

STS-4 AIR/GROUND TRANSCRIPTS

PART TWO

FROM MET 02:16:40 to MET 04:19:20

SPACECRAFT (garble and I noticed that some of these things are called out time critical. I guess you want those done right at the time indicated. Is that correct?

CAPCOM That's correct Henry. And Columbia, Houston, to try and keep you advised of the overall plan, we're going to spend today in bottom sun and then we're going to go to tail sun for the rest of the mission eventually after spending tonight in PTC with a little bit of PTC then prior to entry. Today is going to be pretty heavy as you can see by your CAP update, but the rest of the days should be a little bit lighter, probably give you a chance to get some of your shopping list items in.

SPACECRAFT Okay. Thank you Lewis.

PAO This is Shuttle Control. We've got a short break here between Dakar and Madrid of a few seconds. We'll stand by, have a little bit of overlapping coverage through Madrid.

CAPCOM Columbia, Houston, we're going LOS. We'll see you through Yarragadee at 17:15.

SPACECRAFT Okay. We'll see you then.

PAO This is Shuttle Control. Columbia has moved out of range of Madrid now. Next acquisition through Yarragadee in 29 and 1/2 minutes. Today is Hank Hartfield's wedding anniversary and on this first air/ground pass of the day, he received taped messages from his two daughters and his wife. Columbia will stay in bottom sun attitude today to, in case there's any moisture left in the tiles, this will help continue to bake that out. Today is a full schedule for the continuous flow electrophoresis experiment. There will be some additional activities with the induced environmental contamination experiment, however, that experiment will not be used in conjunction with the remote manipulator system today. And there's considerable activity with the tactical air navigation system today using track end stations in the United States, Mexico, Australia, and Africa in tests to determine whether that system might be helpful for on-orbit navigation. As time allows, the crew will also attempt to troubleshoot the getaway special. The time set out in today's flight plan for that activity is 2 days, 19 hours, 35 minutes. At 2 days, 16 hours, 48 minutes Mission Elapsed Time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 2 days, 17 hours, 14 minutes Mission Elapsed Time. Columbia is about 30 seconds away from a short pass at Yarragadee.

CAPCOM Columbia Houston through Yarragadee for 4 minutes. Standing by. Columbia, Houston, we're 30 seconds LOS. We'll have a short pass through Orroral in a couple of

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minutes. We'll call you then.

SPACECRAFT Okay.

PAO This is Shuttle Control. Yarragadee has loss of signal. Columbia's track on this orbit just skirts the edge of the Orroral acquisition range. We may or may not be able to get communications through that station. We'll stand by and see. At 2 days, 17 20 minutes Mission Elapsed Time, this is Shuttle Control, Houston.

CAPCOM Columbia, Houston through Orroral for about a minute. You're 5 by.

CAPCOM Columbia, Houston, we're going LOS. Stateside next on the hour and a reminder, the fuel cell purge should be done prior to the gas release.

SPACECRAFT Okay.

END OF TAPE

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CAPCOM Columbia, Houston, we're going LOS, stateside next on the hour, and a reminder the fuel cell purge should be done prior to the gas release.

SPACECRAFT Okay.

PAO This is Shuttle Control, Columbia's out of range of Ourroral now. Heading out over the Pacific Ocean, next acquisition through the Merritt Island, Florida Station in 32 minutes. Columbia in orbit now of 163.4 by 160 nautical miles, with a period of 1 hour, 30 minutes, 37 seconds. At 2 days, 17 hours, 28 minutes, mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 2 days, 17 hours, 59 minutes, mission elapsed time. Columbia has started orbit number 45 and is about 30 seconds away from acquisition through Merritt Island, Florida.

CAPCOM Columbia, Houston, with you through the states for about 8 minutes.

SPACECRAFT Alright. Hey, Brewster, it should would help when you guys send up DAP pages to use the DAP codes in the book that we already got set up.

CAPCOM Okay. Columbia, Houston, Dakar at 1 3.

SPACECRAFT Okay.

PAO This is Shuttle Control, Bermuda has loss of signal with Columbia. Next station Dakar in 4 minutes. This is the time in which the Induced Environmental Contamination Monitor gas release is taking place. A mixture of neon and hydrogen is being released, and then Columbia is maneuvered during and after this release, so that the mass spectrometer in the IECM can be calibrated to a known gas and a known quantity of gases. Dakar, a little over 3 minutes away. At 2 days, 18 hours, 10 minutes, mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 2 days 18 hours, 12 minutes, mission elapsed time. Columbia coming up now on acquisition through Dakar.

CAPCOM Columbia, Houston for 5 minutes.

SPACECRAFT Okay, we're still here.

CAPCOM Roger, T.K. We're seeing what we think is an erroneous indication. Could you verify that you did go back to position 2 on the IECM?

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SPACECRAFT Affirmative.

CAPCOM Thank you, sir.

SPACECRAFT Brewster, you folks indicated that you didn't get our summary from yesterday. I guess the only thing that I can remember from what we put on the summary that you probably ought to know, is our VTR no longer will do a rewind, it only plays in one direction. I guess it's fortunate that the direction it chose to play in is forward.

CAPCOM Okay, we copy that, T.K. Columbia, Houston, Indian Ocean at 3 3.

SPACECRAFT Okay.

PAO This is Shuttle Control, Madrid has loss of signal, or Dakar has loss of signal. We should get a little bit of coverage through Madrid in about a minute and a half or so, we'll standby for that.

PAO This is Shuttle Control, loss of signal now through Madrid. Next station Indian Ocean station in 11 and a half minutes. During this pass Columbia's commander, Ken Mattingly reported that the video tape recorder no longer will rewind. At 2 days, 18 hours, 22 minutes, mission elapsed time, this is Shuttle Control, Houston.

END OF TAPE

PAO station in eleven and a half minutes. During the pass Columbia's Commander, Ken Mattingly, reported that the video tape recorder no longer will rewind. At 2 days, 18 hours, 22 minutes mission elapsed time this is Shuttle Control, Houston.

Here's the contents on the COMM check, air to ground two.

PAO This is Shuttle Control at 2 days, 18 hours, 32 minutes mission elapsed time. The Indian Ocean station should acquire Columbia in about 30 seconds.

CAPCOM Columbia, Houston for 6 minutes.

SPACECRAFT Okay, that's a loud and clear.

CAPCOM You too, Henry.

CAPCOM Columbia, Houston, have a switch on panel A1, if you have time.

SPACECRAFT Okay I'll go back there.

CAPCOM Whenever it's convenient Henry.

SPACECRAFT Okay go ahead.

CAPCOM Roger sir, CRYO, O2 tank 4 heaters B to off, OFF.

SPACECRAFT Okay now I have no heaters on and the tanks, all, both the tanks say four.

CAPCOM Okay, we're trying to even up the quantity in the CRYO tanks and while you're there, Henry, could you verify that the recorder voice, which is on panel A1, in the proper configuration?

SPACECRAFT They are OFF now, off.

CAPCOM Okay, we'd like audio center voice record select channel one to air to ground one and channel two to ICOMM A, please.

SPACECRAFT Okay, you've got it.

CAPCOM Thank you sir, that'll help us preclude losing any more of your voice recording.

SPACECRAFT We've turned both of those things on to ICOM A last night when we put our stuff off.

CAPCOM Okay, we copy that and Yarragadee is next at 49.

SPACECRAFT Okay, see you then.
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CAPCOM Roger.

PAO This is Shuttle Control, the Indian Ocean, station has lost of signal. Next acquisition through Yarragadee in 8 minutes. At 2 days 18 hours, 40 minutes mission elapsed time this is Shuttle Control, Houston.

PAO This is Shuttle Control at 2 days, 18 hours, 48 minutes mission elapsed time. Columbia's approaching acquisition through Yarragadee.

CAPCOM Columbia, Houston for 7 minutes.

SPACECRAFT Okay, Houston. We've completed the (garble) check now that's called out at the 1905, everything checked out okay, and standing by to stop the maneuver and go to (garble).

CAPCOM Okay Henry that sounds good, we're glad to see you're not getting too far behind.

CAPCOM Columbia, Houston, we'll be LOS for one minute.

PAO This is Shuttle Control, Yarragadee has loss of signal

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CAPCOM Columbia, Houston, we'll be LOS for 1 minute.

PAO This is Shuttle Control, Yarragadee has loss of signal, Orroral will pick up Columbia in 1 minute.

CAPCOM Columbia, Houston, 4 minutes.

SPACECRAFT Okay, Houston, loud and clear.

CAPCOM Roger. Columbia, Houston, 40 seconds LOS, states are next at 3 3, and if you could, we'd like you to switch cabin fans.

SPACECRAFT Okay, we're running on fan A now, you want to go back to B, is that what you want to do?

CAPCOM Yes sir, that's correct.

SPACECRAFT Brewster, is there a reason for not running on A?

CAPCOM It's just a per the redundant checkout on 5-8, in the ORBIT OPS, T.K.

SPACECRAFT Yeah, that's what I thought, we switched to the opposite unit.

CAPCOM Yeah, it also has you go back to the original configuration, and it's to keep the loads balanced.

SPACECRAFT All you do is crank it up, you don't run on it, is that what you're saying?

CAPCOM Yes sir, that's exactly correct.

SPACECRAFT Okay, thank you.

PAO This is Shuttle Control, Columbia out of range at Orroral Valley. Next acquisition through Merritt Island in 29 and a half minutes. At 2 days, 19 hours, 3 minutes, mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 2 days, 19 hours, 32 minutes, mission elapsed time. The Merritt Island tracking station will lockon to Columbia in about 30 seconds.

CAPCOM Columbia, Houston with you for about 12 minutes.

SPACECRAFT Okay, loud and clear.

CAPCOM Roger, you're loud and clear.

SPACECRAFT Okay, the star trackers were tuned back on at 1854.

CAPCOM Roger.

SPACECRAFT T. K. just got through with the free war inspection and it was dry as a bone.

CAPCOM Roger.

SPACECRAFT Also have your IMU angles if you don't have them.

CAPCOM We're standing by to copy.

SPACECRAFT Okay, ID 26014, angle at head on, .01, the angles are 3 turn U + .03 + all zips + 540. IMU 2, -.12, + .07 - .05, IMU 3, +06 -.16 +.33, it was torqued at 2 days, 19 hours, 12 minutes, 0 seconds.

CAPCOM Roger, thank you Hank. Columbia, Houston, we know y'all are busy, but if you have a minute this pass, we'd like to suggest a change in the flight plan that we think will help you out later this morning.

SPACECRAFT Okay, Roy, go ahead.

CAPCOM Okay, what we would like to talk to you about is the payload bay door test. Right now, they are scheduled in the CAP that 3 days and 3 hours after lunch today. And we think we've got that too close to the backup NAV test and the L!A jet test. And what we would like to do is discuss moving that an hour earlier to give you more time to get it done.

SPACECRAFT Well, getting a little extra time to do something never hurt us.

CAPCOM Okay, if y'all like that, I'll give you the times when we would suggest that you do things.

SPACECRAFT Roy, one of my problems is, I'm trying to get a mental image of what today looks like, and I haven't succeeded yet.

CAPCOM Roger, T. K., we're not surprised, and we're sorry about the number of changes.

SPACECRAFT The changes aren't bad, and the teleprinter message was easy to read. It's just taking me a while to, we haven't had a chance to sit down and look at it and say now, what does the revised day look like? And we're trying to clean that picture as we go along so we get ahead of the game again.

CAPCOM Roger, we can hold off on discussing this a little bit. The problem was you needed to move your random ploy up about 4 hours before the payload bay door test, so we just didn't

SPACECRAFT Teleprinter message was easy to read. It's just taken me a while to, we haven't had a chance to sit down and look at it and say now, now what does the revised day look like and we're to clean that picture as we go along so we can get ahead of the game again.

CAPCOM Roger. We can hold off on discussing this a little bit with you. The problem was, you needed to move your rad deploy up about 4 hours before the payload bay door test, so just didn't want to let that time slip by.

SPACECRAFT Roger. I understand. What was the time constraint that you ran into, Roy?

CAPCOM Well, it looked like starting at about 3 days and 4 hours, you guys have a very heavy schedule doing the backup NAV test and the LIA jet test, and we were afraid that if you didn't get the payload bay door test finished and ran into that it would cause you a lot of rescheduling.

SPACECRAFT Okay. I guess that's not a good thing to do. (garble). I guess that the payload bay door test plus or minus an hour is not very critical.

CAPCOM Roger. It's not critical. What we'd like to do is have you start it an hour earlier and you can take the whole 2 hours to finish it up because we realize you're going to be interrupted for the other activities.

SPACECRAFT Okay. That sounds good.

CAPCOM Okay. The other constraints is, we'd like for you to put the high load duct heater to alpha 30 minutes before you start the payload bay door test, and we'll give you a reminder on that.

SPACECRAFT Can you tell me what the revised time is right now, I'll just, I'll just put my, make a little message for myself here.

CAPCOM Roger. It looks like a good time is 3 days and 1 hour. Also we would like to have the RAD deploy at 20 hours and 45 minutes.

SPACECRAFT Wait a minute, now you're faster than I am typing it. It's 3 days and 1 hour when you want to put the high load heater to A.

CAPCOM Affirmative.

SPACECRAFT What was the next thing you read me?

CAPCOM Hang on just a second and we'll give you the rad deploy. Okay, T.K., we think a reasonable time to do the rad deploy would be 2 days and 21 hours.

SPACECRAFT Okay. On this rad deploy now, are we going to deploy it now and just leave it leave it out, or are we going to start going back to what was in the original CAP, or what do you have in mind?

CAPCOM Okay. What we have in mind, T.K., is we want them out for at least 4 hours before you do the payload bay door test. After you finish the payload bay door test, we will leave the radiators stowed. And just to make sure we all in sync, the time we had in mind for starting the payload bay door test would be 3 days and 2 hours.

SPACECRAFT Okay. Let me concentrate on that. Hank's trying to crank up CFES and he needs to talk to you about that for a minute.

CAPCOM Roger.

SPACECRAFT Okay. I fired up the CFES. I've got 4 hours of limit parameters. RPM 31452, RPM 21435, RPM 10858, 403158.

CAPCOM Okay. We copy, Hank. We'll get back to you on it.

CAPCOM Columbia, Houston, see you at Dakar at 49. We'll try to have you something for the CFES by then.

PAO This is Shuttle Control. Bermuda has loss of signal. Dakar is next in 3-1/2 minutes. The backup CAPCOM on this shift, Astronaut Roy Bridges, has been communicating with the crew during this pass over the United States, discussing this afternoon's payload bay door test. That test will be moved up slightly. Pilot, Hank Hartsfield, is beginning the continuous flow electrophoresis work for the day. We're about 2 minutes, 45 seconds away from Dakar. We'll stand by for that pass at 2 days, 19 hours, 46 minutes Mission Elapsed Time. This is Shuttle Control, Houston.

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PAO I left Hank Hartsfield beginning the continuous flow electricalphoresis work for today. We're about 2 minutes, 45 seconds away from Dakar. We'll stand by for that pass at 2 days, 19 hours, 46 minutes mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control, 2 days, 19 hours, 49 minutes mission elapsed time. Shuttle coming up on acquisition at Dakar now.

CAPCOM Columbia, Houston with you for 5.

SPACECRAFT Okay

CAPCOM And, Henry, have a couple of words for you on CFES.

SPACECRAFT Alright

CAPCOM Roger, they think you just had a couple of spare bits left over in the register and it looks like the flow was okay to clear everything out and they would like for you to cycle the system's power and restart.

SPACECRAFT Okay, I am in the power (garble) is on the card, I had already gone into the systems zero check. You want me to do a restart for this point?

CAPCOM Standby we're checking

SPACECRAFT And my readings now RPM3 11435, RPM2 11433 and RPM1 850, no 860.

CAPCOM Hank, what we'd like are the flows 1, 2, and 3.

SPACECRAFT 01 022, 02 143, 03 152.

CAPCOM Roger, thank you.

CAPCOM Okay, those numbers all look good and you're clear to press ahead.

SPACECRAFT Okay so you think all those numbers are okay, I'll just let it operate and continue then.

CAPCOM Right, no restart required.

SPACECRAFT Okay sir, must have been just a changing on the startup that set those numbers. The same kind of thing happened on day 2.

CAPCOM Roger

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CAPCOM Columbia, Houston, we're 30 seconds LOS. We'll see you at Indian Ocean at 08 and T.K. when you have time to get around to the gas troubleshooting we have some drawings down here that makes it a lot easier to read the end plots, so if you'll let us know we'll help you out on that.

SPACECRAFT Alright.

PAO This is Shuttle Control, Dakar has lost of signal. Columbia moving down across the continent of Africa, next acquisition through the Indian Ocean station in 11 minutes. At 2 days, 19 hours, 57 minutes mission elapsed time this is Shuttle Control, Houston.

PAO This is Shuttle Control at 2 days, 20 hours, 7 minutes mission elapsed time. Columbia should be within range of the Indian Ocean station shortly.

CAPCOM Columbia, Houston with you for 8 minutes.

CAPCOM Columbia, Houston if you have any time this pass we have one switch on R1.

SPACECRAFT Okay hang on I'll be there. Go ahead.

CAPCOM Roger, we'd like payload at Main B off.

SPACECRAFT It's off.

CAPCOM Okay, in 3 minutes I would, I'm going to ask you to turn it back on and we'll give you a reminder.

SPACECRAFT Alright

CAPCOM The reason for the switch action, T.K. is we had an anomaly on the IECM and we're trying to cycle the power to get it back known operating mode.

SPACECRAFT Alright

PAO This is Shuttle Control, the IECM has apparently been operating on internal battery power and

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CAPCOM And we're trying to cycle the power to get it back into a none operating mode.

SPACECRAFT Right

PAO This is Shuttle Control, the IECM has been apparently operating on internal battery power. Trying to get it back on the Orbiter power.

SPACECRAFT What I guess is, we're trying to tell you that, yesterday - did we tell you that we got the - some of the ENT data and I think it was around, I think it's between 6 and 6:30 MET. And I'd like to know whether we need to do that thing again or whether we can stop on it on for now. Apparently someone will have to take a look at it and see if we (garble) set up the gains a little higher this time. Someone will have to look at it and see how it's coming out.

CAPCOM Okay we'll do that.

SPACECRAFT Thank you, sir.

CAPCOM Columbia, Houston, TK we checked on that, the quality of the data was good and the gains were good and we'd like to get some more of that when you have the time.

SPACECRAFT Okay. But, we've got the right configuration now. Okay, thank you.

CAPCOM Roger

CAPCOM Columbia, Houston we're ready to throw the payload aft main B back to OMS.

SPACECRAFT And main B's on.

CAPCOM Thank you

SPACECRAFT And Houston, don't think we told you, we took one of the two MLR power cables off to use for DC utility - (garble) and the one we took off was M052J.

CAPCOM Roger copy and we'll make a note to remind you.

SPACECRAFT Thank you sir.

CAPCOM 25 seconds LOS, Yarragadee is next at 24.

SPACECRAFT Okay

PAO This is Shuttle Control, the Indian Ocean station has lost signal with Columbia. Yarragadee will pick up the

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Spacecraft in 7 minutes. At 2 days 20 hours 17 minutes, Mission Elapsed Time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 2 days 20 hours 23 minutes, Mission Elapsed Time. Columbia coming up on Yarragadee in about 30 secnds.

CAPCOM Columbia, Houston, with you for 8 minutes.

SPACECRAFT Houston, you called?

CAPCOM Roger, with you for 8 minutes.

SPACECRAFT Houston, Columbia.

CAPCOM Go ahead.

SPACECRAFT It sounds to me like we owe somebody down there a great big cheer. Your little fix for the first try on fixing up the gas and we got the relay 02 and 00 systems from laten to hot.

CAPCOM Well that's really great news, your going to make a lot of folks happy down here so, thank you.

SPACECRAFT That was a very clean scheme.

CAPCOM Roger.

PAO This is Shuttle Control, Yarragadee has Loss Of Signal, Orroral Valley will pick up Columbia in about 20 seconds. We'll stand by for that. Columbia's Commander Ken Mattingly, reporting during this Yarragadee pass that he has been successful in the get-away special repair, and that canister experiment canister is now activated.

CAPCOM Columbia, Houston, we've been in a keyhole for the last 30 seconds, with you for 3 minutes through Orroral.

SPACECRAFT Okay, sir.

CAPCOM Columbia, Houston, we have one request for you on the DAP.

SPACECRAFT yes, sir.

CAPCOM Roger, we see in DAP B we'd like to request that you go to DAP A for propellant consumption reasons.

END OF TAPE

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CAPCOM Columbia, Houston, we have one request for you on the DAP.

SPACECRAFT Yes sir.

CAPCOM Roger, we see in DAP D, we'd like to request that you go to DAP for a propellant consumption reasons.

SPACECRAFT Okay, you got A, did we miss that, or is that a change?

CAPCOM I think we forgot to tell you.

SPACECRAFT Okay, I'll split the difference with you on that.

CAPCOM Roger, thanks, sir. 30 seconds LOS, see you over the states at 08.

SPACECRAFT Okay.

PAO This is Shuttle Control, Columbia is out of range at Orroral. Heading out over the Pacific Ocean, next acquisition through Marritt Island in 31 minutes. At 2 days, 20 hours, 37 minutes, mission elapsed time. This is Shuttle Control, Houston.

PAO This is Shuttle Control at 2 days, 21 hours, 7 minutes, mission elapsed time. Columbia is coming up on acquisition through Marritt Island.

CAPCOM Columbia, Houston, through the states for 12 minutes.

SPACECRAFT Okay, read you loud and clear.

CAPCOM You five by as well, Hank. Columbia, Houston, we have six minutes left in this pass, you think you'd have a minute to talk?

SPACECRAFT Okay, go ahead Brewster.

CAPCOM We have a couple of requests from the PAO folks. On the next stateside pass, one REV from now, they were wondering if you could take a moment to configure one of the payload bay cameras for them, and turn it on so we get some live T.V. The idea would be to take camera delta and point it straight up out of the bay. Zoom it out, just turn it on, so we could get some shots of the Earth as it goes by, the states go by underneath you, over.

SPACECRAFT Okay, I don't see any problem with that.

CAPCOM Okay, that would be super, and we'll be sure to remind you in plenty of time to give you a chance to do that. And the other question was, later on today, on REV 50, there's a T. V. downlink scheduled, and we were wondering if you had any cassettes that had already been rewound that you might use for those, and what the subject matter might be?

SPACECRAFT We had some things we wanted to show you, we took a - some RCS (garble) on the nose (garble) at nighttime. That I thought was spectacular and unfortunately it's not rewound. We're talking about now what we want to try to put together for you this evening.

CAPCOM Okay, when you come up with your plan, maybe you could let us know so the folks know what to expect.

SPACECRAFT Okay.

CAPCOM Thank you, a lot. Columbia, Houston, Dakar at 2 4.

SPACECRAFT Okay.

PAO This is Shuttle Control, Columbia has loss of signal with Bermuda. Columbia now on its 47th orbit of the Earth. Next station is Dakar in 3 minutes. Columbia's pilot Hank Hartsfield responding to question from the ground on this pass says sees no problem in providing some Earth viewing television during orbit 48 over the next pass over the Merritt Island station. Just under an hour and a half from now. And then on orbit number 50, the plan is to downlink television from the video tape recorder, and we expect a report later on prior to that orbit on what the video tape recorder contains. The rewind has failed on the tape recorder, but it can be rewound by hand. We're about a minute and a half away from acquisition through Dakar. We'll stand by at 2 days 21 hours 22 minutes mission elapsed time

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PAO ..But it can be rewound by hand. We're about a minute and a 1/2 away from acquisition through Dakar, we'll stand by at 2 days 21 hours 22 minutes, Mission Elapsed Time.

CAPCOM Columbia, Houston, for 8 minutes, standing by.

SPACECRAFT Okay, loud and clear.

CAPCOM Roger.

PAO This is Shuttle Control, Ken Mattingly is running a TACAN test at this time. Pilot Hank Hartsfield continuing to operate the continuous flow electrophoresis equipment.

CAPCOM Columbia, Houston, Indian Ocean at 44.

SPACECRAFT Okay, see you there.

CAPCOM Yes sir.

PAO This is Shuttle Control, Columbia's out of range at Dakar now. Next acquisition through the Indian Ocean station in 11 and 1/2 minutes. At 2 days 21 hours 33 minutes, Mission Elapsed Time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 2 days 21 hours 44 minutes, Mission Elapsed Time. Columbia is coming within range of the Indian Ocean station now.

CAPCOM Columbia, Houston, for 6 minutes.

SPACECRAFT Hello there.

CAPCOM Say, we hope that you fellas brought along some warm clothing, we're told the temperature right now at Edwards is 51 degrees.

SPACECRAFT How much?

CAPCOM That's gonna bring that density altitude right down, T. K.

SPACECRAFT That's centigrade I guess.

CAPCOM We do however, expect it to be a little bit warmer than that on Sunday.

SPACECRAFT Okay. Okay Brewster, when we get back Hank said you folks wanted to talk about some TV plans, it'd be a good idea, we ought to get our tales in sync. What did you guys have to propose?

CAPCOM The first thing we were requesting was that for the next stateside pass, if you could just point the delta camera straight up out of the bay and turn it on with the zoom, zoomed in to get us the widest coverage, we would watch the states go by underneath you. And, the second one was, we were interested in what the subject matter was going to be of the playback on rev 50, if you had a cassette that was rewound and you'd have one to play for us.

SPACECRAFT I think we told you, our machine doesn't rewind anymore. I can rewind a little bit by hand, but it is kinda tedious, and I was going to do that routinely. So, I'm kinda stuck with having to take a picture and just kinda hope that it is all there and available, and you can, I can play it back or you can watch it on real time, but some of the things I had hoped to do of editing and putting it together - unless I can work on that tape recorder sometime later on today, that's not going to happen.

CAPCOM Okay, T..

SPACECRAFT And we had yesterday you might of noticed we had an awful lot of time to put together something special. And, today I'm waiting to take some pictures of the CFES flow, I want to put that together in one sequence and that, rather than just sit there and run it real time.

CAPCOM Okay.

SPACECRAFT Do you know what our attitude will be when we're coming across the states? (garble).

CAPCOM Yes, T. K. we understand everything about, that you said about the cassettes, we though perhaps that you had some that had been rewound prior to the failure. We don't propose that you spend any time doing that by hand, we know your very busy. And, as far as the attitude coming across the states, we figured since you were in bottom-sun -

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CAPCOM We know you're very busy and as far as the attitude coming across the states we figured since you were in bottom sun that we'd be able to get something as you swept across it.

SPACECRAFT Yes, I think that's okay, but I think there's a chance that maybe if I use the handheld camera out the window I might be able to that also has a color lens and that might just do you better than what I can let you have from the payload bay.

CAPCOM Okay TK whatever you think is best. We were just trying to

SPACECRAFT(garble) fix it and not allow it to move.

CAPCOM Okay that's, the plan we had, was not to involve you and take up much of your time, but whatever you think is best, we'll be glad to have.

SPACECRAFT I was just looking to see what's going on in that timeframe. Okay, it looks to me like we'll have time. I didn't want to go run on the treadmill while the CFES was doing it's flow cause that thing really shakes the deck. So I was going to do that after we finish CFES, so maybe I could try to hold that line in realtime and see what happens, and I've done work on the payload bay cameras as an alternative.

CAPCOM Okay that's sounds great, and whatever you think is best. You obviously have the best picture overall of it.

SPACECRAFT Well on that score we have got a pretty good picture. It's really too bad cause I wanted to be able to, there were several things I've been trying to put together, but it requires using the VTR in the sample mode. I wanted to show you a sample of the kind of cloud formations that you run into as you make one lap, and it's quite varied and there are some very distinctive cloud patterns. I've gotten to where I can look at the clouds now and tell about which part of the world I think I'm in, and it only takes a few minutes but it's kind of interesting and I'd also hoped to be able to show you some sunrise and sunset pictures that are, even if the colors aren't perfectly true, I think the size of them might be very interesting, I'll still try to work on that.

CAPCOM Okay, that sounds great TK, we have 20 seconds left. Yarragadee is next at 59 and we'll be more than happy to have anything that you can work out.

SPACECRAFT Okay.

PAO This is Shuttle Control. The Indian Ocean station has loss of signal with Columbia. Next acquisition is through Yarragadee Australia in about 8 minutes. During this pass Ken

Mattingly and CAPCOM Brewster Shaw discussed some of the television possibilities for the video tape recorder. We'll learn more later about what actually is on there. Mattingly has some ideas of what he would like to record, whether he'll be able to do that because of the problem with the rewind, is a question. At 2 days 21 hours 52 minutes mission elapsed time this is Shuttle Control Houston. This is Shuttle Control at 2 days 21 hours 59 minutes mission elapsed time. Yarragadee is about to acquire Columbia.

CAPCOM Columbia, Houston, for 8 minutes.

SPACECRAFT Brewster you're loud and clear.

CAPCOM Roger. Columbia, Houston, 40 seconds LOS we'll have about a minute through Orroral, and at Hawaii we'll send you a teleprinter message that will be a summary of the activities for the rest of the day, much like your deorbit prep and post insertion cue card. If you like that we'll continue each day with something like that.

SPACECRAFT Okay, thank you very much, that sounds like a good idea.

CAPCOM Yes, I think ...

END OF TAPE

SPACECRAFT --sounds like a good idea.

CAPCOM Yes I think we should have thought of it before, if it will help you see the flow, for us too, of the day alot better I think.

SPACECRAFT Okay, thank you sir.

PAO This is Shuttle Control. Yarraquadee has loss of signal. About a minute and a half before acquisition, through Orroral. Short pass at Orroral, about a minute.

CAPCOM Columbia, Houston we are with you through Orroral Valley for 1 minute.

SPACECRAFT Okay, loud and clear.

CAPCOM Columbia, Houston we will see you at Hawaii at 28.

SPACECRAFT Okay, see you there.

PAO This is Shuttle Control. Loss of signal through Orroral. Columbia now heading toward acquisition at the Hawaii tracking station in 17 minutes. At 2 days 22 hours 11 minutes Mission Elapsed Time, this is Shuttle Control, Houston. This is Shuttle Control, at 2 days 22 hours, 27 minutes, Mission Elapsed Time. The Hawaii tracking station should lock onto Columbia shortly.

CAPCOM Columbia, Houston through Hawaii for 2 minutes. Columbia, Houston through Hawaii for a minute and a half.

SPACECRAFT Okay.

CAPCOM Columbia, Houston see you over the States at 37.

SPACECRAFT Thank you.

PAO This is Shuttle Control. Hawaii has loss of signal, next station is Buckhorn, in 5 1/2 minutes. Buckhorn will be followed by Merritt Island, we expect some television through Merritt Island. At 2 days 22 hours, 32 minutes Mission Elapsed Time, this is Shuttle Control, Houston. This is Shuttle Control at 2 days 22 hours, 36 minutes Mission Elapsed Time. Buckhorn should acquire Columbia in about 20 minutes - 20 seconds.

CAPCOM Columbia, Houston through the States for about 19 minutes.

SPACECRAFT Okay we got you loud and clear. When do you want to start the TV.

CAPCOM That will be over Mila, Hank.

CAPCOM How much longer is that?

CAPCOM Okay, Mila comes up at 44 past the hour.

SPACECRAFT Okay.

CAPCOM And Henry, if you're gonna do that okay, we have a request that you tell us which cameras you are going to use, and once you get them setup, if you would go to TV power control command on A7, then we can adjust the intensity and the light and everything.

SPACECRAFT That's what I'm supposed to be doing.

CAPCOM Well we thought we would try and off load you, a little bit T.K.

SPACECRAFT You don't know where I'm going next.

CAPCOM Okay.

SPACECRAFT I think we can get more hands in the pie, than we got forks for or something like that.

CAPCOM Okay T.K. it's your show. And Columbia before we get started on that, we have one panel, or one switch on panel All.

SPACECRAFT All one on All?

CAPCOM Yes sir. O2 tank 4 heaters Bravo to AUTO.

SPACECRAFT O2 tank 4 Bravo heaters AUTO.

CAPCOM Thank you sir. Columbia Houston Mila is locked up and we are ready anytime you are.

END OF TAPE

SPACECRAFT Okay, and right now, I'm trying to get you out the overhead window, using the flight deck camera.

CAPCOM Okay.

SPACECRAFT Have command and enable. What we're taking at look a now is the, should be coming up on the Gulf Coast. You guys let me know when you have a picture.

CAPCOM Okay, we don't have anything yet. T. K. can you tell us which camera you're using?

SPACECRAFT It's the flight deck camera.

CAPCOM Okay, we have a picture now.

SPACECRAFT Okay the picture I'm trying to show you now is looking back at the Gulf Coast and you can look out on the horizon you can see the Earth's rim and a lot of light cloud patterns and as you come down, okay we're going to track right along the Gulf Coast here, you can see some clouds and I don't know how much resolution you have on those clouds.

CAPCOM We can see them quite well, T. K.

SPACECRAFT Well let me know if you can see distinct cloud build up.

CAPCOM Yes, we can see all that.

SPACECRAFT Okay, those are some fairly large clouds that are showing up there. And there's a, those are typical of what you see in this area. The Gulf Coast - i'm not sure there's enough color contrast for it to stand out, we're seeing mostly small clouds that are down along the water. There a little puffy (garble) I imagine their probably not too large. Unfortunately this is pass going backwards, so I'm having to tell you where we've been. I'm looking down and I, from the left fields and I'm beginning to see in the bottom of the picture here.

CAPCOM Right, we see those.

SPACECRAFT That should be, about the area coming out of the Mississippi. And there's a some little crescent Islands there that you can recognize, that ought to be off the coast of Mobile.

CAPCOM Okay.

SPACECRAFT And you should be able to see some of the Coastal features and then it swings around here. Is the contrast good enough to pick up the Coast, or am I wasting your time?

CAPCOM No, we can see it.

SPACECRAFT Okay, on the monitor, it's not all that swift. Coming up on an area now that looks like it ought to be down around the Florida Coast there. And, we should be starting a little inland, my guess is, that last little arc looked like the (garble) area. And we should be sweeping back across where we can see something, as a matter of fact, I'm looking down now, and you should be able to see, that's Tampa. A lot of clouds in the area. And there's Tampa Bay.

CAPCOM We have it.

SPACECRAFT Okay, and we should be, sorry to back into this but, the next thing we can see would be working our way over to the Cape. We did this for on the other attitude, and we had a view looking forward and it's rather a spectacular. Okay, down to the bottom of your picture now.

CAPCOM It's right in the middle of our picture, T. K. and looks great.

SPACECRAFT Yes sir, that's a familiar sight, I don't know if you can see the SLF on your monitor it just stands out like it was painted with a big arrow from here. And we'll sweep over and you pick up things like Lake Okochobee.

CAPCOM Yes, I think we can see the SLF.

SPACECRAFT Okay, and we can sweep in with Florida and you can pick up the whole area with Miami and all of the lands of the South, and you can walk down the Keys where you can see the colors, and in just a minute, I'll show you some of the off shore Islands here, and hopefully you'll be able to see the colors. I don't know what your color resolution is.

CAPCOM Well it looks pretty good, that was a super shot of Florida.

SPACECRAFT Okay, we're coming up now on some of the off shore Islands, and they have a very aqua blue green coloring on their leeward side, and you can see that the way the clouds change between the windward and leeward sides, and the colors in the water are also quite distinct here. Okay, looking back at the horizon here, how much more time do you have on this pass here, Brewster?

CAPCOM We have about 6 minutes.

SPACECRAFT 6 minutes, okay, let me duck inside, and just give you a cook's tour while were here, if that's alright?

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CAPCOM Okay, we have 3 minutes of TV coverage, 6 minutes
total.

SPACECRAFT Okay

END OF TAPE

CAPCOM Okay, we have 3 minutes of TV coverage. Six minutes total.

SPACECRAFT Okay, good. Okay, now we're back inside Columbia.

CAPCOM We have it, looks good.

SPACECRAFT Okay and that was someone you might recognize. If you think this is a junkpile, this is what every kid always wanted, it's a 3-dimensional room so he doesn't have to pick his toys up. They don't lay on the floor and they go everywhere.

CAPCOM Looks like you've been keeping up with your housekeeping.

SPACECRAFT Okay, I'm going to swing down the lower deck and Henry - okay I'm gonna come down one side and Hank's going down the other, and we're looking over at the inside, I'd hoped to be able to give you a map of where we're headed so you could understand the picture. This little article that's right in here is a Volkswagon pouch and we've got it filled with camera magazines and things. On the end of my foot there is a set of the, can you see those shoes, those are suction cup guys we're evaluating.

CAPCOM That's a good picture. You looked out of control TK.

SPACECRAFT Okay, do you know it's early, you're right, and there's the CFES, Hank why don't you point to the bottom where the stuff goes in the bottom. The samples go in down here, they run up this pole all the way up through, that's filled with a buffer fluid, and the column separates it, on the camera, if you would please Hank, I think that clears it, take it away, that clears it, take the camera down.

CAPCOM Okay TK, we're starting to lose the picture now.

SPACECRAFT Okay, all right and it ends up at the top when the samples, reported that Hank.

CAPCOM It's gone.

SPACECRAFT Okay, thank you.

CAPCOM Hey, that was super, thank you very much. Columbia, Houston, we're 1 minute LOS. Dakar is next on the hour, we want to thank you alot for the TV show, the pictures were excellant, good contrast, good color, everything looked great. We enjoyed the description you gave us TK, and we look forward to seeing more of that whenever you can fit it in.

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SPACECRAFT Okay, thank you, we'll do our best.

CAPCOM Okay, and lunch is next, for the next hour, hope you enjoy it.

SPACECRAFT Thank you.

PAO This is Shuttle Control. Bermuda has loss of signal with Columbia. During this pass over Mila, Ken Mattingly gave us a live television tour of the gulf coast and of Florida, and of the flight and middecks of the orbiter Columbia. Next acquisition through the Dakar in 2 and a half minutes. At 2 days 22 hours 57 minutes mission elapsed time, this is Shuttle Control Houston. This is Shuttle Control at 2 days 22 hours 59 minutes mission elapsed time. Columbia about 15 seconds from acquisition through Dakar on orbit number 48.

CAPCOM Columbia, Houston, through Dakar for 10 minutes, standing by.

SPACECRAFT (garble)

PAO This is Shuttle Control it's lunch time aboard Columbia. Here in the Mission Control Center the members of the bronze team of the flight controllers are beginning to arrive, we'll have a handover here in an hour. Chuck Lewis the Flight Director for that team. The off-going Flight Director Harold Draughon estimates 10:30 am CDT for the change of shift news conference in Room 135 at the JSC Newscenter. We've got about 6 minutes remaining in this Dakar pass including a short bit of overlapping coverage through Ascension. We'll standby.

END OF TAPE

CAPCOM Columbia Houston, 30 seconds in this pass Botswana is next at 8.

SPACECRAFT Okay.

PAO This is Shuttle Control. Ascension has lost signal now with Columbia. Next acquisition through Botswana in 8 minutes. At 2 days 23 hours 10 minutes Mission Elapsed Time this is Shuttle Control Houston. This is Shuttle Control at 2 days 23 hours 18 minutes Mission Elapsed Time. Columbia is about 30 seconds away from acquisition through Botswana.

CAPCOM Columbia Houston, with you for 4 minutes.

SPACECRAFT Hello, Houston, loud and clear.

CAPCOM Roger you are 5 by. Columbia, Houston 30 seconds LOS see you at Yarragadee at 35.

SPACECRAFT Okay, see you then.

PAO This is Shuttle Control. Columbia has moved beyond the range at the Botswana station. Heading out over the Indian Ocean, toward Yarragadee, in 12 1/2 minutes. At 2 day 23 hours 23 minutes Mission Elapsed Time, this is Shuttle Control, Houston. This is Shuttle Control, 2 days 23 hours, 35 minutes Mission Elapsed Time, Columbia coming up on acquisition through Yarragadee.

CAPCOM Columbia, Houston with you for 8 minutes.

SPACECRAFT Loud and clear.

CAPCOM Roger you are 5 by. Columbia, Houston before we go LOS I need to discuss a TACAN self test that we would like to request at Hawaii AOS if you have a minute.

SPACECRAFT Standby.

CAPCOM Roger, we'd like to discuss a TACAN self test with you at Hawaii AOS if you have a minute.

SPACECRAFT can't talk right now, standby.

CAPCOM Roger, copy.

SPACECRAFT Getting to where I can talk now, go ahead.

CAPCOM Okay sorry to bother you, but we noticed on Ascent that TACAN 2 airing data was very squirrely, and the GNC folks would like to look at a self test while we are in Ops 8, and Hawaii AOS I can give you the steps now or wait till then.

SPACECRAFT When is it sir, I'm, we're down on the middeck trying to get some stuff done here. How much time do we have?

CAPCOM We've got quite awhile, I'll read it to you in Hawaii.

SPACECRAFT Okay, when does that come, just give me a time feel.

CAPCOM Okay we'll be coming up at 01. That's about 19 minutes. Columbia, Houston 30 seconds LOS we'll see you in Hawaii at 01.

SPACECRAFT Okay, thank you.

PAO This is Shuttle Control. Columbia is out of range of Yarragadee. On a track that carries it across northeastern part of Australia. Over the Pacific Ocean the next acquisition through Hawaii in 17 minutes. At 2 day 23 hours 44 minutes Mission Elapsed Time this is Shuttle Control, Houston. Mission Control, Houston 2 days 23 hours 48 minutes Mission Elapsed Time, Columbia on Orbit #49 passing up over the northern tip of Australia. We are still planning on hold our change of shift press confernance with off going Flight Director Harold Draughon of the crystal team, at approximately 10:30 am in building 2. 2 days 23 hours 48 minutes Mission Elapsed Time, this is Mission Control, Houston.

END OF TAPE

PAO Mission Control Houston, 3 days 0 hours 1 minute, Mission Elapsed Time. Just completed 3 full days of flight on STS-4, we're about to pass within range of the Hawaii tracking station. Crew is currently in their scheduled meal period at this time. They'll be performing some TACAN activity that is verifying the use, the potential use of TACAN, the tactical air navigation system as an on orbit navigation aide. And the day is taken up with also some electrophoresis activity today as well.
3 days 0 hours ..

CAPCOM Houston with you through Hawaii for 7 and 1/2 minutes.

SPACECRAFT We're here.

CAPCOM And Columbia, Houston, we need this TACAN sub test now, if you have time.

SPACECRAFT Okay, I've got all 3 TACANS to GPC and some out on 13.

CAPCOM Roger, thank you very much.

SPACECRAFT Okay, it looks to me like the TACAN test is complete now, we ran that once before (garble).

CAPCOM Columbia, Houston, we've copied the TACAN sub test, and we thank you for your cooperation.

SPACECRAFT Okay, we'll go back to your next data point.

CAPCOM Columbia, Houston, for your info, the TACANS look good to us right now, we still can't explain the anomaly with that on ascent we're still thinking about.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, 1 minute LOS, this'll be the last pass for the Crystal team, we've all been very conscience of your very busy schedule this morning, we have a lot of admiration for the enthusiastic way you approached it and for the great work you've done.

SPACECRAFT Well we thank you, you guys have been a big help, we're working. We'll get it all.

CAPCOM Roger, we'll see you in the morning.

SPACECRAFT Yes sir, take care.

PAO This is Mission Control Houston, 3 days 0 hours 9 minutes, Mission Elapsed Time. On orbit number 49, Columbia has

just past out of range of the Hawaii tracking station. They have a brief Loss Of Signal period of about 2 minutes here before we reacquire over the Continental United States. For a pass of several minutes. During that time we have scheduled in the Crew Activity Plan, a private medical communication with the flight surgeon here in Mission Control where they have an opportunity for the crew to discuss anything they would like with the surgeon. The crew is currently scheduled to be finishing up their meal about this time. And, as they noted in the pass over Hawaii, they were performing the checks of the TACAN system and that apparently came through very well according to the flight controllers here in Mission Control. Be reacquiring communication in about 1 minute here over the United States. 3 days 0 hours 10 minutes, Mission Elapsed Time, this is Mission Control, Houston.

PAO Mission Control Houston, 3 days 0 hours 11 minutes, Mission Elapsed Time, standing by for reacquisition of signal through the Western United States.

CAPCOM Columbia, Houston, with you through the States for about 19 minutes, and the Bronze team is wishing you a good day.

SPACECRAFT Hello there.

CAPCOM And we read you loud and clear T. K.

SPACECRAFT (garble) how are you folks doing today?

CAPCOM We're doing just fine Hank, and it looks like you guys are right on top of things today.

SPACECRAFT We're in proximity, it's hard to tell who's on top.

CAPCOM Roger, and if you start to get ahead, we'll take care of that.

SPACECRAFT You realize, I'm having (garble) program the mals obsolete program, and the changes, you have a slight edge.

CAPCOM Roger, we understand.

PAO This is Mission Control Houston. That CAPCOM is astronaut Mike Coats of the Bronze team that was just speaking with the crew.

SPACECRAFT Mike, will you let me know when they get through with the TACAN tests so we can go ahead and start in on the transitioning the ops back to to 2 and get ready for the next blitz?

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CAPCOM Roger T. K. we'll do that, and just a reminder
you've got a PMC coming up at Mila here in a few minutes.

SPACECRAFT Okay. And are we going to get the..

END OF TAPE

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SPACECRAFT --we going to get the burn pad at the scheduled time or are you gonna have to have it before we leave you here? I'm not rushing you, I just want to have the right books out.

CAPCOM Roger, standby T.K. And Columbia, Houston the burn pad will be on time.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, T.K. we would like you to wait on the transition to G2 until we are LOS, after the GNC there.

SPACECRAFT Okay.

PAO Mission Control, Houston.

CAPCOM And Columbia, Houston the getaway special investigators are here in the Control Center Viewing room and would like to pass up their great appreciation for your outstanding In Flight Maintenance task. Many thanks and for their words here it was one small switch for NASA and a giant turn on for them. And we are getting ready, we're getting ready to turn you over to PMC here.

SPACECRAFT Okay. However thought that (garble) I thought was pretty clever. Somebody gets a gold star for that one.

CAPCOM Roger, T.K. Wayne Boscic down here did that one for us, and did a fine job on it.

PAO This is Mission Control. Off going Flight Director Harold Draughon has left Mission Control now for the press conference over in building 2. Should be arriving shortly.

CAPCOM And Columbia, Houston we've got you for another 7 1/2 minutes over the States.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston we've got the RCS 2 burn pad, if you want it now or we can wait for Dakar.

SPACECRAFT (garble) and we will be there.

CAPCOM And Columbia, Houston you don't need to get the burn pad out, we don't a burn here just a couple of attitude maneuvers.

SPACECRAFT (garble) okay.

CAPCOM That's affirmative.

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SPACECRAFT Do you have anything for me to write down?

CAPCOM Roger Hank, the RCS 2 translation is not required, we would like you to maneuver to the following attitude, at 1 hour 30 minutes, if you are ready to copy.

SPACECRAFT Go ahead.

CAPCOM Okay, roll 55.003, pitch 257.48, yaw 304.75. We would like you to hold the attitude through the RCS to procedure until the end attitude time of 2 hours 0 minutes, and then go back to the bottom-sun attitude, and we've got that, if you'd like to copy that too.

SPACECRAFT (Garble)?

CAPCOM That's affirmative.

SPACECRAFT Okay, we've got that.

CAPCOM Roger. And Columbia, Houston we are 30 seconds to LOS. We will talk to you again through Dakar, at 0+38.

SPACECRAFT Okay, sir. I didn't know you guys had a tell-tell down there that let you know when CFES was going.

CAPCOM Roger, we understand.

SPACECRAFT It's uncanny.

PAO Mission Control, Houston 3 days 0 hours 31 minutes Mission Elapsed Time. Columbia has just passed out of range of the tracking station across the United States and will be reacquiring in about 6 1/2 minutes through the station at Dakar central. Columbia is on Orbit #49 right now. 3 days 0 hours 32 minutes Mission Elapsed Time this is Mission Control, Houston. Mission Control, Houston standingby for acquisition of signal through Dakar.

CAPCOM And Columbia, Houston with you through Dakar for 10 minutes, over.

SPACECRAFT (garble).

CAPCOM Roger, Columbia we're here for about 9 1/2 minutes, over. And Columbia, Houston if you're up there on the flight deck, and we think you are could you get on panel L1 high low duck heater to B please.

SPACECRAFT It's there now.

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CAPCOM Roger. And we are trying to warm up the (garble) before the payload bay door ops, and just as a reminder we would like you to keep your radiators stowed after the payload bay door test.

SPACECRAFT Okay, we will keep it stowed, afterwards. I have the (garble) showed that I was suppose to turn that duction at 1 hr. Did I miss something there?

END OF TAPE

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CAPCOM Roger, and we're trying to warm up the FES enable before the payload bay door OPS and just as a reminder we'd like you to keep the radiators stowed after the payload bay door test.

SPACECRAFT Okay, we'll keep it stowed afterwards. I had the, my list there showed I was supposed to turn that duct on in 1 hour. Did I miss something there?

CAPCOM That's a negative TK, you were correct. We'd like to go ahead and get it on now though, it really doesn't make a lot of difference.

SPACECRAFT Okay, I just want to make sure I'm not working the wrong schedule. I show the door in 2 hours.

CAPCOM That's correct Ken.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, we're 20 seconds to LOS. One more reminder you don't need to go to a dual G2 GPC since we're not doing a burn here, and we'll talk to you again through Yarragadee at 1 plus 12.

SPACECRAFT Okay, I was just getting ready to answer you about that, and the only reason I was thinking about it was, when we go to do the door closing, if we have to stay there any length of time, is it alright to stay in the verniers?

CAPCOM Roger TK, we'll talk to you through Botswana here at 51. Get back to you on that one.

SPACECRAFT Okay.

PAO Mission Control Houston, 3 days 0 hours 48 minutes mission elapsed time. Have about a 2 and a half minute loss of signal period here between Ascension Island and Botswana. Columbia is on orbit number 49 and passing out over the southern Atlantic just off to the east of Africa at this time. 3 days 0 hours 49 minutes mission elapsed time, this is Mission Control Houston.

CAPCOM And Columbia, Houston, with you through Botswana for 8 minutes and we gave you a bad call on the 2 GPC's. We do need to G2 GPC since we're gonna be using the FES and for the OIA test.

SPACECRAFT Okay sir.

CAPCOM And Columbia, Houston, we're 40 seconds to LOS, we'll talk to you through Yarragadee at 1 plus 12 and just a reminder we'll be set up for TV at Hawaii through the states at 1

plus 3 7.

SPACECRAFT Ho ho ho. I'm glad you reminded me, I thought that last one took the place of that, okay.

PAO Mission Control Houston 3 days 1 hour 11 minutes mission elapsed time we're about to reacquire communication with Columbia through Yarragadee for about a 6 and a half minute pass. This is Mission Control Houston.

CAPCOM And Columbia, Houston, with you through Yarragadee for 6 minutes, over.

SPACECRAFT All right, sir. Houston, Columbia.

CAPCOM Okay, go ahead TK.

SPACECRAFT Okay, can you tell me how long is the video coverage on this next pass.

CAPCOM Roger, stand by a second TK. Columbia, Houston, what we've got is 7 minutes over Hawaii and then 12 more minutes over the states. We've got up to 19 minutes there.

SPACECRAFT Henry says thanks alot.

CAPCOM Roger, we thought you'd appreciate that.

SPACECRAFT Okay, we'll be ready.

CAPCOM Roger TK, we'd appreciate whatever you can give us. And Columbia, Houston, we're 25 seconds to LOS and we'll talk to you through Guam at 1 plus 25.

