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S U M M A R Y L O G O F A P O L L O 8

(All Times Eastern Standard)
(All Distances in Nautical Miles)
Saturday, December 21, 1968

7:51 a.m. Liftoff from Cape Kennedy

7:53 a.m. Saturn V first stage completes burn. G forces in spacecraft reach a maximum of 4 1/2. Second stage ignition. Altitude 40 miles.

8:00 a.m. Second stage completes burn. G forces reach maximum of 2. Third stage ignition. Altitude 100 miles.

8:03 a.m. Third stage completes first burn. G forces reach maximum of 2/3. In orbit, perigee 99 miles, apogee 103.

10:17 a.m.

Capcom (Michael Collins): Apollo 8, Houston.

Spacecraft (Frank Borman): Go ahead, Houston.

Capcom: All right, you are go for TLI (Trans-Lunar Injection) over.

Spacecraft: Roger, we understand, we are go for TLI.

10:42 a.m. Trans-Lunar Injection, second burn of third stage.

10:47 a.m. Third stage completes burn. G forces reach maximum of 1 3/4. Velocity 35,556 feet per second.

11:12 a.m. Separation of third stage and instrument unit from Apollo 8 spacecraft.

12:12 p.m. Spacecraft oriented for short burst of service module propulsion system, to increase separation from third stage.

Spacecraft: OK, as soon as we find the earth, we'll do it.

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12:36 p.m. Altitude 17,200 miles. Burn adds 8 feet per second to velocity.

12:51 p.m. Altitude 19,000 miles.

Spacecraft (James Lovell): It's really hard to describe what this earth looks like. I'm looking out my center window, which is the round window, and the window is bigger than the earth is right now. I can clearly see the terminator. I can see most of South America all the way up to Central America, Yucatan, and the Peninsula of Florida. There is a big swirling motion just off the east coast, and then going on over toward the east I can still see West Africa, which has a few clouds right now. We can see all the way down to Cape Horn in South America

Capcom (Collins): Good grief, that must be quite a view.

Spacecraft: Yes, tell the people in Tierra del Fuego to put on their rain coats. Looks like a storm is out there.

6:51 p.m. Altitude 52,770 miles. Midcourse correction burn of service propulsion system engine, duration 2.4 seconds, increases velocity by 24 to 25 feet per second.

8:51 p.m. Borman requests and receives permission to take a Seconal sleeping pill.

Sunday, December 22, 1968

6:50 a.m. Analysis of tracking data shows the second mid-course correction burn would require a velocity change of only 0.7 feet per second. Decision not to bother with so small a correction.

8:55 a.m. Altitude 140,000 miles.

Capcom (Collins): How are you doing up there? Did you get a good night's sleep?

Spacecraft (Lovell): Oh, you know. The first night in space all the time --

Capcom: The old man woke you up earlier than he needed to.

Spacecraft: Well, we just couldn't sleep any longer.

8:56 a.m.

Spacecraft (Borman): This is a mighty nice view we have down there today. A little bit more than a half earth. Looks like Africa and the Red Sea are visible--we're not quite sure as there is quite a bit of cloud cover. But even through the hazy windows it is mighty nice.

11:00 a.m. Apollo 8 crew reports illness.

11:50 a.m.

Capcom (Collins): We are on a private loop now and we would like to get some amplifying details on your medical problems. Could you go back to the beginning and give us a brief recap, please?

Spacecraft (Borman): Mike, this is Frank. I'm feeling a lot better now. I think I had a case of the 24-hour flu, intestinal flu.

Capcom: Roger, understand. When did you first notice it?...

Spacecraft: Roger. About, I guess about 20 hours, 19 hours yesterday....

Flight Surgeon (Dr. Charles Berry): Frank, this is Chuck. The story we got from the tape and from Jim a while ago went like this. At some 10 to 11 hours ago, you had a loose BM, you vomited twice, you had a headache, you've had some chills, and they thought you had a fever. Is that firm?

Spacecraft: Everything is true, but I don't have a fever now. I slept for a couple of hours and the nausea is gone, and controlling the loose BM. I think everything is in good shape right now.

Flight Surgeon: Did you have a sore throat?

Spacecraft: The roof of my mouth was sore, Roger.

Flight Surgeon: As as we understand it at the moment, Frank, neither Bill nor Jim have anything at the present time except some nausea. Is that right?

Spacecraft: No, none of us are nauseated now. We are all fine now.

Flight Surgeon: Okay, and you have taken the Lomotil?

