you'd keep checking my yaw for me there, will you?
I will. You're a little bit left now, or a little right - Go left, just a little bit.

I think you're slightly rolled - Roll right, Frank.

I don't care about the rolls.

Okay, we don't need any of that, Houston.

Okay.

Keep the horizon right there.

Apollo 8 through Redstone, you're looking good. Both primary and secondary loops are holding good.

Roger; looks like we got it reserviced.

And we've got a good horizon.

Looks like you are yawing to the left or something.

No.

He's just about on, Bill.

I've got two separate sources in here that tell me my yaw's zero, don't I? Actually, I can just fly those needles, now.

Apollo 8, Apollo 8 through Redstone. Over.

Go ahead, Houston. This is Apollo 8.

Roger; read you loud and clear. You're looking good.

Roger.

The control arming is not too good in this. You get a lot more pitch than you do yaw and roll.

Hey, there, you're yawing my way.

Look who's coming there, would you?

Yes.

You see it?
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06 02 40 54 LMP
Yes.

06 02 40 55 CDR
Just like they promised.

06 02 40 56 CMP
What?

06 02 40 57 CDR/LMP
The moon.

06 02 40 58 CMP
Oh.

06 02 40 59 CDR
At 6 minutes before, just like it says.

06 02 41 01 CMP
Okay. RRT is 46:13, we're 41:03.

06 02 41 06 LMP
Are you still MIN IMP, Frank?

06 02 41 07 CDR
Yes.

06 02 41 08 CMP
That's right.

06 02 41 09 LMP
Okay.

06 02 41 11 CMP
That's where we stop, MAN ATTITUDE, three, RATE COMMAND.

06 02 41 21 CDR
Well, I'm going to give her to the DAP anyway when we get down.

06 02 41 24 CMP
As soon as you see that needle starts going off the peg, huh?

06 02 41 26 CDR
Yes.

06 02 41 27 CMP
Yes, I would, too. Better see what she does.

06 02 41 36 CDR
Make sure the EMAG's are not changed - they're not. It'll be ... if they are.

06 02 41 48 CDR
Well, men, we're getting close.

06 02 41 54 LMP
There's no turning back now.

06 02 41 57 CMP
Old mother earth has us.

06 02 42 00 LMP
We may end up losing our horizon here when that moon goes down.

06 02 42 05 CMP
That's probably what makes your horizon so good is the moon background - before it rose.

06 02 42 11 LMP
I wonder if ... would like me to do a little airglow photography right now?
06 02 42 13  CDR  Yes.
06 02 42 20  CDR  Check - doublecheck both balls for me, Jim, so - -
06 02 42 22  CMP  Yes, you're okay.
06 02 42 24  CDR  -- we're not just reading one ball, okay?
06 02 42 25  CMP  Yes, this ball's agreeing with that one.
06 02 42 30  CMP  Well, we're 42:30 - -
06 02 42 31  CDR  Check your other ring, just for sure, Jim.
06 02 42 39  CDR  There goes a washer; can you grab it?
06 02 42 41  CMP  Yes, I've been trying to get that washer - -
06 02 42 42  CDR  -- Well, it's too late now.
06 02 42 43  CMP  Well, 42:02 and 46:13. We're at 42:47, 46:32 -
06 02 42 49  CDR  We're getting close to 0.05g, too.
06 02 43 09  CDR  How's the - how high's the voltage?
06 02 43 11  LMP  Voltage is great; 28 volts.
06 02 43 15  CDR  Okay.
06 02 43 22  CMP  Okay, 152 will be the entry pad. Pitch?
06 02 43 27  LMP  Okay, you're about to lose your moon.
06 02 43 32  CMP  Okay, your yaw's looking good.
06 02 43 37  LMP  Got a lot of lightning down there, so you - you'll probably have something.
06 02 43 42  CDR  I got the old - Bill never saw that.
06 02 43 44  LMP  What is that?
06 02 43 45  CDR  Or did you notice? That's the haze level.
06 02 43 47  LMP  Airglow?
06 02 43 48  CDR  Airglow.
Good old airglow is what's --

I'll look at the airglow next time.

That's right, you've never seen the airglow. Take a look at it.

You can't get your pin without seeing the airglow.

That's right.

Let's see, is this where I'm supposed to ask how many g's, Lovell?

That's right (laughter), you ask how many g's.

How are we doing?

We're doing good over here.

Okay in the middle.

44:13; we're 2 minutes away from RRT.

Now that horizon's getting harder to find.

You're within 30 degrees of -- of the attitude.

How do you know?

Well, 152 is it, and you're coming up on it now.

It's getting a little hazy out here; does that mean anything -- every time you fire a thruster.

We're starting to get some reflection off the -- earth, I guess.

Did anybody ever see the service module?

Yes -- No, excuse me.