SPACECRAFT Okay.

PAO Mission Control Houston 3 days 1 hour 19 minutes mission elapsed time. They have loss of signal through Yarragadee. Then about a 5 minute loss of signal period before we reacquire over the tracking station at Guam for about a 5 and a half minute pass. They're just about 5 minutes or so away from orbit number 50 on the fourth flight of Columbia at the 3 days 1 hour 20 minutes mission elapsed time, this is Mission Control Houston.

END OF TAPE

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PAO Mission Control Houston 3 days 1 hour 24 minutes mission elapsed time standing by for acquisition of signal through Guam.

CAPCOM And Columbia, Houston, with you through Guam for 5 and a half minutes, over.

SPACECRAFT Hello Houston loud and clear.

CAPCOM Roger Hank, we read you loud and clear. And Columbia, Houston, we just saw a camera overtemp, we believe, could you tell us which one it was?

SPACECRAFT Mike, that's what happens when you run the tapes back.

CAPCOM Okay, understand it's a VTR problem then. And Columbia, Houston, we're 45 seconds from LOS, be advised teleprinter message 3i delta should be onboard. It's a procedure to repress the forward manifold. We'd like to work that in this afternoon and we'll take up with you later on it, we're looking forward to the TV here at Hawaii.

PAO Mission Control Houston, 3 days 1 hour 30 minutes mission elapsed time. Had a loss of signal through Guam tracking station on orbit number 50 and we have about a 6 and a half minute loss of signal before we reacquire at Hawaii where we expect to have some television downlink from the spacecraft. Crew is also scheduled shortly to begin in about a half an hour or so, a payload bay door cycle test. And they continue to run samples on the continuous flow electrophoresis system. On orbit number 50 at 3 days 1 hour 31 minutes mission elapsed time this is Mission Control Houston. Mission Control Houston 3 days 1 hour 37 minutes mission elapsed time we're standing by for acquisition of signal with Columbia over Hawaii. Hope to get some downlink television on this pass, this is Mission Control Houston.

CAPCOM And Columbia, Houston, we're with you through Hawaii for 8 minutes, over.

SPACECRAFT Okay you're already with us in Hawaii?

CAPCOM That's affirmative TK, we're with you through Hawaii.

SPACECRAFT Okay, I tell you what, Hank's still cleaning up one of the CFES activities. How about letting me run about a minute and a half worth of tape to you. I can't view it, but I can let you do it, and what it is is some pictures over the nose of jet firings. I'll describe what we saw, and let me run you that on a VTR downlink first.

CAPCOM Roger TK, we're ready for that. We need the downlink to enable and the control to command, and Columbia, Houston, we're ready now.

SPACECRAFT Okay, we're running. What you're looking at now is the nose of the Orbiter. This is in moonlight and that was, those are jet firings, and this is taken with our arm-mounted TV. This was during yesterday's test with the arm where we're looking for interactions between the dynamics of the arm and the jet firings, we're trying to look at the plume, measure some of the plume stuff, find the pressures, and contamination that the plumes conduce. So you'll see another sequence here in just a second, that was a vernier firing there. The big ones are normal jets, the 900 lb thrusters, the little ones are 25 lbs, and they burn for a little bit longer pulse, and they aren't as big in diameter, in their wakes which are, at least the part that's visible. We should have another sequence of this coming up.

CAPCOM And Columbia...

SPACECRAFT (garble) I'm gonna turn this one off. I guess we've already seen the firing. I thought it had another one on here.

CAPCOM Roger, we saw some firings TK. We've got some spectacular picture down here.

SPACECRAFT Okay, now I'm switching to the middeck camera.

CAPCOM Okay, we've got that TK.

SPACECRAFT All right, and be down there with you for just a second. Hank is currently finishing up a CFES exercise and we'll turn some lights off here, it'll give you a better picture.

END OF TAPE

SPACECRAFT Okay Mike, can you see the picture now?

CAPCOM That's affirmative TK, we've got both of you. You both look great.

SPACECRAFT Okay, well we kind of thought we'd do, you're getting all of it in unrehearsed, live entertainment, and may find out why people don't do that anymore. What we kind of thought we'd do for the today is give you a little example of a day, kind of synopsis. If we started out in the morning and you get up and you want to start doing things like get up and shave and change clothes, and so forth. In many ways it's not as easy as it is in the environment we're used to. You take things off and they go away, and the next thing you know is you've dropped - all at works pretty good until you have 3 things in 2 hands. You might notice that I've got something on my feet here called suction cup shoes, that we're trying to learn to use. It's not as simple as you might think. Once you're in place you can sort of stay there as long as you don't rock too much, but it's not the same thing. Just to set the stage, we're standing in the middeck, Hank's hanging on the corner here. The waste management system is behind me, the food warmer is over here, and the airlock is right behind us. These are our lockers, we're going to show you some of what we have now. After you get up and get started in the morning, one of the first things you're gonna be interested in doing is getting something to eat. So we put together a food package that Hank, why don't you pick that, and it's got two kinds of food in it. One that we're calling the operational food, and one that we're calling the normal food we've been using, and we'll try to show the differences in the packaging and some of what's involved. Typically we've laid out our utensils and things on the counters, and couple of things you always have to get out in advance for anything in zero g's, you want to be sure and get out something to scoop up fluids with. The water gun is right here behind me, that we reconstitute our food with. We've got our alcohol wipes that you can use to clean up there. So we try to put everything in one place, and then you look for a way to stay here while you do your chores and use two hands. Today I've been trying to learn to use my shoes, and I haven't completely mastered it yet. Hank's been using his toes, and you may have noticed when he was working on his CFES, that sticking your toes underneath these lockers right down here, although it faces his back to the camera, is really the best way you can hold yourself in place. Once you start doing something, you can flow free, but everytime you reach for things and set them down it gets in the way. Hank's gonna turn around now and we'll split up the food and kind of show you the food packages, and why we do what we do.

CAPCOM And Columbia, Houston, we're gonna lose you in about a minute here. We'll be back with you through the states in about 2 minutes.

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SPACECRAFT Okay, read me now Hank? Loud and clear. How about me? Okay, we're both on vaud box. Batteries coming. Okay. Will be as soon as I get ahold of it here, oh I had one. Can you hear me? Hank?

PAO Mission Control Houston 3 days 1 hour 46 minutes mission elapsed time. We have a brief gap in the coverage while Columbia passes between the limits of the ranges that the Hawaii tracking station and those in the western United States. We should be picking up the television again in about 30 seconds or so.

SPACECRAFT 1 2 3 4 5 6 7 8 9 10 11 12, whoops, this is just my hearing on it, okay.

CAPCOM And Columbia, Houston, we're copying you now, we're going through the states for about 8 minutes.

SPACECRAFT Okay, you got the video back?

CAPCOM Not yet, we should pick it up in about 30 seconds.

SPACECRAFT All right. Got the video? How do you read?

CAPCOM Roger, we copy you loud and clear. We don't have

END OF TAPE

CAPCOM Roger, we copy loud and clear. We don't have the picture down here yet.

SPACECRAFT Okay. But you can read in ACQ can't you?

SPACECRAFT That's affirm. Now we've got the picture. We've got you both.

SPACECRAFT Okay.

SPACECRAFT Okay, I want to show you how we work the ops food. we have this little nozzle that fits on the end of the water gun. comes in a little plastic container. Now this a beverage. We insert the nozzle right in the (garble) right in the side here. Easier said than done (garble) as this one goes through the side. Got a problem with --

SPACECRAFT Here use--

SPACECRAFT We'll try again with some food, if T. K. doesn't run over me. This is green peas, we just shoot 2 ounces of water, dehydrate it, let the water soak in and then we will - we take these peas and put them in our food warmer and warm them up. By contrast (garble). Get rid of this nozzle here. This is a (garble) type food bag. Dehydrate that by taking your trusty scissors out and try not to cut you (garble) into. Closing the little valve on the end of it. If I don't fall here, If you could fall up here since I'm (garble). And insert the water gun and this calls for 3 ounces. One potato, two potato, three potato. And this is a good little old dish of noodles and chicken. Actually this is very tasty. This is what I had for lunch today. Came out real good. Put this in the food warmer. So, when it comes out, snip along this next (garble) I think we've got one in the food warmer. Did you get yours out? I'll see if it's in there. This is a food warmer if you hadn't guessed. It's really not a traveling kit. (garble) When it's all warmed up and this is a heat element. (garble) they get nice and hot. We can have a room on the back side you can stick the cold drink bags, little round ones, like the water (garble) alright. This one's all filled up. Let me show you. I can fill it up right quick. Fill these up and then stick them in the warmer, that's good. Okay, then you close this fella up and the third kind of package is one that just has things like meat, vegetables that are reconstituted already and put those in, close it down, turn AC power on and let it cook for about 20 minutes. In about 20 minutes that will be about almost at perfect eating temperature. Something else is new at this time, that is a freezer but can also be used as a refrigerator. Will hold about 3 of those little water bottles we showed you. When they'll full (garble) the other day, was it flight day 2? We had a couple of these filled with ice cream. This thing gets all fluffed up after you've gotten the water in there you have a plastic

membrane you have to pull out. What you have to do then, is take a knife and cut it off, or scissors, but it's kind of neat. Why don't you cut that one out and we'll hang it up, one of the things that's kinda nice here is you don't have to worry about spilling anything. Specially (garble) while Hank's cutting it out just curiosity (garble) one of the things we have in here, look down at the bottom here you can see, at the bottom of the picture is a treadmill, we use that to exercise with and plan to come back and give a demonstration of that, on that later on. I put this on as (garble). Pull you down approximately 1 g force. (garble) treadmill sit there and run away and it's like being on Earth they say. Makes a lot of noise.

END OF TAPE

SPACECRAFT Makes a lot of noise. All of the rest of these lockers have things like cameras and hose in the middle. Got a NOSL experiment that gets stowed in here. Boxes full of towels that (garble) how much water you spill when you, well anytime you do something it seems like it goes the other way. That is a package of peas up there. Don't put too much water in them, you can go ahead and eat them just like you were sitting at a table, they won't come out and float away, just enough water there that they all stick these.... Some of the other things that we have down here in the bottom, we have all our EVA equipment. Let us talk about the inflight maintenance, that stuff all isn't down here we have a set of tools, got everything in here you can imagine, from a (garble) of wrenches, pliers, about as much as we had when we started. (Garble) these kinds of tools and then a whole lot of extra equipment, electrical pin kits that you guys suggested we use (garble) get away special today. All kinds of goodies in their just waiting for some good excuse to us them.

CAPCOM And Columbia, Houston, we're losing our picture here, for about 1 minute and 1/2.

SPACECRAFT Okay, we'll stand by.

SPACECRAFT (garble) go over and show - take the camera down. Show them where the teleprinter and the (garble).

SPACECRAFT But there's a message there I can take it off.

SPACECRAFT Okay. Got some scissors?

SPACECRAFT I'll use that cutter.

SPACECRAFT Okay.

SPACECRAFT Yeah. Why don't you - just take (garble) off and I'll hold it.

SPACECRAFT Got it off?

SPACECRAFT Okay. (garble).

CAPCOM And Columbia, Houston, we're back with you and we got the picture again.

SPACECRAFT (garble) Okay, how do you read?

CAPCOM Roger, Hank, read you loud and clear, and we've got a good picture down here again.

SPACECRAFT Okay, I'm over at the teleprinter now, and you see the little message. The save lights on, you folks have been busy

again. Tell you what that little operation looks like. Open up the door, push receive button, run off a little paper, (garble) this out. (Garble) it's doing it the other way and I trim my little message off. There's the one of interest, take the rest of it and throw it in the trash bag that's conveniently located right here. Need a little more paper down this way for the teleprinter. That's a take-up spool and that's all there is to the operation. I'm trying to read this right now. I want to show you one other thing while I'm over here. This is our freezer, temperature in that is 4.4 positive celsius. Open this up here (garble).

CAPCOM Roger Hank, we read you.

SPACECRAFT Okay, go ahead.

SPACECRAFT Okay, I'll open up this, can you hear me? I'll open the drawer here. In there we've gotten out 2 nice cold drinks right now. All ready to (garble) apple drink and a grapefruit drink. We try to keep a couple cool here all times, and pull them out 2 or 3 times a day to drink through the day. This has been a real pleasure to have on board here. Okay?

CAPCOM And Columbia, Houston, I understand you ate all the ice cream?

SPACECRAFT (garble) Mike. We sure did. How much more time you got on your video scan?

END OF TAPE

SPACECRAFT -- video scan

CAPCOM Roger, we got about 4 minutes and 20 seconds, T.K.

SPACECRAFT Okay. One of the things that you have to learn to do early in the game is, everything you do creates a lot of trash, and it's a problem which is not peculiar just (garble) at home. Every time you open up one of these little packages you find that things float out. First one that I can think of, are these peanuts, and the poor guys are just hard enough, when they hit something in zero g, they fall back off (garble). One of the things that I thought you might get a kick out of, everything in zero g goes in a straight line doesn't it? (garbel)

CAPCOM Roger, T.K.

SPACECRAFT Okay. That little plastic bag I'm holding in my hand?

CAPCOM Roger.

SPACECRAFT Alright, I'm just going to let it go straight now. And you know what happened to it?

CAPCOM Roger, can we see that again T.K. we've lost that picture for a second. Standby for a second. And Columbia, Houston we've lost the video here for a minute. And Columbia, Houston we've got our picture back now.

SPACECRAFT Alright. What happened, why we don't answer ya'll at times, I generally have something stuck in my mouth while trying to hold on to things. Alright.

CAPCOM Roger.

SPACECRAFT I'm going to let it go in a straight line now. It turned. Did you see it turn?

CAPCOM That's affirmative.

CAPCOM Why do you suppose that is?

CAPCOM Roger, we are assuming that it is airflow in the cabin.

SPACECRAFT Oh, you get an A. The only reason I wanted to show that is that, those are really tiny forces. And the neat thing about this environment, after you get away from gravity, now you can use these pre tiny forces to (garble) that's what this experiment called electrophoresis is all about once we got out of the massive G field on the earth, how these very tiny forces can get hold of it (garble) and in fact there is one here right

now, and I don't know if you can see that, but it starts right here, and it comes up and fits in a tube, right up here and the two lines are rather destintively separated in one here and one over here, separated by about 5/8 of an inch when it stops. The only reason it can take place, once we've gotten the gravity it makes out of it, now these very small forces of thermal effects, electrical effects and the like. That's one of those things, a bad thing it's alot of fun, (garble) Hank. I think we probably ought to go back to work and (garble) and I tell you this is a, thing this morning we showed you the (garble). I hope, we got across to you the way we see it, because the, breath taking thing is what a beautiful sight it is to see the whole world and to see it past by that fast, the colors and the clouds and all are really spec...

CAPCOM Roger, Colombia, Houston we are going LOS at this time, and we will talk to you again through Ascension at 2+16 and that was a fantastic show, we really appreciate that.

PAO Mission Control, Houston 3 days 2 hours 4 minutes Mission Elapsed Time we have just completed that pass over the Continental United States and had several minutes of downlink cabin TV, on Orbit tour of the middeck by the astronauts. They will be reacquiring communication with Columbia in about 12 minutes over Ascension Island. That will be about a 7 minutes pass. At 3 days 2 hours 4 minutes Mission Elapsed Time this is Mission Control, Houston. Mission Control, Houston 3 days 2 hours 16 minutes Mission Elapsed Time. We are about to reacquire communication with over the Ascension Island tracking station. It will about a 6 or 7 minute pass at that time.

END OF TAPE

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CAPCOM And Columbia, Houston, with you through Ascension for 7 minutes, over.

SPACECRAFT Alright sir.

CAPCOM And T. K. we know you're busy, just one note. We'd like you to delete the experiment OPS documentation scheduled at 2:50.

SPACECRAFT Alright sir. I was just going through that, looking to see what we're doing here.

CAPCOM Roger, and a reminder you've got a meal prep at 2 plus 40.

SPACECRAFT Didn't you just watch us do that?

CAPCOM Affirmative, and that was a great show T. K. you guys did a real fine job there. Maybe your in the wrong business.

SPACECRAFT (garble) my wireless just bit the dust. It was cutting in and out all during that show, and I've gone to unit C.

CAPCOM Roger, we copy that Hank.

SPACECRAFT Okay, Houston let me make sure I'm on schedule with you now. We need to, we're going to delete the experiment documentation, actually we have time to do that if you'd like. Your doing it just to off load, I think we can handle that. If you really don't need it, why we'll just can keep on going with the things to get a head here. And as I understand it, we're coming up at 3 hours, we go ahead and start the payload bay door stuff?

CAPCOM Columbia, Houston, roger we plan to reschedule that experiment ops documentation, tomorrow. And you're correct payload bay ops performance at 3 hours.

SPACECRAFT Okay. Thank you sir. Is there going to be a chance to get our little exercise in tomorrow, you think Mike?

CAPCOM Roger, we hope so T. K. and we'd like to go ahead and do the payload bay door test here, as soon as you can.

SPACECRAFT Okay, I thought you wanted us to wait. Yes, we'll press on. Good show.

SPACECRAFT How about the DEI power, do you need that now Mike?

CAPCOM And T. K. that's affirmative.

SPACECRAFT Sorry, I missed the times on those.

CAPCOM Roger T. K. we just need that for a minute or two, and that's fine.

SPACECRAFT Heh, you through with it?

CAPCOM Not yet.

SPACECRAFT Okay, just holler when you're ready, that's fine.

SPACECRAFT What about this message we got on manifold 1 repress? When are we supposed to do that?

CAPCOM Roger, stand by Hank.

CAPCOM And Columbia, Houston, we're looking at doing that repress over at Hawaii and Conus at about 3 plus 20, about an hour from now, we'll get back to you on that one.

SPACECRAFT Okay Mike, what I'd like to do is not get so many things going in parallel, if we're going to go concentrate on getting the doors, we'll try to get them done, if we can, then the repress would be a good thing to do. And we got CFES running in the background and it's time constrained and I'd like to get back on to doing things serially instead of parallel whenever we get a chance.

CAPCOM Roger..

SPACECRAFT If it's alright with you, I'm going to press on with the doors and do that as fast as I can. We'll get the sidings on those fellas, we'll run the CFES in the background because we can't stop it, and we'll try to be ready for the repress activity over Hawaii next time. You might give us a tag up just before that and remind us so we don't let it slip by us. But if we're getting behind with the doors I'm going to go ahead and finish that chore.

CAPCOM Roger, Columbia, we concur with that. And the repress is your call whenever you get around to it.

SPACECRAFT Okay, we'll make it today. I think it needs to be one of the sights where you can watch us.

CAPCOM And Columbia, Houston, we're about 15 seconds from LOS here, we'll talk to you through Botswana again in 2 plus 27. And if you turn on the floodlights for the payload bay door test we'd like to note the time if we could. And we'd like to remind you to use a thermal gradient pad for this test.

SPACECRAFT Okay Mike, I'm going ahead and turn the flood lights on now so I don't forget them.

CAPCOM Okay, we copy that T. K.

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SPACECRAFT Put all five switches on although I know only two of them are going to work.

CAPCOM Roger, we copy.

PAO Mission Control Houston, 3 days 2 hours 24 minutes Mission Elapsed Time. We've lost communication with Columbia through the range of the Ascension Island tracking station, but we'll reacquire in about 3 and 1/2 minutes over Botswana. This is Mission Control, Houston.

END OF TAPE

PAO Mission Control Houston 3 days 2 hours 27 minutes mission elapsed time standing by for reacquisition through Botswana.

CAPCOM And Columbia, Houston, with you through Botswana for 7 minutes, over. And Columbia, Houston, with you through Botswana for 6 and 1/2 minutes.

SPACECRAFT Roger, and Mike Henry just reminded that that separation that we're getting on the sample he's running now is much cleaner and nicer than the wider separation and a cleaner separation than what we got on flight day 2.

CAPCOM Roger, we copy that TK, thank you. And Columbia, Houston, we're 20 seconds from LOS. We'll talk to you again through Guam at 2 plus 5 9.

SPACECRAFT Okay Mike, and I've got the theodolite set up here and as soon as I turned it on, instead of getting the usual train of dots, I got a B dot Charlie 1 dot 8 looks like C's and dots and so forth. I'm gonna press on and see how it looks, but it doesn't look like my normally expected display.

CAPCOM Roger, we copy that TK.

PAO Mission Control Houston 3 days 2 hours 35 minutes mission elapsed time. Just passed out of range of the tracking station at Botswana and we have a 23 and 1/2 minute loss of signal period until we reacquire over Guam. Commander T. K. Mattingly reporting on that last pass that he was engaged in the payload bay door cycle test and the theodolite sightings involved in that test. During this operation, the crew cycles the payload bay doors while the vehicle is in the bottom to sun attitude. The payload bay has been cold at that time, and they observe any resulting deframations in the Orbiter structure that might result from the temperature gradient differentials there. 3 days 2 hours 36 minutes mission elapsed time this is Mission Control Houston. Mission Control Houston 3 days 2 hours 58 minutes mission elapsed time standing by for acquisition through Guam.

CAPCOM And Columbia, Houston, we're standing by through Guam for 8 minutes, over.

SPACECRAFT Okay Mike, we just had our 2 theodolite sightings, and we're closing the port door. The door closed normally, the forward latches closed on schedule, and the aft latches, we let them go to little over a minute, and have no indications of any activity. They show 0 0 0 0 on the latches. Observing the aft end while this is going on, Hank said he saw it, the door moving, and it appeared to me that the door kinda, was getting pulled out instead of it the centerline being pulled down. In looking at it, it looked to me like it kinda had a ball being forced in it,

like something was being pulled off at the aft end.

CAPCOM Roger, we copy that TK.

SPACECRAFT And so I'm gonna invoke step 4 here for a second Mike, and let you think about it before I go on. The checklist says things to do, but I want to make sure we have your concurrence since you're here.

CAPCOM Roger, standby. And Columbia, Houston, we'd like you to go ahead and proceed with the sightings as is, set up the CCTV on the aft latch group, and we'd like to open up the latches over a sight where we can watch.

SPACECRAFT Okay, how far away is that? I'd kind of like to wait and save my flashlight and do as much of this in the daylight, as I can, so this flashlight doesn't run out on me, since I'm down a few floodlights, too.

CAPCOM Roger TK, we should have daylight in about 3 minutes.

SPACECRAFT And Mike, I also enabled the (garble) and stayed on the verniers because you hadn't mentioned going to norms, but I figured you could let them watch ...

END OF TAPE

SPACECRAFT -- I figure you could let them, watch the cycling and if its to much we can get off the (garble) you might want to save some gas. If yo want me to go to a wider dead-band and go to the norms let me know.

CAPCOM Roger, T.K. we'll watch that and get back to you if it's a problem. And Columbia, Houston we copied your first description, we'd like to know if the door, where the door appears with the respect to the aft bulkhead, and if there is distortion in a center line, is it aft center line, mid center line or where is it destorted? And Columbia, Houston we've got about 45 seconds to LOS we'll have to talk to you again through Hawaii, at 3+13.

PAO Mission Control, Houston 3 days 3 hours 7 minutes Mission Elapsed Time. We have just passed out of range of the Guam tracking station. During that pass Commander T.K. Mattingly performing the payload bay doors cycle test, which is a test to determine if there is any warping of the doors, or any difficulties encountered after the Orbiter has been in an attitude which part of the vehicle is exposed to a cold very cold temperatures while other parts are very warm. Mattingly noted that there appeared some difficulty in latching the aft latches on the doors, and the aft bulkhead latches and the payload bay doors appeared to have some warping in them. Flight Controllers here have asked for a clarification as to where the warping appeared to have taken place. They will be talking to the crew again in a few minutes, as we pass over Hawaii. That will be in about 5 minutes. After 3 day 3 hours 8 minutes Mission Elapsed Time this is Mission Control, Houston.

CAPCOM And Columbia, Houston with you through Hawaii for 7 1/2 minutes, over.

SPACECRAFT Alright, sir. We're using camera Brovo to look at the latches and the, and it is really hard to get a good view of exactly what we are seeing, I don't know if you can take any of this on downlink and look at it with us.

CAPCOM And Columbia, Houston, roger, we are recording on video, we'll try to have it at Goldstone. A reminder to watch your camera pointing angles here. You might try camera C to get a good view of it.

SPACECRAFT We've looked the two of them Mike. It looks like I can see more of the latch on A. We'll be prepared to run down the back end with both C and A.

CAPCOM And Columbia, Houston did you mean camera C and Brovo?

SPACECRAFT -- sir, what did I say?

CAPCOM You said that --

SPACECRAFT What I meant to say...

CAPCOM Roger, there T.K. And Columbia, Houston we'd like for you to select downlink when ever you are ready, on which ever camera you desire. And we will try to play that back, we'll record it, play back.

SPACECRAFT Okay. We are going to start with camera Charlie and we are going to start with the center line and work our way down.

CAPCOM Roger, we are recording in Hawaii.

SPACECRAFT Mike, I just finished scanning with Charlie and all of the equipment on that bulkhead gets in the way, I'm going to switch over now and give you a downlink on Brovo and monitor Brovo, and I will work it from the center line again.

CAPCOM Roger, T.K. we copy that. Go ahead with the survey, get your comments on an ops recorder if you could, we will be recording now, and then at Buckhorn. We are trying to get realtime TV at Buckhorn.

SPACECRAFT I'm not sure which one we are looking at here, but it looks like we've got one that's clearly identified as a hook that just puts its lip on the roller, and I think it must count down the end, but I think it must be the first one we come to.

CAPCOM Roger, T.K. we copy that. We're about 30 seconds to short LOS and we hope to get realtime TV over Goldstone. We would before we leave the States to get a detailed verbal description if we can, we've got a long LOS after that.

SPACECRAFT Okay, there's not much we can add

END OF TAPE

SPACECRAFT That's (garble).

PAO Mission Control Houston, standing by for acquisition through Goldstone.

CAPCOM And Columbia, Houston, with you through the states for about 7 minutes, over.

SPACECRAFT Yes sir, I just got one piece of data I want to add to it, now that it's gotten a better lighting angle, it looks to me like, looking at the base of the vertical fin on the port door side, it looks like I've got some door that I can see sticking up toward the base of the fin it goes up the distance of one tile, I was trying to get a picture of it on the camera Charlie, and that's what's on there right now. Hank would you put that on downlink? Camera Charlie on downlink show that picture, and that looks to me like there's a gap in the door right at the end. And it's right at the back end where I can't really tell if there's anything that's discrepant, but I think there's a little curvature in the door like, it's like the tail end of the door from here looks like it's kinda pushed up over the seal on the back end. And that makes me kind of wanna back off a little to see what happens, see what it looks like with it partially open. I think we, I know we identified 2 latches on port aft bulkhead that seemed to be partially over their rollers, and the description I gave you of how the doors seem to be flexing is consistent with what I see now, that is slighter. I don't know anything about what would happen, but it seemed to me like I could afford to get that door back off a little bit and see if it's bent or if it's a permanent deflection.

CAPCOM Roger T. K. we're getting a good picture down here now, and let's not move anything just yet.

CAPCOM And Columbia, Houston, we're getting good picture now, if you want to give us a verbal description or zoom in as you want.

SPACECRAFT I don't know what to say, cause I can't see the view that the camera sees. It looks like there's a lapse that goes around the roller there, but also looks like the door is open with a gap. I'm not sure, I think that latch pointer and that roller that we're seeing is really the inboard latch on the starboard door side.

CAPCOM Roger T. K. we can see the gap there.

SPACECRAFT I'm try to see now if, I'm showing you a wider view of the door taken from camera Charlie. And you can see a bow, an apparent bow there.

CAPCOM That's affirmative T. K. we can see the bow.

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SPACECRAFT I'm going to leave that there for a second, I'm going to work on another view on another camera before I downlink it.

CAPCOM Roger, we copy.

CAPCOM And Columbia, Houston, we're going to run out of downlink here shortly, and we'd like you to record anything on the VTR that you think might help. And take some still photos if you could.

SPACECRAFT Okay, what you want me to do, just sit with it like it is?

CAPCOM Roger, just keep it like it is for right now T. K.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, could you try camera Bravo on latch number 2?

SPACECRAFT Okay, can you still see?

CAPCOM No, we just now lost our downlink here T. K.

SPACECRAFT I took it away, I thought you said you were through. You got Bravo on 2 now. Can you see it now Mike?

CAPCOM No, that's a negative T. K. we past over Goldstone, we're going LOS here in about 30 seconds for a long LOS. What we'd like you to do is use your TV cameras, use the aft TV cameras zoom in and take a picture and then step it down, zoom out zoom in again step it down, and then zoom it out, get a good recording that way, if we could.

SPACECRAFT Okay, where should I be prepared to downlink it, cause I'm going to have to manually rewind it for you.

CAPCOM Roger, probably be next Hawaii pass, and we'll talk to you over Ascension in 3 plus 54.

SPACECRAFT Alright sir.

PAO Mission Control Houston, 3 days 3 hours 31 minutes, Mission Elapsed Time. During that recent pass over

END OF TAPE

PAO --recent pass over the western United States within range of those tracking stations the crew downlinked video to Mission Control where flight controllers observed the distortion in one of the doors, the payload bay doors and attempted to discern how the latches were fitting or not fitting on one of those doors to cause that distortion. Flight Controllers are currently discussing backing the latches off of that door and are attempting to observe the phenomenon which may or not be thermally related. It's about another 23 minutes before we reacquire in a brief pass over the Ascension Island. This is orbit #51. It's 3 days 3 hours 32 minutes Mission Elapsed Time. This is Mission Control. Mission Control, Houston, 3 days 3 hours 40 minutes Mission Elapsed Time. Just to review what was going on and we had a briefing going on at the same time. Many of you may not have caught it. There was some downlink video from the spacecraft during the pass over the western United States. There was some video recorded over Hawaii and played back of the payload bay doors looking at the port door near the aft bulkhead from the inside cameras looking out to observe the alignment of the doors and perhaps the position of the latches if any data could be obtained from that. This was being done to analyze an anomaly that occurred when the crew was going through a standard door closing test. That test was one of the planned flight objectives which relates - which is done after the spacecraft has been in the bottom-sun attitude for a considerable period of time. Testing is to observe any structural deformations that could occur because of the thermal gradients. That video was the release of that video in realtime was inhibited to ensure that because the cameras were in the payload bay that there was no compromise of the security of DOD payload. That video will be released shortly, as soon as we can configure the equipment to play that and will be released over the normal NASA video circuits. Mission Control, Houston, 3 days, 3 hours, 42 minutes Mission Elapsed Time. We're currently about 12 minutes away from reacquiring communication with Columbia over Ascension Island. During that pass, flight controllers will most likely ask the crew to release the aft bulkhead latches and observe what happens with the latches and the distortion that was seen in the door. To repeat. There was video of the door operation during the pass over Hawaii and the western United States. During the Hawaii pass the video was downlinked to the ground and was recorded on the ground. During the pass over the Goldstone tracking station the video was downlinked directly to the ground and received here in Mission Control in realtime and flight controllers have observed that. The release of that video in realtime was inhibited to ensure that we do not compromise the security of the DOD payload, and apparently there was nothing within that video to, that would actually compromise the security and there are plans to release that video shortly, just as soon as the equipment can be configured to release that video over the normal NASA channels. At 3 days 3 hours 44 minutes Mission Elapsed Time this is Mission

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Control, Houston. Mission Control, Houston, standingby for acquisition through Ascension.

CAPCOM And Columbia, Houston with you through Ascension, over.

SPACECRAFT Okay, Mike we have had a chance to look some more, looks like we are starting to run out of daylight here, but I used the theodolite to look along the center line and bay, all the latches seem to go kind of uniform steps, and just at the back end of the payload bay there is one of these rollers that takes fore and aft loads and as I recall it's associated with that little short panel segment on the aft end. It looks like that's about the right dimension.

END OF TAPE

SPACECRAFT aft end, that looks like that's about the right dimension, and it appears to be, it looks like that's at the point where there's a discontinuity in the arrangement of the payload bay door. When I run down the little seal, this little black seal that goes along the door here, and I can trace it, and it makes, with the theodolite, it makes a nice little band that runs right up on, in front of the vertical fin. And it looks like I can see a little bit of monkey fluid that's been up, and so it confirms from here that there is some kind of a fairly substantial distortion at the back end. Now when we took a tape which we're finishing up now, and ran a survey. Again, from camera B, and we took it and started at the centerline and worked our way in, and it appeared to us that we had at point 61 on our counter. I don't know if you have any way of correlating that, but it looked like I zoomed in on, what looked to me like a possibility of a hook that was outside, on the outside of the roller, and then I went in further to point 114 where it looks like there is, I'm convinced I'm looking at a hook which is partially over a roller, and it's the hook we thought was the one closest to the longeron ...

CAPCOM TK, and TK we'd like you to go ahead and back off on the latches. Get it on VTR to get the loads off the door, do you copy, over?

SPACECRAFT Okay, we're gonna back off, and let me tell you that I believe the one closest to the longeron is latched.

CAPCOM Okay, we copy that and we'll talk to you again through Botswana at 4 plus 3.

SPACECRAFT Okay.

PAO Mission Control Houston 3 days 3 hours 57 minutes mission elapsed time. We just passed out of range of the Ascension Island tracking station. We're about to replay the television in just a few minutes here, about 2 and 1/2 minutes, television that was of the payload bay door test that was occurring back earlier in this orbit. Initially when the crew was performing that test, they noticed some distortion, or failure to latch along the aft bulkhead, and ground controllers asked them to take some video of that. They did point the cameras at that, and that was while they were passing over the Hawaii tracking station that was downlinked to the ground and recorded. It was downlinked live over Goldstone in the western United States. The release of that was initially inhibited cause it was payload bay TV. In order that we not compromise the security of the Department of Defense payload, that video was reviewed, but not edited. It is being released in it's entirety in just a couple of minutes here, and we will be passing back within range of Botswana in just about 5 minutes here, but momentarily we now are preparing to release that video of the

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payload bay door cycling test. 3 days 3 hours 58 minutes mission elapsed time this is Mission Control Houston. Mission Control Houston 3 days 4 hours 3 minutes mission elapsed time. Had a slight delay in the replay of that video. We'll be bringing up shortly, as soon as the building A television is ready with the tape. About to acquire communication with Columbia here in just about 20 seconds over Botswana in southern Africa orbit number 51. This is Mission Control Houston.

CAPCOM Columbia, Houston, with you through Botswana for 7 minutes, over.

SPACECRAFT All right sir, and we opened the latches and they both opened. The forward latches opened in about 28 seconds, and the aft about 31, and Henry's gotten the TV working now, I'm looking at it. We found out that the one we know was closed, is now open, and we're still trying to find the other latches to identify them. Visually to the theodolite although it's dark with a flashlight, it looks to me like the bow is out of the aft part of the payload bay now.

CAPCOM Roger, we copy that TK.

END OF TAPE

CAPCOM Roger, we copy that T. K.

CAPCOM And Columbia, Houston, we'd like you to go ahead and open up the port door, get to it, and if you get a chance we'd like to request the MET when you first started to close the bulkhead latches that help us on our data retrieval.

SPACECRAFT Oh boy Mike, I don't know how to give you that. That's not the kind of thing I normally write down.

CAPCOM Okay, never mind on that one T. K. we'll get that.

SPACECRAFT Let me think about, I ought to, I tell you, it was just prior to our AOS, we had just looked at each other and said "uh oh" at the time that you came up and called us, cause I said I wanted to wait for some daylight, and you said we'd have sunrise in about 2 minutes. You can pin it down, that's as close as I can get it in a time history.

CAPCOM Okay, T. K. we got that, thank you.

SPACECRAFT Okay, but let me confirm, you do want to open the door?

CAPCOM That's affirmative.

SPACECRAFT Okay, I'm going to open it now.

CAPCOM And Columbia, Houston, go ahead and clean up from the door test here, and you can pick up in the CAP wherever is comfortable for you, if you can do the back up nav test, that's fine, if not, go ahead and skip that.

SPACECRAFT Okay, hey Mike, we're just sitting here trying to figure out which would be useful data. What would think of our waiting until we get some sunlight and opening the door about say 90 degrees and stop, and run a scan from a couple of TVs to look at the back end? Or do you think you have enough data that you don't need all that?

CAPCOM Roger, stand by one T. K.

CAPCOM And Columbia, Houston, I'd like you to take the RF switch on panel L11 to the umbilical position.

SPACECRAFT Okay that's done.

CAPCOM Okay, and now you can do whatever you like to with the door T. K.

SPACECRAFT I'd kinda like to see what the back end looks like. Did I tell you its moxnix with you guys?

CAPCOM That's affirmative T. K. go ahead and do what you'd like to get some data for us there, makes no difference to us.

SPACECRAFT Okay, well if there's nothing adverse about it, remember I'm still in verniers, my present intention is to stay in verniers. I'll wait for daylight, open the door, take a TV of it, we'll put it all in the same tape, we'll then open the door, get the high load off, pick up the CAP, and in the meantime, we will hand rewind the cassette and try to have it available for you, plugged in ready for a downlink.

CAPCOM Roger, we copy that T. K. sounds like a good plan. Hawaii is our only station left here for video, and we're going LOS in about 20 seconds. We'll talk to you briefly through IOS at 4 plus 15.

SPACECRAFT Okay, what time is that Hawaii pass? I'll try and be ready.

CAPCOM That's at 4 plus 50.

SPACECRAFT Okay, I think we can meet that.

CAPCOM Roger, thank you.

PAO Mission Control Houston, 3 days 4 hours 11 minutes, Mission Elapsed Time. Just passed out of range at Botswana we'll have about a 48 second pass over the Indian Ocean station in about minutes.

PAO Mission Control Houston, 3 days 4 hours 13 minutes, Mission Elapsed Time. We are preparing at this time in about a minute and a half to get the playback of that video from the Spacecraft recorded earlier of the payload bay door cycling test in which there was some distortion in the doors and flight controllers here had ask for some information on that so they could analyze the distortion of the door.

CAPCOM ...two minutes, over.

PAO Initially, the video was recorded while the Spacecraft was passing over Hawaii on orbit number 51. That recorded video was, it was recorded on the ground as the Spacecraft passed over, and then over Goldstone and the Western U.S. was linked to the ground. A release of that video was inhibited to ensure that would be no compromise of the security of the DOD payload. Video was reviewed and is now being released in it's entirety.

CAPCOM Through IOS for about a minute, over

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PAO We further expect some additional TV to be recorded on the ground as we pass on orbits number 52 and 53. Again, that will be reviewed to determine that there is no compromise with the security of the payload.

END OF TAPE

PAO compromise of the security of the payload, and we would expect then to release that in it's entirety then, if there were no compromising video in that downlink. 3 days 4 hours 14 minutes mission elapsed time this is Mission Control Houston.

CAPCOM Columbia, Houston, with you through IOS, over.

SPACECRAFT Okay, we're here.

CAPCOM Roger TK, and 2 things for you. We'd like you to stay in the bottom sun attitude, and we'd also like you to do the water dump on time here. We'd like you to dump tank B bravo to 20 percent, 2 0 percent, and it should dump for about 1 hour, over.

SPACECRAFT Okay, you'd like to have tank B to 20 percent at the scheduled time and you want us to stay bottom sun. Does that mean delete the IMU stuff?

CAPCOM Roger, we'll get back to you on the IMU alignment TK. We'd like you to stay bottom sun for tonight though.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, if you can go ahead and get the IMU alignment, that'd be great, otherwise we'd like you to stay in bottom sun.

SPACECRAFT Okay, we'll get you an IMU alignment, how about that?

CAPCOM You guys are doing good work TK.

SPACECRAFT It's all that overtime.

CAPCOM And Columbia, Houston, we're about 20 seconds from LOS. We'll talk to you again through Guam at 4 plus 35.

SPACECRAFT Okay sir.

PAO Mission Control Houston 3 days 4 hours 21 minutes mission elapsed time. We now have a continuation of the video that was taken of the payload bay door cycle test. There was a gap in that video there as we had passed through a keyhole in the Hawaii tracking station area when that was originally recorded. The video has not been edited and is being released in it's entirety. What the cameras have been looking at here is the port door at the aft bulkhead where the latches were cycled, and there was some distortion in the rear portion of that port door, which you've been able to see on the video playback. This was part of a regular payload bay door cycle test, which was one of the normal flight test objectives, which is normally scheduled to

occur after the vehicle has been in the bottom sun attitude for a considerable period of time as we have been for, during the night, and for several hours during the day. Just during one of the recent passes, the crew noted that they released the latches and that the door appeared to resume it's proper shape, and that the distortion had disappeared. So, apparently it's back in the configuration as it was, the condition as it was, before they attempted that latching and the door has been opened and Mission Control flight controllers here will continue to review the data that was taken during that test to determine the, perhaps the causes and the effects of that latching in the payload bay door cycle test. We do expect again, to have some television downlinked on orbits number 52 and 53 relating to the payload bay door situation and observations. That video will be inhibited as it is sent down, and reviewed to determine that it does not indeed compromise the security of the Department of Defense payload, since those cameras are in the payload bay, and once that determination has been made, then those, we expect that that video will be released in it's entirety, assuming that there is no problem in the camera pointing angles in that video. At 3 days 4 hours 23 minutes mission elapsed time Columbia is about to start on orbit number 52. This is Mission Control Houston. Mission Control Houston 3 days 4 hours 35 minutes standing by for acquisition through Guam.

CAPCOM And Columbia, Houston, with you through Guam for 7 minutes, over.

SPACECRAFT Okay sir, we have the VTR tape rewind, and ...

END OF TAPE

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SPACECRAFT ..VTR tape rewound and waiting for sunrise to move the door, the tape will be ready to dump, I've got more than you can dump in a 7 minute pass. You dump it in real time, or can you, there's no other way you can do it, I can't dump it in fast forward can I?

CAPCOM Roger, we have real time only on that T. K.

SPACECRAFT Okay, and I'm going to start you in, start in about a third of the way, I'll start you about halfway through and then get you the last half of that tape.

CAPCOM Roger T. K. we got another Hawaii pass a rev later that we can dump the rest of it.

SPACECRAFT I think we can do that, why don't we do it? Why don't I give you what you can get the first time and give you the rest of it on the second pass?

CAPCOM Roger, that's a good idea.

SPACECRAFT Okay, and we're prepared to do your LIA test, I think that won't conflict with your dump if you want us to wait and do that at Hawaii when you can watch it, which is what I understood you to say.

CAPCOM Roger, stand by T. K.

CAPCOM And Columbia, Houston, you can go ahead and do the LIA test whenever your ready.

SPACECRAFT OK

CAPCOM And T. K. just like to clarify we're deloting the PTC tonight, we're going to stay in bottom sun. Right now the rough plan is to stay in bottom sun until tomorrow and then try PTC for 10 hours, and then back to tail sun.

SPACECRAFT Okay, sir. I understand you want to go bottom sun and that's the attitude we are in right now.

CAPCOM Roger, we concur.

CAPCOM And Columbia, Houston, we'd like you to repress the left OMS tank before you do the LIA test.

SPACECRAFT I'm sorry, your late on that one.

CAPCOM Roger.

SPACECRAFT Wait a minute, we are, just a second. Mike, I'm sorry we are getting our signals crossed, I've got my tongue

ted, I said L1A, what we're doing is this forward manifold thing.

CAPCOM Roger, we see that T. K. and that's fine.

SPACECRAFT I'm sorry sir. Okay we're showing 90 oxidizer, 130 fuel, do you know (garble) you can follow us through.

CAPCOM That's affirmative T. K. we have the data.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, we'd like you to do the staged repress.

SPACECRAFT That's in work here.

CAPCOM And Columbia, Houston, we're 20 seconds from LOS, we'll talk to you through Hawaii at 4 plus 50.

SPACECRAFT (garble).

CAPCOM And Columbia, Houston, we'd like you to close manifold one and leave it closed, copy.

SPACECRAFT Okay, manifold one is closed, and staying closed.

CAPCOM Roger, we copy, thank you.

PAO Mission Control Houston, 3 days 4 hours 44 minutes, Mission Elapsed Time. Just passed out of range of the tracking station at Guam and we're going to reacquire over Hawaii in about 4 and 1/2 minutes. Commander Mattingly reporting that he was working on the repressurization of the L1L, the manifold in the reaction control system jet in which the flight controllers saw a leak early in the mission. It had appeared that that leak also stopped after a period of time and this was a test to determine whether or not the manifold will indeed retain the pressure. And flight controllers are looking at the data from that test as conducted over Guam. Columbia is currently on orbit number 52, we're about 4 minutes away from reacquiring communication over Hawaii. 3 days 4 hours 45 minutes Mission Elapsed Time, this is Mission Control Houston.

PAO Mission Control Houston, 3 days 4 hours 49 minutes, Mission Elapsed Time standing by for acquisition through Hawaii in about 20 seconds.

CAPCOM And Columbia, Houston, with you through Hawaii for 7 and 1/2 minutes, over.

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SPACECRAFT Okay.

END OF TAPE

CAPCOM --and we've got the downlink (garble)

SPACECRAFT Standby. Mike when we just opened this door. We opened it up about 30 degrees, and as soon the door started to move, the back end of it really gave a big jump like it had been laying up on top of the back seal or something. And the door was really warping and it popped loose when the door started up.

CAPCOM Roger, we copy that Hank. And Columbia, Houston is the VTR rolling? We are not getting it down here now.

SPACECRAFT Yes sir.

CAPCOM Roger. Just keep it rolling. And Columbia we've got a downlink

SPACECRAFT (garble). Yes we had it then (garble)

CAPCOM Okay, we've got it now T.K.

SPACECRAFT Let me ask you another dumb question Mike. When I look aft at the door, right where the door makes it's bulk of it's curvature back around the 1, 2, 3 about the first latch, just first wheel latch inside of that, the door is partly open, do you normally see that mechanism hanging down? I've only seen it once and I can't remember clearly, because I didn't look at it that closely to see.

CAPCOM Roger, standby T.K. And Columbia, Houston could you describe that again for us T.K.?

SPACECRAFT When I, right at the aft end of the door when you look at it, normally you see the bold line that is formed by the radiators. In the vicinity of the outboard moors latch where the aft bulkhead on the payload bay door there is a, looks like the linkage is visible, and the rest of it isn't. And I just want to make sure that's normal cause I haven't looked at enough of them in this position to know for sure.

CAPCOM Roger, T.K. we think that's normal.

SPACECRAFT Okay. I couldn't be sure whether it was or wasn't.

CAPCOM Roger, T.K. and we've got the good video down here now. We've got a long LOS after this pass. We would like to make sure that the CFES was closed out and if you could tell us what time that was done.

SPACECRAFT Done during the middle of the payload bay door stuff. In fact we got, have you got something else over here? Do you need it right away Mike?

CAPCOM That's a negative T.K. and the CFES people would like to thank you for a job very well done here, and we need you to get the water dump started please.

SPACECRAFT Oh, okay.

CAPCOM And Columbia, Houston, if you get some time a little later we will get the IMU results from you. And Columbia, Houston we would like you to delete the IIA test for today.

SPACECRAFT Good show. Mike I can give you one other piece of data. The door closed to the ready to latch position without getting a fan works perfect. There is no visible distortion in the door at all.

CAPCOM Okay, we copy that T.K. we've got about 35 seconds to a very long LOS here, we know you've got some work to complete here on the doors. We would like to remind you that you gotta meal break coming up here, we'd like you to get something good to eat, and a reminder to leave the radiators stowed please.

SPACECRAFT Okay, thank you for that. I've got the doors opened now, I'm getting out of 202, and we'll leave the radiators stowed, got the temps coming up on the water, and I think we're going to powerdown here a little bit (garble).

CAPCOM Roger, that and we will pick up the VTR again in Hawaii on the next rev.

SPACECRAFT Okay, good

CAPCOM And Columbia, Houston we'd like you to get the RF switch back on panel L11, to the antenna position.

PAO Mission Control, Houston 3 days 4 hours 58 minutes Mission Elapsed Time just passed out of range of Hawaii tracking station. We have a very long LOS of signal period here of about 41 minutes. During this last pass

END OF TAPE

PAO ...last pass we had some downlink from the Spacecraft of video recorded onboard the Spacecraft. That video was of the latches along the payload bay doors so that there could be some analysis of that by the flight controllers here in Mission Control. That video was inhibited since it was payload bay video to determine and ensure that there is no compromises of the DOD security. We intend at this time to release that in its entirety as soon as that can be turned around technically. At 3 days 4 hours 59 minutes Mission Elapsed Time, this is Mission Control Houston.

PAO Mission Control Houston, 3 days 5 hours 1 minute Mission Elapsed Time, currently planning on releasing that downlink of the payload bay door television at 3:05, in just about 3 and 1/2 minutes here. This is Mission Control Houston.

PAO Mission Control Houston, 3 days 5 hours 13 minutes, Mission Elapsed Time. We completed the playback of the video downlink from the Spacecraft. During that playback there was a part where the video went black that was the condition of the video as we received it from the Spacecraft, it was, the video was not edited and was played back in its entirety as received from the Spacecraft. Columbia is currently on orbit number 52, and just off to the west of South America, and we'll be out of communication with the crew for about another 25 minutes until we pass within range of the tracking station at Botswana. At 3 days 5 hours 14 minutes, Mission Elapsed Time, this is Mission Control, Houston.

PAO Mission Control Houston, 3 days 5 hours 35 minutes Mission Elapsed Time. Columbia is currently out over the South Atlantic and orbit number 52. We're about 3 minutes away from acquiring a communication through the Botswana tracking station. Just to summarize the activities that have occurred lately relating to the payload bay door tests. The crew was performing a payload bay door cycle test, which is one of the stated flight test objectives, as listed in the flight requirements document, to be accomplished after the vehicle has been in the bottom sun attitude for a long period of time. As you know, we were in bottom sun previously to dry out the tiles on the underside of the vehicle to get rid of the water that had accumulated during the heavy rain storms before launch. It was determined that since we had been in that attitude for a considerable period of time that it would be wise to go ahead and get the thermal test data that was planned for that attitude, the bottom sun attitude, was a standard attitude planned for this Mission. So, the crew was proceeding with the flight test objective of closing the payload bay doors to observe any distortion that could of occurred, structural misalignments that might occur when the doors were attempted to close because of the thermal differences from one point of the vehicle to the other. We observed that the crew reported a misalignment, they brought

the doors down, and it was no problem getting the ready to latch signal on the doors, and as they close the aft bulkhead latches, there appeared to be a distortion or a misalignment of the doors and the latches did not properly close, there was some misalignment there. That was on the port door, they were just testing one door at that time. There was noted on flight number 3, STS-3, a problem in closing the payload bay doors. Misalignment was experienced there following an extended period of tail sun exposure. After T.F. Mattingly, the Commander, reported that problem with the door today, the door was left in it's partially closed configuration, while documentary video photography and optical measurements were obtained. In addition, development flight instrumentation data will be acquired on the door structure on latch mechanisms. The latches were subsequently opened to relieve the stress resulting from the uneven latching and the door was opened. Crew reported the opening with the onboard

END OF TAPE

PAO that recorded the opening with the onboard video recorder, and replayed a portion of that video to the ground during a recent pass over Hawaii on orbit number 52. The remainder of that will be replayed on the upcoming Hawaii pass orbit number 53, which should the door opening. Flight controllers in Mission Control continue to evaluate the data this evening and plan to develop a thermal conditioning procedure for the Orbiter before attempting again to close the doors, probably tomorrow. The doors remain open at this time. The stress was relieved from the port door when those latches were opened back up, and the vehicle remains in the bottom sun attitude. There was a plan to take the vehicle to pass a thermal control, and that may be done, or it may be another attitude to thermally condition the vehicle.