Spacecraft: No, we haven't. Pardon me, yes, they have.

Flight Surgeon: They have and you have not?

Spacecraft: Roger. I just woke up, Chuck. They took them while I was asleep.

Flight Surgeon: Okay, I think you ought to take one, Frank, and the Marezine will help if that nausea returns.... The Marezine can be used if you do get nauseated, any one of the three of you.

Spacecraft: Okay, thank you.

3:00 p.m. Altitude 120,600 miles. First television transmission shows good views of inside of Apollo 8 spacecraft, but image of earth is too bright.

4:36 p.m. Anders requests and receives permission to take sleeping pill.

8:14 p.m. Flight surgeon directs Borman to take a second Lomotil tablet.

8:55 p.m. Altitude 136,500 miles. Analysis of tracking data shows that Apollo 8 is headed for a pericyynthion (nearest passage of the moon) between 60 and 70 miles. Third midcourse correction would be less than one foot per second.

10:00 p.m. Discussion of guidance and navigation calculations regarding contingency plans.

Capcom (Kenneth Mattingly): Jim, we have just been looking at your mark with respect to accuracy and they figure they are within a couple of thousandths of a degree of the theoretical optimum. The integrator seems to bear that out.

Spacecraft (Lovell): Well, I hope that they are enough to get us home if we have to use them.

Capcom: Well, I am getting a lot of confidence in your ability to run that mystery shown now.

Spacecraft (William Anders): Hey, Ken, we have to spend four more days up here with him--will you take it easy. He is already talking about going back to MIT as a professor.

Monday, December 23, 1968

2:53 a.m. Altitude 150,500 miles. Temperature inside spacecraft drops to 60°F. Crew requests advice on how to increase temperature.

2:58 a.m. Ground suggests two options. Crew decides to turn up heat exchanger and turn on one fan.

3:40 a.m. Lovell reports he can see stars in daylight at this altitude (152,200 miles). Temperature back up to 70°.

5:40 a.m. Spacecraft (Lovell) reports that each crewman has had two sleep periods and Borman is in his third. In most recent periods, Anders 6 hours, Lovell 4 hours, Borman 5 hours.

Capcom (Gerald Carr); Roger; Jim. How are the three of you feeling?

Spacecraft: Wonderful. We're all feeling pretty good now, no problems.

12:50 p.m. Altitude 171,300 miles.

Capcom (Collins): If you have a few minutes, we would like to hear the detailed crew status report from you.

Spacecraft (Lovell): Like what?

Capcom: Well, like we would like to know, in the last 24 hours has anybody had any symptoms similar to Frank's. We would also like to how--you know we told you the other day to take more Marezine as you like. We would like to know if anybody had taken any drugs and then we would like to talk over there about sleep, rest and water and such.

Spacecraft: Okay, nobody has taken any other drugs. Nobody took any Marezine. Nobody is sick. Bill took one of those pills, a sleep Seconal pill, last night. Everybody had breakfast this morning and ate most of their meal--meal A, day 3. What else do you want?

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

Spacecraft: We all feel fine. We are going to fix it now so that we all have one more rest period before the LOI (lunar orbit insertion).

Capcom: Roger, thank you.

Spacecraft (Lovell): Happiness is bacon squares for breakfast.

Capcom: If you don't eat them all, bring them back and we'll finish them off here.

2:58 p.m. Altitude 175,100 miles. Second television transmission. Camera and filter adjustments succeed in transmitting excellent image of the earth.

Spacecraft (Borman): What you are seeing is the Western Hemisphere. Looking, the top is the North Pole.

In the center, just lower to the center is South America. All the way down to Cape Horn. I can see Baja California and the southwestern part of the United States. There is a big cloud bank going northeast, covers a lot of the Gulf of Mexico up to the eastern part of the United States. It appears now that the east coast is cloudy...

Spacecraft (Lovell): Frank, what I keep imagining is if I am some lonely traveler from another planet what I would think about the earth at this altitude. Whether I think it would be inhabited or not.

Capcom (Collins): Don't see anybody waving, is that what you are saying.

Spacecraft: I was just curious if I would land on the blue or the brown part of earth.

3:29 p.m. Altitude 176,275 miles above the earth; 33,821 miles above the moon. Apollo leaves the region in which the gravitation of the earth is dominant; enters the zone in which the moon's gravity is dominant.