Okay, your needle's coming up.

Okay.

Apollo 8, Houston; 1 minute to RRT.
06 02 45 18 LMP  Roger. RATE COMMAND.
06 02 45 19 CMP  Ready; 1, 2, 3, RATE COMMAND.
06 02 45 21 CDR  RATE COMMAND.
06 02 45 22 CMP  Okay.
06 02 45 24 CMP  The CMC is AUTO?
06 02 45 25 CDR  I'm going there now, but - Now the CMC has got us.
06 02 45 29 CMP  Okay.
06 02 45 32 CDR  Okay, the pitch error is approaching zero.
06 02 45 35 CMP  Is the DAP GO?
06 02 45 36 CDR  DAP seems to be going.
06 02 45 37 LMP  Okay, --
06 02 45 38 CDR  Did you check out the horizon?
06 02 45 40 LMP  MANUAL ATTITUDE, three, RATE COMMAND?
06 02 45 41 CDR  RATE COMMAND.
06 02 45 42 CMP  You've got the checklist again, Bill.
06 02 45 43 CDR  You got it?
06 02 45 44 LMP  Yes.
06 02 45 45 CMP  Yes.
06 02 45 46 LMP  BMAC, three, RATE 2.
06 02 45 47 CDR  RATE 2.
06 02 45 48 LMP  CMC in AUTO.
06 02 45 49 CDR  CMC in AUTO; well, you don't need AUTO, but I'll put it there and make everybody happy.
06 02 45 54 CMP  Okay, 0.05g is at 46:41 --
06 02 45 57 LMP  You call 0.05g, Jim.
I'll call 0.05 - I'll tell you when the g starts going --

I've got to start this thing automatic - manually, if you don't give it to me, Jim --

Okay.

-- so be sure you call it.

At 0.05g time, right?

Yes. God, it is hazy out there, isn't it? That's a different lighting effect, I think.

That's sunrise.

Huh?

Yes, that's the sun --

Oh, here we go.

146:46:20; we should have 0.05g's.

That's the airglow we are starting to get; that's what it is, gentlemen.

Yes.

One - okay, we got the ... --

God damn, this is going to be a real ride; hang on.

I've never seen it this bright before.

Yes. Like you were going --

You got 0.05g yet?

-- ... 0.02, stand by; 38, 39, 40, 41 --

0.05g!

0.05g!

Okay, we got it!
<table>
<thead>
<tr>
<th>Time</th>
<th>Caller</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>06 02 46 44 CMP</td>
<td>Put the EMS, ON.</td>
<td></td>
</tr>
<tr>
<td>06 02 46 45 CDR</td>
<td>Hang on!</td>
<td></td>
</tr>
<tr>
<td>06 02 46 46 LMP</td>
<td>0.05g switch, ON.</td>
<td></td>
</tr>
<tr>
<td>06 02 46 47 CMP</td>
<td>0.05g ROLL to EMS.</td>
<td></td>
</tr>
<tr>
<td>06 02 46 48 CDR</td>
<td>Right. Okay, gang.</td>
<td></td>
</tr>
<tr>
<td>06 02 46 53 CMP</td>
<td>They're building up.</td>
<td></td>
</tr>
<tr>
<td>06 02 46 59 CDR</td>
<td>Call out the g's.</td>
<td></td>
</tr>
<tr>
<td>06 02 47 03 CMP</td>
<td>We're 1g.</td>
<td></td>
</tr>
<tr>
<td>06 02 47 19 CMP</td>
<td>Ohhh!</td>
<td></td>
</tr>
<tr>
<td>06 02 47 21 CDR</td>
<td>Okay.</td>
<td></td>
</tr>
<tr>
<td>06 02 47 23 CMP</td>
<td>5!</td>
<td></td>
</tr>
<tr>
<td>06 02 47 41 CMP</td>
<td>6!</td>
<td></td>
</tr>
<tr>
<td>06 02 47 53 CMP</td>
<td>4!</td>
<td></td>
</tr>
<tr>
<td>06 02 48 01 CMP</td>
<td>She's doing a great job.</td>
<td></td>
</tr>
<tr>
<td>06 02 48 06 CMP</td>
<td>B circular at 48:23.</td>
<td></td>
</tr>
<tr>
<td>06 02 48 24 CDR</td>
<td>B circular.</td>
<td></td>
</tr>
<tr>
<td>06 02 48 26 LMP</td>
<td>Cabin temperature is still holding real good.</td>
<td></td>
</tr>
<tr>
<td>06 02 48 33 CMP</td>
<td>... Okay, we're 67.</td>
<td></td>
</tr>
<tr>
<td>06 02 49 07 LMP</td>
<td>Quite a ride, huh?</td>
<td></td>
</tr>
<tr>
<td>06 02 49 13 CDR</td>
<td>Damnedest thing I ever saw.</td>
<td></td>
</tr>
<tr>
<td>06 02 49 16 CDR</td>
<td>Gemini was never like that, was it, Jim?</td>
<td></td>
</tr>
<tr>
<td>06 02 49 19 CMP</td>
<td>No, it was a little faster than this one.</td>
<td></td>
</tr>
<tr>
<td>06 02 49 27 LMP</td>
<td>I assure you I've never seen anything like it.</td>
<td></td>
</tr>
<tr>
<td>06 02 49 32 LMP</td>
<td>Cabin temperature's holding real good - up 1 degree.</td>
<td></td>
</tr>
</tbody>
</table>
Primary evaporator's crapped out; secondary's still working.