CAPCOM Columbia, Houston, through Botswana for 6 minutes, over.

SPACECRAFT (garble) read you loud and clear.

CAPCOM Roger Hank, we copy you loud and clear. We've got a few notes for you, if you got a second.

SPACECRAFT Okay, go ahead.

CAPCOM Okay, we're hope you're getting something to eat. We hope we're not interrupting it here. As far as the forward manifold 1 repress, it was looking pretty good to us. No leakage is indicated. We'd like to go ahead and complete a couple more repress cycles over Indian Ocean where we can watch it, and then we'll make a decision whether to go ahead and open it up tonight. The repress cycles for the message 31 D.

SPACECRAFT Is there any hurry about opening it up Mike?

CAPCOM That's negative. We'd like to go ahead and get it up to operating pressure. No hurry to open it up, but we'd to get the repress cycles if we could tonight where we can see them.

SPACECRAFT Okay, and what time do you do that? We're down stairs eating.

CAPCOM Roger, we'll go ahead and wait for Hawaii here which is a few minutes yet. One thing we do need to check, if you didn't copy last time was the RF switch on Panel L11 to antenna.

SPACECRAFT (garble)

CAPCOM Roger, I understand it's in the antenna position.

SPACECRAFT That's affirmative.

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CAPCOM Okay, one thing we didn't get was the IECM did not pick up the switch cycle during the GAS release. We'd like you to repeat that at 6 hours and 14 minutes, if you could. All you need to do is take the switch to position 1, wait 30 seconds and back to position 2.

SPACECRAFT What is it you wanted us to do with the GAS cycle switch when?

CAPCOM Roger Hank, at 6 hours and 14 minutes we'd like you to take the IECM switch on panel R11, cycle it to position 1, wait 30 seconds and then back to position 2.

SPACECRAFT Do they think it didn't work when we tried during the maneuver?

CAPCOM That's affirmative, the IECM did not pick up that switch cycle, and we don't want you to maneuver, we'd just like you to go ahead and cycle it again at 6 hours and 14 minutes.

SPACECRAFT Okay, we'll do it. Anything else Mike?

CAPCOM Roger, we're still here Hank.

SPACECRAFT Okay, did you have anything else for us?

CAPCOM Just a few items of information, and we'll pass those up over Guam or Hawaii, so go ahead and finish your meal.

SPACECRAFT Okay. I'm sitting out by about a CFES cue card and it was closed out at 3:31.

CAPCOM Roger Hank, and thank you much.

SPACECRAFT The times in our flight plan don't seem to be in sync with the actual trajectory. When you tell us you'll pick up something at Indian Ocean or Hawaii, you're gonna have to give us a hand about the time.

CAPCOM Roger TK, we'll be switching over to Indian Ocean here at 5 plus 47, Guam at 6:13, and Hawaii at 6:25, and we'll call you on those. We'll give the times from now on.

SPACECRAFT If I just knew that it was, it's going to be 5 minutes early, that's close enough.

CAPCOM And Columbia, Houston, we're going through a short LOS here, we'll pick you up over IOS, and all the sights in the CAP, we're picking them up about 7 minutes early now, than what you see in the CAP.

END OF TAPE

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CAPCOM ...That's 7 minutes early now than what you see in the CAP.

SPACECRAFT Okay.

SPACECRAFT (garble)

CAPCOM And Columbia, Houston, we're with you through Indian Ocean here for about 8 minutes.

SPACECRAFT Okay, loud and clear, I have the IMU angles if you want them.

CAPCOM Roger, we're standing by to copy.

SPACECRAFT (garble)

CAPCOM Roger, Columbia, we'd like to pass up a note here first about going to PTC tonight, because the door problem we're going to have to set up and go to PTC and we've got some data to pass up for you, if you're ready to copy.

SPACECRAFT Okay Mike, before I copy that, did you get my comment about verifying that the doors close physically, without any problem and it looked like it was the latch mechanism that caused our problem?

CAPCOM Roger, we copied that comment T. K.

SPACECRAFT Okay, and I'm ready to copy now. And you want me in parallel, would you like for Hank to go ahead and do the repress?

CAPCOM Roger, T. K. that's affirmative, if Hank can go ahead and do the repress, and I'll pass up the pad for the PTC attitude.

SPACECRAFT Okay, I'm ready to copy, and Hank's getting ready to start.

CAPCOM Okay, for the auto maneuver to the PTC attitude, the maneuver option is roll 138.0, pitch 230.1, yaw 56.9, we'd like you to initiate the maneuver in DAP A, that's Alpha Auto normal, once your in the attitude, we'd like you to change DAP A rotation discrete rate vernier to .4.4 that's a negative .4, make that a 0.4 T. K.

SPACECRAFT I can't put in negative numbers in the DAP.

CAPCOM Roger, we're sorry, that's 0.4, my mistake, body vector of plus 4, we'd like you to initiate the rotation at 6 hours and 15 minutes.

SPACECRAFT Okay, now I understand you want to do PTC in normal, rather than in vernier jets?

CAPCOM Roger, T. K. we'd like to do the PTC in verniers, rotation discrete rate vernier .4, and..

SPACECRAFT I thought you were in normal, (garble). Okay, and can you give me a DAP number instead of just - It's definitely a .4 waiting for PTC?

CAPCOM Roger, stand by T. K.

CAPCOM And Columbia, Houston, we'd like DAP A2 for that .4 rotation rate. And why don't you go ahead and cancel that GAS release if you would. That conflicts with the attitude requirements there.

SPACECRAFT Okay, you just don't want me to do it, or I can work it in probably if you want it, but I'll stop if you don't.

CAPCOM Roger, T. K. it conflicts with our attitude requirements here we need to go PTC at 6:15, so go ahead and cancel the GAS release.

SPACECRAFT Okay. How far is repress. Jets F1L is (garble) reselected and got a normal configuration, is that what you want now, how much longer.

CAPCOM Roger, Hank, why don't you leave it right there, we'll watch it for awhile and get back to you.

SPACECRAFT Okay I have completed the message is that what you intended Houston?

CAPCOM Roger, Hank we're in good shape right now, let's just watch that for a while.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, we'd like to reconfigure the cryo H2 tank heaters if we could, panel A11 and R1, if your ready to copy.

SPACECRAFT Go.

CAPCOM Roger, on panel A11, we'd like the H2 tank 4 heater B to off, and on panel R1, we'd like the H2 tank 3 heaters A and B to auto.

SPACECRAFT Okay, which tanks on R1?

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CAPCOM Roger, H2

END OF TAPE

CAPCOM Roger, H2 tank 3 heaters A and B to AUTO.

SPACECRAFT Okay, I have H2 tank 3 A and B to AUTO.

CAPCOM Roger, we see that Hank, and we are going LOS and we will talk to you through Guam at 6+13. Good work guys.

SPACECRAFT Alright.

PAO Mission Control Houston, 3 days 5 hours 56 minutes Mission Elapsed Time. Passed out of range of the tracking station at Indian Ocean. Columbia is just about to start Orbit #53 as it crosses the Equator in just a moment. We have about almost a 17 minute loss of signal period here before we reacquire over Guam. During that pass Henry Hartsfield the pilot was proceeding with a manifold repressurization of the forward reaction control system jet in which there was a leak seen earlier in the flight. That they have repressurized the manifold which is shared by that jet and 3 others, and have reselected that jet. Everything is in the normal configuration and the flight controllers here will be observing it for awhile to see how it performs, to perhaps observe whether or not that system bleeds back down or remains pressurized and to determine whether that is fully functional again. Flight Controllers also read up to the crew the time to begin to initiate the passive thermal control mode, that is scheduled to begin in about 17 minutes from now. So apparently we will not be in the bottom-sun attitude tonight, the spacecraft will go in the slow rolling mode which evens out the temperatures throughout the structure. And that will be done at about 6 hours, 3 days 6 hours 15 minutes Mission Elapsed Time. Crew is only about 1 hour away from their beginning of the scheduled sleep period in the crew activity plan. They still taking care of a number of detail here, they are trying to get squared away before the beginning of that period. On Orbit #53, about 14 1/2 minutes away from communication with the spacecraft. At 3 days 5 hours 59 minutes Mission Elapsed Time, this is Mission Control, Houston. Mission Control Houston, 3 days 6 hours 12 minutes Mission Elapsed Time, on Orbit #53 we are about 1 minute 1/2 away from reacquiring communication with the spacecraft over the Guam tracking station. Just about 2 1/2 minutes the crew will initiate the roll which will put the spacecraft in the passive thermal control mode, sometimes referred to as the barbecue mode which will equilibrate the temperatures throughout the spacecraft equally exposing all portions of it to the sun for the same period of time. The spacecraft is coming out of the bottom-sun attitude. Flight Controllers here in Mission Control feel that temperatures at this point have reached equilibrium and that they have all the data that they will be gathering from this particular test. There will be some conditioning in the PTC mode before going to the tail-sun attitude tomorrow so, that the data can be gathered for that thermal testing.

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CAPCOM And Columbia, Houston with you through Guam for 3 1/2 minutes, over.

SPACECRAFT Alright, Houston.

CAPCOM Roger, Hank we read you loud and clear and we've got a few things for you again when you've got a chance to copy.

SPACECRAFT Go ahead.

CAPCOM Okay, Hank, we've got some clean up items on L1 and A7. On L1 we would like for you to take the high load evap to off, the high load duct heater to off, you don't have to wait for 30 minutes.

SPACECRAFT That's done.

CAPCOM Okay, on panel A7 T.K. we'd like the payload bay flood lights all off please.

SPACECRAFT Thank you.

CAPCOM And Columbia, Houston if you get a chance we're ready to copy the IMU results and be advised that no check, SM check point is going to be required tonight.

SPACECRAFT Okay, no SM check point and here comes the IMU results. Okay stars 20 and 17, angular error .01. Angles IMU 1, -.03, +.03, +.22, -1.8, +.03, +.01, +.09, -.14, +.27, (garble)

END OF TAPE

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SPACECRAFT 03 + .03, + .22, -1.8, + .03, + .01, + .09, -.14, + .27. torqued at 3 days 4 hours 27 minutes 10 seconds.

CAPCOM Roger, we copy that Hank, and be advised you can go, once you start the PTC rotation here you can go take the RCS to normal feed.

SPACECRAFT Okay.

CAPCOM And once that's going, you can collapse the set back to a single G2 GPC.

SPACECRAFT Alright, roger.

CAPCOM And we're about 15 seconds to LOS here at Guam. Excuse me, we're going through a keyhole here. Just a reminder, we're waiting for the VTR dump at Hawaii.

CAPCOM And Columbia, Houston, T. K. if you would, you might be thinking about where you'd like to put your summary message tonight. We'd like it to be during an LOS period, if possible.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, just a reminder T. K. you might need to hold down that vernier push button when you collapse the set there.

SPACECRAFT Collapse the deadband sir?

CAPCOM Negative, when you collapse to single GPC T. K.

SPACECRAFT Oh that's right, okay, thank you, thank you. I'll tell you what, how about if we try and dump it over this flight called FAA?

CAPCOM Roger, T. K. we'll run that by INCO see what he says.

SPACECRAFT Okay, the last time I did that, it was kind of scratchy, sounded like a lot of static.

CAPCOM Roger that.

SPACECRAFT That's what you get from INCO anyhow.

CAPCOM Roger, T. K.

CAPCOM And we're going LOS, we'll talk to you through Hawaii at 6 plus 25.

SPACECRAFT Okay, we'll be there.

PAO Mission Control Houston, passed out of range of the tracking station at Guam, we'll be reacquiring in 7 minutes over Hawaii. 3 days 6 hours 18 minutes, Mission Elapsed Time, this is Mission Control Houston.

PAO Mission Control Houston, 3 days 6 hours 24 minutes, Mission Elapsed Time, we're standing by for reacquisition of signal with Columbia over the Hawaii tracking station in about 20 seconds or so.

CAPCOM And Columbia, Houston, we're with you through Hawaii for 8 minutes, over. And if you let us know when your ready we'll give you a go for the VTR downlink.

SPACECRAFT Are you ready on the tape?

CAPCOM Roger, stand by T.K.

CAPCOM And Columbia, Houston, you have a go.

SPACECRAFT Okay, the tape is rolling.

CAPCOM Roger, and we see it down here T. K. thank you.

CAPCOM And Columbia, Houston, just be advised T. K. that manifold one, forward Manifold one is looking good to us, and your go for leaving it open through sleep tonight.

SPACECRAFT Okay, thank you.

SPACECRAFT Sir, are we cleared for item 48?

CAPCOM Roger, stand by.

CAPCOM Roger Columbia, you're go for item 48.

CAPCOM And Columbia, Houston, we got about a minute left in this pass and we'll have to tell you to stop the VTR here in just a minute and pick up the rest tomorrow. And be advised, your state vector is go for the next Edwards opportunity. And guys we really appreciate your patience with us today. Things got pretty hectic and you guys really hung in there.

SPACECRAFT I think it's probably a little easier here. Sure appreciate you watching the store for us, you helped us out a lot today. At least Mike within our (garble) all our problems, but we thought about them all in advance.

CAPCOM Roger, T. K. we understand that.

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CAPCOM And Columbia, Houston, we're about 10 seconds away from LOS you might as well go ahead and stop the VTR and we'll pick it up tomorrow on the first pass that's available.

SPACECRAFT Okay, sir.

CAPCOM And we'll talk to you again at Santiago, that'll be the last call tonight.

CAPCOM 6 plus 53.

SPACECRAFT I would guess you got about half of the tape dump?

CAPCOM Roger that, we'll talk to you at Santiago at 6 plus 53.

SPACECRAFT Okay, and just as a by-product, we did find out how to rewind tapes manually almost as fast as the tape recorder does it.

CAPCOM Roger that T. K.

END OF TAPE

SPACECRAFT winding tapes manually almost as fast as the tape recorder does it.

CAPCOM Roger that TK.

PAO Mission Control Houston 3 days 6 hours 34 minutes mission elapsed time. We passed out of range of the Hawaii tracking station. We have about a 20 minute loss of signal period before we reacquire over Santiago. During that pass the crew completed relaying down, or continued to relay down the video that they recorded early of the payload bay door latches. That video has been cleared as not compromising the security of the DOD mission, and we will be releasing that shortly, as quickly we can get it turned around. That will be unedited, and issued in it's entirety, and we will be informing you as to the time we will begin replaying that tape. On orbit number 53 at 3 days 6 hours 35 minutes mission elapsed time, this is Mission Control Houston. This is Mission Control Houston, Flight Director John T. Cox and his granite team of flight controllers that have checked into the Mission Control Center beginning to tag up with the off-going team Flight Director Chuck Lewis and his bronze team are preparing to relinquish authority of the mission, and that handover should occur at about 5:00 local time. The change of shift briefing with Chuck Lewis is scheduled at 6:00 pm Central time. Columbia on orbit number 53 acquisition of signal through Santiago Chile in about 12 minutes, this is Shuttle Mission Control at 3 days 6 hours and 40 minutes. This is Shuttle Mission Control at 3 days 6 hours 53 minutes, just moments away from acquisition of signal through Santiago Chile, that'll be the last contact with the crew before the sleep period, and their Flight Controllers will ...

CAPCOM Houston, with you through Santiago for 4 minutes, over.

SPACECRAFT Okay you're still loud and clear.

CAPCOM Roger, we read you loud and clear. We've got one question for you. When you powerdown the GPC 2 there, by any chance was the GPC mode switch placed back in run after was placed in standby. We've got a couple, we had 2 fault messages here about 7 seconds apart, we're trying to resolve that one.

SPACECRAFT Okay Mike, we got 2 fault messages, and I think that switch in the standby position is kind of a soft detent, and I think I may have bounced it between standby and back to run without realizing it. That's the only explanation I can think of.

CAPCOM Okay TK we copy that, one more thing. Have you got any thoughts about where you're gonna put your comments on the recorder tonight?

SPACECRAFT We're about to finish dinner, so that's our next order of business.

CAPCOM Roger, we copy that.

SPACECRAFT Do you want me to give you a time like 7:15 to 7:30?

CAPCOM Roger, that sounds good. And Columbia, Houston, we're about 30 seconds from LOS. We wish you a good night's sleep, once more thank you for putting up with us today. You guys seem right at home up there. We're gonna turn it over to the granite team now, who'll watch it through the night.

SPACECRAFT The granite team, okay. Before they can talk to us they got to explain where they got their name.

CAPCOM Roger, that's John Cox's nickname there TK.

PAO This is Shuttle Mission Control loss of signal has concluded any further discussion of the Flight Control team's nicknames. We're at 3 days 6 hours 58 minutes. Handover to the granite team has been accomplished in the Mission Control Center. Crew sleep period now beginning. Columbia on it's 53rd orbit of the Earth, and during that last pass through Santiago, last opportunity to talk to the crew before the sleep period, the flight control team got a good look at the data, verified that systems onboard Columbia continue to be in good health and indications are that the crew will spend a restful night. Some TMBU's, table maintenace buffer updates, have been uplinked to the vehicle setting higher tolerances to the caution and warning alarm systems onboard Columbia just to preclude the chance that there will be any alarm system disturbing the crew rest period. Mission elapsed time now 3 days 6 hours 59 minutes this is Shuttle Mission Control.

END OF TAPE

(garble)

PAO This is Mission Control at Houston. Columbia on orbit 54. Just acquired signal at Guam and Mission Control Center's processing data and all's quiet onboard the vehicle. Flight Director, Chuck Lewis, will be available for the Change-of-Shift Briefing with the media and we expect that to occur on time at 6:00 o'clock Central Time. Mission Elapsed Time is 3 days, 7 hours, 51 minutes. This is Mission Control, Houston.

PAO Shuttle Mission Control, 3 days, 7 hours, 57 minutes. All continues to be quiet onboard Columbia on orbit 54. The Change-of-Shift Briefing with Charles R. Lewis, Flight Director, from the Bronze Team will begin momentarily in building 2, room 135. This is Mission Control, Houston.

PAO This is Mission Control, Houston. Columbia on orbit number 55. Just passed ground station at the Ascension Island. Data indicates, affirms that Columbia is in a sleep configuration onboard and it's quiet onboard the vehicle. All systems continue to perform flawlessly. A leap second is coming up very shortly to set clocks throughout the world at Greenwich Meantime of midnight. All clocks are National Bureau of Standard clocks. They're going to stop for 1 second to correct that imperfection. That occurs in just about a little over 8 minutes from now. Mission Elapsed Time is 3 days, 8 hours, 52 minutes. This is Shuttle Mission Control.

PAO This is Mission Control, Houston at 3 days, 9 hours, 26 minutes. Five and one half hours remaining in the crew's sleep period. All continues to be quiet onboard Columbia. Now on orbit number 55, we are presently in an acquisition of signal period over Guam and Mission Control Center flight controllers are now processing data through that site. The decision has been made by NASA management to perform a door test tomorrow on flight day 5. Philosophy will be to mimic the entry day door testing and the flight control team will be working tonight on scheduling that test. The procedure essentially will be to go from as would be the process on entry day door closure, to go from passive thermal control which the vehicle is in presently to a tail sun attitude, then to effect door closure and collect data. Although on entry day, no theodolite data would be performed. There will be a theodolite reading done tomorrow. A theodolite being the surveyor-like optical instrument, and again, the timing of that door test will be determined by the Granite Flight Control Team here overnight and will be uplinked to the crew in the form of a revised crew activity plan through the teleprinter tomorrow morning. Again the door test will mimic the entry day. Door test which is detailed in the de-orbit prep crew activity plan. Mission Elapsed Time 3 days, 9 hours, 28 minutes. This is Shuttle Mission Control. END OF TAPE

PAO This is Mission Control, Houston. Columbia on it's 56 orbit of the Earth, all's quiet aboard the vehicle, systems continue to perform flawlessly. Flight control team in Mission Control Center is working on the update of the crew activity plan for tomorrow including details for cycling the payload bay doors again, sometime during the crew's day, which will be at 5th in space. The mission elapsed time is now on 3 days, 11 hours, 27 minutes, this is Shuttle Mission Control.

PAO This is Mission Control, Houston, everything continues to be quiet aboard the Space Shuttle Columbia. Slightly less than 3 hours remaining in the sleep crew for astronauts Ken Mattingly and Hank Hartsfield. Columbia now on orbit 57, just over North Africa. Here in Mission Control Center here in Houston flight controllers are planning tomorrows activities which will include another closure attempt of the payload bay doors. Controllers suspect that the present situation is similar to one experienced during STS-3, when a closure difficulty was remedied by achieving a stable thermal condition in Columbia's exterior surfaces. That generally will be the plan for Thursday's flight activities soon after the crew is up and completed post-sleep activity. The flight plan will call for them to get Columbia out of the passive thermal control configuration that it's in presently where it's performing a wing over wing roll to stabilize the vehicle exterior's surfaces from a thermal standpoint, then go to a tail Sun attitude, close the doors and take some data, and that is being worked into a revised crew activity plan which will be uplinked to the crew tomorrow morning in a teleprinter after the wakeup call. Mission elapsed time, 3 days, 12 hours, 15 minutes. This is Mission Control Houston.

PAO This is Mission Control Houston, 30 seconds from acquisition through Dakar, Senegal tracking station at which station the flight plan update will be teleprinted up to the crew of Columbia, so the initial contact of my voice will be quite brief, because we need to use 6 minutes of this pass for uplinking the teleprinter message and there's no backup air ground at this site currently, so there's only one loop for a voice and teleprinter.

CAPCOM Columbia, Houston, over.

CAPCOM Columbia, Houston, over.

CAPCOM Columbia Houston on air to ground two, over.

CAPCOM Columbia, Houston, over.

SPACECRAFT Good morning, sir.

CAPCOM Good morning T.K., is your teleprinter running?

SPACECRAFT Right this second it is.

CAPCOM Okay, we had some COMM configuration problems, we're trying to get a new flight day five up to you. We hope it gets onboard, if not, we'll get it to you the next pass at Dakar. In the meantime there's nothing all that critical unless you could start a maneuver for us at 16:08?

SPACECRAFT Hang on, let me get this.

CAPCOM Okay and we have one minute left at this pass.

SPACECRAFT Ready to copy.

CAPCOM Okay the maneuvers to tail Sun, Roll plus 192, pitch plus 278.9, yaw plus 336.8, maneuver time is 16:10, over.

SPACECRAFT Okay, that's tail Sun, 192, 2789, 3368, 16:10 execution.

CAPCOM Okay, good read back T.K., anything else you missed between now and next time won't hurt us at all. We're sending you new flight day five as I mentioned, there are a few items in there that you might not have expected but the day will be pretty relaxed and we think you'll handle it alright, and we'll see you rev from now at Dakar.

SPACECRAFT Okay, thank you.

CAPCOM Have a good breakfast.

PAO Mission Control Houston, lost of signal through Dakar. Next contact with the Columbia will be in Dakar again one orbit from now, 1 hour and 26 minutes away. This time of the

END OF TAPE

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CAPCOM ...relaxed and now we think you'll handle it all right, and we'll see a rev from now at Dakar.

SPACECRAFT Okay. Thank you.

CAPCOM Have a good breakfast.

PAO Mission Control, Houston. Loss of signal through Dakar. Next contact with the Columbia will be at Dakar again one orbit from now in an hour and 26 minutes away. This time of the morning, the orbit ground tracks miss practically all the stations. Flight plan updates being uplinked during this most recent Dakar pass by teleprinter and even though the crew didn't acknowledge CAPCOM's first call at AOS, they could tell on the ground that they were about and stirring because the indications were that the food warmer was plugged in and cooking breakfast. We'll be back in an hour and 25 minutes at Dakar again at day 3, 15 hours, and 19 minutes. Mission Control, Houston.

PAO Mission Control, Houston. Thirty seconds away from acquisition through Dakar. Crew should be wrapping up their meal period at this time. Also, through Dakar, we'll attempt to uplink the balance of the teleprinter message for the day's flight plan activities. Not all of it got aboard last pass.

CAPCOM Columbia, Houston through Madrid.

SPACECRAFT Hello there, Houston. Loud and clear.

CAPCOM Reading you 5 by as well, Hank.

CAPCOM Columbia, Houston, by your configuration we see that the teleprinter message did get onboard.

SPACECRAFT I want to talk to you about that. We're taking hints on the teleprinter (garble)

CAPCOM Okay...

SPACECRAFT Teleprinter's got some (garble) but I think we get the jist of it. Lines 15 through 17 are pretty garbled and I think you're going to have to retransmit to us pages 3, 4, and 5 of the CAP.

CAPCOM Okay, Henry. They should be on their way now. We should be sending you up three messages during this Dakar and Madrid pass and one of them is a complete resend of the CAP update.

SPACECRAFT Okay. Can you folks tell when it's not getting up right?

CAPCOM Not through Dakar. We don't get any tone at Dakar since (garble) were on low data rate down.

CAPCOM And Columbia, Houston, a bit of explanation, the previous thermal attitudes have wiped out a lot of the tests we were going to do today, so the main activity today is make sure the doors are healthy for entry and then we've got some of the hot fire tests and an OMS 5 burn that will help us out a lot for our entry maneuvers. Over.

SPACECRAFT Okay. We copy that.

CAPCOM And I have one note on the DAP we'd like to get to you.

SPACECRAFT Go ahead.

CAPCOM Okay. On the, in the DAP B2, we'd like to modify it with one step. We'd like to change the deadband attitude vernier to 3 degrees. Over.

SPACECRAFT DAP B2, attitude vernier to 3 degrees.

CAPCOM That's right. Deadband for the vernier attitude.

SPACECRAFT Okay.

CAPCOM And one thing for T.K., he'd been promised some time today to do his EMU exercise and, unfortunately, that got wiped out by the payload bay door problems, but we're going to promise it to him again for tomorrow. We hope to have the time between breakfast and lunch all open for him to do that.

SPACECRAFT Brewster, that's no big deal. I just, I don't want to start on something like that and then get halfway into it and find out that I got everything out and I have to stop. That's the only reason I need some planning on it.

CAPCOM Okay. Well, T.K., that's the plan for now unless something unforeseen happens, you should have all tomorrow morning to do that.

SPACECRAFT All right, sir. Well, that'll help me do some planning and for your planning purposes, we have ...

CAPCOM T.K., we're 10 seconds LOS.

SPACECRAFT ...capability to give a tour of the flight deck with a little explanation if you want to do some TV's later on sometime, and we can, if you'll let us know what times and how much time, I think we can put together something to show you a little bit of the inside here.

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CAPCOM Okay. We'll talk to you that at Yarragadee at 22.

SPACECRAFT Okay.

END OF TAPE

SPACECRAFT together something to show you a little bit of the inside here.

CAPCOM Okay. We'll talk to you that at Yarragadee at 22.

SPACECRAFT Okay.

PAO Mission Control, Houston. Twenty seconds away from predicted acquisition through Yarragadee, Australia. Columbia nearing the end of its 61st orbit on this 4th and final orbital flight test. It's meant to have acquisition in Australia at this time.

CAPCOM Columbia, Houston through Yarragadee for 6 minutes.

SPACECRAFT Hi.

CAPCOM Loud and clear.

SPACECRAFT Brewster, are you there?

CAPCOM Yes sir.

SPACECRAFT Okay. We just, just coming up, I guess this is western coastal Australia here. Must be the same area as the folks sent us a message that said those folks said to say hello and I'll tell you, it's one of those queer days with some spectacular cloud formation and an awful lot of country. A geologist flying over here could have a ball for a lifetime.

CAPCOM I assume from that that the weather is good and you have a good view.

SPACECRAFT (garble) you know, Henry says I can make almost any four liner into a two pager.

CAPCOM He wouldn't say that would he?

SPACECRAFT You bet I would. Hey, we'd like to say thanks for the good words from all those folks in Garden City down there. The flight's going well and we appreciate their kindness.

CAPCOM Okay. I'm glad, I'm sure that they're glad to hear that.

CAPCOM And Columbia, Houston, we're 50 seconds left in this pass. Orroral Valley is next at 30 and we'll be ready to talk the TV plan for the day with you whenever you'd like.

SPACECRAFT Okay.

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CAPCOM Columbia, Houston through Orroral Valley for 4 minutes.

SPACECRAFT Okay. We're with you.

CAPCOM And T.K., I'll take it back, on the TV discussion, we're still talking about it.

SPACECRAFT Okay Brewster, and we got a talk summary on the board. It looks good. I have, as I told you earlier, the detailed timeline 3, 4, and 5 we need retransmitted.

CAPCOM Copy.

CAPCOM Columbia, Houston.

SPACECRAFT (garble)

CAPCOM Roger. I need to talk to you a little bit about your timeline. We won't be able to get this up to you quite in time. We want you to set up the VTR if you can to play back over the next MILA site, the remainder of the cassette that had the payload bay door cycle test from yesterday. Can you do that?

SPACECRAFT Okay. We've got it in the VTR and we'll be ready in MILA to dump it to you.

CAPCOM Okay. That sounds good, and then 1 minute after MILA AOS, we're supposed to do an auto maneuver to tail sun, and I probably ought to read that up to you now so you'll be ready to go with it.

SPACECRAFT When does that occur again, Brewster?

CAPCOM The maneuver initiate would be 1807.

SPACECRAFT Okay. Got that, and I got a maneuver to 192278336?

CAPCOM That's it.

SPACECRAFT Okay. That part of the flight plan came through okay.

CAPCOM Okay. Fine. That's on the top of page 3 and we thought you hadn't gotten that.

SPACECRAFT (garble) I think page 3 came through all right. It was, Hank looked at it more closely than I have. We did have some trouble with page, the bottom of page 3 had trouble.

CAPCOM Okay. We plan to ship you 3, 4, and 5 all over again at the states.

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SPACECRAFT Okay. Thank you.

CAPCOM And Columbia, Houston, we'd like the fuel cell
purge heaters to off please. We're 40 seconds LOS and MILA is
next at 1806.

SPACECRAFT Okay. Thank you. Thanks for the reminder.

CAPCOM Roger. See you there.

PAO Mission Control, Houston here. Should be in
acquisition momentarily through MILA and Bermuda. The start of
revolution or orbit number 61...

END OF TAPE

CAPCOM Roger, see you there.

PAO Mission Control Houston here, should be in acquisition momentarily through MILA and Bermuda. The start of revolution of orbit number 61.

CAPCOM Columbia, Houston with you through the States for 8 minutes.

SPACECRAFT Okay, we're here.

CAPCOM Columbia, Houston we're standing by for TV on your go.

SPACECRAFT Okay, I'm ready to go if you are.

CAPCOM Okay, we're ready.

SPACECRAFT It's running now.

CAPCOM Okay, we have a picture.

SPACECRAFT Okay. I noticed that I got a, my TV (garble) setting in reverse here and I don't remember, we discussed that at one time when we were chasing some problems with the play back unit I don't know whether you want it there. I'm not going to change it now, but if you want me to put it back let me know.

CAPCOM Roger, right now we have a good picture, T.K.

SPACECRAFT Would you like some eye viewers on it?

CAPCOM Roger, sir, go ahead.

SPACECRAFT Okay, IMU number one minus .04 plus .09 minus .15. IMU number two minus .10 plus .06 minus .02. Number three, plus .13 plus .08 minus .15. Execution 3 days, 17 hours, 43 minutes and 5 seconds.

CAPCOM Copy

SPACECRAFT Okay and we got your note about putting the capsule flood lights circuit breakers and you didn't mention the forward bulkhead but that's also been a problem for us.

CAPCOM Roger. Columbia, Houston, we've noticed that the maneuver did not execute, if you'd like to recheck it.

SPACECRAFT Say again please

CAPCOM Roger, we've noticed that the maneuver did not execute, if you'd like to recheck it.

SPACECRAFT Thank you, that's a good catch, I don't think I understand what happened. Sorry (garble) go from future to current. We didn't get an immediate start but I thought that was do to the (garble) difference.

CAPCOM T.K., we're not sure why it didn't start.

SPACECRAFT Thanks for watching it for me.

CAPCOM Columbia, Houston, from your comments yesterday on the VTR we thought we would see a payload bay door opening and we did not see that, did you get any of that on the VTR?

SPACECRAFT Alright, you refer to the stuff we sent down to you yesterday?

CAPCOM Negative, the stuff that just came down.

SPACECRAFT Let me get my light out here, I thought we had that. Looks like we had this stuff with the picture.

CAPCOM Say again

SPACECRAFT It looks like when I had you stop, we've got this little mileage marker back here buried let me see if I can find it.

CAPCOM Roger. And Columbia, Houston, we're out of TV coverage right now.

SPACECRAFT Okay. Oh, the notes I have show that the last thing we had on there was the partial opening of the door as it unloaded.

CAPCOM Roger, copy. We'll have to play it back again and take a closer look

SPACECRAFT Well I don't see it, it's kind of hard for me to play it back with this unit, but, and the picture I get is hard to tell, I'll go back and look at it real quick then.

CAPCOM Roger. Columbia, Houston we're 30 seconds LOS. See you at Dakar at 22, you should have a complete copy of the CAP onboard now

SPACECRAFT Okay and from looking at the style you sent it to us in, my hat's off to somebody, that's really good.

CAPCOM Roger, thank you.

CAPCOM Columbia, Houston with you through Dakar for about three and a half minutes.

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SPACECRAFT Okay, Roy.

END OF TAPE

SPACECRAFT Okay, and from looking at the style you sent it to us in and, my hats off to somebody, that's really good.

CAPCOM Roger, thank you. Columbia, Houston, with you through Dakar for about 3 and a half minutes.

SPACECRAFT Okay, Roy. Looks to me like the end of my picture was really bad. I couldn't tell what it looked like the scene changed for the last 15 to 2 seconds. That may have been the door opening, but I can't be sure.

CAPCOM Roger, T. K. don't worry about it, we did not see it start to open but our next T.V. pass over the states we'll be looking at live TV of the payload bay door test, and we'll just wait and go with that.

SPACECRAFT Okay, well, hopefully, we won't get to show you what we saw yesterday.

CAPCOM We're counting on that to, sir.

SPACECRAFT We got our summary comments from last night, good.

CAPCOM Roger, we copied all that, thank you very much.

CAPCOM Columbia, Houston, if you have some questions on the T.V. for later today, after you've had a chance to look over the CAP, we'll be happy to discuss it with you further.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, 30 seconds, LOS, we'll see you at Indian Ocean at 4 0.

SPACECRAFT Okay, thank you.

PAO This is Mission Control, Houston, acquisition in 20 seconds through Indian Ocean station.

CAPCOM Columbia, Houston, with you through Indian Ocean for 8 minutes.

SPACECRAFT Okay, mike it up.

CAPCOM Roger, Columbia, you're 5 by, how me?

SPACECRAFT Okay, loud and clear, now.

CAPCOM Roger. Columbia, Houston, 30 seconds LOS, Yarragadee is next at 5 6.

SPACECRAFT Alright, sir.

CAPCOM Columbia, Houston, with you for 7 minutes.

SPACECRAFT Okay, and we're setting up our TV cameras now and just to make sure we don't get out of sync at the last minute. Number 1 lower is the one closest to the launch run, is that correct?

CAPCOM That's affirmative.

SPACECRAFT Okay. We've got our cameras set up, and when you take a look at the picture from camera Charlie, you're going to see a very oblique shot. What we set it up with is the center of the picture is what we believe is centered on the number 4 latch. And it doesn't really look like that at first glance, but I think that's where we are. And you'll find that we zoomed it out so that the vertical fin is in the top of the picture along with the number 4 latch roller for the starboard door. And when you look at it, it'll take a little getting used to to orient yourself to the field of view.

CAPCOM Roger, T.K., thank you for that mount. Columbia, Houston, we're 20 seconds LOS for about a minute. We may be voice only at Orroral.

CAPCOM Columbia, Houston, with you through Orroral for 5 minutes.

CAPCOM Columbia, Houston, with you through Orroral for about 5 minutes.

SPACECRAFT Alright, Houston, we have you loud and clear.

CAPCOM Roger, and you're 5 by, and be advised we do have a plan in the event the payload bay door cycle test goes as it did yesterday. And we'd be happy to discuss it with you if you'd like or we can give it to you blow and blow in realtime.

SPACECRAFT Alright. Houston, Columbia, how do you read?

CAPCOM You're 5 by now, T.K.

SPACECRAFT Okay, we got a few minutes, if you have the time, why don't you just outline what you're thinking.

CAPCOM Roger. Okay, basically we're going to go ahead and have you do all the preps and be ready to do the closing of the port door, when we come AOS at MILA. And if that is successful, okay, we will continue with the procedure in DEORBIT OPS CHECKLIST.

SPACECRAFT You mean you want and try the latch the aft bulkhead latches, is that correct? END OF TAPE

CAPCOM go ahead and have you do all the preps and be ready to do the closing of the port door when we come AOS at MILA. And if that is successful, okay, we will continue with the procedure in the DEORBIT OPS CHECKLIST.

SPACECRAFT You mean you want and try and latch the aft bulkhead latches, is that correct?

CAPCOM Right, that's correct, if the closing of the port, forward and aft latch groups are successful, we will continue. If unsuccessful, we'll have you do the theotle light pad group B, as listed in the checklist. And then we will stop there and wait until we have TM coverage again before we reopen the port, forward, and aft latches.

SPACECRAFT Okay, can I suggest you think about, I'm convinced the forward latches went over the top. And whether that's thermal induced or not, or course I have no idea. What I would propose to you is that I watch that aft door deflection like a hawk, and the first time I see that thing bend upward, I'm going to stop.

CAPCOM Okay, T.K., we concur with that.

SPACECRAFT I'm sure we had a very substantial deflection in that door.

CAPCOM Roger. In the event we are unsuccessful, the plan would have us go to top sun for 2 revs before we proceed further.

SPACECRAFT Okay. Roy, refresh memory, is this, this is the same set of bulkhead latches that we had trouble with before, isn't it?

CAPCOM That's affirmative, T.K.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, in looking at the data from the test yesterday, we see that the torque limiters did work and we did not see as a high loads as we did on flight 3.

SPACECRAFT Yes sir, I concur that the torque limiters were the things that were working. My concern is bending that door by getting the latches, some of them under the rollers and some of them over the rollers, and getting something jammed so that it doesn't back off. The door was closing, my impression is the door closed completely normally until we tried to latch the latches.

CAPCOM Roger. And we're about 30 seconds LOS, we'll be picking you up at MILA at about 1940 or 41.

SPACECRAFT Okay, sir, thank you very much.

PAO This is Mission Control, Houston. Loss of signal at Orroral Valley, 29 minutes away from reacquisition through Merritt Island Launch Area and in Bermuda, at which time the crew will be running another payload bay door cycle test, following some top sun exposure. Tail to sun, I should say. This will also be downlinked on live video. Probably from the flight deck cameras. Well, I stand corrected, it's aft bulkhead cameras as opposed to the flight deck cameras that will be viewing the payload bay door latch mechanisms. 28 minutes now from reacquisition through MILA, at day 3, 19 hours, 12 minutes, Mission Control, Houston.

PAO This is Mission Control, Houston, about 10 seconds now away from acquisition through Merritt Island Launch Area and Bermuda stations. The crew should be ready to begin the payload bay door cycle test. That scheduled to begin at day 3, 19 hours.

CAPCOM Columbia, Houston, through the states for 12 minutes.

SPACECRAFT Sir, stand by, let's go, come on.

CAPCOM We're ready when you are.

SPACECRAFT Okay, here comes the doors.

CAPCOM We don't have any picture yet. Okay, we have good picture now.

SPACECRAFT Here comes the door to close.

END OF TAPE

SPACECRAFT Houston.

CAPCOM We're ready when you are.

SPACECRAFT Okay here comes the doors.

CAPCOM We don't have any picture yet. Okay, we have good picture now.

SPACECRAFT Here comes the doors to close. Hey, that's the number one (garble) you're seeing there. I'm going to stop it just short of closure.

CAPCOM Okay

SPACECRAFT Okay everything is nice and smooth. We're showing Charlie camera again.

CAPCOM Okay

SPACECRAFT Okay there's B and you can see the hooks going around the roller.

CAPCOM Yeah it looks good.

SPACECRAFT Okay I stopped it, then I got it in close, I have all normal indications for the doors. You want me to go ahead with the two latches? Is that correct Bruce?

CAPCOM Okay T.K., we're ready, go ahead.

SPACECRAFT Standby, mark, close. She's going around number one real clean I'll tell you that.

CAPCOM Yeah that looks good.

SPACECRAFT Sure looks like it's hooking down perfectly normal all. Okay they close normally.

CAPCOM Okay we copy that. T.K., everything looks good to us you can continue with the normal procedures.

SPACECRAFT Okay, thank you, sir.

CAPCOM Columbia, Houston, before you get to far into it. Could somebody switch the high load of that to enable for us?

SPACECRAFT Okay done

CAPCOM Thank you.

SPACECRAFT Houston, the sub is centered right down the center

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line so i can't read any of the labels. How about if I type up the deadband till I get the resighting? Looks like the deadband we have is enough for some walking around (garble)

CAPCOM That'll be fine T.K. Columbia, Houston, we're back with you through Dakar for 7 minutes.

SPACECRAFT Okay we finished that on like (garble) B we're now going to the close the starboard door until near close and check its and check its (garble).

CAPCOM Okay sounds good. Columbia Houston, Indian Ocean at 16.

SPACECRAFT Okay see you there.

PAO This is Mission Control Houston loss of signal at Dakar. We're 8 minutes out from Indian Ocean station. Over the States the crew of Columbia sent down a live television picture of the payload bay door latch test and the port door was successfully latched all the way down snug and the TV downlink lasted 6 minutes 34 seconds and was subsequently replayed from the ground recorders. Seven minutes now away from reacquisition through Indian Ocean station at 3 days, 20 hours, 8 minutes, Mission Control, Houston.

END OF TAPE

PAO at Dakar, 8 minutes out from Indian Ocean station. Over the states, the crew of Columbia sent down a live television picture of the payload bay door latch test. And the port door was successfully latched, all the way down snug, and the TV downlink lasted 6 minutes, 34 seconds, and was subsequently replayed from the ground recorders. 7 minutes now away from reacquisition through Indian Ocean station, at 3 days, 20 hours, 8 minutes, Mission Control, Houston.

CAPCOM Columbia, Houston, through Indian Ocean for 8 minutes.

SPACECRAFT Okay, we're here. I thought I saw it around here somewhere, don't see it right this minute. I ought to put that Lll back there (garble)

CAPCOM That affirmative, T.K.

SPACECRAFT Okay, thanks.

CAPCOM And T.K., another cleanup would be to get the DAP back into normal config.

SPACECRAFT Thank you. That's not much margin for error there. When that sun comes around here, it just brings everything to a halt.

CAPCOM We copy that. And T.K., I do have a couple more things to talk to you about if you have time.

SPACECRAFT (garble) talking about the television perans. We got interrupted last time we started this. Do you want to say something about that now?

CAPCOM That's one of the topics, yes.

SPACECRAFT Do you have some other things you want to do? We're all cleaned up here. I was getting ready to go exercise.

CAPCOM Okay, let me yell at you for a minute then before you start. We've seen an increase current, we'd like you to check the WCS and make sure it's got everything in good configuration.

SPACECRAFT Okay.

CAPCOM In particular we'd like to check that the mode switch is off.

SPACECRAFT Okay, Hank's checking it now.

CAPCOM Okay, fine, while he does that, we have a dual G2,

GPC OPS coming up at 2110, thereabouts, and we want to ask you a question about the operation yesterday. When the GPC was inadvertently taken to run, and it was followed by going back to halt, did you wait and standby long enough to get a talkback barberpole before going back to halt, or do you recall?

SPACECRAFT This is what, what happened is, as I recall it, I took it from run to standby when we were getting ready terminate his operations for the day. And standby, (garble) is kind of soft, and I saw him maybe gone on to halt, so I put it in standby with a talkback barberpole. There is some indication that it may have gone to run, on the switch although the talkback never went back to run, it never went barberpole. And then when it came back home I just took it on over to halt.

CAPCOM Okay, we copy that.

SPACECRAFT I noticed on your message that you said something about we might have to react the (garble). What is the scenario to get you in trouble there?

CAPCOM Okay, if the GPC ever did see the run command and then was taken directly to halt without going through standby for an orderly cleanup, we would not know the status of the GPC subsequent, we might get a fail to sync later on. What we would like you to do is before you do the 2, G2, GPC, we'd like you to re IPL that GPC using the SSR.

SPACECRAFT You want re IPL'ed in any event?

CAPCOM Yes sir, we think so.

SPACECRAFT Okay, that makes sense.

CAPCOM Okay, as far as the TV plan goes, you have a TV option scheduled a couple of revs from now. But it occurs in the same time frame as your FIL test, the RCS hot fire and the PRCS attitude hold, which would keep you pretty busy. So we would like to know whether you move that up one rev earlier to a lighter time frame.

SPACECRAFT Hang on and let me look here real quick. Where is the scheduled now?

CAPCOM Okay, at 2252 is the scheduled VTR playback option, and that could have been live or VTR playback. However, the RCS tests lay in that same general time frame. And those are going

END OF TAPE

SPACECRAFT (garble)

CAPCOM Okay at 22:52 is the scheduled VTR playback option and that could have been live or VTR playback. However, the RCS tests lay in that same general time frame and those are going to be time critical with us looking at some data, so we'd really like to know if you'd rather do the TV at this next Mila pass?

SPACECRAFT Yes sir, I think that would be a much smarter move.

CAPCOM Okay and that would put it right after your G2 GPC OPS and before the meal.

SPACECRAFT Okay

CAPCOM And we would like to know whether you'd be doing the..

SPACECRAFT (garble) approximate time and duration?

CAPCOM Okay the Mila pass is from 21:17 to 21:24 and we'd like to know whether it's going live or TVR and if you know what the subject title will be.

SPACECRAFT We (garble).

CAPCOM Sure.

SPACECRAFT What I've got is, while Harry was exercising this morning between (garble) got a VTR rap and I thought I can ship you a few squirts of that activity and then a little bit of live of around the cockpit here.

CAPCOM Okay that sounds real good.

SPACECRAFT Okay we'll start with the VTR so you know what to expect.

CAPCOM Okay, thank you alot.

SPACECRAFT That's all we're on (garble) for today, right?

CAPCOM That's correct

SPACECRAFT Okay

CAPCOM And T. K. we're see you over at Yarragadee at 32.

SPACECRAFT Okay

CAPCOM Columbia, Houston, 30 minutes

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SPACECRAFT Houston, loud and clear and I just got through implying number two successfully.

CAPCOM Okay Henry we copy that, thank you.

CAPCOM Columbia, Houston, we'll be LOS for about a minute.

SPACECRAFT Okay.

CAPCOM Columbia Houston for 2 minutes.

SPACECRAFT Okay, loud and clear

CAPCOM You are too Henry.

CAPCOM Henry are you upstairs?

SPACECRAFT Hello Houston?

CAPCOM Roger, are you upstairs?

SPACECRAFT I'm ready.

CAPCOM Henry, we see the high load duct heaters still on, we'd like for you to get it off if you could?

SPACECRAFT Okay I guess my time run out and I didn't catch it. So thank you.

CAPCOM And Henry one other comment relative to the payload bay doors, since we had the problem in the thermal attitude with the doors warping or the vehicle warping, if for any reason you have to reenter quickly, we would want you to go immediately to a top Sun attitude and remain there as long as possible, delaying closing the doors until as close to TIG as you could. Over.

SPACECRAFT Okay we understand that.

CAPCOM Okay great. And Columbia, Houston, we'll see you over Buckhorn at 21:10 and we'll be ready for your TV.

SPACECRAFT Okay thank you, see you then.

CAPCOM Roger.

PAO This is Mission Control Houston, lost of signal at Orroral. During the end of orbit number 62, 25 minutes to reacquisition at Buckhorn followed by Mila and Bermuda. The spacecraft will have additional downlink television, both the VTR

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recorded and live during this upcoming Stateside pass. Orbit measurements currently for Columbia, 162.5 nautical miles at apogee and 160 nautical at perigee for a period of 1 hour, 30 minutes, 36 seconds. At day 3, 20 hours, 46 minutes this is Mission Control Houston.

END OF TAPE

PAO ...orbit measurements currently for Columbia, 162.5 nautical miles at apogee and 160 nautical at perigee, at a period of 1 hour, 30 minutes, 36 seconds. At day 3, 20 hours, 46 minutes, this is Mission Control, Houston.

PAO This is Mission Control, Houston. Fifteen seconds away from acquisition through Buckhorn and stateside pass during which we'll have some live television from Columbia of flight deck activity by the crew. The TV won't come down until we get to Merritt Island Launch Area Station coverage though. Should have AOS at Buckhorn through Buckhorn.

CAPCOM Columbia, Houston through Buckhorn initially for 4 minutes.

SPACECRAFT Okay. Loud and clear.

CAPCOM And Columbia, we'll have to wait until we get MIIA AOS for the TV. We'll let you know.

SPACECRAFT (garble). (garble) back in the TGBC OPS.

CAPCOM Okay. We see that, Henry. Looks good.

CAPCOM Columbia, Houston, MIIA in about 1 minute.

SPACECRAFT Okay.

CAPCOM Columbia, Houston through MIIA through 8 minutes and we need you go for the TV.

SPACECRAFT Okay. We'll dump a little VTR first.

CAPCOM And we're ready, Columbia, we have no picture yet.

SPACECRAFT Okay. (garble). Something's going wrong here. So we're going to switch you to (garble).

CAPCOM Okay.

SPACECRAFT (garble)

CAPCOM Yes sir, we sure can. Some kind of funny animal up there with you.

SPACECRAFT Oh, that's no way to talk. Since I talked to you last, I've been to the gym, taken a shower, gone to the bathroom, and I even...If you work real hard at this sort of stuff, you can kind of make life in space just about the same kind of times as you have on Earth. Takes a little learning (garble). We didn't get all that much stuff done in the same length of time when we first started. What we thought we'd do, don't know what happened

to our video tape of the exerciser. We'll try salvage that and show it to you later. Kind of thought we might show you how we got the cockpit arranged and what we do with it. You folks ship up flight plan changes and one of the things we do is keep a couple of files around, one of them on the side of the bulkhead contains all the messages that we've gotten that have general observations, kind of like a (garble) file, and then in the middle of the flight deck here, I generally use one of these big C-clamps and put (garble) today's flight plan markup and it gets clipped to our regular flight plan here, and we generally put those over and make notes in them. I use my kneeboard to carry the notes when you call us and say what's going on, I'll write it on here and then I'll just take and cross it off when I get through, put my kneeboard back on my leg, and we'll be all in business. The calculator gets programmed and it just sits here and I have it beep at me and say, hey, it's time to go collapse the deadband and if you're watching and wondering why we're in...most of the flight control is done from here if you saw a picture of the ohms 4-burn, the control was here. The engine gages are in the middle. The screen CRT's are used for your information (garble) and the keyboards and the setter, which are right in the front here, by the way we talk to the computers that control spacecraft, the rest of these switches are used for controlling various functions, generally to do with the autopilot control system. Across the top, we have general status instruments which tell us about the consumables for cryogenics, the oxygen and the hydrogen that generates electrical power through our fuel cells, and the things we breathe and the things we use to pressurize the cabin to maintain the atmosphere we live in, so it's just like being on Earth.