8:51 p.m. Lunar altitude 21,100 miles. Service module reaction control system (four jets, each 100 lbs. thrust) fired 11 seconds to reduce velocity by 2 feet per second, to approach closer to desired distance of 60 miles to moon at nearest point of flight path.

10:15 p.m. Time of lunar orbit insertion calculated as 4:59 a.m. December 24, while Apollo 8 is behind the moon and out of communication with the earth.

10:55 p.m. Anders requests and is granted permission to take a small Seconal sleeping pill.

Tuesday, December 24, 1968

2:03 a.m. Mission control provides guidance and navigation data to Apollo 8 for the service propulsion system burn for lunar orbit insertion. A sample of the conversation:

Capcom (Carr): Minus 2 niner 837 plus zero 23 niner zero plus zero zero niner niner 4 zero zero zero 2 zero zero zero 5 zero 16 niner 3 plus zero zero 6 zero zero 2 niner niner 4 niner 4 zero 2 2 niner 7 8 2. Copy.

Spacecraft (Lovell): Copy.

Capcom: Roger 8. Zero 1 zero 6 8 niner 2 6 zero. Perpieye zeta. Down zero 4 8 left zero 5. The remainder is not applicable. Sirius Rigel set of stars for GDC alliance. 12 niner 1 5 5 zero 1 zero negative ullage. We'll pass the horizon data later....

3:55 a.m. Altitude 3,100 miles.

Capcom (Carr): Apollo 8, this is Houston at 68:04. You are go for LOI.

Spacecraft (Borman): Okay. Apollo 8 is go.

4:48 a.m. Altitude 400 miles.

Capcom (Carr): Apollo 8 Houston, one minute to LOS (loss of signal). All systems go. Roger, safe journey, guys.

Spacecraft (Anders): Thanks a lot, troops, we'll see you on the other side.

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

Spacecraft: Roger.

4:49 a.m. Loss of signal as Apollo 8 passes behind the moon.

5:00 a.m. Borman presses "proceed" key on guidance and navigation display keyboard. Five seconds later, the service propulsion system begins its burn for lunar orbit insertion.

5:04 a.m. Burn completed after 4 minutes and 2 seconds, reducing speed by 2,994 feet per second, placing Apollo 8 in orbit with apolune (high point of orbit) of 168.5 miles and perilune (low point) of 60.5 miles

7:36 a.m. During second revolution of the moon.

Spacecraft (Anders): There's a very new bright impact crater. Should be in the field of view right now.

Capcom (Carr): Roger, Bill.

Spacecraft: ...The color of the moon looks like a very whitish gray, like dirty beach sand with lots of footprints on it. Some of these craters look like pickaxes striking concrete, creating a lot of fine dust.

8:09 a.m. Mission Control gives Apollo 8 go-ahead for second lunar orbit insertion burn, again behind the moon, to make its orbit circular by reducing apolune from 168 to about 60 miles.

8:55^{a.m.} Loss of signal as Apollo 8 passes behind the moon at the conclusion of second revolution.

9:26 a.m. Service propulsion system burned for 11 seconds to reduce speed by 135 feet per second. Orbit now nearly circular: perilune 61 miles, apolune 61.5 miles.

9:42 a.m. Signal re-acquired as Apollo 8 emerges from behind the moon.

10:35 a.m. During third revolution.

Spacecraft (Borman): Is Ron^A Rose around?...

Capcom (Collins); Ron Rose is sitting in the viewing room. He can hear what you say.

Spacecraft: I wonder if he is ready for experiment P1?

Capcom: He says thumbs up on P1....

Spacecraft: Roger. Ron and I got together and I was going to record a little--say a little prayer for our church service tonight. And I wonder--I guess that's what we are ready on.

Capcom: Stand by one, Frank.

Spacecraft: All right

Capcom: Apollo 8, Houston. Go ahead, Frank, with your message.

Spacecraft: Okay. This is to Ron Rose and the people at St. Christopher's (Episcopal Church in Seabrook, Texas)--actually to people everywhere.

Give us, O God, the vision which can see Thy love in the world in spite of human failure. Give us the faith, the trust, the goodness in spite of our ignorance and weakness. Give us the knowledge that we may continue to pray with understanding hearts, and show us what each one of us can do to set forth coming of the day of universal peace. Amen.

Capcom: Amen.

Spacecraft: I was supposed to lay read tonight, and I couldn't quite make it.

Capcom: Roger, I think they understand.

4:03 p.m. During sixth revolution. Discussion of potential Apollo landing sites.