We're below the 2g's.

Temperature's coming up in the primary loop okay.

Nice job there, gang.

Drogues at - You got them there? 8:16.

That's 50:16?

No, that's not right. 54 ... right.

It's a real glow. I can see our gegenschein --

Second pulse coming up.

(Cough)

How much will this one go up, do you think?

3!

Okay, we should have COMM.

Give them a call.

Houston, Apollo 8. Over.

Houston, Apollo 8. Over.

Go ahead, Apollo 8. Read you broken and loud.

Roger; this is a real fireball; it's looking good.

Come on, John Glenn.

Don't let me forget those - boost entry.

Roger; I got you.

Okay.

It's almost all over but the shouting now, men.

We're in real good shape, Houston.
06 02 52 15 CC Real fine.
06 02 52 18 CMP I think he's going to take Paul Haney's job. (Laughter)
06 02 52 20 LMP (Laughter) My mother was worried.
06 02 52 25 LMP A little smell in here.
06 02 52 27 LMP Don't go to boost entry yet.
06 02 52 30 CC Apollo 8, Houston. Yorktown has radar on you.
06 02 52 42 CDR Alright, I'm in boost entry.
06 02 52 43 LMP Okay.
06 02 52 44 CDR How's it look --
06 02 52 45 LMP Looking good.
06 02 52 47 CDR Is it holding? Cabin pressure?
06 02 52 50 LMP Yes, it's holding.
06 02 52 51 CDR Alright. Watch your altimeter, that's going to come up in a hurry here.
06 02 52 55 CMP Okay.
06 02 52 56 LMP I'll -- I'll give you warning on the steam pressure, if I can see it.
06 02 53 00 CDR 2g's.
06 02 53 02 CMP 54:29 should be --
06 02 53 05 CDR Look's like we're overshooting, according to the EMS.
06 02 53 07 LMP Yes.
06 02 53 08 CDR Okay.
06 02 53 10 CMP 53.
06 02 53 17 CDR Got anything yet, Bill?
06 02 53 19 LMP Yes, I'm getting steam pressure. Okay. --
54:29.

We got steam pressure.

Okay.

Make sure your heels are locked.

We got a - we got a minute to drogues.

Okay, you're in boost entry?

Yes.

Okay, anything on the altimeter, yet?

Not yet.

Okay, we've got 15 seconds from where - from 90K.

Okay.

Okay.

There she comes.

Okay, she's starting to come.

30 seconds from 90K.

Apollo 8, Houston.

Stand by, Houston.

If you get a chance, we'd like to have your DSKY readings before drogues.

Stand by. Can you give him a DSKY reading, before drogues?

Roger; DSKY's reading plus four balls 7, plus two balls 812, minus 16502.

40K.

Coming up on 40K. You should be at 40K now.
We're at 40K.
We are.
Okay, call 30K.
I will.
30K.
ELS -
ELS LOGIC, ON.
Right.
ELS, AUTO.
AUTO.
Stand by for RCS disable. Stand by on the apex cover.
Right.
There goes the apex cover; there go the drogues.
Okay.
20 000.
Cabin pressure's coming up.
19 000.
Stand by for 10K.
Should be approaching 10K soon.
15.
Wonder what that was?
Nothing.
Should be approaching 10K. Stand by with the mains in 1 second.
You see it?
CONFIDENTIAL

06 02 55 46 LMP Can't see it.
06 02 55 47 CDR It should reef pretty soon.
06 02 55 48 LMP Can't see a thing.
06 02 55 52 LMP Okay, you got them?
06 02 55 55 CDR Yes.
06 02 55 56 LMP FLOAT BAG, three, circuit breakers CLOSED.
06 02 55 58 CDR CLOSED.
06 02 55 59 LMP VHF antennas, recovery; VHF AM, simplex.
06 02 56 03 LMP Beacon's going ON. Get your light ON.
06 02 56 05 CDR It's ON.
06 02 56 06 LMP You got your - you got it, Jim.
06 02 56 08 CMP Huh?
06 02 56 09 LMP You got the call - give them a call.
06 02 56 10 CMP Okay.
06 02 56 14 CMP Houston, Apollo 8. Over.
06 02 56 15 CDR Okay, standing by for the dump --
06 02 56 17 ABl Apollo 8, Airboss 1. Go ahead.
06 02 56 19 CMP Roger, Air Force 1. We indicate 8000. We can't see the chutes, but we're going down very slow.
06 02 56 25 ABl Roger, this is Airboss 1. You're sounding very good, very good. You have been reported on radar as southwest of the ship about 25 miles. Go ahead.
06 02 56 37 CMP Roger. We are now indicating 7000.
06 02 56 40 CDR Ask him if he sees our beacon.
06 02 56 42 CMP Airboss, do you see our flashing beacon?