END OF TAPE

SPACECRAFT Across the top, Hank if you could drop your camera a little bit, is it there? Okay. These controls generally handle the RCS, that's the engines that control our attitudes, so that when the spacecraft rotates, or translates in small amounts, these are the systems that take care of that. Next payload over, is a set of panels that control our larger engines the 6,000 lb thrust OMS engines on the back, that's the one's we use for the major thrusting adjustments and we're gonna use this afternoon. While we're about it, this is the temporary home for the NOSL camera. It's picture, it's a experiment being used to study lightning. We've gotten a couple good shots of some night work, and we keep it floating out here in the center of the cabin because you can run to a window right over Henry's head back here or any of these out front, and as soon as you see a thunderstorm area you can run up and grab some shots. Next things back here are just the circuit breakers that control the general use of the spacecraft. Over on my side further, down in this corner, I don't know how much you can see from there Hank, if you push down here, all of the environmental control system is managed from this area, and that's the things that's runs the CO2 that we produce when we breathe, that replenish the oxygen, maintain cabin pressure with nitrogen and oxygen to maintain a normal earth-based environment. It scrubs the water out, and all of the controls that we use for the evaporators to reject heat, some of the radiators we can't show you a good picture of it right now, but the payload bay doors have big radiators inside of them and they reject most of the heat that the spacecraft generates. Any thing that's left over, like during SM entry when the doors are closed, we use a water spray boiler system augmented by some ammonia, and that's all controlled from this panel. Now on Hank's side of the cockpit, (garble) pencil.

CAPCOM 30 seconds TK.

SPACECRAFT come through Hank. Okay over on this side of the cockpit is where we control all the electrical power and the main engines controls are down on the bottom here, down in here is the main engine controls, the hydraulic system, the APUs that generate our power to drive the elevators down here, electrical systems, the cryogenics and the oxygen and hydrogen that go to our fuel cells to create electricity are in the back corner that you can't see, and all the fuel cells control are right in the center. So that's sort of a summary of what we have in the front end of the cockpit. Now if we move back a little bit we can probably see what goes back here, and Hank why don't you let me hold the camera and you kind of walk around the back end.

CAPCOM Henry.

SPACECRAFT Okay on my right over here, (garble) side is the control panel from which we control the mechanical arm the RMS. The control handle over here and it's the panel which we use to

drive the arm up and down.

CAPCOM Henry.

SPACECRAFT Yes sir.

CAPCOM Guess what, we're out of TV coverage.

SPACECRAFT Okay sir.

CAPCOM We're sure sorry we missed the rest of the tour there, but that was a real good cook's tour of the forward flight deck. We sure appreciate it.

SPACECRAFT Okay Brewster, if you want we can do the aft scan and get the rest of that exercise and have it ready next time you're interested.

CAPCOM That would be real great. We'd like to see that.

SPACECRAFT Okay.

CAPCOM And in the meantime TK, when you changed DAP last time, we saw that one of the contacts in the AUTO PBI for the DAP didn't mate. We'd like you to repunch that PBI, and that's on C3.

SPACECRAFT I'm not sure which PBI you're talking about.

CAPCOM The AUTO DAP PBI.

SPACECRAFT Okay, I just hit it, how does that look?

CAPCOM You need to hold it a little bit longer for us TK. Okay TK, that's good, all the contacts made that time, thank you alot.

SPACECRAFT Okay, - -

CAPCOM TK, you broke up on the last transmission, say again please.

SPACECRAFT Was that maneuver that we had, that went from the star sighting attitude to the tail sun - I put it in as a future option and it didn't execute even though the future to current asterisks moved, and it's remained in AUTO control the whole time. But, go ahead and point it out to us if we hadn't started the maneuver so, that one still has me surprised.

CAPCOM Roger. And Columbia, Houston, in the last few evening reports we've gotten, there hasn't been any mention of the NOSI experiment, do you have anything to report on that, or

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did you inadvertantly leave it out.

SPACECRAFT No sir, we inadvertantly left out the time during the day to do it.

CAPCOM Okay

SPACECRAFT You might be surprised, but we haven't had much spare time.

CAPCOM No sir, we're not surprised, I guess maybe we were just looking for a negative report, and we understand.

SPACECRAFT And Columbia, Houston, Dakar is next at 32, and enjoy your lunch.

SPACECRAFT Okay, thank you.

END OF TAPE

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CAPCOM And Columbia, Houston. Dakar is next at 32 and enjoy your lunch.

SPACECRAFT Okay, thank you.

CAPCOM Columbia, Houston, for 8 minutes, standing by.

SPACECRAFT Okay.

CAPCOM Columbia, Houston. We're about 30 seconds LOS. And we'll see you at Indian Ocean at 54.

SPACECRAFT Okay.

CAPCOM Columbia, Houston with you through Indian Ocean for 3 minutes.

SPACECRAFT Okay.

CAPCOM And I know you guys are eating lunch right now but I wondered if I could ask you one question. Hank, on the ops 2 mode recall this morning.

SPACECRAFT Go ahead.

CAPCOM Roger, Hank. We're trying to troubleshoot this DAP button contact disagreement. We wondered if you push the auto DAP PBI drawing or right after that ops mode recall.

SPACECRAFT I'm trying to hold down the 3 DAP buttons during- It's during the change engine. I came off momentary as I pushed away a little bit and got it back. That could had gave it pulse in there.

CAPCOM Roger, thank you very much that helps. Columbia, Houston we're 30 seconds LOS. We'll see you at Yarraqadee at 08. We've noticed a couple of specs 76 comm messages and wanted to remind you to check your cameras and make sure they're not overheating.

SPACECRAFT Yeah, we're playing with the VTR.

CAPCOM Roger. Houston. Columbia we're with you for 8 minutes, standing by.

SPACECRAFT Okay. Roy you still there?

CAPCOM Roger.

SPACECRAFT I'm just looking through here - somewhere in my cleaning up and juggling around I have misplaced or lost or something, your earlier message on the F one L hotfire. I

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remember reading it. It was a short little thing. Could you just read that to me and let me jot down the key points here as I go?

CAPCOM Roger, standby. Okay, if you're ready to copy I'm ready to read.

SPACECRAFT Go ahead.

CAPCOM Okay, step 1 is we want to go to DAP alpha 15 and set it up prior AOS. Like to be in a auto vernier, DAP translation, halt, normal. halt, rotation, discrete brake, all free. Spec 23, override, manifold, foxtrot 3 to close. Primary RJD's 8 of them on, flight control power on. And I'm ready for step 2 if you copied.

SPACECRAFT Okay. The set up is DAP alpha 15, prior AOS. We'll be in A auto burn. We'll have translation, if pulse normal pulse, rotations will be discrete all 3. Spec 23 will override manifold foxtrot 3 to close. All the RJD's are on.

CAPCOM That's affirmative and of course flight control power is on and step 2 is wait for MCC go to proceed, then DAP to A manual normal deflect translational hand controller +y 1 second, wait 30 seconds, then repeat 2 times. And T. K. that's all there is other than the reconfiguration. We can give you that after the test.

SPACECRAFT Okay, I didn't get any of step 2 from you Roy. You were - you dropped out there.

CAPCOM Okay, fine. We're about 30 seconds LOS so I'll go ahead and read it. If we miss it I'll give it to you in Hawaii
END OF TAPE

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CAPCOM It's wait for an MCC go to PROCEED. DAP A MAN NORMAL; THC plus Y 1 second; wait 30 seconds; then repeat 2 times. And we'll see you at Hawaii at 34.

PAO This is Mission Control Houston. We're at acquisition through Hawaii.

CAPCOM --With you at Hawaii for about 6 minutes total, but we will have a keyhole in about a minute.

SPACECRAFT Okay. We're standing by.

CAPCOM Okay, T. K. I don't know if you ever copied step 2 at Yarragadee. We didn't get a Roger on that.

SPACECRAFT Okay, what was step - (garble) we did.

CAPCOM Okay. The step -

SPACECRAFT (garble) A AUTO vern, I've got translation pulse normal pulse; discrete rate in all 3 rotations. We have selected manifold number 3 to override close on the forwards. I've got all the (garble) on and I think we're ready to go.

CAPCOM Roger. Ready to go with flight control power ON. We want you to go A MAN NORMAL. Deflect THC plus Y for 1 second and then wait 30 seconds and repeat 2 times. And you're clear to go.

SPACECRAFT Okay. We've completed it.

CAPCOM Roger. We see it complete and we're ready for the reconfiguration. I'll read that up to you if you like.

SPACECRAFT Okay.

CAPCOM Spec 23, override manifold foxtrot 3 status to OPEN.

SPACECRAFT It's done.

CAPCOM Okay. Flight Control power OFF; DAP A, AUTO, NORMAL; DAP translation pulse, pulse, pulse; rotation discrete on all 3; then DAP A, AUTO VERNIER.

SPACECRAFT Okay, it's all done.

CAPCOM Roger. Thank you.

SPACECRAFT And we're pressing on with our hot fire test.

CAPCOM Roger T. K. We concur. You're in the proper

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configuration. Press on. And for your information the jet look a good jet.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, we're 30 seconds LOS. See you at Buckhorn in 4 minutes.

SPACECRAFT Okay.

CAPCOM And this is the last pass for the Crystal Team. We enjoyed working with you this morning and we'll see you in the morning.

SPACECRAFT Okay. And many thanks for helping us get started on the day. It was a real organized plan. We really appreciate it.

CAPCOM Thank you sir.

PAO This is Shuttle Control at 3 days 22 hours 43 minutes Mission Elapsed Time. Columbia about 50 seconds away from acquisition through Buckhorn. The shift handover is complete in the Mission Control Center. Off going Flight Director Harold Draughon estimates a 9:00 a.m. central daylight time for his change of shift briefing. Change of shift at 9:00 a.m. central daylight time, room 135 JSC newscenter. Flight Director on this oncoming shift is Chuck Lewis. CAPCOMs are George Nelson and Michael Coats. We'll stand by for Buckhorn acquisition

CAPCOM Columbia, Houston the bronze team is with you through the States, looking forward to working with you for the rest of the day.

SPACECRAFT Alright, sir. We're going through our hot fire.

CAPCOM Copy.

SPACECRAFT Houston, Columbia.

CAPCOM Go ahead Columbia.

SPACECRAFT You've got enough time you want to try to do the attitude roll test here?

CAPCOM Roger, T.K. We're just standing by hoping you'd ask that, yeah you're go to do that.

SPACECRAFT Houston, Columbia.

CAPCOM Go ahead, Columbia.

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SPACECRAFT Okay, I'm waiting for your call to terminate.

CAPCOM Roger, we copy.

SPACECRAFT Say, are you still there?

CAPCOM Roger, Hank loud and clear.

SPACECRAFT (Garble).

END OF TAPE

CAPCOM Columbia, Houston. You can go ahead and terminate the test now. Must have sounded like the great war up there.

SPACECRAFT Yeah, we could probably sell it to like some orchestra.

CAPCOM Roger.

SPACECRAFT Syncopated rythm.

PAO This is Shuttle Control. Crew's comm entry refer to the attitude hold test that they have just concluded about a 2 minute test using the primary rafter control system. Engine requires a number of firings of those engines during that test. The change of shift briefing with flight director Harold Draughon is scheduled for 9 am central daylight time in room 135 of the JSC news center, that's about 5 minutes from now. We got 8-1/2 minutes remaining in Columbia's pass over the United States. We'll standby.

SPACECRAFT Houston, Columbia, you still there?

CAPCOM Roger, T. K. We're standing by.

SPACECRAFT Okay, George. Does our states onboard pretty good shape. I've been trying a - I loaded the AOS program this morning with a new state but our times are - seems thad our map tracks seem to be significantly off and I thought I'd try it again. I didn't know how current our state was.

CAPCOM Okay, standby 1. Columbia, Houston. T. K. your state vector should be real good at this time.

SPACECRAFT Okay, we'll reset it. See what happens.

CAPCOM Okay. Columbia, Houston, we're 1 minute to LOS. Dakar will be next at 23+08 and just to give you some idea what we're thinking of we'd like to give you a chance to finish your cabin tour on the TV and we're thinking about the states pass, the rev after next. That'll be at 4 days, 1 hour, 56 minutes and that's your call on that.

SPACECRAFT (garble) we must be on the right team this time. I was just about to call and ask you if you would like to do that. We got it on the VTR we're ready to narrate it.

CAPCOM Okay, good show.

PAO This is Shuttle Control. Bermuda has loss of signal. Next acquisition through Dakar in 3 minutes 45 seconds, that'll be overlapping coverage through Ascension. Crew just confirmed that they will provide some television through the STS-

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Goldstone station on orbit number 66 at mission elapsed time of 4 days 1 hour 56 minutes. It will be scenes that have been recorded on the video tape recorder. A tour the cabin. At 3 days 23 hours 5 minutes mission elapsed time, this is Shuttle Control Houston. This is Shuttle Control at 3 days, 23 hours, 8 minutes, mission elapsed time. Columbia's about 20 seconds away from acquisition through Dakar.

CAPCOM Columbia, Houston through Dakar and Ascension for 11 minutes.

SPACECRAFT Okay.

CAPCOM Columbia, Houston. Botswana is next at 23+25.

SPACECRAFT Okay.

PAO This is Shuttle Control. Columbia is out of range over Ascension on orbit 64. Next station is Botswana in 5-1/2 minutes. At 3 days 23 hours 20 minutes mission elapsed time this is Shuttle Control Houston.

END OF TAPE

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PAO This is Shuttle Control, at 3 days 23 hours 25 minutes Mission Elapsed Time. Botswana station is about to lock onto Columbia.

CAPCOM Columbia, Houston is standing by through Botswana for 5 1/2 minutes.

SPACECRAFT Yes sir, loud and clear.

CAPCOM And you are the same. Columbia, Houston 50 seconds to LOS. Yarragadee is next at 23+43.

SPACECRAFT Hank, hand me the....

CAPCOM Say again.

SPACECRAFT Okay.

PAO This is Shuttle Control. Botswana has lost of signal with Columbia. Next station is Yarragadee in 12 minutes. At 3 days 23 hours 31 minutes Mission Elapsed Time this is Shuttle Control, Houston. This is Shuttle Control at 3 days 23 hours 43 minutes Mission Elapsed Time. Columbia is about 20 seconds away from acquisition through Yarragadee.

CAPCOM Columbia, Houston through Yarragadee for 7 1/2 minutes.

SPACECRAFT Sir, we read you loud and clear.

CAPCOM Roger, and you're the same. Columbia, Houston I have a couple of short notes for you during this pass.

SPACECRAFT Okay, go ahead.

CAPCOM Roger, Hank, the first one is we would like to go back to the original DAP Bravo 2 for the next couple of hours. That will be changing DAP B 2 back to dead-band of 0.1 degrees, over.

SPACECRAFT Okay, 0.1 dead-band, is that vernier?

CAPCOM That's affirmative.

SPACECRAFT Okay, we'll do that.

CAPCOM Roger, and we'll give you a call in a couple of hours then go back to a 3 degree dead-band.

SPACECRAFT Okay.

CAPCOM And Columbia, the other note is an omission from the CAP from this morning, at 4 days, 4 hours 58 minutes, when you are ready.

SPACECRAFT Okay. Say that time again, George.

CAPCOM Roger. We left out minor items from the CAP this morning that we sent up to you at 4 days 4 hours and 58 minutes we would like to get a (garble) pressure readout and an elevon position report at that time, over.

SPACECRAFT Okay, 04 and 7 minutes.

CAPCOM Roger, Hank. That's 4 days 4 hours and 58 minutes.

SPACECRAFT Okay, you want the (garble) gauges on.

CAPCOM That's affirmative, and we would also like to get an elevon position report at that time.

SPACECRAFT Okay.

CAPCOM Roger, and that will be an Hawaii pass. Columbia, Houston we got an HP 41 running on the ground here with the state vector in it about the time you requested one, and it's keeping track within about a minute. We're just wondering how your's is doing.

SPACECRAFT Okay, it's on the back wall. I'll have to go back and check it, but I just reloaded it, and I haven't seen (garble) yet.

CAPCOM Roger, Hank. There's no rush on that. Columbia, Houston we are 45 seconds to LOS. Hawaii will be next at 09 and just for your information, the NOSI folks have a suggestion in case you are having trouble looking through the long foresite of their lens. There is a ring site that's down in locker MF28M if you care to use it, over.

SPACECRAFT Okay, thank you.

CAPCOM Roger, we'll see you in Hawaii.

PAO This is Shuttle Control. Columbia has moved out of range at Yarragadee.

END OF TAPE

PAO Next station is Hawaii in 17 minutes. At 3 days 23 hours 52 minutes mission elapsed time, this is Shuttle Control Houston.

CAPCOM Columbia, Houston. Standing by through Hawaii for 8 minutes.

SPACECRAFT Hello, there.

CAPCOM You're loud and clear.

SPACECRAFT George, why don't you tell your friend Ellen there that she's got some data at 3:23:52 and the period extends up through 4:00, say 09.

CAPCOM Roger, T. K. We'll pass that along.

CAPCOM Columbia, Houston. We're 45 seconds to a short LOS before the states. Just a reminder, we've got a visit with the world's fair coming up over the next Mila pass at 27 after the hour. And that the TV playback will be on the next state's pass an hour and a half from now. Over.

SPACECRAFT Okay, sir. And how are you going to initiate that radio pass. You going to tell us when it's set up? Is someone going to talk to us from the ground or what?

CAPCOM Roger, T. K. We'll give you a lead-in and let you take it from there. It's a one -

SPACECRAFT Okay.

CAPCOM And it's a one way ...

SPACECRAFT Alright. About 15 seconds ought to be enough.

CAPCOM Yeah. And it'll be a one-way conversation.

SPACECRAFT Alright.

PAO This is Shuttle Control. Hawaii has loss of signal. Buckhorn will acquire Columbia in about 20 seconds. We'll continue to standby at 4 days 19 minutes mission elapsed time.

CAPCOM Columbia, Houston through the states for 16 and a half.

SPACECRAFT You're loud and clear.

CAPCOM Columbia, Houston. We'd like to get the right ADI mode switch to inertial so we can monitor it on the ground.

Over.

CAPCOM Columbia, Houston through Mila. Today is the opening day of the NASA exhibit at the World's Fair in Knoxville, Tennessee. We're patched through live to the PA system throughout the fair grounds at this time for the opening day ceremony. And the people there are standing by for few words from the crew of the Columbia. Over.

SPACECRAFT Alright. Thank you, Houston. And good morning to the people at the World's Fair. We're talking to you from the spacecraft Columbia which is currently passing just south of the United States. When the call came in we were viewing the Gulf Coast. We just passed Houston. Little to our north we were looking out and picking up the signs of places like the Mississippi emptying into the Gulf. And looking ahead to the state of Florida. The view is spectacular to say the very least. The things that people talk about from space, often concern themselves with the view. There's probably a great deal more that's worth saying about it than just the immediate impression. And my pilot Hank Hartsfield has a couple of those words he'd like to mention to you.

SPACECRAFT Hello, all you folks down there. This is our fifth day in orbit and we're on our 65th orbit of the earth. Our spacecraft is in good shape and we've had a challenging mission so far. We've been really busy but it seems to hang in there. As you probably know, this is the last of the designated test flights on the Space Shuttle system. We'll be landing on the 4th of July and at that time we anticipate declaring the Space Shuttle transportation system operational. It's kind of fitting that we land on July 4th and celebrate the ushering in of a new era --

END OF TAPE

SPACECRAFT --just as our forefathers ushered an era of democracy for the whole world over 200 years ago on the same date. The operational era of the shuttle I think is going to mean alot to all of us. We're going to explorit space, we're going to put it to work for ourselves and make it pay off like it never has before. There is a whole frontier out there. The NASA exhibit there is open today, I think hopefully it will sho, you some of the things that we have done in space and maybe some of the things we hope to do in the future. I think it's time to renew our thoughts on where we've been and remind ourselves of the things that we utilize from day to da, that are direct out growths of the space program and then be chrilled when we think about what the future may hold for us. I think there is a, the things we can begin to imagine are going to happen for us. Again greetings from the Space Shuttle Columbia, and you folks have a good time.

CAPCOM Roger, Columbia we copied that loud and clear, and thanks alot.

PAO This is Shuttle Control. Bermuda has loss of signal. 30 minute pass over the Continental United States, the crew sent greetings to people visiting the opening day of the NASA exhibit at the Worlds Fair in Knoxville Tennessee. Columbia's next station is Ascension in about 10 minutes. Private medical communication is scheduled for Ascension. At 4 days 37 minutes Mission Elapsed Time, this is Shuttle Control, Houston.

CAPCOM Columbia, Houston we're 30 seconds to LOS. Ascension will be next at 0+48. That will be a private med conferance. We got word back from the World's Fair that your talk was well received with a big round of applause, over.

SPACECRAFT Okay, thank you.

PAO This is Shuttle Control we finally do have loss of signal. Columbia is in a keyhole earlier. We are 10 minutes to Ascension. This is Shuttle Control, 4 days 48 minutes Mission Elapsed Time. The Ascension Island tracking station has acquired Columbia. Private medical communication is scheduled during this Ascension pass. We'll standby.

CAPCOM Columbia, Houston back with you for 3 1/2.

SPACECRAFT Alright, sir.

CAPCOM Columbia, Houston 2 minutes left this pass. We're seeing very small problem. We think it is in the power cable on the middeck TV camera. The cable is still functional, but we'd like you to go ahead and put a piece of tape on it just to mark it so we can look at it post flight, and when you're using that

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camera, check the video and make sure you've got good quality when you're using it, it should work alright, over.

SPACECRAFT Okay, thank you.

CAPCOM Columbia, Houston 20 seconds to LOS, Botswana is next at 0+59.

SPACECRAFT Okay, see you then.

PAO This is Shuttle Control. Columbia has moved out of range of Ascension on Orbit #65. Next station is Botswana in 3 minutes, at 4 days 56 minutes Mission Elapsed Time, this is Shuttle Control, Houston. This is Shuttle Control at 4 days 58 minutes Mission Elapsed Time. Columbia is about to be acquired through Botswana.

CAPCOM Columbia we're standing by through Botswana for 7 1/2.

SPACECRAFT Okay, loud and clear.

CAPCOM You're the same.

END OF TAPE

CAPCOM You're the same.

SPACECRAFT George, this is a geologist delight up here. I never had a chance to look at the patterns in Africa before, but you can see the rift's and the fault zones and you can see all of the various volcanic sequences and trace and it's really complex and facinating. It's (garble) which you see out in the some part of the western U.S. but on a much grander scale.

CAPCOM Roger, T.K. wish we could be there.

SPACECRAFT As we tick along here today George, we are making rather notable progress in cleaning up our shopping list of getting the photos, and try to, maybe I can give you a summary of that a evening wrap up of where we stand. On an organized day like we did today we know what's coming and can plan around it and seeing, what we have been able to take real good advantage of our opportunities. You guys have been super about helping us stay on the tracks to advert our attention to other things.

CAPCOM Roger, thank you sounds good. Columbia, Houston we haven't given you much on the NOSL yet this flight. There is a chance of some thunderstorm over South America immediately following our next State side pass, over Venezuela, Columbia and Brazil, if you have time you might take a look at those.

SPACECRAFT Okay, we've got a, some spectacular stuff down around Rio and Buenos Aires the other evening, what was that flight day 2. It was really dramatic, and I think we got 2 mags of that stuff. I haven't been able to coordinate look angles and areas of the world since that.

CAPCOM Roger, we copy that. And since we are coming up on the night time here in about 1 minutes and 1/2, we'd like to get a confirmation that the forward bulkhead light is really out. We did see shorts on the forward port, and aft starboard lights. When we go into darkness if you could turn on the forward bulkhead for us we would like to see if it's working or if you can confirm that now.

SPACECRAFT Just turned it on, but we tried them all individually and there is just no joy. (garble). The lights that we told you were out we had the switches on for an entire night pass and the payload never lite up from any one of them.

CAPCOM Okay, Hank we copy that you can go ahead and leave those switches off then and cover them if you want.

SPACECRAFT (garble).

CAPCOM Columbia, Houston, Hank is there, there is one coming out, there's a flood light electronic assembly #1 which

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connects all 3 of those pluse 1 that we have locked out in the mid fusilage, over.

SPACECRAFT Okay, well then maybe our failure point is in there somewhere.

CAPCOM Roger, could be. Columbia, we are 30 seconds to LOS. Yarragadee is next at 1+21.

SPACECRAFT Okay, see you then.

PAO This is Shuttle Control. Columbia is moving over the Indian Ocean now out of range at Botswana. During this pass over the southern part of Africa Columbia's Commander Ken Mattingly said that part of the world was a geologist delight, full of rifts and fault zones. He enjoyed observing the area as he flew over. Mattingly of course had considerable amount of geology and training during the Apollo Program. The crew is also advised that there will be a chance for NOSL photography over South America on a next pass

END OF TAPE

PAO - - on the next pass thunderstorms are in that area of the world. Ken Mattingly reported that they got some spectacular photography of a lightning on flight day 2 in the South America area. The payload bay floodlights are still inactive, not working. Columbia is 12 minutes away from acquisition through Yarragadee at 4 days 1 hour and 9 minutes mission elapsed time this is Shuttle Control Houston. This is Shuttle Control at 4 days 1 hour and 9 minutes with a summary of the private medical communication that was conducted over Ascension. The crew continues to be in good health, feeling good and eating well. They each got about 6 hours of sleep last night, and report they slept well. At 4 days 1 hour 10 minutes mission elapsed time this is Shuttle Control Houston. This is Shuttle Control at 4 days 1 hour 20 minutes mission elapsed time, Shuttle coming within range of the Yarragadee station now.

CAPCOM Columbia, Houston, through Yarragadee for 4 minutes.

SPACECRAFT Okay sir.

CAPCOM You're loud and clear.

SPACECRAFT Henry was waiting, dark adapted to the cockpit here, been sitting here since sunset, trying to see what we can see with the dark adapter, which is something we haven't had a chance to do much of, and Henry noticed that obvious horizon, is not the horizon at all, but it's the horizon of the atmosphere, and he noticed he could see stars setting through this apparent horizon, and track it all the way down until it was occulted by the actual Earth's limb, which is amazing to space types and astronomers (garble) of the satellites and all. But then I turned the payload bay TV on it, and Hank and I were able to pick out, he's looking at it visually and I'm looking at the TV, and I was able to make a tape that records all of that, and it's really impressive.

CAPCOM Roger TK, we copy, sounds like fun. Columbia, Houston, 30 seconds to LOS. Guam will be next at 1 plus 31.

SPACECRAFT Okay sir, thank you.

PAO This is Shuttle Control Yarragadee has loss of signal. Next acquisition is through Guam in 6 minutes. At 4 days 1 hour 25 minutes mission elapsed time this is Shuttle Control Houston. This is Shuttle Control at 4 days 1 hour 31 minutes mission elapsed time. Columbia is about 30 seconds away from acquisition through Guam.

CAPCOM Columbia, Houston, through Guam how do you read?

SPACECRAFT Okay.

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CAPCOM Roger, you're loud and clear. We're with you for about 8 minutes.

SPACECRAFT Alright, thank you.

CAPCOM Columbia, Houston, we're 40 seconds to LOS. Hawaii is next at 1 plus 45.

SPACECRAFT Okay, we'll see you there.

PAO This is Shuttle Control. Columbia has loss of signal with Guam on orbit number 66. Next station is Hawaii in just under 6 minutes. We anticipate television on this revolution - and--

END OF TAPE

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PAO --at the Goldstone station. At 16 minutes from now. At 4 days 1 hour 40 minutes Mission Elapsed Time this is Shuttle Control, Houston. This is Shuttle Control at 4 days 1 hour 44 minutes Mission Elapsed Time. Columbia is coming up on acquisition through Hawaii now.

CAPCOM Columbia, Houston through Hawaii for 7 1/2.

SPACECRAFT Okay, we still got you loud and clear.

CAPCOM You're the same. And Columbia, a reminder we'll be looking for some TV over Goldstone, we've got about 6 minutes on this up coming States pass.

SPACECRAFT Okay.

CAPCOM Columbia, Houston we're 40 seconds to LOS. Buckhorn is next at 1+55.

SPACECRAFT Okay see you.

CAPCOM Roger.

PAO This is Shuttle Control loss of signal at Hawaii, Buckhorn in a minute and a half. We'll continue to standby.

CAPCOM Columbia, Houston with you through the States.

SPACECRAFT Yes sir, loud and clear.

CAPCOM And you're the same.

SPACECRAFT Let us know when you are ready for the TV.

CAPCOM Roger, be about 20 seconds. And Columbia, Houston we'd like the downlink enable then control to command.

SPACECRAFT Got it. Are you ready for (garble)?

CAPCOM Standby. And Columbia, Houston you're at go for the TV. Columbia you are at go for the TV.

SPACECRAFT Okay, should be coming down to you now, this was taken this morning, when I was doing my exercise bit. This is using the treadmill that we have onboard. The harness that I have around my waist carries most of the load, the shoulder straps carries a small part of it. The bungee that pulls down on the harness apply a load of about 160 lbs. to my lower legs which is about my approximate weight. So, I'm really getting about a 1 G load on my legs. The idea of this device is to be able to keep the muscle tone in the legs, and keep the cardiovascular function in good shape, such that during entry and also when we return

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back to the 1 G in OMS that the burn will not tend to bruise so badly in the lower portion of the body.

CAPCOM Roger, Hank we copy and we're getting good video.

SPACECRAFT Say again Houston.

CAPCOM We're getting real good video.

SPACECRAFT Okay, and there is also a device thats about clipped on my ear, which I can monitor my heart rate. The little device also keeps up with how many miles if I get that far, that I run, or walk on this thing. It can keep time for me or how long I was on it. This morning I have calculated I walked about 6,000 miles. So it is a pretty good device.

CAPCOM Grant you that.

SPACECRAFT T.K. got a good run on it this afternoon. We also caught some 16 millimeter events which we will be able to show you after we return to Houston. Bill (garble) can be proud of this thing, it is really a great device.

CAPCOM Roger, thanks. Hank and we will forward that on to Bill.

SPACECRAFT (garble) you want to continue a survey of the cabin. Pointing out here the gas controller, this is a device that we did the mile on and worked off the controls a little gas payload in the back of the bay. Back on the right side over there is a panel for which we control the OMS the mechanical arm. This arm is built very much like the a, the human arm. Imagine the end of your finger with a controller the controller on my right hand

END OF TAPE

SPACECRAFT ... the human arm and if you could imagine you control it with the end your finger with the controller. The controller I had on my right hand allows the controller to move and move in on (garble) move the arm very much like the end of my finger. If I yaw moving yaw I pitch up and down the end (garble) moves up and down and can also make it roll. The controller that I have on my left hand on is the control I use to make the end effector go back and forth, up and down and left and right. So with those 2 controllers I can drive the remote manipulator system just much like I would drive a - move my own arm. We have mode selector (garble) which can use to select the different modes on the controller. Moving over one panel. The longer switches that were used to control the closed circuit TV system or one like that we recorded this on, we have the option to select 5 different (garble) cameras. Actually, 2 of them on the arm and 4 in the payload bay. We also have 2 in flight in the deck inside cameras that we can use on flight deck. The 2 markers i'm touching on the right over there are the TV monitors I use to monitor the TV system. To the left of that is the control panel which we control the auto pilot and there is the anchor controller we use from aft station to when we're flying the vehicle from the aft station. Turn it around here a little bit then get a look at what's on the starboard side of the aft deck, if we can get the camera turned around here. Before I do that let me show you one thing. This is our world map. We have on here our roller that has on the plastic the trajectory of the orbit and then we have a world map that we can adjust it to trajectory use and the computer I hold in my hand, we calculate the longitude, descending node, and the time for the descending node, and that way we can keep up with where we are and if at all times. After we get the calculation on the computer we adjust this longitude of descending node and I'm pointing to there. I slide the plastic over the map and then we can look at along the track, measure the time from the ascending node which the computer tells us and we can tell where we are and where were going to reach, what time we'll reach it other points in our orbit.

CAPCOM Columbia, Houston, Hank. We just lost the picture. We're going LOS. We'll come back over Mila in about 2 minutes.

SPACECRAFT Okay.

CAPCOM Thanks alot, that was a great show.

SPACECRAFT Do you want us to have the rest of that now?

CAPCOM Negative, Hank. We won't have any TV over Mila.

SPACECRAFT Okay, thank you.

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CAPCOM And Fran is smiling in the back room. She was back here watching you.

PAO This is Shuttle Control. About a minute LOS period between Goldstone and Merritt Island. As CAPCOM George Nelson informed Columbia's pilot, Mrs. Hartsfield is in the viewing room here at Mission Control Center at this time, was here during the television pass.

CAPCOM And Columbia, Houston's back with you for 4 minutes.

SPACECRAFT Okay, we read you.

CAPCOM Roger, Columbia. And we'd like to get the deadband widened back to 3 degrees on DAP BRAVO. That's deadband attitude burn item 23 and 3 degrees.

SPACECRAFT I can barely read you George. I understand you want to go back to the 3 degree deadband on the DAP B. Is that correct?

CAPCOM That's correct, Hank. Columbia, Houston. We're 40 seconds til LOS. Ascension is next at 2+25 and I'll have the pad for you to read after that time for the oms 5 burn, over.

SPACECRAFT Okay, we'll be ready (garble).

CAPCOM Okay, see you then.

PAO This is Shuttle Control. Merritt Island has lost it's signal. Columbia's going down across ...

END OF TAPE

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PAO - - going down across South America on orbit number 66. Next station will be Ascension Island in 14 minutes at 4 days 2 hours 11 minutes mission elapsed time this is Shuttle Control Houston.

CAPCOM (garble) you're Ascension for 6 and 1/2 minutes.

SPACECRAFT Okay.

CAPCOM Roger, and you're loud and clear. Columbia, Houston, we have transferred the target load for OMS 5 onboard, I'm standing by to read up the pad.

SPACECRAFT Yes, how about standing by a minute.

CAPCOM Roger.

SPACECRAFT Okay, go ahead with the pad.

CAPCOM Roger Hank, the OMS 5 we burn from the left OMS TV roll 1 8 0 plus 0 decimal 5 plus 5 decimal 0 minus 5 decimal 1, weight 2 2 2 9 8 9. TIG 0 0 4 0 3 3 3 0 0 decimal 0 plus 0 0 1 5 decimal 0 all balls, all balls burn attitude 3 4 1 1 6 3 3 2 9. Delta V total 0 0 1 5 decimal 0 0 0 1 7. TGO plus 0 0 1 4 decimal 1 7 plus 0 0 3 decimal 0 0 plus 0 0 3 decimal 8 9. HA 169 HP 162, readback.

SPACECRAFT Okay, it's the left OMS 1 8 0 plus point 5 plus 5 point 0 minus 5 point 1, 2 2 2 9 8 9, 4 hours 3 minutes 34 days 3 hours 33 minutes 0 seconds plus 1 5 decimal 0 all zips all zips. Attitude 3 4 1 1 6 3 3 2 9, 1 5 decimal 0, 17 seconds, 1 4 that's plus 1 4 decimal 1 7 plus 3 decimal 0 0 plus 3 decimal 8 9, 169 by 162.

CAPCOM Roger Hank, that's a good readback, 30 seconds left this pass. Botswana is next at 2 plus 35.

SPACECRAFT Okay, see you then.

CAPCOM Roger.

PAO This is Shuttle Control loss of signal through Ascension. Columbia will be picked up by the Botswana station in 3 and 1/2 minutes. Over Ascension CAPCOM George Nelson read up the PAD for the OMS 5 burn. That burn designed to target the crossrange, such that we can do some of the maneuvers that are programmed during entry. Ignition time of 4 days 3 hours 33 minutes will be a single OMS engine, the left engine, duration of the burn 17 seconds for the change of velocity of 15 feet per second posigrade. The resulting orbit is expected to be 169 by 162 nautical

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PAO - - at 162 nautical miles. Columbia's current orbit is 162.7 by 159.5. 4 days 2 hours 33 minutes mission elapsed time this is Shuttle Control Houston. This is Shuttle Control, Botswana has acquired Columbia at 4 days 2 hours 36 minutes mission elapsed time.

CAPCOM Columbia, Houston, with you through Botswana for 7.

SPACECRAFT Loud and clear Houston.

CAPCOM And you're the same. Columbia we're 50 seconds LOS. Talk to you through Guam at 3 plus 0 7.

SPACECRAFT Okay.

PAO This is Shuttle Control. Columbia moved out of range at Botswana. Columbia's groundtrack misses Australia this time, the next acquisition through Guam in 24 minutes. We're about 49 minutes 20 seconds away from ignition of the OMS 5 burn. At 4 days 2 hours 43 minutes mission elapsed time this is Shuttle Control Houston. This is Shuttle Control at 4 days 3 hours 6 minutes mission elapsed time. Columbia has just started orbit number 67, and is about 30 seconds away from acquisition at Guam.

CAPCOM Columbia, Houston, through Guam for 7 and 1/2.

SPACECRAFT Okay. While I'm waiting for this thing to get to attitude, we were discussing how this changes the entry setup, and our guess was that by changing the period, we can change the phasing so that you adjust the crossrange for entry, is that right?

CAPCOM That's affirmative TK, you got it psyched out.

SPACECRAFT And since we're going higher I presume we're trying to force the orbiter to move back a little bit on the groundtrack, and what does it do to crossrange? That's the point we couldn't sort out.

CAPCOM Roger TK, we increased the crossrange about 25 miles, up to about 579 miles now. Should give you a little more time.

SPACECRAFT Okay, is that about the same as the original 113?

CAPCOM Roger, it's within 20 miles TK.

SPACECRAFT Okay, you guys do good work.

CAPCOM Thank you. Columbia, Houston, before we get too busy with the OMS burn, there's a water dump coming up post the

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OMS burn. We'll be dumping tank bravo to 5 percent, and it should take approximately an hour.

SPACECRAFT Okay, that's bravo to 5 percent.

CAPCOM Roger that.

SPACECRAFT Okay, I tell you, I sure appreciate you getting all that stuff up to us early like that. Let's us do some planning ahead. It really makes our life easy.

CAPCOM Our's too TK, the bronze flight just told me we're really enjoying the pace of today's shift, and we don't plan on changing.

SPACECRAFT Okay. You guys need someone to work with you again, one of these days I think we just got two volunteers.

CAPCOM Maybe we can swap sometime.

CAPCOM Fair, but unattractive choice.

CAPCOM Roger. Columbia, Houston, we're 1 minute to LOS. Hawaii is next at 3 plus 21. If you think you've got time over Hawaii, you could give us the IMU alignment results, over.

SPACECRAFT I'm sorry, I could've given it to you now, and I forgot all about it, okay catch you in Hawaii.

CAPCOM Okay, no problem.

SPACECRAFT Got time for it now.

CAPCOM Got 30 seconds TK.

END OF TAPE

CAPCOM That's 30 seconds T. K.

PAO This is Shuttle Control, Guam has loss of signal. Next station Hawaii in 6 minutes. 4 day 3 hours 15 minutes mission elapsed time. This is Shuttle Control Houston. This is Shuttle Control at 4 days 3 hours 21 minutes mission elapsed time. Hawaii has acquired the Columbia.

CAPCOM Columbia, Houston thru Hawaii for 7.

SPACECRAFT Houston loud and clear. We are running the gimbal check now.

CAPCOM Roger. Columbia Houston. We see the gimbal check. It looks good and the targets loaded and they look good.

SPACECRAFT Okay, and how about a little IMU pad?

CAPCOM Roger, and we're ready.

SPACECRAFT Okay, stars 41 and 34, angular error of .01, angles for IMU number 1: $-.01 + .08$, $-.07$. IMU number 2: $-.07 + .11$ all zips. IMU number 3: $+04 +07 -19$. Execution time 4 days 2 hours 50 minutes.

CAPCOM Okay, T. K. we copy, thank you. One other note of information. Post the oms burn you may get SM alert, left oms valve, right oms valve and that's not a worry, it's just to let you know that your helium valves are open, over.

SPACECRAFT That the helium valves are opened. Okay I understand.

CAPCOM Columbia, we're 30 seconds to LOS. States are next in 2-1/2 minutes.

SPACECRAFT Okay, my ...

PAO This is Shuttle Control. Hawaii has loss of signal. Buckhorn picks up Columbia in 2 minutes. Columbia's 3 minutes 19 seconds away from the oms 5 burn. That burn will be done within sight of the Buckhorn tracking station. We'll continue to standby for acquisition through Buckhorn. Mission elapsed time is 4 days 3 hours 30 minutes.

END OF TAPE

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PAO -- burn. And at LOS we were showing Columbia in an orbit of 169.5 by 161.5 with an orbital period of 1 hour 30 minutes 48 seconds. It will require some additional tracking to refine that orbit. That is the initial results of the mark based on the short amount of tracking at Buckhorn. At 4 days 3 hours 38 minutes Mission Elapsed Time this is Shuttle Control, Houston. This is Shuttle Control, at 4 days 4 hours 10 minutes Mission Elapsed Time. Columbia is about 30 seconds away from acquisition through Botswana.

CAPCOM Columbia, Houston standing by through Botswana for 7 1/2.

SPACECRAFT Okay.

CAPCOM Columbia, Houston 1 minute LOS before IOS. Columbia, Houston back with you through Indian Ocean for 6 1/2 minutes. Hope you are enjoying your shrimp cocktail and beef steak.

SPACECRAFT Right. We're kind of going slow on this flight, we're trying to get some general documentation of it (garble) camera out and see if we can't get that stuff all cleaned up today so we don't have to mess with at the end of the next mission.

CAPCOM Roger.

SPACECRAFT Hey, George?

CAPCOM Go ahead T.K.

SPACECRAFT You might tell Robert that we only got the VTR on flight day 1 when we got his 16 millimeter on today.

CAPCOM Roger, T. K. we copy, we'll pass it on. And Columbia if you're on the flight deck you're at go to do the item 48.

SPACECRAFT Okay, thank you sir.

CAPCOM And Columbia sense you're up there to save a little prop we would like to go to DAP Bravo give us a little bigger dead-band.

SPACECRAFT Okay. We'll do that.

CAPCOM Columbia, Houston we're 20 seconds to LOS. Guam is next at 4 + 44.

PAO This is Shuttle Control. Columbia has moved out of range of the Indian Ocean station, heading toward acquisition at Guam in 17 minutes. At 2:30 central daylight time a couple of minutes from now, we expect television of the Challenger's arrival at the Dryden Flight Research Facility after it's overland trip from the Rockwell plant in

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Palmdale. First part of the transmission will be video tape, and then we will go to a live picture. That's scheduled for 2:30 pm central daylight time. At 4 days 4 hours 28 minutes Mission Elapsed Time this is Shuttle Control Houston. This is Shuttle Control at 4 days 4 hours 43 minutes Mission Elapsed Time. Shuttle coming up on acquisition through Guam. Columbia started #68 Orbit a short time ago.

CAPCOM Columbia, Houston through Guam for 5 1/2 minutes.

SPACECRAFT Alright.

END OF TAPE

CAPCOM loud and clear.

SPACECRAFT George, you still there?

CAPCOM Roger, T. K. Standing by.

SPACECRAFT What's taking us so long is i'm trying to get some pictures on the middeck. We finally tried taking all the sleeping with the shades. It had a very nice shiny illuminized surface on one side and we plastered the other side with it in between all of the flood lights and the illuminization lights and everything else, we finally got the omination up there up to where the (garble) all your lamps will work.

CAPCOM Okay, that's good thinking.

SPACECRAFT Sure is time consuming.

CAPCOM Roger. Columbia, we're 50 seconds till LOS. Hawaii is next at 4+57 and we'll be looking for a tire pressure readout at Hawaii and then a view of aleron position.

SPACECRAFT Okay.

CAPCOM And Columbia, the TPR onboard is blockweather.

SPACECRAFT Okay, thank you.

PAO This is Shuttle Control. Columbia's out of range at Guam now.

CAPCOM affirmative.

PAO We're still getting data.

CAPCOM We'll talk to you at Hawaii at 4+57.

SPACECRAFT What time left here?

PAO Guam has loss of signal now. Hawaii's next in 5-1/2 minutes. At 4 days 4 hours 52 minutes mission elapsed time, this is Shuttle Control Houston. This is Shuttle Control at 4 days 4 hours 56 minutes mission elapsed time. Columbia's approaching acquisition through Hawaii.

CAPCOM Columbia, Houston, we get through Hawaii for 8 minutes.

SPACECRAFT Okay.

CAPCOM Columbia, Houston. You can get the string gauges on now. We'd like you to get those tire pressure readouts.

on that panel. Could you get the wideband mission power to off, over. And Columbia, Houston, i've got about 2 minutes worth of chatter to start closing things out for sleep, over.

SPACECRAFT Okay, go ahead.

CAPCOM Roger, Columbia. I'll take down my list for sleep tonight, we'd like to go back to the nominal data bravo 2, that's a tenth of a degree deadband in the vernier. There'll be no SM check point required tonight. Because of your tail sun attitude we're expecting the cabin might be 3 or 4 degrees cooler. We just wanted you to be aware of that in case you noticed it.

SPACECRAFT Okay, be sure and noticed that is was a lot warmer in DPC than it had been the other day.

CAPCOM Okay, we copy. Also before sleep, we'd like to get the right ADI switch back to inertial so we can watch that through the night.

SPACECRAFT Okay.

CAPCOM Roger. A couple more things during this pass. We'd like you to note the position of the eleron.

SPACECRAFT The eleron on the right outboard are off 20 and the inboards are up almost full, not quite, the left inboard is up full it looks like and the left outboard is down some amount it's where we can't see it.

CAPCOM Roger, T. K., thank you. And in regards to the problem we had this morning with the auto maneuver, after we did the IMU alignment, the maneuver to tail sun, we went back and looked at a playback and what we saw was that the coordinates were entered and the maneuver time was entered but we never saw the item 18 or the asterisk. It looks like the software was working okay on that one, over.

SPACECRAFT You think I just failed to put it in, okay.

END OF TAPE

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SPACECRAFT - - that's so long ago, I sure wouldn't remember it. I thank you.

CAPCOM Okay, and we're through with the tire pressure reading now, you can get the strain gauges off, and the last thing, there's one more thing we'd like to get some idea of when you're planning on doing the summary on the ICOM tonight, and we prefer during an LOS period if we could.

SPACECRAFT Okay, it'll be during an LOS. It'll be at least an hour from now, make it an hour and 1/2.

CAPCOM Roger TK, we copy. Okay, that's all I have on my list now, we're a minute to LOS. Botswana will be next at 5 plus 47, and one other note, we were just watching the TV monitor here a little while ago, and we saw your companion vehicle the Challenger rolling out, and he's on the ramp at Edwards waiting for you.

SPACECRAFT Okay, I can't even think of a retort. Guess the sooner we fly it the better.

CAPCOM Roger that, I'll talk to you through Botswana 5 plus 47.

PAO This is Shuttle Control. Columbia has loss of signal with Hawaii on orbit 68. Next acquisition through Botswana in 41 minutes. Crew is an hour and 33 minutes away from beginning their sleep periods. At 4 days 5 hours 6 minutes mission elapsed time, this is Shuttle Control Houston. This is Shuttle Control at 4 days 5 hours 46 minutes. Columbia approaching acquisition through Botswana.

CAPCOM Columbia, Houston, standing by through Botswana for 6 minutes.

SPACECRAFT Hello there.

CAPCOM You're loud and clear.

SPACECRAFT We're now participating in a live television performance of dinner.

CAPCOM Okay, enjoy your meal. Columbia, Houston, we've been looking around for something for you to do, but haven't been able to find anything, so I'll just let you finish your meal. We'll be back with you through Indian Ocean in about a minute.

SPACECRAFT Okay, thank you sir.

CAPCOM Columbia, Houston's back with you through Indian Ocean for 7 and 1/2.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, you still up in the flight deck? Columbia, Houston, 40 seconds to LOS. Guam is next at 6 plus 23, and at your convenience we'd like to return to the original DAP bravo 2 with the 10th of a degree deadband, over.

SPACECRAFT (garble) about the deadband, you want it now you say?

CAPCOM Roger, the nominal DAP bravo 2 with a 0.1 degree deadband.

SPACECRAFT You're not coming through very clear, say again.

CAPCOM Roger, that's, we'd like you to go to the nominal DAP B 2 with a 0.1 degree deadband, over.

SPACECRAFT You're getting clearer, I hear a nominal B, but then, I hear something that sounds like point 1 deadband, is that what you mean?

CAPCOM That's affirmative.

PAO This is Shuttle Control. Columbia is out of range at the Indian Ocean station now. Next acquisition through Guam in 17 and 1/2 minutes. Columbia has just started orbit number 69 during this pass at Indian Ocean station. At 4 days 6 hours 5 minutes mission elapsed time this is Shuttle Control Houston.

END OF TAPE

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PAO This is Shuttle Control at 4 days 6 hours 22 minutes mission elapsed time. Columbia approaching acquisition through Guam for a short pass.

CAPCOM Columbia, Houston, through Guam for 4 and 1/2 minutes.

SPACECRAFT Loud and clear Houston.

CAPCOM Roger Hank and you're loud and clear. Columbia, Houston, 20 seconds to LOS. Hawaii is next at 6 plus 33.

SPACECRAFT Okay Mike, I hope we got the right configuration for you now.

CAPCOM Roger, you're looking good to us TK.

SPACECRAFT Okay, so we're about to point left and back out, we still owe you a summary.

CAPCOM Roger that.

PAO This is Shuttle Control. Guam has loss of signal. Next station Hawaii in 6 and 1/2 minutes. Hawaii nominally will be the last station at which we'll talk to the crew today. Their sleep period due to start in 12 and 1/2 minutes. At 4 days 6 hours 27 minutes mission elapsed time this is Shuttle Control Houston. This is Shuttle Control at 4 days 6 hours 32 minutes mission elapsed time. Columbia is approaching the range of the Hawaii station now on orbit number 69.

CAPCOM Columbia, Houston, last pass through Hawaii for 8 minutes.

SPACECRAFT All right then. Has anyone got a short summary of tomorrow right off the top of your head? Just a general outline of where we think we're headed.

CAPCOM Roger, stand by one. Columbia, Houston, TK I'll give you a rundown on what we're thinking for tomorrow. There's still might be some changes, and I'll give you what we've got.

SPACECRAFT Okay, well just tell me if I have a, just a broad idea of the major activities you've planned.

CAPCOM Okay, here it comes. We plan on doing an IMU align first thing in the morning. Then moving on to the F3F pulse test, still in the morning. In the afternoon we'll be doing a single F3F test. We still plan on doing the RMS unloaded test in the afternoon. We're going to try and get in the IECM GAS release, and that's what we've got so far. We should, with the

plan we've got so far, we're still plan on leaving the CDR free in the morning, over.

SPACECRAFT Okay, that's what I was wondering, if I ought to plan to get started early in the morning on my own activities. It's going to be light enough to get started.

CAPCOM Well, that's the way we're trying to work it TK.

SPACECRAFT Okay, and how about clarifying that GAS release thing. As I understand it, we did everything, we thought we did everything right the first time, but apparently the IECM didn't see the switch provision, is that right?

CAPCOM That's affirmative TK. We're still looking at that, and trying to unsort the IECM, but it looks like it didn't get the GAS release, and that if we cycle it one more time we'll get it, over.

SPACECRAFT Okay, so we'll go ahead and do the whole thing with the maneuver and all this time.

CAPCOM That's affirmative.

SPACECRAFT Alrighty, and the predominant attitude for tomorrow is going to be tail sun?

CAPCOM That's affirmative.

SPACECRAFT If we didn't get their GAS released, is there any question in your mind, or anybody's mind whether we got the contamination and the plume survey?

CAPCOM Hank, we're looking at that real hard, now we're sure we got the contamination survey, we're taking a hard look at the plume.

SPACECRAFT Can you determine that on the ground?

CAPCOM Columbia, we have a pretty indirect way of determining that now, and they're still looking at it.

SPACECRAFT Is there any recovery on that? I mean, have we gone past the sequence so there's no recovery now if you found out you hadn't gotten it before?