Spacecraft (Lovell): Mike, there are an awful lot of objects down on the landing site. It's just as formidable Jack Schmitt (Dr. Harrison H. Schmitt, scientist astronaut) marked. All of the objects are tracking perfectly on the target, and if you like it we can get it out beautifully. I have a beautiful view of it. The first I've seen just barely beneath the vertical now, and the second one coming up--just a grand view.

Capcom (Collins): Roger, Go ahead, Jim, Jack's listening.

Spacecraft: Jack, the information--the triangles that we see now are from the first IV, second IV and the C1 are just right, I think, for landing conditions. The shadows aren't too deep for you to get confused, the land has texture to it and enough shadows there should make everything stand out.

4:10 p.m.

Spacecraft (Lovell): We have a little piece of useful information if you're interested in deliberating over it.

Capcom (Collins): Go ahead.

Spacecraft: Roger. Our first control point (for navigation) is very near the terminator, and as the objects we're tracking, I had an occasion to watch the sun come up, and at about two minutes before sunrise you get the limb begins to brighten up into sort of a fine white haze, a faint glow completely over the space just behind the limb.

Capcom: ...How far out does it extend?

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

6:32 p.m. During seventh revolution, following a report by Bowman that the Apollo 8 crew is getting tired.

Capcom (Collins): This rev coming up we would like to clarify whether you intend to scrub control point 1, 2 and 3 only and do the pseudo landing site or whether you also intend to scrub the pseudo landing site mark, over.

Spacecraft (Borman): We're scrubbing everything. I'll stay up and try to keep the spacecraft vertical and take some automatic pictures but I want Jim and Bill to get some rest.

Capcom: Roger, I understand.

8:20 p.m. During eighth revolution. Conversation about the weather.

Capcom (Mattingly): They told us that there is a beautiful moon out there.

Spacecraft (Borman): Now we were saying that there is a beautiful earth out there.

Capcom: It depends on your point of view.

8:23 p.m. Communications demonstration shows that a radio signal from the earth to Apollo 8 and back to earth takes about 3 seconds to make the round trip of more than 400,000 miles.

9:40 p.m. Television transmission during ninth revolution.

Spacecraft (Borman): I think that each one of us... carries his own impression of what he's seen today. I know my own impression is that it's a vast, lonely forbidding type existence—a great expanse of nothing, that looks rather like clouds and clouds of pumice stone, and it certainly would not appear to be a very inviting place to live or work.

(Lovell): ...The vase 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 vastness of space.

9:43 p.m.

Spacecraft (Anders): ...The mountains coming up now are heavily impacted with numerous craters whose central peaks you can see and 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 rather forbidding, foreboding extents of blackness

with no stars visible when we're flying over the moon in daylight. You can see by the numerous craters that this planet has been bombarded through the eons with numerous small asteroids and meteoroids, pock-marking the surface every square inch. And one of the amazing features of the surface is the roundness that most of the craters--seems that most of them have a round mound type of appearance instead of sharp, jagged rocks. All, only the newest of features have any sharp definitions to them, and eventually they get eroded down by the constant bombardment of small meteoroids.

9:56 p.m.

Spacecraft (Anders): ...I hope all of you back down on earth can see what we mean when we say that it is a very foreboding horizon, a very dark and unappetizing looking place...Now you can see the long shadows of the lunar sunrise. We are now approaching the lunar sunrise and for all the people back on earth the crew of Apollo 8 has a message that we would like to send to you.

9:58 p.m.

Spacecraft (Anders): In the beginning, God created the Heaven and the earth. And the earth was without form and void and darkness was upon the face of the deep. And the spirit of God moved upon the face of the waters and God said, Let there be light. And

there was light. And God saw the light and that it was good and God divided the light from the darkness. (Lovell): 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 above the firmament. And it was so. And God called the firmament Heaven. And evening and morning were the second day.

(Borman): And God said let the waters under the Heavens be gathered together in one place. And the dry land appear. And it was so. And God called the dry land earth. And the gathering together of the waters called He seas. And God saw that it was good. And from the crew of Apollo 8, we pause with good night, good luck, a Merry Christmas and God bless all of you - all of you on the good earth.

10:17 p.m. Time of trans-earth injection calculated as 1:10 a.m. December 25, while spacecraft is behind the moon completing its 10th revolution.

11:55 p.m. Mission Control gives Apollo 8 a go-ahead for trans earth injection.

Wednesday, December 25, 1968

12:42 a.m. Loss of signal as Apollo 8 passes behind the moon.