CONFIDENTIAL
This is Airboss 1. Negative. Welcome home, gentlemen, and we'll have you aboard in no time. Go ahead.

Stand by for the dump, Frank.

Alright.

This is Recovery 3. I have a flashing light, my 4 o'clock position, almost level.

Recovery 2, sever contact 260 --

Okay, ready for the dump, Frank?

Ready.

CABIN PRESSURE RELIEF valves, both, CLOSED.

Got that.

-- my position at --

DIRECT O₂, OPEN.

-- 09548.

CM RCS LOGIC, ON.

ON.

Command module propellant, DUMP.

Recovery 2, Airboss 2. You are cleared to dispatch for your altitude over clouds. Over.

Roger ... This is Recovery 2, I see the chutes; I see the light almost directly over Yorktown, level with me at 4000 feet precisely.

Stand by. Stand by for earth landing!

Yorktown, Airboss 1 ... received a message that he sees the chutes, sees the flashing light almost over Yorktown, descending 4000 ... very, very ... Out.

All aircraft, this is Yorktown ... have capsule in sight. Out.

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06 02 58 15 LMP  Okay!  Purge.  Purge it.
06 02 58 20 CDR  We're purging.
06 02 58 22 LMP  Purge complete?
06 02 58 24 AB1  Yorktown, this is Airboss 1.  We consider recovery splashdown in your area.  Take control recovery helos and vector them.
06 02 58 33 LMP  Floodlights to POSTLANDING.  ...
06 02 58 34 YORK  This is Yorktown.  Roger; out.
06 02 58 35 LMP  CABIN PRESSURE RELIEF valves, ...
06 02 58 37 R3  This is Recovery 3.  Have lost sight of visual light.  ..., Yorktown.
06 02 58 40 AB1  Dump - purge the cabin at 3000 feet.
06 02 58 44 LMP  Recovery 2, 'boss 2.  You're 22 out.
06 02 58 46 AB2  CM RCS propellant, both, OFF.
06 02 58 49 LMP  Recovery 2.  Roger.  Passing 1500 feet, descending --
06 02 58 53 LMP  ROTATIONAL CONTROL POWER DIRECT, OFF.
06 02 58 55 CDR  DIRECT, OFF.
06 02 58 56 YORK  This is Yorktown.  Affirmative, we do have him in capsule in sight.  Out.
06 02 59 00 LMP  Turn him down.  Christ, we can't get anything done.
06 02 59 02 CDR  Alright, DIRECT is OFF.
06 02 59 03 R2  This is Recovery 2.  Passing 1000 feet.
06 02 59 10 CDR  Okay --
06 02 59 11 LMP  What's that?
06 02 59 12 CDR  Cabin dump.
06 02 59 13 LMP  -- okay, cabin dump.  Okay, hold it.
06 02 59 16 YORK Recovery 3, Yorktown. The module bears 147°; 5000 yards. Yorktown, over.

06 02 59 23 LMP ... OFF.

06 02 59 25 CDR Alright, anything else we missed?

06 02 59 27 R3 Roger.

06 02 59 28 LMP Negative; just stand by to release the mains.

06 02 59 30 CDR Yes.

06 02 59 32 LMP Stand by for the MAIN BUS ties.

06 02 59 34 LMP Brace yourselves.

06 02 59 36 CDR Well, wait; we've got 2000 feet, yet.

06 02 59 38 CMP I don't know if we have or not. They - reporting us as lower.

06 02 59 42 LMP Oh, they were?

06 02 59 47 CDR Who was worried about getting hot?

06 02 59 51 LMP Only because I cooled you down.

06 02 59 58 R2 Recovery 2 is at level 1000.

06 03 00 00 CMP 1500.

06 03 00 01 AB1 Roger, 2. This is ... 3.

06 03 00 03 CDR He called it 1000. Maybe we better get these -

06 03 00 06 R2 Recovery 2, descending through cherubs 5.

06 03 00 08 LMP Okay, Frank, you put them CLOSE whenever you want. I'm turning the MAIN BUS ties OFF now.

06 03 00 14 AB1 Recovery 1, this is Airb --