CAPCOM I think it's too early to tell

END OF TAPE

SPACECRAFT Can you determine that on the ground?

CAPCOM Columbia, we have a pretty indirect way of determining it now and they're still looking at it.

SPACECRAFT Is there any recovery on that? I mean have we gone past the sequence so there's no recovery now if you found out you hadn't gotten it before?

CAPCOM I think it's too early to tell right now but it looks like there might not be any recovery if we've lost it.

SPACECRAFT Okay, well I was just wondering if maybe we ought to hold up until we find out what you're doing in the morning because we still have 1 more chance at it.

CAPCOM Roger, we're still looking at it.

SPACECRAFT Okay.

CAPCOM Columbia, Houston. We have 1 more plan for knowing when you got the summary for us on the tape. If you'll hold off on turning off the last CRT until after you're done we'll see that on the pulse summary page and know when to go back and rewind the tape.

SPACECRAFT Okay, you guys got any more (garble) it'll be dangerous.

CAPCOM Roger.

SPACECRAFT (garble) can you confirm that we're on the flight plan schedule for wake up time?

CAPCOM Roger, Columbia. Wake up time will be nominal. Columbia, Houston, we're 1 minute till LOS if you should need us in this next pass we'll be Santiago at 700 hours. Think it's been a pretty good day for everybody, we've enjoyed working with you and we look forward to doing it again tomorrow.

SPACECRAFT Okay, we sure had a good time.

CAPCOM Roger, and the granite team will be watching with you over the night and the crystal team will be with you again in the morning.

SPACECRAFT I guess they call the granite team because they have such hard heads, huh?

CAPCOM Roger, that. The granite head is just coming on shift here. And Columbia, going LOS. Your state vector is good for next Edward?

SPACECRAFT Okay, and thank you alot.

CAPCOM Roger, and get a good nights sleep.

PAO This is Shuttle Control. Columbia's moved out of range at Hawaii now and crew is getting ready to retire for the night. We won't be calling them again. Next station is Santiago, Chile in 18 minutes in case they want to put in a call to the ground here in the Mission Control Center. Trying to change shifts of flight controllers. Flight director Chuck Lewis's team is handing over to the team led by John Cox. Lewis estimates his change of shift briefing for 5:30 p.m. central daylight time in room 135 at the JSC newscenter. We expect the change of shift briefing to be 5:30 p.m. central daylight time. At 4 days 6 hours 43 minutes mission elapsed time, this is Shuttle Control Houston.

FAO Mission Control Houston, 4 days 7 hours mission elapsed time. About to acquire communication with Columbia through Santiago. Mission Control Houston, 4 days 7 hours 7 minutes mission elapsed time. We just passed out of range of the Santiago Chile tracking station and we've got about 25 minutes before we reacquire. That'll be over the Indian Ocean station for about a 7-1/2 minute pass. Columbia's currently on orbit number 69. Just passing over South America. Data coming down from the spacecraft, although there was no voice on this pass, indicated that all the CRT's, the displays and the on the flight deck were on indicating the crew is still active and working with those. Flight controllers here in mission control reviewed the data coming back on all of their systems that they're responsible for and indicated that everything looked good at this time. Just a review of few of the items that could be highlighted during for today's activity today. The crew performed a door close early today, latched the doors and everything latched perfectly. That was the port door which was the one that had given kinda of everyone some difficulty yesterday. There was a hot fire of the reaction control system jet.

END OF TAPE

PAO latched the doors and everything latched perfectly. That was the port door which was the one that had given kind of everyone some difficulty yesterday. There was a hot fire of the reaction control system jet FIL which had early in the mission indicated a leak and that system performed well and is back on line. Was a hot fire test of the reaction control system which is a normally scheduled test and everything checked out well on that, and an OMS five burn which set up the cross range properly for the entry maneuvers on Sunday. Crew is not yet asleep yet, although we are into their scheduled sleep period. At 4 days, 7 hours, 8 minutes, mission elapsed time, this is Mission Control, Houston.

PAO Mission Control, Houston, 4 days, 7 hours, 28 minutes, mission elapsed time. Shortly be starting orbit number 70. Columbia is now over the southern section of Africa. That change of shift press conference with the off going Bronze Team flight director, Chuck Lewis, scheduled for 5:30, will delayed about 15 minutes. So that's currently scheduled for approximately 5:45 central daylight time in building 2, room 135.

PAO Mission Control, Houston, 4 days, 7 hours, 31 minutes, mission elapsed time. We're about to pass within in range of the Indian Ocean station. We'll be starting on orbit number 70 very shortly, not expecting any communication with the crew on this pass, unless they have something to relay down to the ground. 4 days, 7 hours, 32 minutes, mission elapsed time, this is Mission Control Houston.

PAO Mission Control, Houston, 4 days, 7 hours, 39 minutes, mission elapsed time. Columbia has just passed out of range of the Indian Ocean tracking station. Be about another 19 minutes before we reacquire over Guam. There are indications that the crew is still active onboard, although we haven't had any voice communication on the last two passes. 4 days, 7 hours, 40 minutes, mission elapsed time, this is Mission Control, Houston.

PAO Mission Control, Houston, 4 days, 8 hours, 36 minutes, mission elapsed time. Columbia is on orbit number 70 at this time. About to pass within range of the Santiago tracking station. Ground controllers here in Mission Control continue to monitor vehicle systems and everything appears to be going well at this time. They expect that the crew is in their sleep period at the present time, they're due to get up in about 6 hours to begin their work on day 5, at 4 days, 8 hours, 36 minutes, mission elapsed time, this is Mission Control, Houston.

PAO Mission Control, Houston, 4 days, 8 hours, 54 minutes, mission elapsed time. Spacecraft is currently within the range of the Ascension Island tracking station on the last piece of orbit number 70. Columbia is in a 170 by 162 nautical

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mile orbit. Takes about 1 hour, 30 minutes and 47 seconds to circle the Earth one time. Astronauts Mattingly and Hartsfield are well into their scheduled sleep period at this time. They're due to get up about 5 hours and 45 minutes, to begin to get an early start on the next flight day. Temperature in the cabin is about 81 degrees at the present time, and 32 percent relative humidity, according to the data coming back from the spacecraft. At 4 days, 8 hours, 55 minutes, mission elapsed time, this is Mission Control, Houston.

END OF TAPE

PAO Mission Control, Houston, 4 days, 9 hours, 35 minutes Mission Elapsed Time. Columbia is currently within range of the tracking station at Guam on orbit number 71. Crew is well into their scheduled sleep period at this time and there is not any activity to indicate that they may be awake at this time. Flight controllers here in Mission Control continue to look at the data as it comes down from the spacecraft and are observing the onboard systems. Everything appears to be good at the present time and Columbia is in orbit of approximately 170 by 162 nautical miles. Current altitude is 163.2 nautical miles, at 4 days, 9 hours, 36 minutes Mission Elapsed Time. This is Mission Control, Houston.

PAO Mission Control, Houston, 4 days, 10 hours, 14 minutes Mission Elapsed Time. We're currently within range of the tracking station at Santiago on orbit number 71. We expect that the crew is asleep at this time. They turned off their displays, the cathode ray tubes at about 3 hours ago. Flight controllers here in Mission Control will continue to look at the data coming back from the spacecraft whenever we pass over a site. Everything appears to be working well at this time. Cabin temperature is about 80 degrees. Humidity in the cabin is 33 percent. Crew is scheduled to wake up at about 12:40 a.m. Central Daylight Time. Not really banker's hours on this flight unless you happen to be on Greenwich Mean Time. At 4 days, 10 hours, 15 minutes Mission Elapsed Time, this is Mission Control, Houston.

PAO Mission Control, Houston. Four days, 10 hours, 31 minutes Mission Elapsed Time. Spacecraft is currently within range of the Ascension Island Tracking Station and just completing the last portion of orbit number 71. Flight controllers in Mission Control are preparing the teleprinter messages for in the morning and updating the activity plan for tomorrow's events. Crew has about 4 hours remaining in their scheduled sleep period. They'll be getting up about 20 minutes before 1:00 a.m. on Central Daylight Time. All systems on the vehicle appear to be operating normally at this time. Four days, 10 hours, 32 minutes Mission Elapsed Time. This is Mission Control, Houston.

END OF TAPE

PAO Mission Control, Houston, 4 days, 11 hours 9 minutes mission elapsed time. Columbia is within range of the Guam tracking station and data is coming down from the spacecraft. Flight controllers here in Mission Control have observed the status of the systems on board the craft all during the evening hours here and everything continues to look good. Columbia's on orbit number 72, mission controllers here are preparing the teleprinter messages to be sent up to the crew, in the not too distant future. On the timeline here the crew is scheduled to wake up in about three and a half hours to begin a day very early. One item of interest (garble) people have reported that there is a piece of space garbage come within a, oh perhaps as close as 20 kilometers or so of the spacecraft and the crew may be able to observe it. The information we have at this time, that it is a Soviet upper stage of a launch vehicle relating to the Intercosmos 14 flight and we will be having some more information on that for you later as it becomes available. The flight dynamic's people are currently calculating the closest approach to the Orbiter as it, of the Intercosmos 14 upperstage and at what point the crew might be able to see it. That event should occur, probably about an hour after crew wakeup and should be somewhere close to 2 a.m. this morning Central Daylight Time, we'll have some more information on that for you a little later. 4 days, 11 hours, 11 minutes mission elapsed time, this is Mission Control Houston.

PAO Mission Control Houston, 4 days, 11 hours, 58 minutes mission elapsed time, Columbia's now over South America on the very end of orbit number 72, a little more information for you about the piece of space garbage that the vehicle may encounter and shortly after the crew wakes up at about 4 days, 16 hours, 2 minutes and 51 seconds they will have a time of closest approach with an upperstage from a Soviet vehicle the Intercosmos 14 which launched a satellite a scientific satellite in December 11, 1975. At the figures, the calculations are continuing to be refined at this time, it appears as if that upperstage may passback as close as about 3.8 miles from the vehicle, crew should see it out the front window, approaching from the nose about 60 degrees above the nose and it will pass over the vehicle and disappear right behind the tail. That object, the Intercosmos 14 upperstage, is listed as having an orbit with a perigee of 314 kilometers and an apogee of 1155 kilometers. Flight controllers continuing to review the data and keeping an eye on a close approach of this piece of space garbage that will occur in about 4 hours or so from now. At 4 days, 12 hours mission elapsed time, this is Mission Control, Houston.

PAO Mission Control Houston at 4 days, 13 hours mission elapsed time. The improved data coming into Mission Control here on the status of the piece of space junk that's going to pass fairly close to the Columbia indicates that now that the point of closest approach will be about 7.7 miles away rather than the 3.8 miles that had been indicated by the earlier data so it appears that the, perhaps the crew will

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still be able to see that but just to review the item that it is in orbit will cross fairly close to the Columbia a distance of almost 8 miles is a upperstage of a Soviet launch vehicle called the Intercosmos 14 and about seven minutes after two this morning Central Daylight Time that object will pass within about 7.7 miles of the Columbia. The crew perhaps may be able to see that out, looking out the nose of the vehicle and it should pass out of their view back over the tail area of the spacecraft. That would occur on orbit number 75 at a latitude of about 16 degrees, 52 minutes, south longitude 135 degrees, 3 minutes East or over North Central Australia just out of range of the Yarragadee tracking station. So just to review the object, the Intercosmos upperstage would, current calculations put that closest approach at nearly 8 miles. 4 days, 13 hours, 2 minutes mission elapsed time, this is Mission Control, Houston.

END OF TAPE

CAPCOM Houston COMTEX, Dakar COMTEX, air to ground 1.

PAO Mission Control, Houston. Four days, 14 hours, 15 minutes Mission Elapsed Time. Columbia is currently on orbit number 74. We're about an hour away from our next pass over a ground tracking station where we'll have communication with the spacecraft. All systems onboard the Columbia continue to function well through the night. Flight controllers here in Mission Control monitor the data, as it comes down, from the ground and everything looks good at the present time. Astronauts Mattingly and Hartsfield are due to be awakened in about 25 minutes to begin their busy day. Among the items on the schedule for tomorrow are demonstration of the preparations that would be made before a crewman would go outside the spacecraft. T.K. Mattingly will enter the airlock and don the space suit and go through the other procedures that would precede an exit from the spacecraft. There will be some testing, additional testing, with the Remote Manipulator System and the RMS cameras will be used to observe the radiators on the space shuttle payload bay doors. Some additional information on the earlier announced close pass of a piece of space junk that has been tracked by the NORAD people and observed by the trajectory people in Mission Control. The item, an upper stage of an Innercosmos 14 Soviet launch vehicle, which launched a scientific satellite in 1975, is on an orbit which intersects that of the spacecraft. That will occur shortly after 2:00 a.m. Central Daylight Time, but had a rather rapid closing speed and at such an angle that the crew may not be able to view it. Also, as the calculations are improved with additional data that comes in, it appears that the range will not be as close as originally thought. The object may pass as close as about 8 miles to the spacecraft, but will be coming at such an angle and at a closing speed that the crew may find it difficult to see it at all. The scheduled press conference with the off going flight director, Change-of-Shift Briefing, with off going Flight Director, John Cox, originally scheduled for 1:30 a.m. may be cancelled due to lack of interest. We'll make a final decision on that in about 30 minutes. At 4 days, 14 hours, 18 minutes Mission Elapsed Time, this is Mission Control, Houston.

PAO Mission Control, Houston. Four days, 14 hours, 24 minutes Mission Elapsed Time. The Change-of-Shift Press Conference with off going Flight Director, John Cox, which we had scheduled tentatively for 1:30 a.m. Central Daylight Time, we're considering cancelling that at this time due to lack of interest. We'll probably announce a final decision in about 15 minutes. This is Mission Control, Houston.

PAO Mission Control, Houston, 4 days, 14 hours, 39 minutes Mission Elapsed Time. Spacecraft is currently on orbit number 74, and we're just nearing the crew wake time. Crew is currently scheduled to be awake at any moment, however, the next time that the ground can communicate with the crew to pass up the wakeup call is in about 40 minutes.

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The Change-of-Shift Briefing with off going Flight Director, John Cox, which had been scheduled for 1:30 a.m. Central Daylight Time in building 2, has been cancelled. Repeating, that Change-of-Shift Briefing with off going Flight Director, John Cox, scheduled originally for 1:30 a.m. Central Daylight Time has been cancelled. Four days, 14 hours, 40 minutes Mission Elapsed Time. This is Mission Control, Houston.

CAPCOM (Wake up music)

END OF TAPE

Wake up Music, (Chariots)

CAPCOM Columbia, Houston, through Dakar and Madrid.

SPACECRAFT Good morning, Houston, how you doing today?

CAPCOM We're doing just fine, and how bout you guys?

SPACECRAFT Oh, I'm stirring and getting things going.

CAPCOM Okay glad to hear it, hope you got a good nights sleep.

SPACECRAFT Slept like a log.

CAPCOM Okay, if you notice in your mission summary, there's a comment about a satellite or a upperstage, you might see this morning, and the numbers in the update are a little bit error. We think the closing rate is going to be more like 9000 feet per second. So you're have to look quickly if you're going to see it.

SPACECRAFT Roger, I think you're right about that.

CAPCOM Additionally, we have one correction to your CAP for today at 16:30 it would have you do a PCS reconfig? We want you to postpone that indefinitely, we'll give you a call later in the day to go to the other systems, we'd like to look at this one for awhile and see if we can get some more data on it. We do believe that it's going to leak a little bit.

SPACECRAFT Okay, I'll hold off on the PKS reconfig and wait on your call.

CAPCOM Okay and we have the summary timeline coming up to you this pass.

SPACECRAFT (garble)

CAPCOM And if you don't have anything for us I'll give you a brief verbal rundown of the days activities.

SPACECRAFT Okay go ahead.

CAPCOM Okay we'll spend the day essentially in tail Sun on DAP B2, go with DAP A1 as the backup to be used for some of the IMU work and occasionally going to a different DAP pass called out in the CAP. Early this morning you have the PRCS thermo soak back initiation, and interconnect right OMS to RCS and the backup

END OF TAPE

CAPCOM in tail sun on DAP B2 on this DAP A1 is a backup to be used for some of the IMU work and occasionally going to a different DAP as called out the CAP. Early this morning you have the FRCS thermal soap back initiation, and interconnect right OMS to RCS and the backup NAV test in the nighttime. Then after breakfast, the CDR has a EMU demo. There is 2 and a half hours allowed prior to lunch for that, and he can use as much other time as he thinks necessary. And while T.K.'s doing that, Henry, you'll have the FRCS thermal soap back test. Then after lunch you have a GAS release that will call for a change of DAP, a VTR option. The RMS work, consisting of RAD survey, singularity handling, and unloaded RMS PRCS interaction. Then after dinner, you'll have a DAP change and the FRCS thermal soap back. And those are the major activities for the day, over.

SPACECRAFT Okay. Columbia?

CAPCOM Go ahead.

SPACECRAFT Is it okay if we go ahead and get the water dump now, or is that going to interfere with something down the line?

CAPCOM Standby, one. Henry, in response to your question about the water dump. You have about an hour before you get into the backup NAV test, and the stars are rather low magnitude. But other than that concern, you can go ahead and do it and we think it will take about 40 minutes.

SPACECRAFT Okay, I'll get it going right now then.

CAPCOM And, Henry, I got an update for your water dump numbers.

SPACECRAFT Go ahead.

CAPCOM Roger. Dump A to 90 percent, and B to zero percent, over.

SPACECRAFT 90, B zero.

CAPCOM Okay. We'll see you next at Yarragadee at 58.

SPACECRAFT Okay, see you then.

PAO This is Mission Control, Houston. Mattingly and Hartsfield's wakeup music this morning was Chariots of the Gods, beamed up through the Dakar tracking station. And spacecraft communicator, Brewster Shaw, also briefed them on what today's flight plan activities looked like. Which includes for Mattingly a 2 and a half hour period in which he will go through EMU demo, which means spacesuit tryon in the airlock. This was scheduled originally back on STS-2, but had to be deleted when the flight was cut short, and it was really not in the original crew activity plan for STS-4, except in

the one day extension timeline that was added. So this is a bit of real time flight planning. Also, during the day, there is some other tests of the small RCS thrusters as part of the engineering evaluation that completes the shakedown and ringout of the Orbiter systems on this final orbital flight test. 29 minutes away from Yarragadee, Australia on the 75th orbit. At day 4, 15 hours, 29 minutes, Mission Control, Houston.

CAPCOM Columbia, Houston, for a minute and a half.

SPACECRAFT Okay, got you loud and clear.

CAPCOM Henry, people are worried about the star trackers and the water dump. We'd like you to stop the water dump at this pass, and then continue it again after the backup NAV test and use the same numbers I gave you earlier.

SPACECRAFT Okay, stopping the dump now.

CAPCOM And Henry, I have a NOSL opportunity for you if you could copy.

SPACECRAFT Go ahead.

CAPCOM Roger, there are some nocturnal thunderstorm activity over Central America. The data start is 4 days, 16 hours, and 38 minutes, 40 seconds; latitude 6.0 north; longitude 87.0 west. Comments, it's a night pass, you

END OF TAPE

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CAPCOM the data start is 4 days, 16 hours, 38 minutes, 40 seconds. Latitude 6.0 north, longitude 87.0 west. Comments, it's a night pass, use two magazines with no grading, over.

SPACECRAFT Okay, I got that and we'll try to look for it if we got a break here.

CAPCOM Okay, understand it's during your backup NAV work and we're 20 seconds LOS, we'll see you stateside at 43.

SPACECRAFT Okay.

PAO Mission Control, Houston, about 5 seconds now away from reacquisition of Columbia through Bermuda and MILA, for a very short pass.

CAPCOM Columbia, Houston with you for 5 minutes.

SPACECRAFT Hello there.

CAPCOM Good morning, T.K. And Columbia, we're going to have to update your dump number one more time. It's due to changing the times of the dumps around. We'd like you to dump tank bravo only down to 10 percent. And that will finish us up.

SPACECRAFT Okay, bravo to 10, forget about A. And clear to do that is from now on. Is that correct?

SPACECRAFT Finish your last backup NAV test.

CAPCOM That's affirm. And T.K., for your information, the mission summary that you got up this morning was not quite what we intended to send you. And the one comment in there that you commented about Hank's response yesterday morning, was an erroneous comment on our part, and you should not have gotten that.

SPACECRAFT That's alright. These little 1 page timelines that you folks are putting together is, those things are really helpful. Turns out that we use one of those as our master log to keep track of where we are and the details item we pass back and forth to verify any actions. And they really work out slick. Whoever put that together is doing a good job on that stuff.

CAPCOM Well, we try to help. And T.K., this is not a suggestion or a push in any way, merely a question. If you do intend to do any live T.V. coverage of your EMU work, we'd like to know about in advance.

SPACECRAFT Yeah, I understand Brooster, until I get the camera setup and see what the lighting was like I really don't know what to tell you. I'm going to be recording a good bit of the work on

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VTR, but I think we're using our VTRs up and probably we'll just put it on and let it run continuously, and it depends on busy Hank is, whether he can manage it and put it (garble) wait till we get in a little closer.

CAPCOM Okay, that's fine, we understand that Hank's going to be pretty busy as well while you're doing that. It's just if you decide to do something if you'll let us know sometime in advance so we can be ready for you.

SPACECRAFT Yes sir, we sure will.

CAPCOM Columbia, Houston, we'll see you over Dakar at 54.

SPACECRAFT Okay, sir.

CAPCOM Columbia, Houston with you through Dakar and Madrid for about 8 minutes, standing by.

SPACECRAFT Okay, sir. And Roy, in the continuing saga of where elevons, noticed looking out the window just now that the starboard outboard elevon has gone almost full up. It's not quite all the way up compared to the inboard. And my guess is that the right starboard inboard is probably very close to full up. And I can't see the port outboard, it's far enough down, I can't get to it, we'll see where it is when we get the arm out and look at it with the T.V.

CAPCOM Okay, we copy, thank you for the report. Columbia, Houston, for your information, we've been monitoring the VCS number 2 system, we have been seeing an into leak. The rate is, looks like about 3 pounds in the last hour and a half. And we'll be keeping you advised and we'll be going to the other system probably pretty shortly.

END OF TAPE

CAPCOM Okay we copy, thank you for the report.

CAPCOM Columbia, Houston, for your information we've been monitoring the PCS number 2 systems, we have been seeing an into leak, the rate is, looks like about 3 pounds in the last hour and a half and we'll be keeping you advised and will be going to the other system probably pretty shortly.

SPACECRAFT Okay. Hey Roy, I got a TV camera on liftoff right eleven now and my guess is it is almost full down, not quite.

CAPCOM Okay thank you, T.K.

SPACECRAFT I'll tell you, once you get used to the idea of handling these TVs it's amazing what you can do with them.

CAPCOM Yeah that's a great capability we've been very impressed with the flight.

SPACECRAFT I wish I knew what the color comes out as. There's some things I'd show you if I had any feel that you were getting the same colors we are and I just don't have the appreciation for how well it's working out.

CAPCOM Well we just need to go back and do it again.

SPACECRAFT I think that's right I may need a remedial course of this.

CAPCOM That would be a fun one to take.

SPACECRAFT There's one that, when we get a chance I'd like to dump you on a little snatch of a tape that I took last night, we were watching stars set into the horizon, we thought, and we were surprised when we realized that the stars kept going below the horizon and then we realized that we were seeing the atmosphere, there's a very sharp demarkation above the Earth's surface. That's very, very pronounced and it appears at night to go higher than it does in the daytime. And with the TV I could track stars through there and Hank can track them visually and I can track them on my TV and correlate our results. That was very impressive it shows you how thick the atmosphere is, it explains why people are so anxious to get their telescopes and things out here so you don't have to penetrate all that.

CAPCOM We would like to see that and we'll coordinate some times with you later today when you have an opportunity.

SPACECRAFT Okay what I was going to do is try to pick up, I've got a couple little snaps here and things here now I was going to try to pick out a couple of interesting ones and see if I could put together enough to make you worth your while to dump it.

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CAPCOM Roger that sounds good, be advised on your CAP summary there is a VTR dump set up for 2244. And we're about 5 seconds LOS and we'll see you at IOS at 15.

SPACECRAFT Okay

CAPCOM Columbia, Houston, with you at Indian Ocean for about 6 minutes.

SPACECRAFT Okay, sir, I'm with you.

CAPCOM Roger, Columbia, this is Houston with you for about 5 minutes through Indian Ocean we had a slight problem momentarily.

SPACECRAFT Okay we're still here.

CAPCOM Roger we're just standing by.

SPACECRAFT Boy I've lost track. What orbit number are we on?

CAPCOM We're on orbit number 76.

SPACECRAFT Okay

CAPCOM Columbia, Houston, 30 seconds LOS, see you at Yarragadee at 30.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, with you over Australia for six and a half minutes.

SPACECRAFT Houston, you still there?

CAPCOM Roger go ahead.

SPACECRAFT Okay I think when Hank went to do his exercise I forgot to give you IOB readings, did I give you those?

CAPCOM Roger we would like them if you have time.

SPACECRAFT Okay I'll let Hank read them to you.

CAPCOM Okay

SPACECRAFT Okay, plus 34 and 41.

CAPCOM Break, break. We just copied them off of playback so you don't need to read them.

SPACECRAFT Plus 4 plus 4 and 01, plus 4 and 01, plus 4 and 03. Zero and plus .01, minus .01, plus .06 minus 402 plus .07. Torqued at 4 days, 6

END OF TAPE

SPACECRAFT Okay, first 34 and 41

CAPCOM Break, break, we just copied them off of playback, so you don't need to read them.

SPACECRAFT Swift. +.01, +.01, +.03; 0 +.01, -.01, +.06, -.02, +.07. Torqued at 4 days, 16 hours, 20 minutes, 0 seconds.

CAPCOM Roger, thank you very much, Hank. Columbia, Houston, we're going to loose you for about a minute, we'll see you at Orroral.

SPACECRAFT Okay, see you then.

CAPCOM Columbia, Houston, with you again at Orroral for 5 minutes.

SPACECRAFT Okay, loud and clear.

CAPCOM Roger, you're loud and clear.

SPACECRAFT I just got a treadmill cleaned up and I'm getting some coffee and a sweet roll. It's very, what Ken told you about the treadmill broke this morning.

CAPCOM No, we hadn't heard that.

SPACECRAFT What happened, the little pin you stick through the belts and then slip the large cottered pin through, ripped loose from the cord. It was tied in there with thread and it broke. Found a way to improvise by taking the push cords and hooking them directly to the belt. It kind of hooks you over, but you still get the load and exersie although it's not quite as good. We'll explain it all to Bill when we get back, and show him what happened.

CAPCOM Okay, great. But understand you're still going to try to use it?

SPACECRAFT That's affirmative.

CAPCOM Okay, thanks for the report. And I would like to check with you just a second about some more information on TV today and this is just information and not a suggestion. If you do decide to give us any live TV during the EMU demo, say like on orbit 78. Just let us know over Orroral, preceding the stateside pass, so we can set it up.

SPACECRAFT Okay, about what time is that?

CAPCOM Okay, orbit 78 TV would be at 4 days, 19 hours and 50 minutes. It would be a 7 minute pass over MILA.

SPACECRAFT Okay, thank you.

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CAPCOM Columbia, Houston, we're 30 seconds LOS, see you at MILA at 15.

SPACECRAFT Okay, see you there.

PAO This is Mission Control, Houston. Loss of signal through Ortoral Valley. 30 minutes across the Pacific now on orbit 76 and 77, to AOS MILA. Hank Hartsfield reported that the onboard treadmill for exercise is now caput, but has been improvised where it's workable again. The straps for restraining the exercising crewman, apparently had some thread or seizing where they loops are made, that came loose. And by his improvisation the straps are somewhat shorter and you have to hump over a little bit as he put it. The spacecraft systems people are watching for gathering statistical data on a nitrogen leak in system 2 at a rate of about 2 pounds per hour. This same leak was experienced on STS-3. It then somewhere downstream of the regulator inlet valve leaks overboard. This leak is not mission threatening, nor does it involve any crew safety. And the system could be isolated if it became necessary to stop the leak. But by watching it over several orbits, they can establish a trend on rates and quantities in leak, and perhaps even isolate where the leak is. 28 minutes to the states, at day 4, 17 hours, 47 minutes, Mission Control, Houston.

PAO This is Mission Control, Houston, about 8 seconds away from acquisition through Merritt Island and Bermuda. At this time, Ken Mattingly should be in the midst of getting ready to do the EMU, that is the Extravehicular Mobility Unit space suit demonstration in the airlock.

END OF TAPE

PAO This is Mission Control, Houston, 90 seconds away from acquisition through Merritt Island and Bermuda. At this time Ken Mattingly should be in the mist of getting ready to due the EMU, that is the Extra Vehicular Mobility Unit, or space suit demonstration in the air lock while Hank Hartsfield busies himself with the thermal soakback series of pulse firings of the RCS thrusters.

SPACECRAFT Okay, loud and clear

CAPCOM I hear you loud and clear, we're standing by.

SPACECRAFT Houston, Columbia,

CAPCOM Say again Columbia

SPACECRAFT Okay we just went through a (garble) and we'd like to, Ken and I would both like to pass our thanks to Senator Denton for his kind remarks. We're both mighty proud of our university at Auburn and me being a native Alabamian. I'm especially appreciative of his remarks and like him to know that we appreciate it very much.

CAPCOM Thank you very much for your comments and we'll pass it along.

SPACECRAFT Houston, Columbia, when you look at your RCS data I had a configuration error when I made the first attempt to do the change in the pulse, (garble) your first crack at it we sent the norm and got the 30 second burst.

CAPCOM Roger, we copy.

CAPCOM Columbia, Houston, 30 seconds LOS, Dakar's next at 31.

SPACECRAFT Okay see you there, sir.

CAPCOM Columbia, Houston, with you at Dakar for about 6 minutes. Standing by.

SPACECRAFT Okay, loud and clear.

CAPCOM Roger, you're five by.

CAPCOM Columbia Houston, 30 seconds LOS, Indian Ocean next at 50.

SPACECRAFT Okay, sir, see you then.

CAPCOM Columbia, Houston, with you for eight and a half minutes, standing by.

SPACECRAFT Okay, loud and clear.

CAPCOM Roger, you're five by.

SPACECRAFT Calling Houston, Columbia.

CAPCOM Go ahead, Columbia

SPACECRAFT Could you have someone verify the EVA flight assemblies and the fit check on the helmets that are in the air lock?

CAPCOM Roger, we'll check.

CAPCOM Columbia, Houston, T.K. in answer to your question we understand the light assembly has been fit checked/

SPACECRAFT Okay.

CAPCOM Columbia, Houston, 30 seconds LOS, Yarragadee is next at 06.

SPACECRAFT Okay, see you then.

CAPCOM Columbia, Houston, with you at Yarragadee for eight and a half minutes.

SPACECRAFT Okay, read you loud and clear.

CAPCOM Roger, you're five by.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, we're with you on 2968.

SPACECRAFT Okay, sir, you want to go back to 2597?

CAPCOM We're just monitoring you, if you let us know when you go back we'll switch back.

SPACECRAFT Okay, Carl, (laugh) we were doing the count checks on the EVA thing and I got back on 2968 and forgot to tell you I was switching.

CAPCOM That's no problem at all, we're just trying to keep up with you.

SPACECRAFT Roy, want time did you say that tentative possible TV package was?

CAPCOM Okay that would be coming up on next stateside pass, 4 days, 19 hours, and 50 minutes.

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CAPCOM That's no problem at all. We're just trying to keep up with you.

SPACECRAFT Roy, what time did you say that tentative possible TV pass was?

CAPCOM Okay. That would be coming up on next stateside pass, 4 days, 19 hours, and 50 minutes at MILA.

SPACECRAFT 19:50, copy.

CAPCOM And if you'll let us know at Orroral before we go LOS whether or not you want to do it, we'll have everybody standing by.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, we're about 15 seconds LOS. We'll see you at Orroral in about 30 seconds.

SPACECRAFT Okay. See you there.

CAPCOM Columbia, Houston, with you at Orroral for 5 minutes.

SPACECRAFT Okay. Loud and clear, Roy.

CAPCOM (garble) you're 5 by.

SPACECRAFT Okay. I think we'll go ahead and I think Ken will be at a point where we might get some TV. You might be interested in this, so why don't we go ahead and plan on it?

CAPCOM Okay. We'll set up for live TV at MILA. Thank you, Hank.

CAPCOM Columbia, Houston, we've got a NOSL opportunity approaching Baha, California at 19:44. It's pretty close to your TV and it's your choice whether you want it or not.

SPACECRAFT Okay. We'll see if we can work it in.

CAPCOM Okay. The time is 4 days, 19 hours, 44 minutes, 46 seconds at latitude 15 north, longitude 110 west, TIG one magazine, that'll be at night no grading, and this will be tropical storm Carlada southwest of Baha, Mexico.

SPACECRAFT Okay. We'll be looking.

CAPCOM Columbia, Houston, 30 seconds LOS. See you at MILA at 50.

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SPACECRAFT Okay, sir. See you then.

PAO This is Mission Control, Houston. Loss of signal through the two Australian stations on orbit 77. Thirty minutes across the Pacific again to the states during which time we likely will get a television downlink from Ken Mattingly's activities in the airlock as he tries on the shuttle space suit for the first time in space.

END OF TAPE

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JAN 25

1983

STS-4 AIR/GROUND TRANSCRIPT

PART ONE

PRE-LAUNCH THROUGH MET 02:17:20

KSC The countdown clock will hold in 5 seconds. 3, 3, 1. T-9 minutes and holding. This is a planned 10 minute built-in hold. The final one in our countdown for launch of STS-4 at 11:00 a.m. EDT this morning. All of things in our countdown have proceeded satisfactorily up to the present time, and we are anticipating an on-time liftoff. The countdown T-9 minutes and holding. This is Shuttle launch control. This is Shuttle launch control T-9 minutes and holding. Approximately 5 minutes remaining in this built-in hold, prior to picking up the count once again. Prior to doing that, we'll have a status check to ensure that we're ready to resume the count and go on to launch. Following ignition of the solid motors and liftoff the vehicle will take approximately 7 seconds to clear the tower. At that point the Shuttle velocity will be greater than 100 feet per second and increasing. When the velocity reaches 121 feet per second the vehicle will begin to pitch over followed by a roll maneuver to align it properly with the flight azimuth. At 53 seconds into the flight, the vehicle will encounter the greatest structural loads on it. And the crew will reduce the main engine thrust to 72 percent to help keep the dynamic pressure below 58 pounds per square foot. At 1 minute and 3 seconds into the flight, the vehicle is through the maximum que region, the crew will increase the thrust back to 100 percent. At approximately 2 minutes into the flight, the solid rocket booster chamber pressure will drop below 50 lbs per square inch and the separation sequence will start. The main engines will continue to burn for 8 minutes 81 seconds and the external tank will separate 18 seconds later. At that point, the orbiter will be at an altitude of approximately 60 nautical miles. The orbital maneuvering system will be started at 10 minutes 31 seconds into the flight, and will burn for approximately 1 minute and 38 seconds. This will place it at an egg-shaped orbit with an apogee of 130 nautical miles and a perigee of 58 nautical miles. A second orbital maneuvering burn will also be conducted to circularize the orbit and then 2 additional ones which will be used to raise that orbit to a circular 165 nautical miles. At present time, the system's engineers are discussing measurement on the number 1 fuel cell to determine whether it is acceptable to come out of the hold which should be up 3 minutes from now. The countdown clock at T-9 minutes and holding. This is Shuttle launch control. This is Shuttle launch control, T-9 minutes and holding. We have about 56 seconds remaining before coming out of the hold at the T-9 minute point. We have had a go on the fuel cell and are presently getting goes from the various managers monitoring this morning's launch. Al O'Hara, the launch director, has wished the crew a successful liftoff and mission and says that we will see them in California on the country's 206th anniversary. Center Director Dick Smith wished them a good trip and said God's speed and a war eagle. The war eagle being the battle cry of the Auburn University teams, of which both of our astronauts on this morning's flight are alumnus as well as center director Dick Smith. Coming out of our built-in hold T-9

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minutes and counting. The launch events are now being controlled by the ground launch sequencer from now up to T-25 seconds when they switch to the onboard redundant SEP on sequencer. The ground launch sequencer is part of the launch processing system and operates by relaying command for the orbiter's onboard computers which then report back to the launch processing system, that the commands have been executed. The primary job of the computers is to check that all of the launch commit criteria, such as propellant loads, temperatures, pressures, and other measurements are proper. The launch and recovery director has ordered the chase planes to take off. T-8 minutes 15 seconds and counting.

END OF TAPE

Minus 8 minutes

KSC A number of events will happen during this final 8 minutes of the countdown.

In TD flight

KSC That's T -7 minutes. The orbiter access arm which has remained in place will be retracted. And the astronauts asked to close their visers, and verify their seats in the launch position. At T -6 minutes, they will perform the APU or auxillary power unit prestart. At 5 minutes there will be a go for APU start. The countdown at T-7 minutes 20 seconds, and counting everything continuing to go smoothly towards an on time lift-off at 11 a.m. Eastern daylight time this morning. The liquid oxygen fill and drain valve and the external tank has been closed and topping of the tank completed. The crew access arm will be retracted just seconds from now, and has started to move. This is the walk way used by the crew to walk from the service structure on the pad to the Orbiter. If an emergency occurs, it can be replaced, within 15 seconds.

SPACECRAFT 6:45

KSC The crew has been advised to lower their helmet visor's and verify that their seats are in launch position.

SPACECRAFT The hydraulic bus recorder that T-6

KSC T-6 minutes, 35 seconds and counting. At the 6 minute point, the crew will perform the auxillary power unit prestart, which consists of positioning a number of switches and verifying that they are in the proper position. Then, throwing the 3 propellant isolation valve switches, which allows the hydrazine fuel to start flowing from the tanks, toward the APUs. Coming up on the 6 minute point

SPACECRAFT T-6 minutes

KSC T-6 minutes, and counting. The pilot Henry Hartsfield has been asked to perform the APU prestart.

SPACECRAFT Flight OTC.

SPACECRAFT Transmitt recorder command.

CAPCOM Copy, Wilco.

KSC T-5 minutes, 30 seconds and counting. The development flight instrumentation recorders are on. The DFI provides measurement on temperatures, pressures and physical stresses in the Orbiter. The recorder stores this information

for playback after landing. Coming up on the 5 minute point, 12 seconds away the Orbiter flight recorders are on

SPACECRAFT Coming up on T-5 minutes

KSC Coming up on T-5,

SPACECRAFT Mark.

KSC T-5 minutes and counting. And we have a go for APU start. T-4 minutes 50 seconds and counting.

SPACECRAFT OTC, reconfigure heaters.

KSC The APU start is complete. The APUs provide hydraulic power to move the aero space, aero surfaces, and main engines for steering. T-4 minutes, 30 seconds and counting. The firing circuit for the solid rocket booster ignition and range safety destructive vices have been on. This is done with a motor driven switch called a safe 7 arm device. T-4 minutes, 15 seconds and counting. At 4 minutes, and 30 seconds the main fuel valve heaters were turned off and preparation for engine start. T-4 minutes, and counting. The main engines on the Orbiter will actually be started at T-6.8 seconds. It takes 3 seconds for them to reach 90% thrust at which time the solid rocket ignition sequence starts, culminating with ignition and liftoff at T 0. The final helium purge of the Orbiters main engine has started, to ensure there is no surplus hydrogen or oxygen in the area at the time of ignition. T-3 minutes, 30 seconds, and counting. The elevon speed brakes and rudders are moved through a preprogram pattern at this point to ensure they are ready to be used during flight. The shuttle is now on internal power, however the fuel cells are still receiving their fuels from ground support equipments for another minute. T-3 minutes, 5 seconds and counting. The engine gimbal or movement check is under way. T-3 minutes, and counting.

END OF TAPE

T-2 minutes 54 seconds, the liquid oxygen valve for filling the external tank is closed and pressurization has begun. After the tank is pressurized, the hold capability is limited to 3 minutes and 36 seconds. T-2 minutes 40 seconds and counting, the gaseous oxygen vent arm is be retracted. T-2 minutes 30 seconds. The fuel cell ground supply of oxygen and hydrogen has been terminated and the vehicle is now using it's onboard supply. The gaseous oxygen vent arm has been retracted, T-2 minutes 15 seconds and counting. The main engines have been moved to start position. The astronauts have cleared the caution and memory warnings in their onboard computers and verified there are no unexpected errors. T-2 minutes and counting. The astronauts are configuring auxiliary power units for liftoff. The liquid hydrogen vent valve has been closed and flight pressurization underway. T-1 minute 45 seconds. The computer will automatically verify the readiness of the main engines to start at T-1 minute. T-90 seconds and counting. T-1 minute 20 seconds and counting. The liquid hydrogen tank is at flight pressure. Coming up on the 1 minute point in our countdown.

SPACECRAFT Coming up on T-1 minute.

KSC T-1 minute and counting. The firing system for the sound suppression water system on the pad is on. T-45 seconds, we're 14 seconds away from switching command of the countdown from the ground computers to the onboard computers and the development flight instrumentation recorders are on. T-35 seconds, the GOX vent arm is fully retracted and we're switching control of the countdown to the onboard computers. T-25 seconds, the SRB hydraulic power units have started. T-20 seconds and counting, T-15, T-10-9-8-7-6 we have main engine ignition 4-3-2-1 and we have solid motor ignition and liftoff. Liftoff of America's Space Shuttle on it's 4th mission and we have cleared the tower.

PAO Houston now controlling Mission Control confirms roll maneuvers started. 20 seconds thrust looks good. 26 seconds, the roll maneuver completed, 30 seconds 1 nautical mile in altitude throttling engines down to 65 percent now as programmed. 36 seconds plot board status looks good Mission Control. 42 seconds, Columbia now 3 nautical miles altitude, 46 seconds coming up on (garble) a maximum air dynamic pressure on the vehicle. 52 seconds, Columbia now 4 nautical miles in altitude 56 seconds past through max que still looking good, throttling engines give it a go at throttle

SPACECRAFT Roger, go at throttle up.

PAO Mark, 1 minute 10 seconds Columbia now 7 nautical miles in altitude 4 nautical miles downrange. 1 minute 20 seconds now 9 nautical miles in altitude, 6 nautical miles downrange. 1 minute 30 seconds, Columbia now 12 nautical STS-4

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miles in altitude, 9 nautical miles downrange Velocity now reading 3900 feet per second. 1 minute 42 seconds coming up now on negative seats where altitude is too high for ejection seat use.

CAPCOM Columbia, Houston, negative seats.

SPACECRAFT Roger, negative seats.

PAO 1 minute 57 seconds, Columbia now 21 nautical miles in altitude, 21 nautical miles downrange 2 minutes 3 seconds standing by for solid rocket booster separation. 2 minutes, 14 seconds confirmed solid rocket booster separation. 2 minutes 20 seconds onboard guidance is converging as programmed.

END OF TAPE

PAO Columbia is now straying for a precise one in space.

SPACECRAFT (garble) station, if you'll watch (garble) for us, I've got it on.

CAPCOM Roger, Columbia. We copy. We're watching.

PAO 2 minutes 35 second. Columbia now 33 nautical miles in altitude. 2 minutes, 43 seconds...

CAPCOM ...you're mode boundary calls will be light due to a depressed trajectory.

SPACECRAFT Alright, sir, thank you.

PAO 2 minutes, 50 seconds. We'll standby for 2 engine TAL capability.

CAPCOM Columbia, Houston. You have two engine TAL capability.

SPACECRAFT Roger, 2 engine TAL.

PAO 3 minutes, 12 seconds. That call up by CAPCOMM, Dave Griggs says that Columbia now has landing capability at the DACAR airport should 1 engine go out. 3 minutes, 20 seconds. Columbia now 44 nautical miles in altitude, 83 nautical miles downrange. A return status check in mission control by flight director, Tom Holloway. 3 minutes, 35 seconds. Mattingly and Hartsfield give it a go to continue. 3 minutes, 40 seconds. Columbia now 48 nautical miles in altitude, 102 nautical miles downrange. Velocity now reading 7800 feet per second. 3 ...

SPACECRAFT (garble)

PAO Standing by for negative return.

CAPCOMM Standby for negative return, mark. Negative return.

SPACECRAFT Roger, negative return.

PAO 4 minutes, 8 seconds. With that call up Mattingly and Hartsfield committed to Space travel, they can no longer turn around and return to the launch site. 4 minutes, 15 seconds. Columbia now 53 nautical miles in altitude, 142 nautical miles downrange. Still riding on 3 good engines. Columbia now traveling at a velocity of 9100 feet per second. 4 minutes, 30 seconds, of flash evaporators activated to provide cooling for Columbia. 4 minutes, 46 seconds, we'll standby for the press to MECO call up by CAPCOM Dave Griggs. 4 minutes 55 seconds, STS-4

Columbia now 57 nautical miles in altitude, 193 nautical miles downrange.

CAPCOM Columbia, Houston. You are go at 5.

SPACECRAFT Roger, go at 5.

CAPCOM Standby for press to MECO. Mark, press to MECO.

SPACECRAFT Roger, press to MECO.

PAO 5 minutes, 16 seconds of press to MECO call from CAPCOM Griggs says should Columbia lose but 1 engine, press on, keep flying forward, Columbia's engines have enough energy to achieve normal altitude and velocity at cutoff. Columbia now 58 nautical miles in altitude, 243 nautical miles downrange. Velocity now reading 12,000 feet per second. Mark, 5 minutes, 45 seconds. Columbia now 58 nautical miles in altitude, 262 nautical miles downrange. 5 minutes, 58 seconds. We'll standby for single engine TAL capability. Columbia now 58 nautical miles in altitude.

CAPCOM Columbia, Houston. You have single engine TAL capability.

PAO Mark, 6 minutes, 12 seconds. That report from CAPCOM Griggs indicates if a 2 engine failure occurred, Mattingly and Hartsfield are capable of an emergency landing at the DECAR airport. 6 minutes, 25 seconds. Columbia now 58 nautical miles in altitude, 358 nautical miles downrange. Velocity now reading 15,400 per second. 6 minutes, 40 seconds. Trajectory plots in mission control still on target. 6 minutes, 48 seconds. Columbia now 57 nautical miles in altitude, 412 nautical miles downrange. Columbia pitching over now, diving to increase velocity, decrease altitude, giving Columbia a more favorable attitude. 7 minutes, 5 seconds. Columbia now 50 - standing by for single engine press to MECO...

CAPCOM (garble) you are single engine press to MECO.

SPACECRAFT Roger, single engine press.

PAO 7 minutes, 18 seconds. That report says that Mattingly and Hartsfield could achieve normal engine cutoff target even if 2 engines go out. 7 minutes, 25 seconds. Columbia now 56 nautical miles in altitude, 515 nautical miles downrange. Velocity now reading 19,900 feet per second. 7 minutes, 40 seconds. G force is building for Mattingly and Hartsfield now coming up to 3 g's. Columbia now 56 nautical miles in altitude.

END OF TAPE

PAO -- 570 nautical mile down range. 7 minutes, 55 seconds Columbia's 3 main engines, slowly being throttled back now, should be throttled at 65%, at 6 seconds before main engine cutoff. Flight dynamics reports velocity of 23,000 ft. per second. Mark 8 minutes, 10 seconds, Columbia now 57 nautical miles altitude, 656 nautical miles down range. 8 minutes 20 seconds, status looks good Mission Control. 8 minutes 29 seconds, standing by now for main engine cutoff. 8 minutes 40 seconds, confirmed shutdown. Columbia returned to space for the fourth time, not yet returned to orbit. Standing by now for external tank separation. Confirm external tank separation. Columbia now moving below and beyond the external tank. GO/NO GO status check in Mission Control by Flight Director Tom Holloway, for the first OMS burn, and shutting down the auxiliary power units.

CAPCOM Columbia, Houston, you're go for nominal OMS one, APU shutdown on time.

SPACECRAFT Thank you David.

PAO 9 minutes, 30 seconds Columbia given a go for the first OMS burn. Columbia will now be maneuvering to OMS one burn attitude.

CAPCOM Columbia, Houston, the thermal evap heater messages can be ignored.

SPACECRAFT Okay, thanks. I was wondering about that.

PAO Using the two 6,000 lb. thrust engines.

CAPCOM Houston, and the APU thermal can be ignored also.

SPACECRAFT Thank you David.

PAO OMS one will be (garble) moving Columbia forward and higher on her flight path. 10 minutes mission elapsed time about a minute and a half away from the loss of signal. Columbia now in proper attitude for the first OMS burn. Prop systems engineer reports ignition on both OMS engine looks good.

CAPCOM Columbia, Houston, we are 30 seconds to LOS. Configure LOS. Talk to you next at the DAKAR.

SPACECRAFT Okay. See you there Dave.

PAO 11 minutes, 40 seconds mission elapsed time a loss of signal now with Columbia with Bermuda, the next station to acquire will be DAKAR, in a little less than 6 minutes. This is Shuttle Control Houston. Shuttle Control Houston, 13 minutes, 18 seconds Mission Elapsed Time, flight dynamics officer Ron Epps,

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reports the following predicted numbers for the first OMS burn. Time of ignition 10 minutes, 39.3 seconds. Delta V 153.5 ft. per second. Burn duration 1 minute 30.5 seconds a resulting apogee of 130 nautical miles. A resulting perigee of 33.3 nautical miles. At 14 minutes, Mission Elapsed Time, this is Shuttle Control, Houston. Shuttle Control, Houston, 17 minutes 28 seconds standing by for reacquisition.

CAPCOM (garble) DAKAR for about 6 minutes. Configure AOS and we are standing by for gimbal check.

SPACECRAFT Okay (garble) we just got a forward RCS message on manifold left one.

CAPCOM Roger, Columbia, we see that.

PAO 18 minutes, 40 seconds, that was a report of a RCS leak message. The RCS known as FL. We'll standby and continue to monitor.

CAPCOM Columbia, Houston, configuration we would like see RT3 on GPC 3.

PAO The RCS jet in question is forward manifold 1 left firing. 19 minutes, 40 seconds, continuing to monitor this is Shuttle Control Houston.

END OF TAPE

SPACECRAFT Houston, copy. I don't see any divergence between the fuel and option that I saw on the pad (garble). Do you?

CAPCOM Standby, Hank, we're looking. Columbia, Houston, we're satisfied. Currently with your forward RCS configuration, we'll continue to watch it and advise you of the changes.

SPACECRAFT Okay, sir, thank you.

PAO That was CAPCOM, Dave Griggs speaking with Hank Hartsfield aboard Columbia. 23 minutes mission elapsed time, a little over a minute away now from loss-of-signal with Columbia. We'll standby and continue to monitor.

CAPCOM Columbia, Houston. We are 30 seconds to L-O-S, configure L-O-S. You are go for a nominal OMS 2. PVC looks good. You're onboard target solution looks good. As a reminder, you'd like to DFI PCM to high sample after your vacuum inerting.

SPACECRAFT Thank you, Dave. (garble) just got an (garble) tempt on low on fuel cell 1 and 3.30. It's popping on and off between 1:30 and 1.31.

CAPCOM Roger, Columbia. We copy.