1:10 a.m. Service propulsion system begins burn to propel Apollo 8 back to earth.

1:13 a.m. Burn completed after 3 minutes and 23 seconds, increasing velocity by 3,523 feet per second.

1:20 a.m. Apollo 8 signal re-acquired as it emerges from behind the moon.

1:21 a.m.

Capcom (Mattingly): Apollo 8, Houston.

Spacecraft (Lovell): Apollo 8, over.

Capcom: Hello, Apollo 8, Loud and clear.

Spacecraft: Roger, Please be informed there is a Santa Claus.

1:35 a.m.

Capcom (D. K. Slayton): Good morning, Apollo 8, Deke here. I just would like to wish you all a very Merry Christmas on behalf of everyone in the Control Center and I'm sure everyone around the world. None of us ever expected a better Christmas than this one. Hope you get a good night's sleep from here on and enjoy your Christmas dinner tomorrow and look forward to seeing you in Hawaii on the 28th.

Spacecraft: Okay, leader, see you there.

11:57 a.m.

Spacecraft (Anders): How was Christmas at your house today?

Capcom (Collins): Early and busy as usual. I told Michael you guys are up there and he said who's driving?

Spacecraft: That's a good question. I think Isaac Newton is doing most of the driving right now.

12:38 p.m. Altitude 175,528 miles above the earth. Apollo 8 leaves the lunar sphere of influence and returns to the region in which the gravity of the earth is dominant.

3:51 p.m. Mid-course correction burn of service propulsion system, 14 seconds in duration and perpendicular to flight path, changes velocity by 5 feet per second.

4:15-24 p.m. Television transmission shows interior of spacecraft, controls, and food preparation.

Thursday, December 26, 1968

6:07 a.m. Analysis of tracking data shows there will be no need for midcourse correction No. 6. Decision will be made later regarding the final correction shortly before re-entry.

8:45 a.m.

Capcom (Carr): Could we have a crew status report?

Spacecraft (Borman): You may. We had a good night's sleep. Everyone slept at least 7 hours yesterday, and we have just finished breakfast, drunk a lot of water, and I think we are in very good shape. Just used the exerciser.

9:05 a.m.

Spacecraft: And we're happy to report the earth is getting larger.

12:40 p.m. Altitude 108,300 miles. Apollo 8 has passed that point in the return flight in which there are possibilities of landing in the Atlantic or Indian Oceans, permitting the release of recovery forces in those oceans.

3:51-56 p.m. Altitude 97,500 miles. Television transmission shows views of earth.

Spacecraft (Anders): I think I must have the feeling that the travelers in the old sailing ships used to have. Going on a very long voyage away from home and now we're headed back and I have that feeling of being proud of the trip, but still happy to be going back home and back to our home port.

Friday, December 27, 1968

4:30 a.m. Altitude 43,000 miles. Calculations show that Apollo 8 flight path is within 0.06° of desired angle of entry. Thus there will be no further course correction. Entry interface (arrival at 400,000 ft. altitude, where earth's atmosphere begins to be felt) will be at 10:37 a.m.

5:44 a.m. Altitude 37,000 miles. Pre-landing stowage of flight equipment completed.

10:22 a.m. Altitude 9,000 miles. Service module separates from command module and its engine is fired to carry it 100 miles to the south of the landing point.

10:37 a.m. Apollo 8 reaches 400,000 feet altitude, traveling at 35,556 feet per second.

10:38 a.m. Communications blackout begins as meteoric heat of entry ionizes atmosphere surrounding spacecraft. G forces climb to almost 7.

10:43 a.m. Communications restored.

Spacecraft: We are in real good shape, Houston.

Capcom: Real fine.

10:45 a.m. Main parachutes deploy.

10:49 a.m. Voice contact reported with recovery forces.

10:51 a.m. Splashdown at 165° West Longitude, 8°8' North Latitude, about 5,000 yards from carrier USS Yorktown. Apollo 8 crew reports all is well. According to plan, deployment of pararescue personnel is delayed until local sunrise, due in about three-quarters of an hour. Helicopters and aircraft hover in area.

11:31 a.m. First swimmer in the water.

11:35 a.m. Sea anchor attached to Apollo 8.

11:52 a.m. Large life raft dropped near spacecraft.

12:04 p.m. Apollo 8 hatch opened.

12:14 p.m. All three astronauts aboard helicopter. Yorktown less than 3,500 yards away.

12:20 p.m. Touchdown on the deck of the Yorktown.