PAO This is Shuttle Control, Houston. 25 minutes, 20 seconds mission elapsed time. Loss-of-signal now with Columbia. The next station to acquire will be Botswana in a bit over 9 minutes, however, that's a very short duration pass. That's less than 40 seconds in duration. Yarragadee will be acquired at about 26 minutes from now. The - Hawaii will be the next station to acquire in which we will receive data. At 26 minutes, 15 seconds mission elapsed time, this is Shuttle Control, Houston. Shuttle Control Houston, 28 mission elapsed time. Flight dynamics officer Ron Epps has passed along a further OMS burn numbers. The resulting - for the refined numbers for the first OMS burn are as follows. The time of ignition was 10 minutes, 32.6 seconds. The delta-v in fact was 154 feet per second. The burn duration was 1 minute, 37.7 seconds. The apogee read 130 nautical miles and the perigee read 33.3 nautical miles. His forecast for the second OMS burn gives a time of ignition of 37 minutes, 40.6 seconds, delta-v of 175 feet per second. A burn duration of 1 minute, 47.1 seconds, giving an apogee and perigee of 130 by 130 nautical miles. The OMS 2 is up. The OMS transfer bringing the perigee up close to make a circular orbit. We're at 29 minutes, 30 seconds mission elapsed time. This is Shuttle Control, Houston. Shuttle Control, Houston. 34 minutes, 20 seconds mission elapsed time. Less than half a minute away now from a short burst of acquisition through Botswana. That's a pass of 37 seconds in duration. We'll continue to monitor in the event we have any voice contact with Mattingly and Hartsfield. Shuttle Control, Houston. 36

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minutes mission elapsed time. No contact through Botswana. Yarragadee is a little less than 16 minutes away. This is Shuttle Control, Houston. Shuttle Control, Houston. 37 minutes, 35 seconds mission elapsed time. Although we're out of station contact, Columbia should be coming up on the time of ignition for the second OMS burn. Three major events must occur in the next few --

END OF TAPE

PAO -- hours for Mattingly and Hartsfield aboard Columbia to stay on orbit. First the onorbit computer system must be reloaded from OPS 1 to OPS 2. This is needed to aline the inertial platforms. Also, one computer will be loaded with OPS 3 the entry program and put to sleep -- taken off-line. Second the payload bay doors must be opened to provide cooling through the radiators to Columbia. The flash evaporator has a lifetime of several hours. Third, at least two of the three fuel cells must be purged with hydrogen and oxygen to rid the impurities the fuel cells can survive only so many hours without purging. We're at 38 minutes 39 seconds mission elapsed time this is Shuttle Control Houston.

PAO This is Shuttle Control Houston at 51 minutes mission elapsed time less than a minute away now from reacquisition of Columbia through Yarragadee this will be a voice contact only station. We'll standby and monitor the conversation as it takes place. This is Shuttle Control Houston.

CAPCOM Columbia, Houston, with you through Yarragadee for approximately 7 minutes, go ahead.

SPACECRAFT Hello there sir, we're here and everything on OMS 2 (garble). Out of the seat we're getting all stored, things like that. -- So far is that we get a nuisance a lot on that fuel cell exit temp, it's come on numerous times. (garble) a little over 130 but it's been as high as 134 which it is right now, it gets down to 130 and starts toddling (garble) C&W.

CAPCOM Roger, Columbia, we're having a little trouble picking you up through Yarragadee on downlink but we copied most of that and we recommend changing cryo tank O2 tanks 1 and 2 A heaters to OFF to improve the low temperature exit temperatures on fuel cell 1.

PAO That was CAPCOM Dave Griggs speaking to both Mattingly and Hartsfield. Mattingly spoke first as we acquired Columbia through Yarragadee.

CAPCOM Columbia, Houston, did you copy O2 tanks 1 and 2 A heaters OFF

SPACECRAFT Houston, Columbia, you're breaking up bad we can't reach it.

CAPCOM Roger, Hank, I'll try again. To improve the fuel cell 1 exit temperature problem, recommend O2 tanks 1 and 2 A heaters OFF.

SPACECRAFT Okay, I have O2 tanks 1 and 2 A heaters to OFF.

CAPCOM Roger, Hank we copy.

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PAO Shuttle Control Houston 55 minutes mission elapsed time very scratchy communications on this first station pass over Yarragadee. Yarragadee is a UHF station. 55 minutes mission elapsed time we'll continue to monitor. This is Shuttle Control Houston. Shuttle Control Houston 55 minutes 30 seconds mission elapsed time we've also had a report, of course, that the second OMS burn went as programmed.

CAPCOM Columbia, Houston, we are 30 seconds to LOS Hawaii next.

SPACECRAFT Okay Dave, see you there.

CAPCOM Roger.

PAO This is Shuttle Control Houston at 59 minutes mission elapsed time. Loss of signal now with Columbia through Yarragadee. The next station to acquire will be Hawaii in a little more than 18 minutes. This is Shuttle Control Houston.

END OF TAPE

PAO This is Shuttle Control, Houston. 1 hour 12 minutes mission elapsed time. We've just received the heart rate numbers from the flight surgeon. During the ascent phase of the mission both the commander and the pilot peaked at 110 in the case of commander Ken Mattingly, his heart rate peaked at 110 right at lift off and it would appear in the case of pilot Henry Hartsfield, his rate peaked at 110 very close to main engine cutoff time. At 1 hour 13 minutes mission elapsed time, this is Shuttle Control, Houston. Shuttle Control Houston. 1 hour 13 minutes. It also appears in the case of pilot Hartsfield, he had peaked at 110 at liftoff as well as main engine cutoff. This is Shuttle Control Houston. Shuttle Control Houston. 1 hour 17 minutes mission elapsed time. Reacquisition of signal coming up through Hawaii.

CAPCOM Columbia, Houston. With you through Hawaii for approximately 6 minutes. Go ahead.

SPACECRAFT Houston, read you loud and clear. We got the dips transmission complete. Ken's in the aft station shutting some switches. And Dave, how do you read.

CAPCOM Roger, TK we got you loud and clear.

SPACECRAFT Okay, sir. Working in the aft. I'm on the wireless now and the only thing I've seen so far is pedal R12L. The galleys supply - I've got a barber pole talk back on that fellow I just noticed and I think he's generally - it says opener close and just giving you that for information.

CAPCOM Roger, TK. We copy that. And Columbia, Houston. We'd like the BFS to halt.

SPACECRAFT Okay. We getting over that way. I just haven't gotten out of my seat to go over and do that. I'll take care of that. Complete everything on that transition Dave, except the final switch configuration. That's the only thing left.

CAPCOM Roger, Hank. Columbia, Houston. We need you in the payload bay door opening attitude or delay the opening until 1 + 40.

SPACECRAFT Okay, I'll start us on our way.

CAPCOM Roger. Columbia, Houston. We need you to go to track on your maneuver, current maneuver.

PAO Shuttle Control Houston. 1 hour 22 minutes mission elapsed time. About 2 minutes remaining on this pass over Hawaii. Columbia's onboard computer system now configured for ops 2.

CAPCOM And Columbia from Houston we'd like to upstate the verbal parameters if you give us SM spec 1.

SPACECRAFT Okay, I'll give them to you on the CRT pass.

CAPCOM Columbia, Houston. We're about 45 second till L-O-S. We're going to get behind on our dumps unless we can get the BFS to halt to permit INCO to uplink.

SPACECRAFT Okay, we'll get it now.

CAPCOM Roger. And Columbia, Houston. We're through with SM spec 1. We'll need spec 1 GNC at the states.

SPACECRAFT Okay.

PAO This is Shuttle Control Houston at 1 hour 24-1/2 minutes mission elapsed time. Loss-of-signal now with Columbia now through Hawaii. We will next acquire Columbia during her first stateside pass. Meanwhile, the crew will be coming up on the work on the payload bay door, both Mattingly and Hartsfield are at the back station for this operation. Unlike STS-3, no fuel lights sighting will be taken prior to the start of the first door opening operation.

END OF TAPE

PAO The door opening sequence goes as follows. The port aft bulk head latches are first cycled. These were replaced after use on STS-3. The payload bay doors are then automatically opened. The port door is closed, then the starboard door is brought down, close, before closing and latching. Both doors are again automatically opened this time for on-orbit operations. We are a little less than 2 minutes away now from reacquisition, this is Shuttle Control, Houston. This is Shuttle Control Houston, at 1 hour, 27 minutes Mission Elapsed Time, less than 30 seconds away now from reacquisition of Columbia during her first state side pass. We will standby and monitor. Shuttle Control, Houston 1 hour 28 minutes Mission Elapsed Time, we have acquisition of signal through Buckhorn.

CAPCOM Columbia, Houston, with you through Buckhorn on UHF, how copy?

SPACECRAFT Loud and clear, Dave.

CAPCOM Okay, we are having some S-Band downlink problems. And we've tracked down the galley supply barber pole talkback, we believe that's normal for your current configuration circuit breaker on ML86B to be set later will correct it.

SPACECRAFT Okay, Sir.

SPACECRAFT Down in the middeck right now. Be back on the top deck in a minute and Henry's still switching comm units.

CAPCOM Roger, copy.

SPACECRAFT (garble)

CAPCOM Columbia, Houston to improve comm we would like you to select manual upper left antenna.

SPACECRAFT How do you read PLT.

CAPCOM Roger, Hank. We got you loud and clear. And Hank we are having S-Band downlink problems, request you go manual, select upper left antenna.

SPACECRAFT Now you got it.

CAPCOM Roger.

PAO Shuttle Control, Houston, 1 hour 32 minutes Mission Elapsed Time. Because of the S-Band, and downlink problems we are still not receiving data in the Control Center. CAPCOM Dave Griggs, is presently talking to Mattingly and Hartsfield through UHF. We are 1 hour, 32 1/2 minutes Mission Elapsed Time. This is Shuttle Control, Houston.

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CAPCOM Columbia, Houston, request select lower right antenna.

SPACECRAFT Okay.

CAPCOM Roger. Columbia, Houston, we are still without S-Band, request upper right antenna. Columbia, Houston with you through MILA for 10 minutes go ahead.

SPACECRAFT Okay, Dave got you loud and clear.

CAPCOM Roger, and we do have S-Band downlink at this time.

PAO Shuttle --

SPACECRAFT Got you GNC spec 1 on (garble).

CAPCOM Roger, we see it. Thank you. We will give you a call when we are through with it.

PAO Shuttle Control, Houston, 1 hour, 36 minutes Mission Elapsed Time. Now receiving data in Mission Control through MILA.

SPACECRAFT (garble)

CAPCOM Columbia, Houston, we are through with GNC spec one and you can go back to GPC on the antenna's.

PAO This is Shuttle Control, Houston, 1 hour, 39 minutes Mission Elapsed Time. Monitoring, the payload bay door displays no activity yet, on the payload bay door opening.

END OF TAPE

PAO 1 hour 41 minutes mission elapsed time. We show the port aft latches on the bulkhead have been released, the start of the payload bay door operations. The port aft bulkhead latch has been cycled back. Closed again. We're 1 hour 43 minutes mission elapsed time. About 3 and a half minutes remaining on this pass. The automatic door opening sequence has begun. Centerline latches are coming open. Latches 5 through 12 now show open. All center line latches are now open. We show the starboard bulkhead latches open. We now show the starboard door is open. We're at 1 hour 45 minutes mission elapsed time. The port latches are beginning to open or be released. All the latches are released.

CAPCOM Columbia, Houston. (garble) LOS. We aren't go for VRCS at this time due to temperatures. We expect to be go by Ascension. Entry REFSMATs are onboard. You're go to clear the CAMs and we'll have some information on fuel cell 1 configuration changes due to the temperature problem, for you at Ascension.

SPACECRAFT Okay, David. I'm just getting the port door open now and all the things are running a little bit ahead of time and think we've got most of our chores here. We're back on schedule. We ought to make up a bit here in the next few minutes. And I'll copy that stuff from you next time go, DAKAR.

CAPCOM Roger, we copy. See you at Ascension.

PAO 1 hour 46 minutes mission elapsed time. Loss of signal now with Columbia. At the close of that pass we showed both the starboard and port doors as being open. 1 hour 47 minutes mission elapsed time.

PAO 1 hour 52 minutes mission elapsed time less than a minute away now from reacquisition of Columbia through DAKAR. This is a very low elevation pass so we'll stand by and see if we actually have any contact with the crew. Acquisition with Ascension is about 3 minutes away now. 1 hour 52 minutes mission elapsed time. We have AOS DAKAR. 1 hour 53 minutes elapsed time.

CAPCOM Columbia, Houston. With you through DAKAR and Ascension for 9 minutes.

SPACECRAFT Okay, Dave.

CAPCOM Roger. We copy.

PAO Shuttle Control Houston at 1 hour 55 minutes mission elapsed time. The crew aboard Columbia continuing with their payload bay door sequence. They presently have the port door closed and the starboard door close to being closed. We're

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at 1 hour 55 minutes mission elapsed time this is Shuttle Control
Houston.

SPACECRAFT (garble)

PAO Both the starboard and port doors are closed
now.

END OF TAPE

PAO The bulkhead latches - are all latched. Shuttle Control Houston, 1 hour 57 minutes mission elapsed time. All of the latches, the bulkhead and centerline latches are presently closed and latched.

SPACECRAFT Houston, you still with us?

CAPCOM Roger, TK, we got you loud and clear. Go ahead.

SPACECRAFT Okay, just give you a little status on where we are. I got all of the times coming in - we checked the 2 doors together. The - I'd have to say that all the latches are going to hit exactly the same time and they all look like - absolutely nominal drawing you had in your PDP we're currently in the process of opening the doors for what we hope will be the last time for a couple of days.

CAPCOM Roger, TK. Sounds good down here.

PAO That's CAPCOM Dave Griqqs responding to commander Ken Mattingly. We presently show all of the center line latches released now.

SPACECRAFT Okay, Dave. We got the star board door is now in it's opening cycle and it moves with an (garble) right but it's not jerky. It's a smooth but a very rate.

CAPCOM Roger, copy. We believe that to be normal.

SPACECRAFT Oh yes sir. I wasn't throwing any concern over it. It's kinda hard to be quiet.

CAPCOM Roger, I understand.

PAO Shuttle Control Houston. 1 hour 59 minutes 48 seconds mission elapsed time. We show the star board door open now. Shuttle Control Houston, 1 hour - 2 hours 1 minute mission elapsed time. We show both the star board and port doors open now. This will conclude the payload bay door activity for today. Less than 1 minute away from Loss-of-signal with Columbia through Ascension. This is Shuttle Control Houston.

SPACECRAFT And Dave, we got the doors open and we're setting up shop.

CAPCOM Roger, Columbia. Sounds good. We're 20 seconds to L-O-S. Botswana next at 7 minutes past the hour. Talk to you the're.

SPACECRAFT Okay, sir.

CAPCOM And prop informs me that you're go for verniers.

SPACECRAFT Okay, I understand. That the temperatures are good verniers and as soon as I get the high load off we'll transition.

CAPCOM Roger. Talk to you at Botswana.

SPACECRAFT Roger.

PAO Shuttle Control Houston. 2 hours 7 minutes mission elapsed time. Standing by for reacquisition of Columbia through Botswana.

CAPCOM Columbia, Houston. With you through Botswana for about 6 minutes.

SPACECRAFT Alright, sir.

CAPCOM Columbia, Houston. You can disregard the H2O tank message. That's on tank b at 10 percent. We should have changed it prior to flight.

SPACECRAFT Okay, thank you, Dave. (garble) Houston, Columbia.

CAPCOM Go ahead Columbia. We have you.

SPACECRAFT Okay, Dave. I didn't remember whether you had given us a formal go for orbit or not.

CAPCOM We hadn't yet but we intend to. You have a formal go for orbit.

SPACECRAFT Alright, sir. In that case, we'll get out of our formal go for orbit clothes and get into something more comfortable. Henry's on the mid deck, starting...

END OF TAPE

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SPACECRAFT Middeck starting in on that activity now. I'll of mind the store top side (garble).

CAPCOM Roger, we copy.

PAO Shuttle Control, Houston, 2 hours, 12 minutes, Mission Elapsed Time, that was CAPCOM Dave Griggs passing along to Commander Ken Mattingly onboard Columbia. A formal go to remain on orbit. The remark from Mattingly indicated that they would change out of their space suit.

CAPCOM Columbia, Houston we are 30 seconds to LOS at Botswana, Yarragadee next. UHF at Yarragadee was shakey ORB one, if we don't talk to you there not to worry.

SPACECRAFT Okay, Dave, thank you very much.

PAO Shuttle Control, Houston, 2 hours 14 minutes Mission Elapsed Time loss of signal now with Columbia through Botswana. We acquire Yarragadee in a little less than 13 minutes. This is Shuttle Control, Houston. This is Shuttle Control, Houston, at 2 hours, 27 minutes Mission Elapsed Time standing by for reacquisition of Columbia through Yarragadee.

CAPCOM Columbia, Houston with you through Yarragadee for 6 minutes.

SPACECRAFT Okay, Dave. I can read you, how me?

CAPCOM Roger. Much better this time T. K..

SPACECRAFT You are very weak, so we will have to go slow. We were just getting ready to finish our middecks configuration and Hank was getting ready to do his suit/doff. And I got my temperatures down. Each time I took the payload heat exchanger, put it to the payload position for both loops 1 and loops 2, I got a master alarm at the time I took the switch to payload heat exchanger position. And on spec 88 I've got a couple of missing parameters on loop 1 and it makes me think I got a signal conditioner problem somewhere.

CAPCOM Okay, we copy all that T. K. EECOMs looking at it.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, T. K. can you identify the missing parameters?

SPACECRAFT Sorry, just a second. What is

CAPCOM Columbia, Houston believe UHF is breaking up. We have not copied the missing parameters.

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SPACECRAFT Dave, go ahead now.

CAPCOM Right, I think we are hearing you better now, go ahead now with the missing parameters.

SPACECRAFT Okay, you are very weak, I'll go on the assumption you can hear me. On spec 88 up in the right hand corner I got water loop number 1, pump delta P on zero low. The interchanger flow is 1 low. Interchanger outlet temperature is 71 high. In the lower left hand corner of that same spec, under the evaporator section, I have topping and high/low, both A & B, zero's and low. That's four parameters.

CAPCOM Roger, we copy. Columbia, Houston if you are not in payload position on the interchanger, go ahead and select payloads this time.

SPACECRAFT Okay, I am in payload Dave.

CAPCOM Roger.

END OF TAPE

PAO Columbia, Houston. 30 seconds to L-O-S. Hawaii next at 2 + 51.

SPACECRAFT Okay, Dave.

PAO This is Shuttle Control Houston at 2 hours 33 minutes mission elapsed time. Loss-of-signal now with Columbia through Yarragadee. We should reacquire Columbia in about 18-1/2 minutes over Hawaii.

SPACECRAFT Houston, contacts Sunnyvale paycomm.

CAPCOM Read you loud and clear, Ken, it's good. You getting good checks.

Houston contact, this is Sunnyvale. Can we verify that we're keying to air to ground 1 and UHF simultaneously?

CAPCOM Roger, you may try.

Alright, I'll give you a call on air to ground 1. Houston, contact, Sunnyvale on air to ground 1 and UHF simultaneously.

CAPCOM Give it to me one more time.

Roger, Houston contact, this is Sunnyvale, paycomm on air to ground 1 and UHF simul.

CAPCOM Now you're only keying on air to ground 1. You're not keying on UHF.

Roger, but we keyed all three individually without trouble?

CAPCOM That's affirmative.

Okay, we'll look into that.

CAPCOM Okay.

Sunnyvale out contact.

PAO Shuttle Control Houston. 2 hours 51 minutes mission elapsed time. We're standing by for reacquisition of signal through Hawaii. Processing data through Hawaii now.

CAPCOM Columbia, Houston. With you through Hawaii for approximately 8 minutes.

SPACECRAFT Okay, sir.

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1960. *Journal of the Royal Society of Medicine*, 53, 1-10.

1961. *Journal of the Royal Society of Medicine*, 54, 1-10.

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CHICAGO, ILLINOIS 60637

TO: THE DIRECTOR, NATIONAL BUREAU OF STANDARDS
433 RIVER ROAD
GAITHERSBURG, MARYLAND 20885

DATE: 10/15/77
BY: [Signature]

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4. The fourth part of the document is a list of names and addresses of the members of the committee.

1. The first step in the process of the scientific method is to make an observation or ask a question.

2. Next, you do research to learn what is already known about the topic.

3. Then, you make a hypothesis, a prediction that can be tested.

4. After that, you test your hypothesis by conducting an experiment.

5. You then analyze the data you collect and draw a conclusion based on the results.

6. Finally, you communicate your findings to others in the scientific community.

7. The scientific method is a systematic way of gathering information and testing ideas.

8. It is used by scientists to study the natural world and to develop new technologies.

9. The scientific method is a key part of the scientific process.

10. It helps scientists to understand the world around them and to solve problems.

11. The scientific method is a process that is used by scientists to study the natural world and to develop new technologies.

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CAPCOM Columbia Houston, 40 seconds to LOS. Santiago is next at 8 plus zero 7.

SPACECRAFT Okay. See you there.

CAPCOM Roger.

PAO Mission Control Houston, 7 hours, 45 minutes Mission Elapsed Time. Just passed out of the range of the Hawaii tracking station. Have a long swing out over the Pacific Ocean here and we will reacquire in about 21 minutes in a brief pass over the Santiago tracking station just skirting the northern edge of that. Crew finishing up their meal period at this time; is currently maneuvering to an attitude to align the inertial measurement units. We're about an hour and 43 minutes away from the scheduled beginning of the crew sleep period. Crew will be going to sleep a little bit early on this mission and getting up very early in the morning to begin their day. At 7 hours, 46 minutes Mission Elapsed Time, this is Mission Control Houston.

PAO Mission Control Houston, 8 hours, 6 minutes Mission Elapsed Time. We're standing by for acquisition of signal with Columbia through the Santiago tracking station. This will be a very brief pass over the Santiago station. Following that, it will be about another 18 minutes or so before we reacquire at Botswana in southern Africa. We are approaching that time of the evening where the passes are few and far between as the orbit precesses westward during day. They'll be many periods of long loss of signal during the night here, but the crew will be entering their sleep period in about an hour and 20 minutes. Eight hours, 7 minutes Mission Elapsed Time. This is Mission Control Houston.

CAPCOM Columbia Houston, we're 30 seconds through Santiago. We've got a teleprinter

END OF TAPE

PAO Columbia, Houston, we're 30 seconds through Santiago, we've got a teleprinter coming up to you, we'll see you again about Botswana 8 plus 27.

SPACECRAFT OK.

CAPCOM Mission control Houston, 8 hours, 26 minutes mission elapsed time. We're about to reacquire signal with Columbia over the Botswana tracking station on orbit number 7, flight controllers and mission control looking over the items which need to be relayed up to the crew before the crews sleep period which begins in about one hour. One of the things they'll be looking at is the sequence in which the crew attempted to initiate the getaway special experiments, so that an attempt can be made to determine what position the switches or the relays in that experiment are set so that it can be activated. The crew has been going through a number of activities, caution warning tests, calibrations, and many other items listed in the crew activity plan and they're about 20 or 30 minutes away from the presleep activities.

PAO Columbia, Houston..Through Botswana for 5 minutes, over.

SPACECRAFT Copy.

PAO Roger and reach fly by.

PAO Columbia, Houston, can you verify that you received the teleprinter message in Santiago, over.

PAO Columbia, Houston, how do you read?

SPACECRAFT Yes sir, I'm trying to take a COAS mark can you will it hold for a minute George or are we running out of time? Cause I'm going to run out of nighttime here in a second.

PAO Will stand by.

PAO Columbia, Houston, we're 30 seconds to LOS. IOS is next at 8 plus 35 and we'll have the bottom SUN attitude for you there if you need it, over.

SPACECRAFT OK.

CAPCOM Mission Control, Houston, 8 hours, 33 minutes mission elapsed time. Passed out of range at the Botswana tracking station, we will reacquire in about two minutes over Indian Ocean station for a 9 minute pass. Crew is working, taking sightings now for the crew optical alignment system. And when we get over the Indian Ocean station its expected that the, there'll be some discussion of the payloads, the getaway special,

activation primarily and many minor items that I think the flight controllers are looking at to get them squared away before, the crew enters their sleep period scheduled to begin in less than an hour from now. At 8 hours, 33 minutes mission elapsed time, this is Mission Control, Houston.

CAPCOM Mission Control, Houston, standing by for acquisition of signals through the Indian Ocean station.

PAO Columbia, Houston through IOS for 8 minutes, over.

SPACECRAFT OK, I'm having trouble getting these marks from the COAS to come down. The first time we took them at point two, then we took some at point 15, and got that dressed up and now I'm getting like a point 18 and the vehicle seems to be moving around alot, I think this water dumps handling making it a lot harder than it ought to be. Do you have any ideas on these limits?.

PAO Roger, stand by, ok.

PAO Columbia, Houston, TK we see you with almost 8 minutes of nighttime left, you want to dress up the DAP to give you some rotation compensation on spec 20. Item 21, then enter point 003, that should give you some help on attitude hold, over.

SPACECRAFT It's not attitude hold George, it's background in pulse plus you've got an end going.

PAO Roger and copy.

PAO We're going to forgo the COAS work tonight and press on, over.

END OF TAPE

SPACECRAFT Okay George, we got through that last one, one up. Looks like we're getting around .12, might want to quit at that.

CAPCOM Okay TK, we copy.

CAPCOM Columbia Houston, we're still curious as to whether you've received any teleprinter messages. Over.

SPACECRAFT We looked , we heard one, we'll go take a look.

CAPCOM Columbia Houston, we'd like to get your attitude right up to for the bottom sun if you're ready to copy. Over.

SPACECRAFT I'd like to do that. I was going to say why don't you tell me where to go instead of telling me to go (garble). That's just right (garble).

CAPCOM Roger. That would be the easiest way. The maneuver to bottom sun is going to be 35 degrees off of normal bottom sun to expose the bottom of the Orbiter, we think was the wettest. We'd like to go to DAP BRAVO 2. The attitude is roll 271 decimal 8, pitch 59.6 and yaw 298.2. Over.

SPACECRAFT Okay. I read that. BRAVO 2, 271 decimal 8, 59.6, 298.2. Now I'm on my way.

CAPCOM Roger. Good read back.

CAPCOM Columbia Houston, we still see the DAP in A, we'd like that to be in BRAVO 2. Over.

SPACECRAFT You mean you want maneuver in BRAVO, or do you want a hold BRAVO when I get there?

CAPCOM We'd like to do both TK. Both maneuver and hold in BRAVO 2.

SPACECRAFT All right.

CAPCOM Columbia Houston, 1 minute left in this pass. Guam will be next at 9 plus zero 4. For your presleep, we will want an SM checkpoint tonight, and when we do the voice recorder, we'd like the time that you switch the IECM for us, and that was back in the PI, post insertion book, on page 117. Over.

SPACECRAFT George, you're hard to read. Sir, we haven't had a chance to catch up and right OMS or do anything today. Just as soon as we get a chance to do that we sure will.

CAPCOM Roger TK. We copy.

SPACECRAFT Roger. If you wanted the time we cycled the IECM switch, it was 3 hours, 38 minutes, and 38 seconds when we went back to two.

CAPCOM Okay Hank. We copy. Thank you.

PAO Mission Control Houston at 8 hours, 45 minutes Mission Elapsed Time. Loss of signal through Indian Ocean Station and it will be about 20 minutes before we reacquire over the Guam tracking station for a low elevation pass. Columbia is currently on orbit number 7. Flight controllers and the crew working on squaring away the items that need to be taken care of before the crew sleep period, now about 45 minutes away, at 8 hours, 45 minutes Mission Elapsed Time, this is Mission Control Houston.

PAO Mission Control Houston, 9 hours, 2 minutes Mission Elapsed Time. Standing by for communication with Columbia through the Guam tracking station, a very low elevation pass. Not much opportunity for communication on this pass here.

CAPCOM Columbia Houston, through Guam. Over.

SPACECRAFT Okay George. We're still here.

END OF TAPE

CAPCOM Roger, TK, you're loud and clear, you verify for us if the teleprinter is working.

SPACECRAFT Yes sir, I'm just now getting around to reading the message.

CAPCOM Okay, that's good, thanks. Columbia Houston, we're 20 seconds to LOS. Hawaii is next at 9 plus 13 and be advised we'll have a Sunnyvale PAYCOM with you at Hawaii, over.

SPACECRAFT Understand PAYCOM'S will be talking next time?

CAPCOM We'll give you the AOS and hand over to the PAYCOM, over.

SPACECRAFT Okay. Sir.

PAO Mission control, Houston, standing by to reestablish communication with Columbia through Hawaii. Last opportunity before the crew goes to sleep to clear up any remaining items. 9 hours, 12 minutes, mission elapsed time, this is mission control Houston.

CAPCOM Columbia Houston, through Hawaii for 7 and a half minutes, teleprinter message coming up is weather data.

CAPCOM Columbia Houston, through Hawaii for 7 minutes, how do you read?

CAPCOM Roger, TK, I copy you with a squeal in the background, say again please.

SPACECRAFT Can you read me now?

CAPCOM Roger, loud and clear.

SPACECRAFT Okay, I'm guessing you on the upstairs speaker box, we'll checkout for a lower deck.

CAPCOM Roger, TK, it sounds good to us.

SPACECRAFT Houston, Columbia, how do you read?

CAPCOM Roger, Hank, you're readable, but there is a squeal in the background, over.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, a word on the gas. Sometime tonight, if you haven't tried to switch those relays, we'd like to give it one try to activate the gas as per the procedures on 44, just in case it's the ptok, the information coming back from

the gas to the hand controller that we're missing, over.

SPACECRAFT Okay, George, go ahead.

CAPCOM Roger, TK, did you copy the information on the gas?

SPACECRAFT Yes sir, I sure did. We're trying to get the boxes set up here, go ahead.

CAPCOM Okay, good comm now. We'd like to try and get the gas activated tonight. We think we may just be missing the information coming back from the gas to the hand controller. So we'd like you to go through and try setting those relays, each once, over.

SPACECRAFT Okay, you'll have to be more specific. I thought I had tried to do that. Can you talk me through real quickly what you want done?

CAPCOM Roger, TK. Can you verify that you've tried to do the enter to change the state of those relays?

SPACECRAFT Yes sir, I can get no readout, all I get is a dash, and trying to make entries doesn't seem to do anything.

CAPCOM Okay, we copy that. And Columbia, Houston, this time we're going to hand over to Sunnyvale, PAYCOM.

PAYCOM Columbia, this is Sunnyvale on air to ground, how do you read?

SPACECRAFT Loud and clear.

PAYCOM Roger, Columbia, you're not loud and clear with us, so we'd like you to go ahead and go up to panel L11 and perform the following procedure as I read it.

SPACECRAFT (garble)

PAYCOM Roger, Columbia, the first step is for you to perform experiments C power on select. And then verify that the on LED is on.

SPACECRAFT Verified.

PAYCOM Roger, Columbia, the second step is for select cover open and then verify that the open LED is on.

End of tape.

SPACECRAFT Okay, that's no joy, and no visual joy either.

PAYCOM Roger, Columbia, I understand. Now step 3, we'd like you to select cover closed. Columbia, Sunnyvale, we would like to then get a status of the closed LED.

SPACECRAFT Okay, that's been done, both the opened and the closed are off.

PAYCOM Roger, Columbia. Now we would like you to select cover open, and then cover closed, one more time. And now we're going to turn you back to Houston.

SPACECRAFT Same work.

PAYCOM And Columbia, one more activity we'd like you to perform at tab charlie.

SPACECRAFT Tab charlie, that was part of our normal procedure. You want to do it again after this, is that correct?

PAYCOM That's affirmative Columbia.

SPACECRAFT Okay, we've completed your second try with no joy.

PAYCOM Roger, understand.

CAPCOM And Columbia, Houston, we're back with you for 50 seconds, real short tag up, we really don't have any major issues going. Vehicle looks real good, nothing for you into the sleep period, we hope you get a good rest, it's been a pleasure working with you tonight. One reminder, if you haven't got the circ. pumps on, we'd like the hydraulic thermal conditioning done sometime before sleep, till then, we'll be with you for a while tonight. The entry team will be with you, and get you up in the morning, and have a good rest guys, good work.

SPACECRAFT Okay George, we just been falling further behind all day. We're trying to get some of the com things done and some of the things you can see from presleep. We're going to be awake for awhile, we haven't got around to dinner yet, so we're going to go clean up our chores and see if we can't keep from getting behind tomorrow. Don't hesitate to call us for another, in fact we'll probably sign off with you. I won't get a chance to do the data dump, probably for 45 minutes to an hour, and I'll go ahead and do it then, and I'll tell you when I'm signing off, if you'd let us just kind of wander around here and do things, if you need something, holler at us, we're going to put you on the soup box.

CAPCOM Roger, we copy Hank, we've got nothing for you now. We'll give you some time to work, over.

PAO Mission control, Houston, 9 hours, 22 minutes, mission elapsed time. Just passed out of range of the Hawaii station. Crew reported that they have quite a number of activities to catch up with before they actually get into some time for sleep and TK Mattingly reporting that he has quite a lot of things going, it may be 45 minutes or an hour before he completes some of those activities. Commander Mattingly also noting that they had not had an opportunity yet to have their evening meal which was scheduled some time ago. And they will be continuing to perform many checks and activities here as they pass out over the Pacific on orbit number 7 and there may be yet some further opportunity for communication a little later. Columbia will pass within range of the Santiago tracking station in about 17 minutes. At 9 hours, 23 minutes, mission elapsed time, this is mission control, Houston.

End of tape.

PAO Mission control, Houston at 9 hours, 39 minutes, mission elapsed time. We're coming within range of the Santiago Chile tracking station. Mission control flight controllers did not plan on initiating any communication with the crew over this pass but the crew may have something to report or some communication they wish to make during this pass. It's about a 6 minute pass and we'll be standing by for anything that might come through. 9 hours, 39 minutes, mission elapsed time, this is mission control Houston.

PAO Mission control, Houston, 9 hours, 47 minutes, mission elapsed time. We passed out of range at the Santiago tracking station with no communication taking place during that pass. And we'll be passing over the Ascension Island station in about 10 and a half minutes with an additional opportunity for the crew to relay any information that they may have on their activities this evening. Crew has gone beyond the scheduled sleep period beginning of the sleep period with their activities trying to catch up with the items that were in the time line and things they were unable to accomplish during a very busy first 10 hours today. Mission control not initiating any communication with the crew, just waiting for their reports on closing out their activities today. 9 hours, 48 minutes, mission elapsed time, this is mission control, Houston.

PAO Mission control, Houston, 9 hours, 57 minutes, mission elapsed time. We're passing within range of the Ascension Island tracking station right now, and once again we'll be waiting for any communication from the crew, but mission control will continue to monitor things and watch any data that may be coming down. We'll not attempt to contact the crew during this pass. 9 hours, 58 minutes, mission elapsed time, this is mission control, Houston.

PAO Mission control, Houston, 10 hours, 12 minutes, mission elapsed time. We're about to pass within range of the Indian Ocean tracking station. There may not be communication again on this pass depending whether the crew has anything to relay to the ground. Crew is working on into their scheduled sleep period, trying to catch up with some items that they had left over from the activities scheduled for the day. Controllers here at mission control have indicated that presently there are no plans to alter the time that the crew must get up in the morning to begin their day. Flight controllers will be watching the data as we pass over the Indian Ocean station, and there was some indication there may now be communication some talk with the crew here as we pass over the station.

CAPCOM Columbia Houston, through IOS for 5 minutes, how do you read?

CAPCOM Columbia, Houston, through IOS for 4 and a half

STS-4 AIR/GROUND TRANSCRIPT t48j GMT 17:90:02 PAGE 2

minutes, how do you read?

SPACECRAFT Hi, George, read you loud and clear, we got finished with dinner, and we're starting to finish our other

End of tape.

CAPCOM Columbia, Houston through IOS for four and a half minutes, how do you read?

SPACECRAFT Hi, George, read you loud and clear. We have finished with dinner and we're starting to finish our up storage in getting our spacecraft put together so we can have tomorrow ready, we have not gotten around to doing a summary yet for you.

CAPCOM Roger, T. K., we copy that and one thing we'd like to get from you now if we could is, earlier you mentioned you'd like to get back with us on, have Ron or Oscar step 4B and we'd like for you to go ahead and expand on that for us, if you could, over.

SPACECRAFT No, we don't haven't had time, lost train the thought there, before we go topside see what I can find.

CAPCOM Roger.

SPACECRAFT OK, George, I've got Ron or Oscar, the only thing I could think of was at the time we were talking about this I had some general comments, they concern the status of material around the spacecraft and just in general let me summarize the - after we opened the payload bay doors, it was the - what makes a very spectacular picture of material around the payload bay. In fact, around the entire spacecraft, it's not just around the payload bay, it's very fascinating that after insertion and for a number of hours after that, looking out the forward windows, with the right lighting, you can see little particles that seems to be steaming, they appear to stream by you. However, the payload bay you see a lot of little white fireflies, they're all radiating away from the spacecraft. Right now I'm looking out the tail and its a dark sunshining on the starboard side they've got a little down from vertical (garble) from where its shield (garble) and got some very bright things that are moving on when you set here and look at it, it looks like a great deal, however, I suspect it really isn't much at all, it's just a very bright background you see a lot. And that is a fairly continuous ring and I can not, I haven't had a chance to stop and look for a source or a focal point. My impression is that a lot of these mylar shreds things like that and it may be some fluid, some ice that's breaking off. But it's been this way from insertion o. (Garble)

CAPCOM Roger, T.K. copy. And we were concerned with some torging. We were seeing on the vehicle during gravity gradient. Do you think that has any impact on that? And, T. K., we're still seeing that torging.

SPACECRAFT Rapid departure from being in attitude, quite frankly took me by surprise which I didn't - I haven't been monitoring it that close. I looked at it once not long after we established it and I thought that probably one didn't work as

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well as we had in the simulator but I was very much surprised when I (garble). I really had worked out.

CAPCOM Roger, T. K. We're going LOS now.

SPACECRAFT I would guess, 40 minutes from sound we turn quite a ways out so I just buttoned things up and reestablished it. The second attitude you gave me seemed to depart much less rapidly - our - my impression was that neither of them were cycling that they departed, they just strating picking up a rake and I do indeed have my flash evaporators off so I don't know what to say about that.

CAPCOM Roger, T. K., we copy. For information, we'll still see that torqing on the vehicle and trying to find its source, over.

SPACECRAFT Okay, so the torqing that was bugging me during the (garble).

PAO Mission Control, Houston. 10 hours, 19 minutes mission elapsed time. On that pass over the Indian Ocean, station commander T. K. Mattingly reporting that the crew had - was completing their dinner and they were trying to finish out the items they still had remaining for the crew before getting to bed tonight. Mattingly also remarked about the number of particles apparently that were either streaming from or going pass the spacecraft, and that he'd not had sufficient time to observe any particular source for those.

END OF TAPE

STS-4 AIR/GROUND TRANSCRIPT t50j GMT 179:10:20 PAGE 1

PAO (Garble) and tonight, Mattingly also remarked about the number of particles apparently that were either streaming from or going past the spacecraft and that he had not had sufficient time to observe any particular source for those. Mattingly noted that those might be shreds of mylar material or some frozen fluid, but again, had not had any time to really analyze that situation any further. At 10 hours, 20 minutes Mission Elapsed Time, this is Mission Control Houston.

SPACECRAFT Air to ground one.

CAPCOM This is Houston. You're 5 By.

SPACECRAFT Roger.

CAPCOM I don't see any keying from you.

PAO Mission Control, Houston, standing by for acquisition of signal through Guam. Ten hours, 37 minutes Mission Elapsed Time.

PAO Mission Control, Houston, 10 hours, 44 minutes Mission Elapsed Time. Orbit number 8. We've just passed out of range of the Guam station. It will be about another 31 minutes before we reacquire or have another opportunity to speak with the crew if that is necessary. That'll be over the Santiago station.

END OF TAPE

1946-1947

1948-1949

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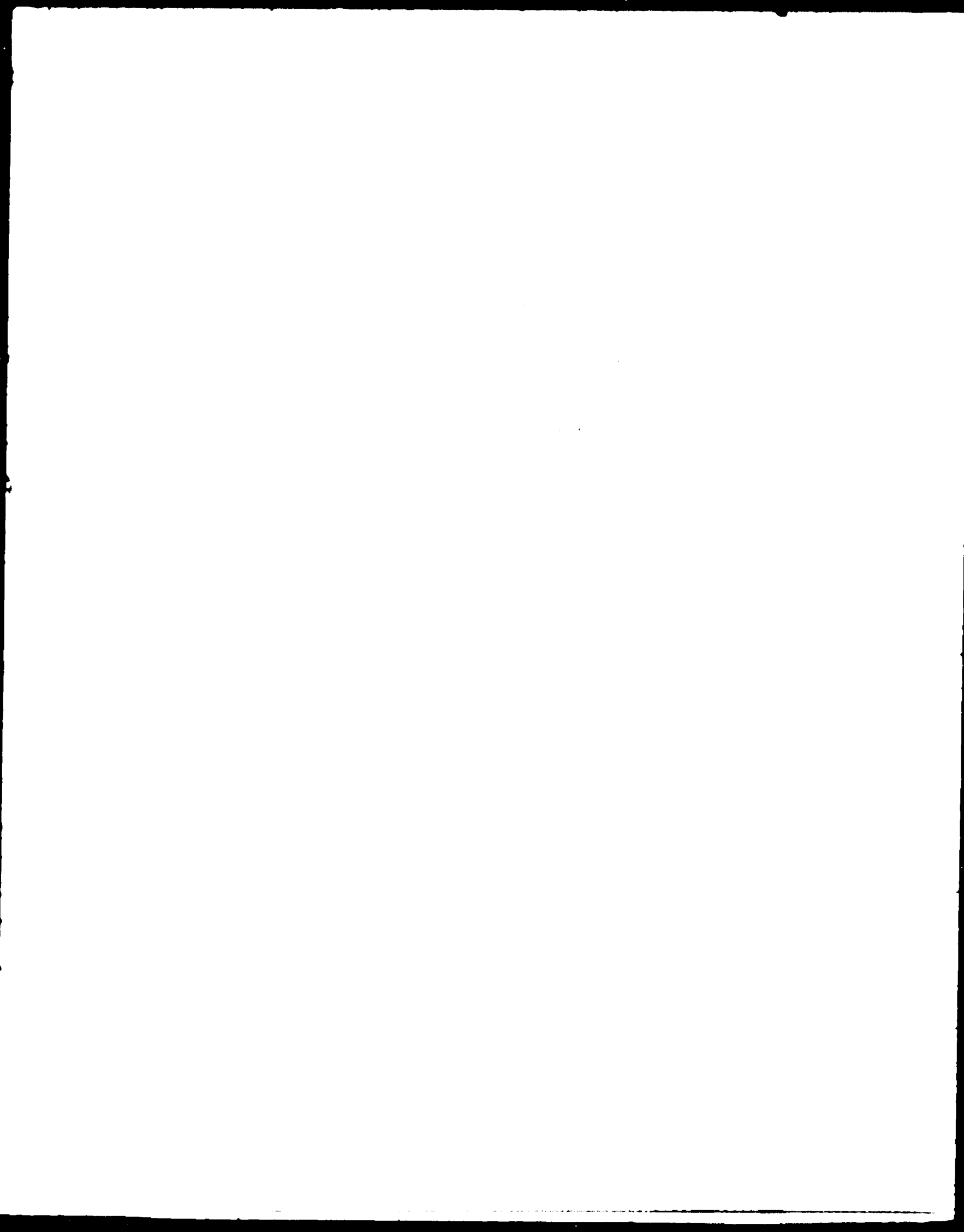
1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is essential for ensuring transparency and accountability in the organization's operations.

2. The second part outlines the various methods and tools used to collect and analyze data. This includes the use of surveys, interviews, and focus groups to gather qualitative information, as well as the application of statistical techniques to quantitative data.

3. The third part describes the process of identifying and measuring key performance indicators (KPIs). It highlights the need to select indicators that are relevant to the organization's strategic goals and to establish clear targets and benchmarks for these indicators.

4. The fourth part discusses the challenges and limitations of data analysis. It notes that while data provides valuable insights, it is not infallible and can be subject to various biases and errors. Therefore, it is crucial to interpret the results of data analysis with caution and to consider the context in which the data was collected.

5. The fifth part concludes by summarizing the key findings and recommendations of the study. It suggests that the organization should continue to invest in data analysis capabilities and to foster a culture of data-driven decision-making to achieve its long-term success.



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STATE OF TEXAS, COUNTY OF DALLAS

Know all men that I, the undersigned, do hereby certify that the following is a true and correct copy of the original as the same appears in the records of the County of Dallas, State of Texas, to-wit:

the original of the above and entitled instrument, together with a true and correct copy of the same, as the same appears in the records of the County of Dallas, State of Texas, to-wit:

the original of the above and entitled instrument, together with a true and correct copy of the same, as the same appears in the records of the County of Dallas, State of Texas, to-wit:

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The book is a collection of essays on the history of the United States, edited by the author. It covers the period from the early 19th century to the present. The essays are arranged in chronological order.

THE EARLY YEARS

THE MIDDLE YEARS

The author discusses the political and social changes that took place in the United States during the 19th century. He examines the role of the federal government and the impact of the Industrial Revolution.

The author also discusses the role of the states and the impact of the Civil War. He examines the political and social changes that took place in the United States during the 20th century.

...

CONCLUSION

APPENDIX

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REFERENCES

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The author discusses the role of the federal government and the impact of the Industrial Revolution.

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2. The second part of the document outlines the specific procedures and protocols that must be followed when conducting business. This includes guidelines for communication, decision-making, and the handling of confidential information. It also addresses the roles and responsibilities of various staff members and the importance of teamwork and collaboration.

3. The third part of the document focuses on financial management and budgeting. It provides detailed information on how to allocate resources, track expenses, and ensure that the organization remains within its budget. It also discusses the importance of regular financial reviews and reporting to management and the board of directors.

4. The fourth part of the document deals with human resources and employee relations. It covers topics such as recruitment, hiring, training, and performance evaluation. It also addresses the importance of creating a positive work environment, promoting employee well-being, and resolving any disputes or conflicts that may arise.

5. The fifth and final part of the document discusses the organization's long-term strategic goals and vision. It outlines the key areas of focus for the future and provides a roadmap for achieving these goals. It also emphasizes the importance of staying current with industry trends and technological advancements to maintain a competitive edge in the market.

PAO During the end of orbit number 16 for Columbia. 19 minutes across the Southwest Pacific to Hawaii for the next station contact followed by almost continuous comm across the states with Buckhorn, Goldstone, Myla, Bermuda followed by Dakar as the orbit precesses back into the network stations. Will be back in 18 minutes in Hawaii. Mission Control at 23:29. This is Mission Control, Houston. Spacecraft Columbia will be acquired through the Hawaii tracking station in about 25 seconds. Brief gaps across to the states.

CAPCOM Columbia, Houston. Your over Hawaii for 3 minutes, over.

SPACECRAFT We're here.

CAPCOM Roger, standing by.

SPACECRAFT Listen Columbia, I've got a couple of words on the CPES if your interested.

CAPCOM Go ahead Hank.

SPACECRAFT Okay, I just got through collecting a sample one. I'm about ready to move the sample to the collectors driven down. But just some general observations on the device. There are very small bubbles flowing around the babbles and the bumper flow on either side of the collection tube and also the - with an extra tail on and the flow of the sample slow enough that you can see it separating. However, the thing is following me and it will do it also when the voltage off the polar tends to make little s turns as it goes from bottom to top.

CAPCOM Okay, Hank. Thank you, we copy that.

SPACECRAFT Okay, and Houston, let me give you a couple of comments about that attempt to take the flow in the orbiter. The only evidence of flow that I think we got was a couple of vernier firings which have possibly long persistence. Those times were adated. We seem to have some discrepancy on our times too. It appeared to me that we got a lighted earth limb in the last two exposures which probably over exposed those two and came earlier than they indicated on CAP and if I want to do much more of this, maybe you can give me some kind of a guide about how to bias it and maybe two minutes in one direction or something like that. I got caught with the exposure open and I wasn't sure what to do so - I finished it.

CAPCOM Copy, T. K.. We'll work on it.

SPACECRAFT Okay, and I'm just goint to leave this gear available because I suspect we'll need to do this again.

CAPCOM We copy. And Columbia, Houston. We'll see you over the state in about 3 minutes.

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SPACECRAFT Okay.

CAPCOM Columbia, Houston, through the states for 19 minutes. Standing by.

CAPCOM Columbia, Houston, through the states for 18 minutes. Standing by.

SPACECRAFT Alright, sir. We're trying to get some pictures now. If you keep an eye on the pipeland and let us know if we do anything or miss something or have something coming up or if we have an opportunity to miss something.

CAPCOM Okay, looks to us like it is lunchtime.

CAPCOM Columbia, Houston. You should be getting an operator call from the CFES shortly.

SPACECRAFT Well thank you.

END OF TAPE

SPACECRAFT Hey, that's kind of impressive on the (garble) where we went - where we can see Houston. It was pretty clear, and there were little puffy clouds forming. Just about an hour and a half later when we came back by, you guys had disappeared underneath a layer of clouds, and there is a redder, the impression size buildup out in the Gulf just off shore. And that same pattern held throughout the Gulf coast, and the (garble) of Florida. Those are rather dramatic changes on hand.

CAPCOM Okay, T.K. we can see that on the radar, but we haven't see the light of day yet, so we will have to take your word for it.

SPACECRAFT I don't think you'll want to see it.

CAPCOM Columbia, Houston, we are 20 seconds LOS. Dakar is next at 20 after.

SPACECRAFT Okay, sir. Thank you.

CAPCOM Columbia, Houston with you through Dakar, and Ascension for 10 minutes.

SPACECRAFT Okay, Brewster, thank you. Houston, Columbia.

CAPCOM Go ahead sir.

SPACECRAFT Okay, I am kind of in a dilemma about what you may see, looking ahead that you gotta a TV pass set up and I know you are planning, on our, we had been talking about doing a VTR dump instead of a live, but I just looked at what we were trying catch that last time, and it looks to me like it we just don't have a functioning VTR. However, it might be a playback circuit rather than a record circuit. And if that was the case, I guess we could do something quite different with it. What I would like to do is when we come up next time is start with a dump to you from the VTR and see how that goes, and then plan the switch after about 30 seconds or to (garble), so at least we would get something.

CAPCOM We copy.

SPACECRAFT And if we've got a little time so if you want to suggest an alternative plan, that's fine, but what I had, what we had recorded looks like it is available.

CAPCOM T.K. we assume from what you've said, that you tried to playback the latest recordings you took, and it was unsuccessful.

SPACECRAFT That's affirmative. It just jumps and flickers.

CAPCOM Okay, thank you.

SPACECRAFT The picture on the monitor's and on the CCTV at the time that the picture is taken, looks good, and I tried it with several cameras on sure it's not one camera. It's only when you play a tape back that it gets jerky and jumpy, and makes single.

CAPCOM Okay, we copy that, thank you. T.K. we think your suggestion for the VTR is a good one and we'll plan on going with that.

SPACECRAFT Okay, and I will come up ready to dump a piece of VTR, and then I will be prepared to switch it over live or hang on to it until you call.

CAPCOM Roger. And T.K. while we are talking about the VTR, a reminder that the time limit on having the VTR in the record mode is 4 hours and after it has been in that mode for 4 hours, it needs a 30 minute cool off period.

SPACECRAFT Roger, I've been pretty stingy with it.

CAPCOM Okay, sir. Columbia, Houston, we are 30 seconds LOS, Botswana is next at 38.

SPACECRAFT Okay.

PAO This is Shuttle Control, at 1 day 0 hours, 32 minutes Mission Elapsed Time. Columbia is out of range at Ascension. Next station Botswana in 6 minutes. During the next Merritt Island pass, Commander Ken Mattingly will again

END OF TAPE

PAO Mattingly will again try to dump the video tape recorder. That is not successful. He plans to try a live television pass at Merritt Island. That pass beginning at 3 hours 19 minutes mission elapsed time. One day, 3 hours, 19 minutes. Air to mission control center shift handover is about 25 minutes away. A team of flight controllers directed by Chuck Lewis preparing to take over from flight director Harold Drawn and his team. CAPCOM on this upcoming shift is Brewster Shaw. One day, - this is mission control, correction on the CAPCOM. The present CAPCOM is Brewster Shaw. The oncoming CAPCOM will be George Nelson. We're about 3 minutes 20 seconds away from Botswana. 1 day, 35 minutes mission elapsed time. This is Shuttle Control Houston. This is Shuttle Control at 1 day 38 minutes mission elapsed time. Columbia is approaching acquisition through Botswana.

CAPCOM Columbia, Houston. Through Botswana for 4 minutes. Standing by.

SPACECRAFT Okay, Brewster, I'm trying to update my page 4-25 of the CAP. It's the last thing on the message you sent us this morning and I'm not sure I got a good copy. How about giving me pitch, yaw and overdrawn purple please.

CAPCOM Roger. Pitch is +90, yaw +348, omacron +270 over.

SPACECRAFT Okay. That's 90, 48, and 270. Thank you.

CAPCOM The yaw was 348, 348 over.

SPACECRAFT Okay, 348.

CAPCOM That's correct.

SPACECRAFT Okay, can - do you have any idea what our general plan is to do this ZOV tonight and then move into the tail sun tomorrow morning and then follow the normal sequence of maneuvers from that point on?

CAPCOM That's the current plan, yes.

SPACECRAFT Okay. You know I won't change.

CAPCOM That's right. Columbia, Houston. We're 20 seconds LOS, Yarragadee next at 55.

SPACECRAFT I can't say that.

PAO This is Shuttle Control. Botswana has loss-of-signal. Next acquisition through Yarragadee in 12 minutes. At 1 day, 43 minutes mission elapsed time, this is Shuttle Control Houston. This is Shuttle Control 1 day 55 minutes mission elapsed time. Columbia is coming within range of the Yarragadee station.

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CAPCOM Columbia, Houston. Through Yarragadee for 8 minutes. Over.

SPACECRAFT Okay, we're still here.

CAPCOM Roger, T. K. Sometime during this pass I'd like to discuss with you a teleprinter message were going to send up over Hawaii that has to do with your gg.

SPACECRAFT Okay. Lets see. I'm still timing out my tab activity. Moving in on another 30 seconds or so.

END OF TAPE

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SPACECRAFT Thirty seconds or so, give you one (garble)

CAPCOM Okay, just yell when your ready.

SPACECRAFT Okay, Charlie is off, LED is off, and we have no cover LEDs illuminated, and I guess we visually confirmed that status, no joy.

CAPCOM Roger, we copy that, thank you.

SPACECRAFT Okay I'm ready, go ahead.

CAPCOM Roger sir, you have coming up at 25 past the hour, maneuver to gravity gradient and we are going to send up at Hawaii a teleprinter message that will give you some assistance should the vehicle leave the gravity gradient due to the type of torquing we saw before.

SPACECRAFT Okay, you said it's coming up at 25, you mean the message is coming up at 25 or you'd like execution at 25?

CAPCOM At 25 is the time to initiate the gravity gradient.

SPACECRAFT Oh, let's see here, what hour is that? It's not the next hour you mean?

CAPCOM Yes sir it is, at 5 minutes past the hour is initiate for the maneuver and then at 25 past the next hour is the initiate the gravity gradient itself.

SPACECRAFT (garble) Okay, and your going to send some data that might help in knowing what to do in case we have the same responses we had yesterday.

CAPCOM That's affirmative.

SPACECRAFT Okay, be looking for that. And Brewster, when we come up on the next before we have TV here at this live pass, would the (garble) people want us to show a hand sketch of what they are seeing or do they pretty much understand what's going on?

CAPCOM We'll ask them that, T. K. and want to make sure that we're in sync here, the next TV we have is a dump over Mila at 3 hours 19 minutes, on page 4-20.

SPACECRAFT (garble)

CAPCOM 4-21, my mistake.

SPACECRAFT I just got, flipped the wrong page in my hymnal here.

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CAPCOM And T. K. the answer to your question is affirmative, we'd like to see whatever you can show us on the CFES.

SPACECRAFT Okay.

CAPCOM And T. K. a little bit of clarification on the teleprinter message we're going to send you, if it turns out that at sunrise the gravity gradient uncorks the way it has been, this procedure will just help you get it set up, and we'll reinitialize at sunset each time.

SPACECRAFT And reinitialization is at sunset, okay.

CAPCOM Columbia, Houston, 20 seconds LOS, Hawaii is next at 21.

SPACECRAFT Alright sir

PAO This is Shuttle Control, Columbia has passed out of range at Yarragadee. Now over North Central Australia. With the next acquisition through Hawaii in 17 minutes. The crew will attempt to reestablish Columbia in a gravity gradient attitude at 1 day 1 hour 25 minutes, Mission Elapsed Time. There's been a problem in Columbia maintaining that attitude whenever they've attempted it, they'll give it another try. And at 1 day 1 hour 5 minutes, Mission Elapsed Time, this is Shuttle Control Houston.

PAO This is Shuttle Control, the change of shift briefing is estimated for 11:40 a.m. Central daylight time. That briefing with the off-going Flight Director Harold Draughn.

END OF TAPE

PAO Estimated at for 11:40 a.m. Central daylight time in room 135 at the JSC Newscenter, this is Shuttle Control.

CAPCOM Columbia, Houston, through Hawaii for 8 minutes, over.

SPACECRAFT (garble)

CAPCOM Have you five by T. K., we're going to send you two teleprinter messages, the first will be the one we talked about earlier, the second will be a follow on to your gas experiment, probably a last try at it.

SPACECRAFT Alright, sir will you give me the times to start, do you want me to defer going free until 125, or would you like me to go ahead and start now?

CAPCOM T. K. whenever your happy with the rates you can go free.

SPACECRAFT You're there at 122.

CAPCOM Roger, we copy.

SPACECRAFT Okay, Houston, since we have no opens, would you like for us to try to do something on our own to make this thing work? Or are we going to be working in conflict with other folks.

CAPCOM Stand by one. Columbia, Houston, in response to your question, we are working on some further procedures probably have them ready for you late tomorrow, in the meantime we will be taking our gravity gradient DTO data, and we'll use the test for that. So, we'd like you just to sit tight then.

SPACECRAFT Alright sir, I'll do that, thank you.

CAPCOM Columbia, Houston, we're 1 minute LOS stateside is next at 31. And the Crystal team is signing off, we sure enjoyed working with you today, and the Bronz team will pick you up over the states. Have a good day.

SPACECRAFT Okay, thank you very much, you guys are a lot of fun to work with.

PAO This is Shuttle Control, Hawaii has LOS. Acquisition through the Buckhorn California station in a minute and 50 seconds. We'll stand by for that. Change of shift news conference scheduled for 11:40 a.m. Central daylight time, room 135 at JSC Newscenter, Flight Director Harold Draughn, who is now breaking shift here in the Mission Control Center. Flight

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Director Chuck Lewis, and his team taking over. CAPCOM on this shift will be heard starting this next stateside pass is Astronaut George Nelson. We're about a minute away from acquisition, we'll stand by. At 1 day 1 hour 30 minutes, Mission Elapsed Time.

CAPCOM And Columbia, Houston, with you through the states for 16 minutes and the Bronze team is wishing you a good day.

SPACECRAFT Alright Houston, we're just trying to get a couple of pictures here.

CAPCOM Roger.

PAO This is Shuttle Control, the CAPCOM who greeted the crew that time is Mike Coats, the backup CAPCOM on this shift.

CAPCOM And Columbia, Houston, we've got a few notes, we'd like to pass up at your convenience.

SPACECRAFT Okay Mike, can you hold off for about

END OF TAPE

SPACECRAFT Okay, Mike can you hold on for about five?

CAPCOM That's affirmative, T. K.

SPACECRAFT Just now coming up on the Texas Gulf Coast again, and we've been tracking this rather large cloud formation all morning and when we came by a few refs by, Mike it was just sort of a (garble) around the Houston area. Really impressive the way it rolls in an hour and a half we are current looking down over...

CAPCOM Roger, we copy that T. K.

SPACECRAFT You can even see Scholls field when you look down at it Mike. That's a (garble) stand out pretty neatly.

CAPCOM Roger, we copy that T. K., that's really amazing.

PAO This is Shuttle Control, that was Ken Mattingly reporting he could see Scholls field, that is the municipal airport at Galveston, Texas.

SPACECRAFT I'd like you to tell Bob that the path he picked up for the video tape, was absolutely perfect and I decided to go with the 16 instead of the VTR we had so much trouble with it this morning, so I guess (garble) perfect pass.

CAPCOM Roger T. K. we'll pass it on to Bob.

SPACECRAFT (garble) another chance before we get through here. Really neat SLS stands out, we're passing south of Miami now and the SLS is loud and clear from here. You can see a (garble) and you can even see (garble) and I'm passing an area now that is south of Miami just before you turn into the (garble) looking down at Homestead and Miami International, and whole complex up and down the coast there and moving out now into the Windward Islands and they offer some of the most vivid colors, green, blue green, it shows the current and next thing was the brown land and blue free water, and the white clouds, it's almost pretty enough to take a picture. Just to put a final topping on it I will take the camera around so it's on the horizon, and look in the direction, almost in the direction of motion up off the moon at the same time.

CAPCOM Roger, we copy all that T. K. sounds real beautiful.

SPACECRAFT Well I didn't want to bore you, but I knew you'd enjoy it, kinda , in spite of Henry's comment when he got airborne.

CAPCOM Roger, Ken, we're looking forward to seeing those

movies.

SPACECRAFT Okay, I'm through playing here for a while if you would like to give me some work to do, I'll be glad to talk to you about it.

CAPCOM Okay, T. K. first note here, sunrise is running about 1 minute and a half, earlier than the CAP indicates and getting earlier by about 13 seconds each revolution, Moon set is getting later each time, the glow experiment PI would like you to take nominal exposures, glow experiments, don't worry about the Earth rim, just start the photos at Moon set and be advised another opportunity exists on page 4-22, at 4 hours and 9 minutes. Sunrise is at 4:21.

SPACECRAFT Sure wish I could look at that.

SPACECRAFT And in case you didn't get all of that Mike,

END OF TAPE

SPACECRAFT It (garble) Mike, it turned out that the moon is (garble) really overpowers everything else when it's out there, you see everything, and on this last pass, we didn't see a thing or watch a Moon set.

CAPCOM Roger, we copy that T. K.

SPACECRAFT And since the Moon set is getting later and the sunrise is getting earlier, I could get them all in a lot easier if we knocked off a little of that (garble) second pass, I guess, I'll stick with it unless you tell me to knock 30 seconds or so off of it.

CAPCOM Roger, T. K. stand by. And Columbia, Houston, stand by on that one. Be advised that we'd like you to save the nylon ring or washer from the VTR for post-flight analysis, and also we're planning a VTR dump over Mila next time, on Rev 19, in about 3 hours 19 minutes, we planned to have you begin the dump, we'd like to be watching the dump onboard, we'd like to command an A sinc mode from down here and if there is no joy on the VTR dump we'd like you to switch to the live telecast, over.

SPACECRAFT Okay. You guys must have someone pretty smart figuring out those new angles, this thing seems to be holding pretty good today.

CAPCOM Roger, we concur with that. And Columbia, Houston, we're going LOS in 30 seconds, we'll talk to you again at Ascension on the hour, you guys are sure sounding good today.

SPACECRAFT Alright sir, we'll be there.

CAPCOM Roger.

PAO This is Shuttle Control, Columbia is out of range at Bermuda. Next station is Ascension in 8 and a half minutes. During this pass over the Gulf Coast, we had a travel log by Columbia's Commander Ken Mattingly, reporting on the cloud formations along the Texas Gulf Coast. Said he could see Scholls field in Galveston, and good view of the Miami Florida complex. As Columbia went over Florida he was taking 16 mm movies during this pass. The data acquisition camera could be heard in the background during the air to ground there. Apparently a very good pass for photography in terms of weather and scenery. And he reports that so far the gravity gradient attitude is holding very well. Columbia entered gravity gradient at 1 day 1 hour 22 minutes this morning and no problems so far. There were some problems yesterday with the gravity gradient attitudes and torquing problems but those have not cropped up yet today. At 1 day 1 hour 52 minutes, Mission Elapsed Time, this is Shuttle Control Houston.

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PAO This is Shuttle Control, at 1 day 1 hour 59 minutes Mission Elapsed Time, we're standing by for acquisition of Columbia through Ascension.

CAPCOM And Columbia, Houston, with you through Ascension for 8 minutes, over.

SPACECRAFT Okay sir.

CAPCOM And Columbia, Houston, Sunnyvale PAYCOM would like to talk to you for a few minutes.

SPACECRAFT I'll be there in just a second.

PAYCOM Columbia, this is Sunnyvale on air to ground 1, how do you read?

SPACECRAFT Okay.

PAYCOM Roger Columbia, we've got an update for you, about your tab activity. Over the next hour, any activity that you feel would assist the operations would be appropriate, and we suggest at your convenience tabs Bravo Alpha, Bravo Bravo, and experiment C, power OFF.

END OF TAPE

PAYCOM And experiment C power OFF, and then ON cycling in any order.

SPACECRAFT Okay, I just didn't want to mess up anything else that might be going on (garble) look like we're at a point where a little dickering might not hurt.

PAYCOM Roger Columbia, we've looked at the memory loads we've got and we don't have any problem with you taking any of those actions.

SPACECRAFT I don't have any insight to say one is better than another, but I just thought I wanted to help.

PAYCOM Roger, Columbia, and we'd like to get a reading of some of the meters on L11.

SPACECRAFT Okay, I'm ready to give you a Bravo Alpha, if you'd like.

PAYCOM Rog, that doesn't quite have what we need, what we'd like to get is have you move the (garble) select switch to the orbiter position and give us the voltage that you see.

SPACECRAFT Okay, how bout 31?, no call it 30 and a half.

PAYCOM Roger, I understand 30.5.

SPACECRAFT What else would you like?

PAYCOM We'd like you to move the (garble) select switch to the hybrid position and give us a reading, and then finally the orbiter amps.

SPACECRAFT Okay, on hybrid I got about 29 and a half.

PAYCOM Roger, 29.5.

SPACECRAFT And which amps did you say you wanted sir?

PAYCOM Columbia, that's the Orbiter amps, that's the meter just to the right of the voltage meter.

SPACECRAFT Okay its the one that has been fluctuating, it's normally parked around 22 or 3 and sometimes I recall it going up to about 40.

PAYCOM Roger, understand.

PAYCOM And Columbia, Sunnyvale, that's all we have for you now, we'll turn you back to Houston, thank you.

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SPACECRAFT Okay, I'll talk to you later.

CAPCOM And Columbia, Houston, we've got about 4 and a half more minutes through Ascension.

SPACECRAFT Okay sir. Just a minute ago I said I thought I had seen the amps go up to about 40, I was sitting here watching it kick a little bit, and I guess maybe 30 is a better number. Don't want to mislead someone into thinking we had very high amps.

CAPCOM Okay, we copy that T. K.

CAPCOM And Columbia, Houston, we're 30 seconds LOS we'll be with you again through Botswana at 11 and be advised if you need F5L jet go ahead and reselect it, you may get a leak message in the next half hour or so.

SPACECRAFT Okay, that's which jet?

CAPCOM Roger F5L T. K.

SPACECRAFT Is it getting cold?

CAPCOM Roger, it's a transducer bias again.

SPACECRAFT Okay, thank you.

PAO This is Shuttle Control, Columbia is out of range at Ascension, but Botswana will have acquisition in 2 and a half minutes, we'll stand by for Botswana. Mission Elapsed Time is 1 day 2 hours 8 minutes.

CAPCOM Columbia, Houston, with you through Botswana for 8 minutes, over.

SPACECRAFT Okay sir.

CAPCOM Columbia, Houston 30 seconds to LOS, we'll talk to you again through Yarragadee at 32.

PAO This is Shuttle Control, Columbia's had Loss Of Signal with Botswana, next station is Yarragadee in 12 and a half minutes. At 1 day 2 hours 19 minutes, Mission Elapsed Time this is Shuttle Control Houston.

CAPCOM Columbia, Houston, with you through Yarragadee for 5 and a half minutes, over.

END OF TAPE

CAPCOM Columbia, Houston with you through Yarragadee for 5 minutes, over.

SPACECRAFT Rog, we hear you.

CAPCOM Roger, we copy you, we got a couple of notes concerning the glow experiment and gg when you're ready to copy.

SPACECRAFT Alright, just a second. Okay, I show it's time for me to go here in a couple minutes, (garble) better give it to me first.

CAPCOM Roger T. K. we just advised you to go ahead and use the 400 second exposure and as soon as the Moon sets start using it, if you see any sun coming up go ahead and close the aperture and stop it.

SPACECRAFT Okay.

CAPCOM And T. K. concerning gg, it's looking real good to us right now, we almost set the pitch limit but it was diverging slowly and it's now re-converging, we'd like you to let us call the (garble), however if you see it's outside limits during LOS we'd appreciate a report on that.

SPACECRAFT Okay, yes I'm really impressed.

CAPCOM Roger that.

SPACECRAFT And Houston, I got some words on the CFES.

CAPCOM Go ahead Hank.

SPACECRAFT Okay (garble) lot of bubbles forming on the left side of the tube, stand by one, some of them are rather large, I'd say most of them are on the order of 3/16 of an inch in diameter, there's one big one at the top just before the exit it's about 3/4 of an inch in diameter and there are several that are 3/8 of an inch or more, one almost a half an inch, but a whole lot of little bitty bubbles, there all collected along the left-hand side.

CAPCOM Roger, we copy that Hank. And Columbia, Houston, Hank can you verify that the bubbles are in the electrode baffles front and back?

SPACECRAFT Can I what?

CAPCOM And Columbia, Houston, we're 30 seconds from LOS, we'll talk to you again through Guam, at 44.

PAO This is Shuttle Control, Yarragadee has loss of

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signal. Next station Guam in 5 minutes, 50 seconds. Columbia still maintaining the gravity gradient attitude looking good in that attitude. And during this pass, Hank Hartsfield reported a lot of bubbles in the left side of the continuous flow electrophoresis experiment. He gave estimates of varying sizes, we hope to be able to take a look at that experiment during the next pass over the Merritt Island of Florida tracking station. At about 1 day 3 hours 19 minutes, Mission Elapsed Time. At 1 day 2 hours 39 minutes, Mission Elapsed Time, this is Shuttle Control Houston.

PAO This is Shuttle Control at 1 day 2 hours 43 minutes, Mission Elapsed Time, Columbia is 25 seconds away from acquisition through Guam.

CAPCOM And Columbia, Houston, with you through Guam for 6 minutes, over.

SPACECRAFT Okay, Mike.

CAPCOM And Columbia, Houston, we're 15 seconds from LOS, we'll talk to you again through Hawaii at 57, and we see the spec 76 comm message on the fault message, we assume that's from the VTR?

SPACECRAFT I sure hope so.

PAO This is Shuttle Control, Columbia's moved out of range of the Guam station, moving toward Hawaii which will pick up the Spacecraft in 5 minutes 50 seconds. At 1 day 2 hours 51 minutes Mission Elapsed Time, this is Shuttle Control Houston.

END OF TAPE

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PAO This is Shuttle Control, at 1 day, 2 hours 56 minutes Mission Elapsed Time. Columbia is approaching acquisition through Hawaii.

CAPCOM Columbia, Houston, with you through Hawaii for 8 minutes, over.

SPACECRAFT Alright.

CAPCOM And Columbia we've got a cryo note here, we've got here for you, at your convenience.

SPACECRAFT Okay, standby.

CAPCOM And Columbia, Houston, we're 30 seconds from LOS we will talk to you again in 2 minutes through the states.

SPACECRAFT Alright. And I am still waiting for you to give me the call on these recorders.

CAPCOM Roger, T.K. we will wait for those through the states.

PAO This is Shuttle Control. Hawaii has LOS. Next acquisition is through Buckhorn in a minute and a half. During this stateside pass we expect television during the Merritt Island Florida pass, either a dump from the video tape recorder or if that tape recorder is still not functional live television real-time television from onboard of the continuous flow electrophoresis experiment. We will standby for acquisition through the states, in about 45 seconds. Mission Elapsed Time 1 day 3 hours 6 minutes.

CAPCOM And Columbia, Houston, with you through the states for about 14 minutes.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, we've got a switch on panel All when you get a chance.

SPACECRAFT Go ahead.

CAPCOM Okay we would like the cryo H2 tank 4 heater B to OFF. This will help us troubleshoot the H2 tank 4 heater anomaly. And when you get a chance on panel O2 we would like to get a read out of the Cryo H2 tank 2 quantity.

SPACECRAFT Okay, Mike, you got a cryo H2 tank 4 heater B is OFF.

CAPCOM Roger we copy.

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SPACECRAFT Mike, you cut out just at the end. You asked me to position heaters in tank 4 hydrogen B to OFF. You asked for some reading and I didn't understand what that was.

CAPCOM Roger, T.K.. On panel O2, we would like to get a read out of the cryo H2 tank 2 quantity, and help us check our quantity transducer problem.

SPACECRAFT 45%.

CAPCOM Roger, we copy 45%, and be advise that we may have to make our recorder call during TV downlink over Mila.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, when you have the time we would appreciate any more words you have on CFES bubbles.

SPACECRAFT Okay, and Hank just finished drawing you a sketch.

CAPCOM Roger. And Columbia, Houston, if bubbles run the electrode baffle chambers there on the left side, they tell us that's probably normal operation.

SPACECRAFT Okay, you know you can't look at that thing and tell exactly where they are. All I could tell is that they're not mobile like the bubbles that are flowing along with the cross wall.

CAPCOM Roger, we copy that Hank. And Columbia, Houston, we may have a short 40 second LOS here, let us know when you are ready on the TV and we will give you the go for that.

SPACECRAFT Okay.

END OF TAPE

CAPCOM And Columbia, Houston. Now were with you again through Mila for about 4-1/2 minutes.

SPACECRAFT Okay, I'm just waiting for you. Whatever - you're waiting for us. (Garble) 3 ring circus the CFES called for Henry's (garble) in the middle of all this. Are you ready to try some downlinks?

CAPCOM Roger. We'd like TV control to command and downlink to enable Ken.

SPACECRAFT You got command and enable. And I've got downlink VTR. I'll start it running when you're ready.

CAPCOM You have a go, Ken.

SPACECRAFT Our picture is flickering very badly and I don't know whether what you get does it or not but it's shaking around and by now it's not even a recognizable picture on my screen. So do you have any way of knowing that before we press on? Because the next thing I'm going to show you requires some explanation.

CAPCOM Okay, we got a good picture down here, Ken.

SPACECRAFT You do?

CAPCOM Affirmative.

SPACECRAFT Okay, well then all I can do is to time it. If I can't see it up here and for right now knowing it's only my playback capabilities that's bad, what you're looking at is a picture of oms 4 and actually we set the cameras up during the OMS 3 to 4 period ...

CAPCOM Break, break, T. K. We'd like you to take the DFI wideband to continuous record.

SPACECRAFT Alright. You got wideband mission continuous. How about the PCM?

CAPCOM No PCM call, Ken. Just 30 seconds and then back to standby.

SPACECRAFT Okay, Mike. Now I've lost my train of thought on what was on that channel but what we're trying to put together was a picture that shows you OMS 3 preparations that would go along with the intercom (garble), actually right after ignition the camera (garble) they're good enough to hold up these cameras they aren't quite in the center of the mass and so during the burn the camera rotated around, you got a beautiful picture of the ejection seat from what I saw before the playback stopped. We'll see if Hentry can point the camera out the window for a

quick look at the ground. Looks like we ought to be going over Mexico here. Hey Mike, is that VTR stopped? I'll switch (garble) TV?

CAPCOM We're still watching the picture down here, Ken. And you can take the DFI recorder wideband mission back to standby.

SPACECRAFT Okay.

CAPCOM And then to off, T. K.

SPACECRAFT Say again.

CAPCOM And now you can take it off and OEX power off and wideband mission power off.

SPACECRAFT Okay, they are.

CAPCOM Okay, on the downlink here we saw just a shift over to the ejection seat like you said we would.

SPACECRAFT Okay, what you needed was some words and I couldn't see them. You want to switch over now to stop that. I don't think - I don't remember what was on the rest of that take, so I think I'll stop it. Now I know that some of our tapes do work. I'll go ahead and continue to cut them and we'll ship them to you and hope that you can make some sense out of them.

CAPCOM Roger, that.

SPACECRAFT You want quick tour with a live TV or not?

CAPCOM That's affirmative, T. K.

SPACECRAFT Okay. Okay, Ken's going down the ladder now with the TV. He's coming down in the middeck. He's going to turn around here in a minute and get us a view on the CFES.

CAPCOM Okay, we're seeing all of that down here.

SPACECRAFT You see the treadmills are all stowed away properly. Okay, he's centered up on the CFES now. And what that device does, you know, that we put in our protein sample in the bottom, or some other sample and there's a flow of or a buffer fluid that carries the sample up to the top and it comes in a very fine stream on the left ...

END OF TAPE

SPACECRAFT and right of each side of that electric field that tends to separate the proteins because they all pick up their own inherent charges, it's a very slow process it takes several minutes for the fluid to transport from one from the top from the bottom of the system to the top. The end product of course is what we're all interested in, and there's a great future for this in developing new drugs and isolating and biological materials that can only be there in microscopic portions in a laboratory.

CAPCOM And Columbia, Houston, we're about 10 seconds to LOS appreciate those good words there Hank, we'll talk to you again here through Ascension at 37.

PAO This is Shuttle Control, we've had Loss of Signal through Merritt Island, next acquisition, Ascension Island in 13 and 1/2 minutes. First portion of this downlink television was from the video tape recorder that was video of the crew during an OMS burn, then shifted to live television the last minute and a half or so of the pass of the continuous flow electrophoresis experiment on the middeck of Columbia. At 1 day 3 hours 24 minutes Mission Elapsed Time, this is Shuttle Control, Houston.

CAPCOM Columbia, Houston, with you through Ascension for 6 minutes, over.

SPACECRAFT Okay Mike, we're here.

CAPCOM Roger, read you five by and we'd like to verify that you deactivated the MLR on the last pass.

SPACECRAFT Yes sir, the time was 03:27.

CAPCOM Roger, we copy that T. K. 03:27

CAPCOM And Columbia, Houston, we're 30 seconds to LOS, we'll talk to you again through Botswana at 48.

SPACECRAFT Okay.

PAO This is Shuttle Control, Ascension has Loss Of Signal. Columbia out over the South Atlantic moving toward acquisition through Botswana in 4 minutes. Crew reporting over Ascension that the mono dispersed latex reactor experiment was deactivated at 1 day 3 hours 27 minutes, Mission Elapsed Time. At 1 day 3 hours 43 minutes, Mission Elapsed Time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 1 day 3 hours 47 minutes Mission Elapsed Time. Columbia coming up on acquisition at Botswana.

CAPCOM Columbia, Houston, with you through Botswana for 7 minutes, over.

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SPACECRAFT Yes sir. I'm sitting here marking up the entry checklist for the post landing time when its all over, I guess that's what you wanted me to do with that message, is that right?

CAPCOM That's affirmative T. K. and while your marking things up we have a minor change to the CAP we'd like to give to you.

SPACECRAFT Okay. Go ahead.

CAPCOM Okay, on page 4-24 of the CAP, we'd like you to delete the FES restart, that's at 6 hours 40 minutes, since our attitudes are changing tonight, I'd like to delete that restart.

SPACECRAFT Okay, on 4-24, about 6:40, you say when you leave gg, just leave the radiators the way they are.

CAPCOM Roger T. K. we'd like you to leave the FES F E S where it is.

SPACECRAFT It's all flow with the radiator stowed. That's what you want right?

END OF TAPE

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SPACECRAFT Flow with the radiator stowed, that's what you want right?

CAPCOM That's affirmative, radiator stowed and FES off.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, we're 30 seconds to LOS we'll talk to you through Guam at 4 plus 19.

SPACECRAFT Okay, Mike thank you.

CAPCOM And Columbia, Houston, be advised that the next pass will be a PMC.

SPACECRAFT Okay, thank you sir.

PAO This is Shuttle Control, Botswana has Loss Of Signal, next acquisition through Guam, the Private Medical Conversation will take place during the Guam pass. We'll stand by during that pass if that Private Medical Conversation does not go on through the pass we'll pick up whatever air to ground there is at that time. Guam acquisition in 23 minutes. Crew continuing to operate the continuous flow electrophoresis experiment. At 1 day 3 hours 56 minutes Mission Elapsed Time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 1 day 4 hours 18 minutes Mission Elapsed Time, Columbia has just started orbit number 20, and is coming up on acquisition through Guam.

PAO This is Shuttle Control, Columbia is beyond Guam's range now, heading toward Hawaii, which we'll acquire in 6 minutes. This Guam pass devoted to the scheduled Private Medical Communication. At 1 day 4 hours 27 minutes, Mission Elapsed Time, this is Shuttle Control, Houston.

PAO This is Shuttle Control, at 1 day 4 hours 32 minutes, Mission Elapsed Time. Columbia is approaching acquisition through Hawaii.

CAPCOM And Columbia, Houston, with you through Hawaii for 7 minutes, over.

SPACECRAFT Okay Mike, and I just took a look at our attitudes and I was just getting ready to intervene with GG, what is your opinion?

CAPCOM Roger, stand by, we're taking a look at it T. K. And while we're doing that, would you, panel All, we'd like you to tank the cryo tank 4 heater H2, A switch to OFF and B to AUTO, we think we've got H2 tank 4 heater failure here.

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SPACECRAFT Okay, I've got on All, hydrogen, tank 4 A is OFF and B heater is AUTO.

CAPCOM Roger we copy, we think heater A is failed.

SPACECRAFT Okay, the CFES is all put to bed for today.

CAPCOM Roger we copy the CFES is put to bed.

CAPCOM And Columbia, Houston, be advised that we'd like to leave GG as is.

SPACECRAFT Okay that's fine.

CAPCOM And Columbia, Houston, when you get a chance we'd like to get the times that you powered up the CFES today and the time you powered it down.

SPACECRAFT Okay Mike, stand by one, I'll push down and get that for you.

CAPCOM Roger.

SPACECRAFT Okay the time that I logged for sample one was 0 days, 20 hours 51 minutes. And I powered it off at 1 day 3 hours and 50 minutes.

CAPCOM Okay, we copy that Hank.

CAPCOM And Columbia, Houston, we missed the tire pressure measurements over Guam, if you could turn the DFI power up at this time, we'll get that now.

END OF TAPE

SPACECRAFT (garble) Mike.

CAPCOM Roger. And Columbia, Houston, we are 30 seconds from the 2 minute LOS we will talk to you through Buckhorn.

SPACECRAFT Okay.

PAO This is Shuttle Control. Columbia out of range in Hawaii, moving toward acquisition through Buckhorn in a minute and a half. Hank Hartsfield reporting during this pass that he has shutdown the continuous flow electrophoresis experiment for today. We will standby for Buckhorn acquisition. Columbia will miss the Merritt Island station during this pass, as it skirts down the west coast of Central America, and will cut across to South America to Ascension after Buckhorn LOS. We are about 1 minute away from Buckhorn.

CAPCOM And Columbia, Houston with you through Buckhorn, and you can turn the DFI power off at your convenience.

SPACECRAFT Okay those are off.

CAPCOM Roger, copy that Hank, and be advised there is a G state message, teleprinter message onboard, that was sent up in Hawaii.

SPACECRAFT Okay I just took it off the telepress.

CAPCOM Roger, we copy, thank you.

SPACECRAFT Okay, Mike, you still there?

CAPCOM That's affirmative T.K..

SPACECRAFT Okay. Finally found me a place where I could use the tail to shield the sun. Looking at this radiator performance. Not radiator, but payload bay liner. And I think I can say verbally that the only thing I see that all of the things that look like dacron cloth blankets. The ones in the bottom all look like they have had a little air trapped under them, but they've taken a little set. But, I'd bet if you were to push on them, they go right back down. It looks like all those on the bottom and I'll get a picture of them when the sun (garble) now. The stuff on the back of the bulkhead and sides that all looks perfectly clean. And just at the side I was looking at the, I had my binoculars out and was looking at things on the tail end, and I went around and looked, and from where I am it doesn't look like we've got even 1 ding on the OMS POD. Not even a little scratch, they're just as clean as when they were put it on.

CAPCOM Roger, we copy that T.K. that's good news. And

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Columbia, Houston, we are 25 seconds from LOS, we will talk to you again through Botswana at 23.

SPACECRAFT Okay, see you then.

PAO This is Shuttle Control. Buckhorn has loss of signal. The elevation angle at Ascension is too low to talk to Columbia during this orbit, so the next station will be Botswana in 33 1/2 minutes. Columbia's Commander T.K. Mattingly reporting during this pass that he's been looking over the OMS pods with his binoculars. That's the area where we had some tile damage during the last flight. He said the OMS pods looked very clean. No dings no scratches. At 1 day 4 hours, 50 minutes, Mission Elapsed Time, this is Shuttle Control, Houston. This is Shuttle Control, Columbia being acquired at Botswana now. At 1 day 5 hours 23 minutes, Mission Elapsed Time.

CAPCOM Columbia, Houston with you through Botswana for 7 minutes, we hope you are enjoying your meal.

END OF TAPE

MUSIC

SPACECRAFT Hello, there Robert. How are you doing?

CAPCOM Roger, we copy all that, T. K.

SPACECRAFT Okay, Robert.

CAPCOM T. K. this is Mike, we copy.

SPACECRAFT Oh, excuse me, I thought it sounded like Bob came back in. I'm sorry Mike. On the spare electrode we had, I wonder if you could ask (garble) or somebody you think can find out where that thing was stowed. We can't find the spare. Sure enough, we've lost the original.

CAPCOM Roger. We're checking on that T. K.

END OF TAPE

SPACECRAFT Houston, Columbia

CAPCOM Roger we copy you T. K.

SPACECRAFT Oh, okay, did you hear my last rambling question?

CAPCOM That's affirmative Ken, we're looking into it right now.

SPACECRAFT Okay, gonna have to go get some of these (garble)down there at the Cape to find out for you.

CAPCOM Roger, Ken we're on the phone right now, checking on it.

SPACECRAFT Okay, thank you.

CAPCOM And Columbia, Houston, we're checking on that, but you might check the STS locker up there, on by R5, pilot side over there.

SPACECRAFT Sounds like a good plan, I'll check it right now.

CAPCOM And Columbia, Houston, Steve Holly says it's in a blue bag there in P5.

SPACECRAFT And by george, you guys are right.

CAPCOM Roger T. K. and we're 30 seconds from LOS, We'll talk to you through Indian Ocean here at 35.

SPACECRAFT Okay, thank you Mike.

PAO This is Shuttle Control, Botswana has LOS. The Indian Ocean station is next in 3 and a half minutes, at 1 day 5 hours 31 minutes, Mission Elapsed Time, this is Shuttle Control Houston.

PAO This is Shuttle Control, at 1 day 5 hours 34 minutes, Mission Elapsed Time, the Indian Ocean station is about to acquire Columbia.

CAPCOM Columbia, Houston, with you through Indian Ocean for 2 minutes, over.

SPACECRAFT 123 okay that's it. (garble) Okay.

CAPCOM And Columbia, Houston, we're copying you here, we got about 45 seconds to go through Indian Ocean, over.

SPACECRAFT Okay, we're just having a little trouble getting over (garble) middeck.

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CAPCOM Roger, we copy, your about 30 seconds to go at Indian Ocean, we'll talk to you again through Guam at 56.

SPACECRAFT Okay.

PAO This is Shuttle Control, Loss Of Signal now at the Indian Ocean station. Next station is Guam in 18 minutes. At 1 day 5 hours 37 minutes Mission Elapsed Time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 1 day 5 hours 55 minutes, Mission Elapsed Time. Guam is about to acquire Columbia.

CAPCOM Columbia, Houston, with you through Guam for 6 minutes, over.

SPACECRAFT Is that you Houston?

CAPCOM That's affirmative Columbia, we're with you through Guam for 6 minutes, and standing by if you need us.

SPACECRAFT Okay, just making some good ole barbeque. Want some?

CAPCOM Roger, sounds good Hank.

PAO This is Shuttle Control, Columbia's crew is in the midst of the evening meal period aboard the spacecraft, we don't expect much conversation during this pass. Hank Hartsfield had nice words to say about the Barbeque. We'll stand by.

CAPCOM And Columbia, Houston, we're 30 seconds from LOS, we'll talk to you again through Hawaii at ten minutes after.

SPACECRAFT Okay, see you later.

END OF TAPE

SPACECRAFT Okay, we'll see you then.

PAO This is Shuttle Control. Columbia is out of range at Guam, Hawaii is next in 6 1/2 minutes. Columbia on its 21 orbit of the Earth now. At 1 day 6 hours, 3 minutes Mission Elapsed Time, this is Shuttle Control, Houston. This is Shuttle Control at 1 day 6 hours 9 minutes Mission Elapsed Time. We are standing by for acquisition through Hawaii.

CAPCOM And Columbia, Houston with you through Hawaii for 8 minutes, over.

SPACECRAFT Aloha.

CAPCOM And we read you 5 by, Hank. And Columbia, Houston you can expect the teleprinter message onboard VTR troubleshooting message disregard the partial message that came up.

SPACECRAFT Okay we follow yellow line over there, we thought we would go get it soon as we get free.

CAPCOM Roger, and it looks like you'll probably get a FI valve fail leak due to the bias low cold temperature, go ahead and reselect as required, if you haven't already.

SPACECRAFT Okay, Mike. You guys busy, or you just kibitzing?

CAPCOM Roger. We're not busy T.K..

SPACECRAFT We are just finishing up (garble). This is a first class operation. When you can (garble) two ice creams, (garble) off with regular ole store bought food and a cup of coffee, and watch the world go by, that's kind of neat.

CAPCOM Roger, we copy that, that sounds like quite a meal.

SPACECRAFT I tell you, I put in a plus for the freezer it really does some nice things. (garble) cycle in the refrigerator tomorrow. That thing really works neat, it held everything (garble)

CAPCOM Roger, we copy that. And Columbia, Houston we have a long LOS after this Hawaii pass we gotta few things that we would like to pass up when you have a second.

SPACECRAFT (garble).

CAPCOM Roger Hank we gotta few things that we would like to pass up when you've got a second.

SPACECRAFT (garble)

CAPCOM That's affirmative.

SPACECRAFT (garble)

CAPCOM Okay Hank we would like you to change the dead-band for the maneuver for IMU line attitude at 650 and for the alignment 1/2 a degree instead of 1 degree.

SPACECRAFT (garble) is that right?

CAPCOM Roger. For the maneuver to the IMU align attitude, and for the IMU alignment itself we would like for you to have a dead-band of 1/2 a degree. And you can go back to 1 degree for returning to attitude.

SPACECRAFT Okay that's what I wanted to know. We go back to 1 degree (garble).

CAPCOM That's affirmative. And for your supply water dump, we would like you to dump supply water tank B Bravo to 45%, and we estimate it will be 45 minutes of dump.

SPACECRAFT Okay, B to 45.

CAPCOM And Columbia, Houston, one last thing at this pass, for the hydraulic thermal conditioning enable scheduled at 7:15 we would like you to report the position before and after the hydraulic thermal condition enable, of the elevons out there. (garble) interested in the elevon changes during the circ. pump activation.

SPACECRAFT Okay, we are looking before we enable plus look at them after.

CAPCOM Okay, thank you much. And Columbia, Houston we are 30 seconds to go before a long LOS we will talk to you again at Botswana at 59.

SPACECRAFT Okay Mike see you later.

END OF TAPE

PAO This is Shuttle Control, Hawaii has Loss Of Signal. Columbia misses the United States during this pass. The descending node of the 21st orbit goes down the Pacific Ocean across South America, next acquisition through the Botswana station in Africa in 41 minutes. At 1 day 6 hours 18 minutes, Mission Elapsed Time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 1 day 6 hours 58 minutes, Mission Elapsed Time. Shuttle is approaching acquisition through Botswana.

CAPCOM Columbia, Houston, with you through Botswana for 6 and a half minutes, over.

SPACECRAFT Hello Houston.

CAPCOM Roger, we read you loud and clear Hank.

SPACECRAFT Just let you know where we are, we think we're caught up. T.K.'s working on the IMU alignment and I'm getting set up for the water dump soon as he's through.

CAPCOM Roger, we copy that Hank.

CAPCOM And Columbia, Houston, we're 30 seconds to a 1 minute LOS, we'll talk to you again through Indian Ocean.

SPACECRAFT Okay, we'll see you there.

PAO This is Shuttle Control, Botswana has LOS however, the Indian Ocean station will see Columbia in less than a minute, we'll continue to stand by. At 1 day 7 hours 6 minutes, Mission Elapsed Time.

CAPCOM And Columbia, Houston, with you through IOS, for 8 and a half minutes, over.

CAPCOM And Columbia, Houston, if somebody's up on the flight deck, we'd like you to take the right ADI to inertial from LVLH please.

SPACECRAFT (garble)

CAPCOM Roger, we just wanted it there so we could watch you during sleep.

SPACECRAFT (garble)

CAPCOM Columbia, Houston, Hank we can see that without the power being on.

SPACECRAFT Okay, we'll put the switch in inertial instructions

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about the (garble) I didn't realize this is the one we (garble) I presume

CAPCOM Okay, we see that, thank you Hank.

SPACECRAFT Hey, Mike, at the time (garble) about the point 5 degree deadband, I didn't realize that this was the one we just did a water dump (garble) and I presume you meant hold that attitude through the water dump, is that correct?

CAPCOM Roger, stand by T. K. we're gonna have to think about that for a minute.

SPACECRAFT Okay, and I can read you the IMU numbers unless you already have them.

CAPCOM Roger, T. K. can you read those to us, we don't have them.

SPACECRAFT Okay, it's 0. star 74 and 47 IMU number 18 is a +.1 + 06, -10, IMU number 2, -14, -19 -02, IMU number 3, is -21, +23, -33 (garble). 07 00 00.

END OF TAPE

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CAPCOM And Columbia, Houston, understand IMU 1 X was +.5 was that true?

SPACECRAFT Negative. plus .18.

CAPCOM Roger, +.18.

SPACECRAFT That's affirmative.

CAPCOM And T.K. you can go back to 1 degree dead-band.

SPACECRAFT Okay, sir thank you.

CAPCOM And Columbia, Houston, we see the water tank A inlet valve is closed, that is not in the a procedure, and you can go ahead and get the water dump started, the nozzle temperatures are getting pretty high.

SPACECRAFT Okay, say again about the valves.

CAPCOM Roger, Columbia say again.

SPACECRAFT What did you say about the tank A inlet valve?

CAPCOM Roger. We show that tank A inlet valve is closed.

SPACECRAFT That is correct. You told me to just to dump tank B. I can't dump B without dumping A, if I dump A it's going to go (garble). Okay I'll dump B, B goes first then A, okay.

CAPCOM Roger, Hank B goes first and we are 30 seconds to LOS and we will talk to you again through Guam briefly and be advised we're planning a brief tag up at Hawaii.

SPACECRAFT Okay see you then.

PAO This is Shuttle Control. Columbia has moved out of range at the Indian Ocean station now, and heading toward Guam acquisition at that station in 17 1/2 minutes. At 1 day 7 hours 16 minutes Mission Elapsed Time this is Shuttle Control, Houston. This is Shuttle Control at 1 day 7 hours 33 minutes Mission Elapsed Time. We have AOS at Guam now. Telemetry shows the water dump in progress at this time.

CAPCOM And Columbia, Houston with you through Guam for about 2 minutes, over.

SPACECRAFT (garble), Houston, read you loud and clear.

CAPCOM Roger, Hank. And Columbia, Houston be advised we're sending a teleprinter message up this pass.

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CAPCOM Okay. (garble)

CAPCOM That's affirmative. And Columbia, Houston we are about 25 seconds to LOS and we've got several things we want to tag up with you at Hawaii.

SPACECRAFT Okay we will be ready for you.

PAO This is Shuttle Control, Guam has LOS now we're in the key hole for awhile. Next acquisition is Hawaii 7 1/2 minutes. We are 1 hour 22 minutes away from crew sleep period. And at 1 day 7 hours 37 minutes Mission Elapsed Time this is Shuttle Control, Houston. This is Shuttle Control, 1 day 7 hours 45 minutes Mission Elapsed Time. Hawaii has acquired Columbia.

CAPCOM Columbia, Houston with you through Hawaii for 8 minutes, over.

SPACECRAFT Go ahead.

CAPCOM Roger, T.K., we've got several things we would like to pass up when you've got a moment to copy.

SPACECRAFT Go ahead.

CAPCOM Okay, we had a pretty short pass there at Guam, we're not sure you got all of the teleprinter message. We would like you to check it please. Be advised that no SM check point will be required tonight. And Columbia on your voice summary tonight we'd like you to give us a nozzle film magazine status, and we'd like to know if you did the third glow orbiter glow experiment today, and did you get the 400 second exposure on it. And we planned to dump the OPS recorder time between 9 and 9:20, unless you'd like us to wait later.

CAPCOM And Columbia, Houston, a brief tag up here, the GG summary, for your information the largest excursions we saw during the GG today were 8 degrees

END OF TAPE

CAPCOM And Columbia, Houston. A brief tag up here. The GG summary for your information the largest excursions we saw during the GG today we're 83 degrees in yaw, 3 degrees in pitch, and 25.1 degrees in roll. And Columbia, Houston. The new anomalies we saw today were first of all the cryo tank 4, H2, heater A failed, B seems to be working fine. We're planning how to manage our cryos for the PRSD now. The vernier jet P56 AUX injector temperature was bias low. The jet is cooled in the bottom sun. You may get a false fail leak, there's no impact on that, just reselect the jet and leave the RM disabled. The gas battery checkout is on teleprinter message 9B. Additional PBR is in work and should be coming up to you a little bit later. And VTR trouble shooting is in teleprinter message 11A. We got a real good downlink today from the VTR of your oms 3 burn.

SPACECRAFT Okay. I really sorry all the confusion on that (garble) today. We had some other stuff we put together and when I saw what it looked like I thought it was the recorder rather than the playback loop itself. We played back a IFM tape at your suggestion and it worked just fine. So, I'm really confused now but if it works, we're going ahead and try and make plans and use it that way. I can answer quickly the question about nozzle. We did activate it but I have not had a chance to take any films with it. We may get some later on South America on that last pass, but we but we went over, my guess is, somewhere around Buenos Aires. There is an awful lot of lightning activity right after sunset. It was rather spectacular. If we go anywhere near that area again, we'll try to take a shot at it. The nozzle is one of those things you got to be sitting at the window. It's not - you can't just pick up the camera when you see it. You got to go get all your stuff together and it's just - I don't want that to be convenient and probably won't tomorrow. And we're gonna have to work it in the off hours and on the following days when there aren't quite as many pacing items. But, we haven't forgotten it. The glow experiment, I can tell you right now, we did both exercises and took both 400 second exposures.

CAPCOM Roger, T. K. We copy that. And Columbia, Houston. Looks like you'll be passing over Buenos Aires on this pass here about 20 minutes or so and you might also be advised that we've got volcanic activity over Java and over El Shacone again in Mexico. That'll be a good photo opportunities if you have that opportunity. And be advised that we're going to update some gyro biases to your IMU's here.

SPACECRAFT Okay, Mike. I wish we had more time to look out the window but we keep getting our attention split and we get fractured. I feel like today we didn't do anything all that efficiently. We spent our time inside, we got distracted out and vice versa and so our plan tonight is to make a better do a better job on having the cameras available for pictures of of opportunity for things like the nozzle and the geology kind of

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stuff. We're positioning that around the windows now with the right film. We got caught a couple of times today with the right ideas and the wrong equipment.

CAPCOM Roger, we copy that, T. K. It appeared to us that you've been right on top of things all day today.

SPACECRAFT That's called an altitude advantage.

CAPCOM Roger, copy that. And Columbia, Houston. We'd like to remind you to do the hydraulic thermo conditioning enable that was scheduled at 7:15 with the positioning reports in place.

SPACECRAFT Yes sir, we were waiting for sunrise so we could see the elevators and then - that's just the example I was talking about Mike. Then we started taking pictures of the water dump and then we started talking to you and now we're going to go do our VGO.

CAPCOM Okay, copy that, Ken. Thank you. And Columbia, Houston. We're about 20 seconds till LOS and we'll talk to you again through San Diego at 8+12.

SPACECRAFT Okay, we will see you there.

END OF TAPE

CAPCOM ...plus 12.

SPACECRAFT Okay. We'll see you there.

PAO This is Shuttle Control. Columbia passing out of range at Hawaii. Next station is Santiago Chile in 19 minutes. Columbia on orbit number 22. We do intend to later today to send up on the teleprinter an additional troubleshooting procedure for the getaway special. At 1 day, 7 hours, 54 minutes Mission Elapsed Time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 1 day, 8 hours, 1 minute Mission Elapsed Time. Columbia is still almost 11 minutes away from acquisition through Santiago Chile. Following the private medical conference, the flight surgeon reports the crew is in good health. Hartsfield reports having a light headache accompanied by occasional queasiness. He has taken aspirin and was advised to continue to take aspirin and to take Scopex. Neither crewman has taken Scopex for motion sickness other than the planned preventive dose taken by Hartsfield following the launch. The flight surgeon noted the crew had a short sleep period last night and that Hartsfield had skipped lunch today. Crew said they planned to eat a good dinner and hoped to get a good night's sleep. That's the end of the summary on the private medical conversation at 1 day, 8 hours, 3 minutes Mission Elapsed Time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 1 day, 8 hours, 12 minutes Mission Elapsed Time. Columbia is about 30 seconds away from acquisition through Santiago.

CAPCOM And Columbia, Houston, with you through Santiago for 4-1/2 minutes. Over.

SPACECRAFT Okay. (garble). What are you guys doing? I thought we had them all for tonight.

CAPCOM Roger. Say again Hank.

SPACECRAFT We're down here trying to get the freezer going again and the teleprinter is pecking away. I thought you had sent us the last one.

CAPCOM That's a negative Hank. We've got a troubleshooting procedure for the gas coming up to you now.

SPACECRAFT Oh, let me tell what I did with that thing. (garble). Back earlier in the day, I had already tried changing batteries in that thing. Andn the battery I got out of the locker was apparently dead. The thing wouldn't even turn the gas control on. We couldn't get any reading so I took it, put the original back in, got out the multimeter, per your message and I

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can't read any voltage on any of the batteries for some reason or another and I know that 2 of them are good enough to light up the LED's.

CAPCOM Roger. We copy that Hank and the teleprinter message comes up as additional procedures for you.

SPACECRAFT Hey Mike.

CAPCOM Go ahead T.K.

SPACECRAFT Okay. If it's all right with you guys, I'm going to go ahead and try to catch this nozzle pass this time so we can say we got that one started on today, but that will mean that I'm going to be a, probably won't be able to answer all your questions intelligently by 9:30. Don't mind using a few more few more minutes to work on it, well I'd like to do that.

CAPCOM Roger. Columbia, Houston, we'd like you to pass up the nozzle pass and get to bed on time tonight. You've got a busy day tomorrow and we'd like you to get a good night's sleep. Over.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, we're 30 seconds from LOS. We'll check in with you again at Botswana at 35.

SPACECRAFT Botswana at 35. Okay.

END OF TAPE

PAO This is Shuttle Control, Santiago has LOS. Columbia on orbit number 22, proceeding towards Botswana now, that station in about 17 minutes. At 1 day, 8 hours, 18 minutes, mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control, at 1 day, 8 hours, 34 minutes, mission elapsed time. Columbia coming up on acquisition through Botswana.

CAPCOM Columbia, Houston, with you through Botswana for 5 minutes, over.

SPACECRAFT Okay, we are talking over various things and in general let me summarize our opinions of things we've seen and teleprinter traffic and our general impression of tomorrow. Yes, it's a busy day, I think right now, we are in the condition that we can handle it for some pad. I don't have any qualms at all about doing things, but we do need to be careful to pick the things to do that are the big ones, and not try to throw in a bunch of little things, the kinds of things that were, We allow to catch ourselves, I don't mean it was due your sending things to us but we got distracted. And when we work a bunch of little problems and then the little problems preoccupy you, and not get the bigger ones done. And having trouble with the HP 41 approach because alarm probes could just barely be heard and I guess it's due to the noisier cabin environment than what I expected, or maybe there's some other phenomenon, I'll get to that later in the flight. But at any rate, I cannot count on those things popping in, it means that I have to keep reading the flight plan and that's taking an inordinate amount of time that I haven't intended and I'm still looking for a way around that. We've also had some troubles with the HP timer module stopping a couple of times, so I'm keeping a close look at it and I'm going to switch to the backup unit for tomorrow. But in general, I think our strategy would be let's take the big items and pursue them. And Hank is in good shape and is looking forward to doing as much as he can do with the arm.

CAPCOM Roger, TK, we copied all that and concurred, thank you for your comments.

SPACECRAFT Okay, (garble)

CAPCOM Roger, Columbia, Houston, we lost a little bit on the last transmission, he advised your state vector is go for the next Edwards opportunity.

CAPCOM And Columbia, Houston, we're going LOS, we'll talk to you again through IOS in a couple of minutes.

PAO This is Shuttle Control, Botswana has loss of signal. Columbia will be picked up by the Indian Ocean station

in about a minute and 40 seconds, we'll standby.

CAPCOM And Columbia, Houston, with you through Indian Ocean for about 5 minutes, over.

SPACECRAFT Okay, read you loud and clear.

CAPCOM And Columbia, Houston, regards to your last comments, we plan to help you keep an eye on things tomorrow. Pass up flight plan reminders, and systems to configurations, if you think you'll need it.

SPACECRAFT Okay, Mike, you folks, both your team and your predecessors did a really good job of catching me sleeping and heading me off at the pass today. I really appreciate that, cause you called up some very appropriate things and I thought everybody really jumped in and told it all for us, and we really appreciate it.

CAPCOM Roger, TK, a couple of last things here. We plan to dump your voice recorder between 9 and 9:55 tonight. Your state vector is go for Edwards tomorrow, and we think you guys have done a super job today.

SPACECRAFT Okay, Mike, I guess you didn't catch the last end of my last comment. I won't have it ready by, it'll be close if I make it by 9, I'll be close.

End of tape.

SPACECRAFT Hey, Mike, I guess you didn't catch the last end of my last comment. I won't have it ready by (garble) would I make it by nine. I'll be close, but it's time to do the presleep things first so you can look at that.

CAPCOM Roger T.K., we copy. Just be advised that (garble) on between...after 9:00 o'clock for about an hour.

SPACECRAFT Okay sir. Thank you very much.

CAPCOM And Columbia, Houston, there's a Hawaii pass about 30 minutes after you start your sleep here at about 9:25. We're not going to call you, but if you could call us at Hawaii, let us know if you're finished with the voice recording, or give us an estimate on it, we'd appreciate it. We're going to turn it over to the Ivory Team after we sign off here.

SPACECRAFT All right sir. They sound like they must be a pure team.

CAPCOM Roger that.

SPACECRAFT (garble) gets worse with the timeline.

CAPCOM And Columbia, Houston, you're 1 minute to LOS and get a good night's sleep and have a good day tomorrow.

SPACECRAFT Okay. Thank you sir and you guys have been there a long time.

PAO This is Shuttle Control. The Indian Ocean Station has loss of signal. We won't attempt to talk to the crew anymore tonight. The next station to see Columbia is Guam in 20 minutes. We have asked Commander Ken Mattingly to give a call at Hawaii about 30 minutes from now and give us the status whether he's through with the voice recorder. Here in the Control Center, a shift handover is underway. As soon as we have an estimate on the time for the Change-of-Shift Briefing, we'll pass that along. At 1 day, 8 hours, 52 minutes Mission Elapsed Time, this is Shuttle Control, Houston.

PAO This is Shuttle Mission Control at 1 day, 8 hours, 54 minutes. Flight Director, John Cox and the Ivory Team have us in flight control of STS-4. Capsule communicator during this shift will be Astronaut Bob Stewart. We now estimate the time of the Change-of-Shift Briefing with offgoing Flight Director, Chuck Lewis, to begin at 7:45 pm Central Time. This is Shuttle Mission Control.

PAO This is Mission Control, Houston. Mission Elapsed Time 1 day, 9 hours, 21 minutes. We are now on orbit 23 approaching Hawaii with the signal period of 7 minutes in

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duration here and capsule communicator won't initiate contact with the vehicle but we will be standing by just in case there is anything the crew wants to downlink to us.

SPACECRAFT Houston, Columbia.

CAPCOM Good evening Columbia. Houston's with you.

SPACECRAFT We completed our (garble) so I think we have completed all of our chores. Unless you have something else for us, we're going to go ahead and reconfigure our COMM system for a sleep configuration.

CAPCOM Columbia, did you complete your comments prior to the AOS at Hawaii?

SPACECRAFT Let's see. I was through with them at one zero nine about one five, I guess.

CAPCOM Okay. Sounds good and we've gotten no traffic for you down here. Sounds like it would be a good idea for you to get some sleep.

SPACECRAFT I'll tell you Robert, it's hard to get up, muster the interest in going to bed.

CAPCOM So I've heard. Maybe someday I'll find out.

SPACECRAFT We'll save some for you...

END OF TAPE

CAPCOM (Garble) you to get some sleep.

SPACECRAFT I'll tell you, Robert, it's hard to get up...muster the interest in going to bed.

CAPCOM So I've heard. Maybe someday I'll find out.

SPACECRAFT Now, we'll save some for you. All right sir, sorry to say hello and then goodnight, I'm going to bed, but I guess that's what we'd better do. We'll talk to you later then.

CAPCOM Well, just sleep soundly tonight because your ascent team is awake.

SPACECRAFT All right. The ascent team was sure awake and on the ball the other day.

CAPCOM Well, you must have done a good preflight on the spaceship.

SPACECRAFT Alpha, that was one heck of a ride and you guys are right on it all the way. That's really not what he said when he turned on orbit.

CAPCOM Well, we'll talk about that when you get back down.

PAO This is Shuttle Mission Control. Mission Elapsed Time, 1 day, 9 hours, 29 minutes. We've had loss of signal through Hawaii and that last call down from Mission Commander, T. K. Mattingly, indicating that they had finished up, cleaned up all their remaining activities for the day and with some apparent reluctance, T.K. indicated that they would be closing up shop for the day and going into their sleep period which, in which there are 7-1/2 hours remaining at this juncture. Columbia on orbit number 23 just passing down across the South Pacific. Mission Elapsed Time, 1 day, 9 hours, 30 minutes. This is Shuttle Mission Control.

PAO This is Shuttle Mission Control at 1 day, 11 hours, 25 minutes. Crew is still asleep and although there is, of course, no communication with them, the spaceship Columbia continues to talk to the flight controllers downlinking system status data through telemetry as it passes over ground stations. We are now passing over the Santiago Chile ground station. Telemetry indicates the vehicle continues to be healthy and all systems onboard are functioning normally. There is 5-1/2 hours remaining in the sleep period at 1 day, 11 hours, 26 minutes. This is Mission Control, Houston.

PAO Shuttle Mission Control, Mission Elapsed Time, 1 day, 14 hours, 52 minutes. There's about 2 hours remaining in the crew's sleep period. Columbia is on its 27th orbit of the

Earth, presently over the South Atlantic Ocean, just in the range of the ground station at Dakar. The temperature onboard Columbia is 81 degrees and steady, humidity, 37 percent, and the vehicle continues to be in a very nearly perfectly circular orbit of 161.5 nautical miles by a 160.7 nautical miles. No alarms have awoken the crew and downlink data continues to indicate that everything onboard the Columbia is performing nominally. Mission Elapsed Time, 1 day, 14 hours, 53 minutes. This is Shuttle Mission Control.

PAO This is Shuttle Mission Control at 1 day, 16 hours, 27 minutes. About 30 minutes remaining in the crew's sleep period. Just approaching acquisition of signal with Columbia over Dakar. Harold Draughn, ...and Flight Director Harold Draughn and his team of flight controllers have reported into the Mission Operations Control Center and are being debriefed by the outgoing team of flight controllers and the Flight Director, John Cox. Dakar now processing downlink data from Columbia and flight controllers are looking at that presently.

END OF TAPE

PAO and the flight director, John Cox. The CAR now processing downlink data from Columbia and flight controllers are looking at that presently.

CAPCOM Columbia, Houston, good morning tigers. Got a good day for you today and everything you need should be onboard.

SPACECRAFT Captain, we love that tune. (garble) can't stop your (garble), go on sailing.

CAPCOM Columbia, Houston, we're 15 seconds LOS, see you over Dakar at 04, have a good breakfast.

SPACECRAFT Okay sir, thank you.

CAPCOM Columbia, Houston, through Dakar for 6 minutes. We are recording voice again, and we're standing by.

SPACECRAFT Okay, Houston loud and clear. We got your water on board and the fuel cell pressure on, just didn't have it (garble)

CAPCOM Okay, sounds good. Columbia, Houston, 30 seconds LOS, fuel purge looks good, we'll see you through Indian Ocean for a low elevation pass at about 27 after.

SPACECRAFT Okay, sir, see you then.

CAPCOM Roger.

PAO This is Mission Control, loss of signal through Dakar. Crew had been awake for almost an orbit before the wake up music of Oh that Tiger was beamed up. Next station in 12 minutes will be Indian Ocean station. Fairly low pass at 1 degree, probably unlikely that we'll even use that station. After that, Yarraquadee in 26 minutes. At 1 day, 18 hours, 15 minutes, Mission Control, Houston.

CAPCOM Columbia, Houston, with you through IOS for 2 minutes, then we'll see you next at Yarraquadee at 4 1.

CAPCOM Columbia, Houston, through Yarraquadee for 6 minutes, standing by.

SPACECRAFT Good morning, Houston, how do you read, Columbia.

CAPCOM Read you 5 by, T.K.

SPACECRAFT Alright, thank you. George?

CAPCOM Columbia, Houston, did you call?

SPACECRAFT Yes sir.

CAPCOM Go ahead.

SPACECRAFT Hey just a note for those people that were worried about the little laser and how it would work. That thing works like a champ.

CAPCOM Okay, I'll be sure to pass that along to the appropriate individual.

CAPCOM Columbia, Houston, 15 seconds LOS, we'll see you through Orroral Valley in 2 minutes.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, back with you through Orroral Valley for 4 minutes, standing by.

SPACECRAFT Okay, sir. Interesting, if not significant category. We just gave the little refrigerator its first operational test, and it passed with flying colors.

CAPCOM Okay, we're glad to hear that.

CAPCOM Columbia, Houston, we're 50 seconds LOS. Mila is next at 2 6, and your wake up music this morning was provided from your alma mater, the Auburn Tiger Band.

SPACECRAFT Tremendous, thought they sounded to good to be my old (garble) I had on a record.

PAO This is Mission Control, Houston, have about 5 seconds here before predicted acquisition at Merritt Island Launch area at Bermuda on orbit number 30. Crew at this time should be finishing their morning breakfast. Before unstowing the remote arm and getting the IECM Contamination Survey Instrument pulled out of its mounts

End of tape.

PAO This is Mission Control, Houston, at about 5 seconds here before predicted acquisition at Merritt Island Launch Area and Bermuda on orbit number 30, before unstowing the remote arm and getting the IECM contamination survey instrument pulled out of its mounts.

CAPCOM Columbia, Houston, with you through MILA and Bermuda for about 7 minutes.

SPACECRAFT All right, Houston, loud and clear.

CAPCOM Columbia, Houston, we're 30 seconds LOS. Dakar is next at 41.

SPACECRAFT Okay sir.

CAPCOM Columbia, Houston, with you through Dakar for 4-1/2 minutes.

SPACECRAFT Okay. Powered up the RMS and doing the MBM check now and I had a check CRT light and I have a down arrow on the (garble) pitch. (garble) position (garble).

CAPCOM Roger, Hank. We copy. You can ignore it and just do an item 12 and an item 11 to clear it.

SPACECRAFT Okay. Okay, Houston, I'm having a little trouble getting my second star to come in on this check and star attitude. It looks like, my guess is, I'm just a little bit close to the sun. I'm trying to maneuver it around. Do you have any limits on how far off I can get before it violates the purposes of your test?

CAPCOM We copy. Stand by a moment.

CAPCOM Columbia, Houston. T.K., we don't think the sun is the problem. Be advised we think you'll have that star until 19:59. If for some reason you cannot complete the DTO, we would still like to go ahead and use just the star data you have to align the IMU.

SPACECRAFT Okay. Thank you. That was my other question. I'll ride this one til about 59 and then if no (garble) here, I'll align it with the (garble) later. (garble) or do you want me to give it to you?

CAPCOM Columbia, Houston, T.K., we have the angle data here. All we'll need is the times and you might try auto again.

SPACECRAFT Okay. I was trying to get the same point away from the sun. I'll go back to the original attitude.

CAPCOM Roger.

CAPCOM Columbia, Houston, we're 30 seconds LOS. We'll see you at Indian Ocean on the hour.

SPACECRAFT Okay, and just got two stars in.

CAPCOM Great, and we concur.

CAPCOM Columbia, Houston, with you through Indian Ocean for 8 minutes.

SPACECRAFT Coming in loud and clear. I got a couple of more RMS things to talk over with you.

CAPCOM Roger. You're loud and clear. Go ahead.

SPACECRAFT Okay. I went over and checked out the backup dryer. Everything worked well. The payload release, backup payload release worked well. When I came back to the primary power, this is on page 1-7 of the checklist, and did the save and cancel, I got a control error light, a check CRT light, and appropriate SM alerts, and I checked my stagnation. I had down hours on control errors for (garble) shower position for (garble). Last night, I waited and talked to you about those and I went ahead and started to do the auto release check. When I got down to where it says hold those switch and read it for 20 seconds til you get the talkback. When I got the talkback, I also got a release light, so I got several things here I don't understand. (garble) still appear to be closed.

CAPCOM Roger. We're looking at it and we'll get back to you shortly.

SPACECRAFT Can you tell me where I am?

CAPCOM Roger, Hank. Hold for just a moment.

END OF TAPE

CAPCOM Roger, we're looking at it, we'll get back to you shortly.

SPACECRAFT Can you tell me where I am?

CAPCOM Roger Hank, hold for just a moment. Columbia, Houston, Hank we would like for you to initiate a capture.

SPACECRAFT Okay. From the (garble) position you want me to hit the capture switch?

CAPCOM Roger, hit the capture switch.

SPACECRAFT Okay, that the release light.

CAPCOM Roger.

SPACECRAFT Okay. Now what about my control error and tank CRT message, Do you want me to try to (garble) do that?

CAPCOM Hank, you can go ahead and clear those cycle of breaks and do an item 12, item 11.

SPACECRAFT Okay. Anything (garble)

CAPCOM Hank, we think it's a transient when you came back out of backup.

SPACECRAFT Okay, we'll (garble)

CAPCOM Okay, Hank everything looks good to us you can press on.

SPACECRAFT Okay, (garble) auto release and I got the tank CRT light.

CAPCOM Roger

SPACECRAFT It looks like the auto sequence stopped right in the middle, I have gray flags on close and capture and on (garble) and open. I have open and close at the same time.

CAPCOM Roger

SPACECRAFT (garble)

CAPCOM Hank, we want you to go to Malf book, page 12-10. Will be Malf 12, 1 foxtrot.

SPACECRAFT Malf, 1 foxtrot.

CAPCOM And we're 30 seconds LOS, we're see you in

Yarragadee at 16.

SPACECRAFT Okay

CAPCOM Columbia, Houston with you through Yarragadee with you for 8 minutes.

SPACECRAFT Okay, can you talk a minute about this sorry mess?

CAPCOM Roger

SPACECRAFT Okay, I've gone through the mal and it seems that block 3 is the one the applies and I opened the top, closed top back at the same time, which, but I had some other talkbacks. I had a capture talkback which should never be there with nothing there, in any event I concluded that block A was the right answer, microswitch failure, and that I had the manual mode capability, which appears to be true. The looking at the TV, the spare drive in respond to the manual switch, however, every time I go to do a manual rigidize, just after the derigid flag goes off and just before the rigid flag comes on, I get a release light. I can drive it on the rigid and then I can hit the trig and turn the release light out, I don't know what's happening there, the snares do not move. They appear to be fully closed when the release light is off.

CAPCOM Roger and copy.

SPACECRAFT Also our (garble) auto release sequence and it hangs up everytime by giving me a, the rigid flag will go out, the derigid flag will go gray, I will get both the open and close flag and a capture flag and the extend flag will be auto fold. And that's repeatable with the auto release.

CAPCOM Roger, Hank. Hank, give us a minute to finish thinking about this and we'll get back to you.

CAPCOM Columbia, Houston, Hank I have some info for you, if you're ready.

SPACECRAFT Go ahead.

CAPCOM Okay, what we would like for you to do is to go to manual derigidize, open the snares, deselect, and then reselect the arm. We would like for you to hold at that point until we pick you up at Orroral and at that time we will do the end effector checkout, starting on page 1-4.

SPACECRAFT Okay

CAPCOM And Hank..
End of TAPE

CAPCOM Columbia, Houston, Hank I have some info for you if you're ready.

SPACECRAFT Go ahead.

CAPCOM Okay, what we would like for you to do is to go to manual derigidize, open the snares, deselect, and then reselect the arm. We would like for you to hold at that point until we pick you up at Orroral, and at that time we will do the end effector checkout starting on page 1-4.

SPACECRAFT Okay.

CAPCOM And Hank, what we're thinking is that it may be a logic problem and that by deselecting and reselecting the arm, we will reset the logic.

SPACECRAFT You're doing something, cause I just did a manual derig, I got a release flag, and a release light and a close flag. I hit the trig and got rid of that, but I'm in derig and extend talkbacks at the same time.

CAPCOM Roger. Columbia, Houston, we're about 15 seconds, LOS, pick you up at Orroral in about a minute.

SPACECRAFT Okay, and we'll run check there, I deselected the arm and reselected it.

CAPCOM Roger.

CAPCOM Columbia, Houston, with you through Orroral for about 5 minutes.

SPACECRAFT Okay, you want me to run the check? Houston, how do you read?

CAPCOM Read you five by, Hank, we're just still our act together, just a moment.

SPACECRAFT Okay, I'll standby for your call. I reselected and I still got these funny talkbacks. I have a derig and an extend talkback, and no open talkback.

CAPCOM Roger, we're going to give you something to help on that, just a moment. Columbia, Houston, Hank, we'd like for you to go to end effector manual mode, hit the release and hold it for 3 seconds.

SPACECRAFT Okay, I got all three flags like I should have.

CAPCOM Roger. Okay, Hank, we're ready for the end effector checkout on 1-4, you can press ahead.

SPACECRAFT Okay, I closed all that.

CAPCOM Okay, Hank, you're looking good so far, we're ready for manual rigid.

SPACECRAFT Okay, but it don't look like the picture, that picture's not right, is it?

CAPCOM It's looking good to us.

SPACECRAFT What we're looking at is we have gray extend talkback and page 1-5 it shows a barberpole for the extend after the first step on the end effector capture switch. In the meantime, we're going to press on with the end effector manual control to rigid.

CAPCOM Roger, we copy.

SPACECRAFT Okay, just right after the derigid flag, went barberpole, I got a release light and then I got the rigid flag.

CAPCOM Roger.

SPACECRAFT It still looks closed in the picture.

CAPCOM Okay, Hank, we're fixing to go LOS, we want you to go ahead and maneuver to capture the IECM, but do not proceed beyond that point, we'll pick you up at Mila on the island.

SPACECRAFT Okay, just for position and order, be ready to capture, but do not capture, is that correct?

CAPCOM Affirmative.

PAO Mission Control, Houston, Spacecraft Columbia, now in the end of orbit 31 in its seven day flight. Pilot Hank Hartsfield having a bit of difficulty getting the end effector checked out on the remote manipulator system, the robot arm aboard Columbia. For today's survey of contamination in the area around the Orbiter, using the IECM, Induced Environment Contamination Monitor package. And the people here in the MCC are hoping to have their procedures put together by the time we come up on the states, in another 25 minutes through Mila and Bermuda to aid Hartsfield in sorting out what the problem is with the remote arm. At 1 day, 20 hours, 35 minutes, mission elapsed time, Mission Control, Houston.

END OF TAPE

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PAO At 1 day 20 hours 35 minutes mission elapsed time
this is Mission Control Houston.

CAPCOM Columbia, Houston, through the states for 13
minutes, over.

SPACECRAFT Okay Houston loud and clear and we're the RM poised
and waiting for your assessment.

CAPCOM Okay Henry, here it comes. We want, first of all,
to verify that when you did the backup release checkout you had
good results, over.

SPACECRAFT That's affirmative on that.

CAPCOM Understand that's affirmative.

SPACECRAFT Affirmative, I did, when I had it captured, when I
went over the backup system it failed to release, I got a normal
release this past load.

CAPCOM Okay Henry, that's good. What we'd like you to do
now is, in the manual mode, we'd like to do a manual capture and
rigidize on the IECM. If everything looks good from that you
will be go to continue OPS. If however, you get an inadvertant
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release again, we want you to do another capture command. If
that clears the release, then we will be go for further OPS,
over.

SPACECRAFT Okay, I got it.

CAPCOM Columbia, Houston, the data on the capture and
regidize looks good from down here, you are go for further
operations. Columbia, Houston, we're 40 seconds LOS, Dakar is
next in 16. For your future planning this noon when we put the
IECM away, you do not have to leave it down for 2 hours the
requirement is 30 minutes, 30 minutes only.

SPACECRAFT Okay, understand.

CAPCOM Roger.

CAPCOM Columbia, Houston, thorough Dakar for 7 minutes
standing by.

SPACECRAFT All right sir, the lever's released.

CAPCOM We copy.

CAPCOM Columbia, Houston, we'll be waiting at Indi at 3 6.

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SPACECRAFT Okay, and would we just typewrite that command in the (garble) checklist.

CAPCOM Copy.

CAPCOM Columbia, Houston, standing by through Indian Ocean for 8 minutes.

SPACECRAFT Okay, loud and clear.

CAPCOM Roger.

SPACECRAFT That's 4 and 3 right now, check you later.

CAPCOM Okay, thank you.

SPACECRAFT There's a problem with the auto sequence, we got to point 2 and it powered down. It lost the ready light, so we had to operate a command to point 3 to get the sequence going again, I don't know what happened, but it seems to be working right now.

CAPCOM Okay, we copy that. Columbia, Houston, Yarragadee next at 51.

SPACECRAFT Okay, see you then.

CAPCOM Columbia, Houston, through Yarragadee for 8 minutes standing by.

SPACECRAFT Hello Houston we're at point 10 now in the sequence.

CAPCOM Copy, point 10.

SPACECRAFT Damn.

CAPCOM Columbia, Houston, we'll be LOS for about a minute.

SPACECRAFT Okay sir.

CAPCOM Columbia, Houston, for 2 more minutes.

SPACECRAFT Okay Houston loud and clear.

CAPCOM Roger. Columbia, Houston, we'll see you at the states at 3 0.

SPACECRAFT Okay, see you then.

END OF TAPE

PAO This is Mission Control Houston. LOS of signal through the two station in Australia. On orbit 31, 24 minutes to the states with Buckhorn and Myla, Bermuda overlapping coverage across the southern part of the U.S. Meanwhile Hank Hartsfield is doing the contamination survey using the remote manipulator system robot arm and the IECM contamination monitor package which has been unberthed from the hold downs in the cargo bay and is being waved around to sniff the contamination around the Orbiter, in and around the Orbiter. Little bit behind the timeline because earlier, Hartsfield had some trouble getting the end effector through it's checkout period. Apparently one of the talkbacks displays was not giving the right indication and after several attempts and some consultation with the ground, was able to get the end effector active and operating properly where the snare wires would indeed grasp the grapple fixture on the IECM. 23 minutes now till reacquisition of the spacecraft Columbia. Over the states at day 1 22 hours 6 minutes, Mission Control Houston.

CAPCOM Columbia, Houston. With you through Buckhorn, Mila, and Bermuda for about 18 minutes.

SPACECRAFT Okay. And we're on page FS218 coming up on .16.

CAPCOM Roger. Columbia Houston. We'll be in a keyhole for about a minute.

SPACECRAFT In the keyhole. Houston you still there?

CAPCOM Roger, we're here.

SPACECRAFT Okay, looks like we passing here south of you. Looks like a good bit of cloud out there this morning.

CAPCOM Thanks for telling us. We haven't had a chance to go out and look. Columbia, Houston. We'll see at Dakar at 52.

SPACECRAFT Okay, sir. Okay, we're passing the 418 now.

CAPCOM Roger. Columbia, Houston. With you through Dakar for 9 minutes and I have a couple of planning notes that will fix your near term planning if you have a few seconds during this pass.

SPACECRAFT Okay, be ready in a minute.

CAPCOM Roger.

SPACECRAFT Okay, sir. Go ahead. I got something to write on.

CAPCOM Roger. We would like for you to delay going to tail-sun and tail after your IECM timer expires. Also we have

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delayed the private medical communication until Botswana at 2 days 0 hours and 50 minutes. Also we think that it would be okay if plume survey completion is as much as 20 minutes late. We would rather that the plume survey was started as close to on time as possible though and delay using up any slack time until after that's over.

SPACECRAFT Okay. Our intent had been to do what we had to here and make up the difference between and as I understand it, we had to have to IECM down for only 30 minutes between the termination of this sequence and the commencer of the next. Is that correct?

CAPCOM That affirmative, T. K.

SPACECRAFT Right now it look to me like we'll probably have about - looks to me like we can have it in it's hold for about an hour and still start on time. Be my quest right now.

CAPCOM Okay, that fine.

END OF TAPE

SPACECRAFT and Houston, Columbia

CAPCOM Go ahead.

SPACECRAFT Let's make sure we're all in the same position that I haven't misinterpreted anything here. I think I've got somewhere around 35 or 40 minutes left to go in this sequence the way Hank's been running it, and if that's about right, I think I can afford to use about an hour and 10 and perhaps get one of the, perhaps even both of the contingency maneuvers. We'll put it down. And we'll try to get him out of this mess on time and that'll give you some slop on the other end to work with, and in doing this, things like TV and all that kind of stuff may suffer a little bit, but it seems to me that we're probably getting the most for our money's worth and we'll pick up a little more slack here. And we'll be the last one to show you by the end of the day anyhow.

CAPCOM That sounds good TK.

SPACECRAFT Okay.

PAO This is Mission Control Houston. Loss of signal through Dakar on revolution 32 7 minutes away from reacquisition through Botswana and Indian Ocean's station. Meanwhile the loquacious crew of STS-4 are continuing with the IECM contamination survey. The IECM has been unberthed at this point an hour and 46 minutes, and they expect to spent another 35 to 40 minutes in the contamination survey. At day 1 23 hours 4 minutes this is Mission Control Houston.

CAPCOM Columbia, Houston, through Indian Ocean for a minute and 45 seconds.

SPACECRAFT Okay Houston, loud and clear.

CAPCOM And if you have a second, I have one other major note for your future planning.

SPACECRAFT Wait a minute.

CAPCOM Roger, for your future planning, you have a go to implement TTR message 1 7 Charlie at the published time.

SPACECRAFT Houston, you were cut out in the middle. Say again.

CAPCOM Roger, you have a go to implement TTR message 1 7 Charlie at the published time. Yarragadee is next at 2 7. Columbia, Houston, with you through Yarragadee for 8 minutes.

SPACECRAFT Hello there.

CAPCOM And be advised if you're running short of time you can delete the trim to attitude requirements for the rest of the IECM procedure, your option.

SPACECRAFT Okay, that will save a little time. We're in the dark right now, don't think it will make much difference, we're just about to finish up at point 24 and go to 25.

CAPCOM Roger, good work. Columbia, Houston, we'd like to find out if you copied the go for teleprinter message 17 Charlie last pass.

SPACECRAFT That's affirmative sir, sure did.

CAPCOM Roger, one other note before we go LOS. Before you go tail to sun would you note the elevon positions and pass them along to us later.

SPACECRAFT Okay.

CAPCOM See you in Hawaii at 54.

SPACECRAFT See you.

CAPCOM Columbia, Houston, through Hawaii for 6 minutes.

SPACECRAFT Okay, we're with you. We're going through the control evaluation now and another one of those remarkable things when everything is (garble).

END OF TAPE

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SPACECRAFT His last data time out go for data collection. We were within 6 seconds of the time we had when we started the sequence.

CAPCOM Okay, we copy that, it's great planning.

SPACECRAFT Well that's one way of saying it.

CAPCOM Columbia, Houston, 30 seconds LOS, over the States at 4 after, and before you go to the loaded arm test check you DAP and your attitude.

SPACECRAFT Okay, it's my understanding I can let the attitude go Brewster, is that not true?

CAPCOM We'd like you to go to tail-sun, T. K.

SPACECRAFT Alright.

CAPCOM Columbia, Houston, for 19 minutes.

SPACECRAFT Houston, you still there?

CAPCOM That's affirmative.

SPACECRAFT Okay. On the, this loader arm test is the (garble) about manifold (garble) apply here. I don't want to close in - link on page 3-5 of the (garble) checklist.

CAPCOM T. K. the loaded arm has reference to left and right manifold ones, and the forward manifold one is the only one were concerned about, so you can do the procedure as written.

SPACECRAFT Okay good, that makes better sense, thank you.

CAPCOM And T. K. one clean up from the contam survey, we'd like a FES (garble) on please.

SPACECRAFT Okay, I didn't turn it on, cause we hadn't been using it? I thought you were just going to continue to go with RADS only.

CAPCOM Columbia, Houston, 30 seconds to LOS, Dakar next at 28, we see both of those tests done that's great work.

SPACECRAFT And remind me to call in on what I saw about the jet firings, just (garble) not right now, but later.

CAPCOM Wilco.

CAPCOM Columbia, Houston, with you for 11 minutes.

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SPACECRAFT Okay, we're putting the IECM down now.

CAPCOM Roger, copy.

CAPCOM Columbia, Houston, we have a couple minutes left this pass, I have a couple notes for you.

SPACECRAFT Okay sir, I didn't realize you were there. Did you, were you able to see our lunch time?

CAPCOM Yes sir, we got it down at 32.

SPACECRAFT Okay.

SPACECRAFT Ready to copy, go ahead.

CAPCOM Roger, T. K. at on the hour you have a supply water dump, and we'd like you to dump tank Bravo, to 10 percent, that's 10 percent. And after the dump, close the tank Bravo inlet and we'll let Charlie and Delta fill up, over.

SPACECRAFT Okay, you want to do supply water dump on Bravo to 10 percent, and when the dumps complete, close the inlet on Bravo.

CAPCOM That's affirmative. Also, your next pass is Botswana, and that will be a PMC if you have time.

SPACECRAFT Okay, we're going to try to grab a cup of coffee here and looks like we ought to be getting ready to take it back out here on the hour.

CAPCOM Okay, we copy that.

CAPCOM Columbia, Houston, we're 40 seconds to LOS, Botswana is next at 44 and the Crystal team is signing off, and sure enjoyed working with you guys today, you really are a couple of Tigers.

SPACECRAFT Meow.

PAO This is Mission Control Houston, Loss Of Signal through Ascension Island, Botswana in 4 minutes. The contamination monitor package has been reberthed after being out, attached to the end of the robot arm for approximately 3 hours and....

END OF TAPE

PAO -- robot arm far approximately 3 hours 14 minutes total time. And sniffing the atmosphere contamination around the spacecraft at different locations. The IECM package is now reberthed and back on Orbiter power. Change-of-shift is underway here in Mission Control. And Hal Draughon's team handing over to Chuck Lewis' team of flight controllers for the afternoon shift. Flight Director Hal Draughon is - will be in the JSC newsroom at approximately for his change-of shift briefing. At day 2, zero hours 41 minutes and 3 minutes away from reacquisition through Botswana voice relay station. This is Mission Control, Houston.

PAO This is Mission Control, Houston. Acquisition through Botswana in about 35 seconds. Flight Director Hal Draughon off-going Flight Director from the previous 9-hour shift will have a change-of-shift briefing at 11 a.m. central daylight in the JSC briefing room, building 2. Following that at noon, central time, George Hardy of Marshall Space Flight Center will discuss the solid rocket booster situation from Kennedy Space Center. This will be carried by television. We should have acquisition at this time through Botswana.

CAPCOM Columbia, Houston, through Botswana for another minute and a half. The bronze team is with you. Looking forward to working this afternoon and hope you're enjoying some lunch.

SPACECRAFT Hello, there, Bronze.

CAPCOM You're loud and clear. Columbia, Houston. 30 seconds LOS. Talk to you through Yarragadee next at 1 plus 03.

SPACECRAFT Okay.

PAO Mission Control, Houston. 2 days 1 hour 3 minutes Mission Elapsed Time. Standing by for acquisition of signal through Yarragadee in about 15 seconds.

CAPCOM Columbia, Houston through Yarragadee for 7 and a half minutes. Standing by.

SPACECRAFT Okay. Houston, Columbia.

CAPCOM Go ahead, Columbia.

SPACECRAFT I'd like to make sure that you're aware that LEDs alpha and bravo have never been lit in any of our activities. It sounds like - you think maybe they have been and - want to make sure we're all singing the same song.

CAPCOM Okay. We copy that. And Columbia, Houston. We concur with that assessment and (garble) we're all in sync. Columbia, Houston, 30 seconds LOS. Hawaii's next at 1 plus 29.

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SPACECRAFT Okay.

PAO Mission Control Houston, 1 day 29 hours Mission Elapsed Time - 2 days 1 hour 29 minutes Mission Elapsed Time. Standin by for acquisition through the Hawaii tracking station.

CAPCOM Columbia, Houston through Hawaii for 8 minutes. Standing by and we're sending you to up a state vector this pass.

SPACECRAFT George, you were talking just as we were firing. Say again, please.

CAPCOM Roger, T.K.. Just some information. There's a state vector coming up this pass.

SPACECRAFT Oh, okay. At Hank's suggestion, we decided to take a look at this - see if I couldn't watch the arm from the front. So I'm working the firing problems from the front seat where I can keep my eye on the IECM at the arm. And Hank's working the arm stuff in the back. And I get it all right here in front of me.

CAPCOM Roger, T.K.. Good teamwork.

SPACECRAFT The other neat thing is that it's not often you have to wear your sunglasses at night. But with the attitude we got in the IECM out there it'll just about drill little holes in your head if you don't.

CAPCOM We copy. Columbia, Houston, we see you finishing up your water dump. At your convenience could you get us down the METs of the IECM cycle time and deploy time.

SPACECRAFT I just happen to have that. Last time was 2 days 1 hour and 8 minutes. The cycle time. Is that what you wanted?

CAPCOM That's affirmative. And the deploy time too if you've got it.

SPACECRAFT It was last sent at 2 days 1 hour and 10 minutes.

CAPCOM Okay, Hank. Thank you.

END OF TAPE

CAPCOM Okay Hank, thank you. Columbia, Houston, we're 40 seconds to a 2 minute LOS before the states. One note, we've noticed we haven't had any voice on our ICOM tape playback, so I'd like you to make sure you have the panel switches in the right position, if you want us to record the voice.

SPACECRAFT Okay George, what did you want?

CAPCOM Roger TK, if you want us to get the voice record on the ICOM, we haven't been getting that, you might check the panel A1.

SPACECRAFT Okay, unless you're asking for it, that was an oversight.

CAPCOM Okay. That's no problem.

CAPCOM Columbia, Houston. Back with you through the states.

SPACECRAFT Okay. Thank you.

SPACECRAFT Houston - -

PAO Mission Control Houston, 2 days 1 hour 53 minutes mission elapsed time. We're currently in a pass over the United States. Orbit number 34. During the recent private medical conference with the crew, the crew reported that they were currently feeling very well and that pilot Henry Hartsfield took one Scopex last night and that he has had no further discomfort and that his headache is gone. Both crewmembers got 6 and a half hours sleep. The crew is currently about a third of the way through their RMS activities which are scheduled at this time. At 2 days 1 hour 53 minutes mission elapsed time this is Mission Control Houston.

CAPCOM Columbia, Houston. 45 seconds till LOS. Ascension is next at 2 plus 09.

SPACECRAFT Okay, see you then.

PAO Mission Control Houston 2 days 1 hour 57 minutes mission elapsed time we've just completed a pass over the continental United States and we're about 11 and a half minutes away from a period of communication with Columbia as it passes over the Ascension Island tracking station on orbit number 34. Repeat the announcement just a moment ago, a summary of the private medical conference the crew had with the flight surgeon. Both crewmembers reported feeling very well. That pilot Henry Hartsfield took one Scopex last night, and has had no further discomfort and his headache is gone, and both crewmembers got 6 and a half hours of sleep. At 2 days 1 hour 58

minute mission elapsed time this is Mission Control Houston. Mission Control Houston 2 days 2 hours 8 minutes mission elapsed time we're standing by for acquisition of signal with the Columbia over the Ascension Island tracking station in about 20 seconds.

CAPCOM Columbia, Houston, standing by through Ascension for 6 and a half minutes.

SPACECRAFT Okay, we just to point 55 on the plume survey.

CAPCOM Copy that. Columbia, we're 30 seconds to LOS. Botswana is next at 2 plus 19.

SPACECRAFT Okay George

PAO Mission Control Houston 2 days 2 hours 15 minutes mission elapsed time. Just had loss of signal with Columbia through the Ascension Island tracking station. Will reacquire in about 3 minutes over Botswana in Southern Africa. Crew is continuing with their IECM survey of the reaction control system plumes and is progressing well through that sequence. About halfway through that at this time. 2 days 2 hours 16 minutes mission elapsed time this is Mission Control Houston.

CAPCOM Columbia, Houston, standing by through Botswana for 7 and a half.

SPACECRAFT Okay, you all still there? Houston, we just finished point 63.

CAPCOM Roger, we copy. Columbia, Houston, 45 seconds to LOS. Yarragadee is next at 2 plus 4 1.

SPACECRAFT Okay George, and we just threw an extra diddy in there for you to get a good look at what the jets look like we get - -

END OF TAPE

SPACECRAFT What the jets look like, we got a little piece will play back on the VTR.

CAPCOM Roger, we copy.

CAPCOM Mission Control Houston, 2 days 2 hours 27 minutes, Mission Elapsed Time. Just past out of range with the Botswana tracking station and we'll reacquire in about 14 minutes over Yarragadee for a brief pass. Commander T. K. Mattingly reporting that as the crew was proceeding through their Remote Manipulator System activities with the contamination monitor and it's interaction and observation of the Reaction Control System jet firings that they did obtain some video tape recordings of that and at some point presumably we would be seeing some of that. At 2 days 2 hours 28 minutes Mission Elapsed Time, this is Mission Control Houston.

PAO Mission Control Houston, 2 days 2 hours 41 minutes, Mission Elapsed Time were about to reacquire communication with Columbia over the top edge of the range of the Yarragadee tracking station.

CAPCOM Columbia, Houston, with you through Yarragadee for 2 and 1/2 minutes.

SPACECRAFT Hello there, we just finished point 86.

CAPCOM Okay.

CAPCOM Columbia, Houston, 25 seconds to LOS. Guam is next at 2 + 51.

SPACECRAFT Okay.

PAO Mission Control Houston. 2 days 2 hours 44 minutes Mission Elapsed Time. Just past out of range through the Yarragadee tracking station. We'll be reacquiring over Guam in about 7 minutes. Crew reported that their nearing the end of the series of activities in the IECM plume survey, that's the use of the contamination monitor package to evaluate the plumes, that is the, from the Reaction Control Systems there. At 2 days 2 hours 44 minutes Mission Elapsed Time, this is Mission Control Houston.

CAPCOM Columbia, Houston, standing by through Guam for 7 and 1/2 minutes.

SPACECRAFT Okay, read you loud and clear.

CAPCOM Roger, your the same.

CAPCOM Columbia, Houston, I have a small correction to your teleprinter 18 Charlie when you have time.

SPACECRAFT Okay. Go ahead George.

CAPCOM Roger T. K. on step 2, I'd like to delete the last line and add the following, wait 3 minutes 20 seconds, check instrument motion complete, over.

SPACECRAFT Okay, we're talking about message 18 Charlie, and we're talking about step 3, delete that and make it wait 3 minutes 20 seconds and check instrument motion complete.

CAPCOM Negative T. K. We'd like to delete the last line in step 2, and insert what I read up, over.

SPACECRAFT Last line in step 2, excuse me.

CAPCOM Okay.

CAPCOM Columbia, Houston, we're 40 seconds to LOS. Hawaii is next at 3 + 05, and a reminder that teleprinter message 23 is now on board.

SPACECRAFT Okay, is it time critical?

CAPCOM Roger T. K. I would like to have you take a look at it in the next 10 or 15 minutes.

SPACECRAFT Okay. Thank you sir.

PAO Mission Control Houston, 2 days 2 hours 59 minutes, Mission Elapsed Time. We've just past out of range of the tracking station at Guam. And we'll reacquire in about 5 and 1/2 minutes over Hawaii. Flight Controllers here in Mission Control have noted from the data coming back from the Spacecraft that the crew has completed the IECM plume survey. One of the flight test objectives on the...

END OF TAPE

PAO One of the flight test objectives on this flight. According to the timeline, very shortly the pilot Henry Hartsfield will be reberthing the IECM and it's position in the payload bay. And Commander Mattingly, he is due to begin an exercise period in about 15-20 minutes, or so. Columbia is currently on orbit number 35 out over the Pacific Ocean. And will be passing within range of the Hawaii tracking station in about 4 and 1/2 minutes. At 2 days 3 hours Mission Elapsed Time, this is Mission Control Houston.

PAO Mission Control Houston, 2 days 3 hours 5 minutes, Mission Elapsed Time, we're reacquiring signal momentarily with Columbia over Hawaii.

CAPCOM Columbia, Houston, with you through Hawaii for 7 and 1/2 minutes.

SPACECRAFT Okay, Houston, read you loud and clear.

CAPCOM Roger Hank, read you, you've got a squeal in the background.

SPACECRAFT You really know how to hurt don't you?

CAPCOM Columbia, Houston, we're 20 seconds to LOS, states are next at 3 + 15.

SPACECRAFT Okay, and we're starting to press now.

CAPCOM Okay.

PAO Mission Control Houston, 2 days 3 hours 15 minutes, Mission Elapsed Time. During that last pass over Hawaii, crew reported that their berthing the IECM, that is returning it to its parking spot in the payload bay. Crew's pretty much on the timeline with that activity, and following that we're scheduled at about 2 days 3 hours 30 minutes to powerdown the Remote Manipulator System. We'll be reacquiring communication with Columbia after this brief pass through a spot here between the tracking stations, be reacquiring over the western United States in about 45 seconds. 2 days 3 hours 14 minutes, Mission Elapsed Time, this is Mission Control Houston.

CAPCOM Columbia, Houston, with you through the states.

SPACECRAFT Okay, loud and clear.

CAPCOM Your the same.

CAPCOM Columbia, Houston, 20 seconds to a 2 minute LOS here over the states. We see a down and latched configuration, looks good that's fast work Kenny.

SPACECRAFT We're here to please.

PAO Mission Control Houston, 2 days 3 hours 23 minutes, Mission Elapsed Time. The crew has just reported that they have the payload down and latched. Flight Controllers here in Mission Control were very happy with the progress that the crew has made and moving along the timeline today and getting many things accomplished. We'll be reacquiring communication in just about another minute here. 2 days 3 hours 23 minutes, Mission Elapsed Time, this is Mission Control Houston.

CAPCOM Columbia, Houston, back with you for 3 and 1/2 minutes.

CAPCOM And Columbia, Houston, the entire IECM team is delighted with the events today, and want to give you a big thank you for a job well done.

SPACECRAFT I appreciate that very much. We worked awful hard to get it done, but I think it flowed fairly smoothly.

CAPCOM Roger.

CAPCOM Columbia, we're 40 seconds to LOS, Ascension will be next at 3 + 45.

SPACECRAFT Okay, we're pressing on.

CAPCOM Roger that.

END OF TAPE

PAO Mission Control, Houston. 2 days 3 hours 29 minutes mission elapsed time. Just passed out of range of the tracking station during that pass over the continental United States. Crew during that time period reberthed the contamination monitor and its package and the payload - in it's position in the payload bay and have disconnected the arm from the IECM. They're doing a few other activities with the mechanical arm at this time and will power that down shortly. We'll be reacquiring communication with Columbia in about 15 minutes as we approach the Ascension Island tracking station. 2 days 3 hours 30 minutes mission elapsed time. This is Mission Control Houston. Mission Control Houston, 2 days 3 hours 44 minutes, mission elapsed time. We're about ready to reacquire communication with Columbia over Ascension Island.

CAPCOM Columbia, Houston. Through Ascension for 4-1/2 minutes, over.

SPACECRAFT Okay, we're working along on step 7 now. We've tried at once, no joy and we're kind of - assessing the situation.

CAPCOM Roger, we copy. Columbia, Houston, we're 30 seconds to LOS. Botswana is next, that's 3+55.

SPACECRAFT Okay.

PAO Mission Control Houston. Passing out of range at the Ascension Island tracking station. We'll be reacquiring communication with Columbia in about 5 minutes over Botswana. 2 days 3 hours 50 minutes, mission elapsed time. This is Mission Control Houston. Mission Control Houston, 2 days 3 hours 55 minutes mission elapsed time. Standing by for acquisition of signal over Botswana.

CAPCOM Columbia, Houston. Through Botswana for 7.

SPACECRAFT Okay, we've gone through step 7 a couple of times and we ended up going through 8, 9, we're working on 10 now.

CAPCOM Roger, we copy.

SPACECRAFT And we had no success.

CAPCOM Understand.

SPACECRAFT Okay, Houston. And I presume you'd like me to go ahead and pick up the IMU alignment.

CAPCOM That is affirmative, T. K.

SPACECRAFT Alright, sir. We're almost all on schedule aren't

we?

CAPCOM You're looking real good. Columbia, Houston.
We're 30 seconds to LOS. Guam is next, at 4+27.

SPACECRAFT Okay.

PAO Mission Control Houston. 2 days 4 hours 3 minutes
mission elapsed time. Just past out of range of the Botswana
tracking station. We have a long loss of signal period here
until we reacquire over Guam in about 23 minutes. Columbia's
currently on orbit 35. 2 days 4 hours 3 minutes mission elapsed
time, this is Mission Control Houston. Mission Control Houston,
2 days 4 hours 26 minutes mission elapsed time. Within range of
the Guam tracking station at this time.

CAPCOM Columbia, Houston. Through Guam for 7-1/2 minutes,
over.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston. I'd like to hand over to
SUNNYVALE PAYCOM for about 3 minutes, over.

SPACECRAFT Okay, go ahead.

END OF TAPE

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PAYCOM Columbia, this is Sunnyvale on air to ground 1.
How do you read?

SPACECRAFT Columbia, go ahead.

PAYCOM Roger, Columbia. We'd like to perform our
probaoscar cab now and then move to the log and update book and
perform a power status pad.

SPACECRAFT This is Columbia, go ahead, please.

PAYCOM Roger, Columbia. We'd like to perform a tab bravo
oscar now and then move to logging updates book and perform a
power status pad. Columbia this is Sunnyvale on air to ground
1. How do you read?

SPACECRAFT Loud and clear. Sunnyvale do you read Columbia?

PAYCOM Roger, Columbia. We've got you 5 by. Did you
catch our request for the tab bravo oscar?

SPACECRAFT Yes, sir. Just a second.

PAYCOM Roger, understand.

SPACECRAFT Okay, (garble) over and out.

PAYCOM Roger, Columbia.

SPACECRAFT Sunnyvale, can you read now?

PAYCOM Columbia, this is Sunnyvale on air to ground 1. We
have you 5 by 5.

SPACECRAFT Alright, bravo oscar number 1, on, on. I'm sorry
number 1 is on and off, number 2 is currently 18 to 20, 3 alpha
off, 3 bravo off, 3 Charlie on, 3 delta on, 3 echo off, 3
(garble) strot off, 3 golf off. 4 alpha close, 4 bravo is
correct.

PAYCOM Roger, Columbia.

SPACECRAFT Sunnyvale you still there?

PAYCOM Columbia, this is Sunnyvale. We copied all that
and we'd like to move to logging up updates now and do a power
status pad.

SPACECRAFT Hello Houston, Columbia.

CAPCOM Go ahead Columbia. Houston here.

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SPACECRAFT Okay. I can't tell if I'm getting through. Apparently I'm not getting through to Sunnyvale.

CAPCOM Roger, Columbia. We're copying 40 seconds left on this pass at Hawaii coming at 4+41. We'll have an RCS burn pad for you and also some minor deltas through the RCS burn card. Over. And Columbia, we're 5 seconds LOS. Hawaii's next at 4+41.

SPACECRAFT Okay, we'll be there.

PAO Mission Control Houston. 2 days 4 hours 35 minutes mission elapsed time. We pass out of range at the Guam tracking station. We'll have about a 5-1/2 minute loss of signal period here before we pick it up again in Hawaii. This is Mission Control Houston. Mission Control Houston, 2 days 4 hours 41 minutes mission elapsed time. We're within range of the Hawaii tracking station at this time.

CAPCOM Columbia, Houston. Through Hawaii for 7-1/2 minutes. Over.

SPACECRAFT Okay, we're here.

CAPCOM Roger, you're loud and clear. I'd like to read up an RCS burn pad that - you can copy.

SPACECRAFT Okay. Ready to copy.

CAPCOM Roger, T. K. Interconnect will be left oms to RCS. The +X burn, RCS burn, connect 4, TV roll 180, weight 224425, TIG 002 ...

END OF TAPE

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CAPCOM 0 0 2 0 5 4 5 0 0 0 plus 5 decimal 7 plus all balls.

SPACECRAFT Hey George, you're going to have to read slower this is one of those tiny pads and I'm having a hard time fitting it.

CAPCOM Okay TK where do you want me to pick up.

CAPCOM Columbia, Houston, TK where would you like me to pick up on the pad.

SPACECRAFT Help me out just a second, I'm coming. Okay, what I've got so far is interconnect left OMS to RCS and says +X RCS select 4, whatever that little indication is in there. And I got 180 roll 2 2 4 4 2 5 0 0 2 0 5 4 5 0 0 0 and start in on item 19 is a plus something.

CAPCOM Roger TK, +5 decimal 7 plus all balls plus all balls. Burn attitude 8 decimal 0 3 0 decimal 0 2 7 decimal 4. Delta V total 5 decimal 7 TGO 0 0 2 3 VGO 5 decimal 5 9 all balls 1 decimal 1 0. HA164 HP160, over.

SPACECRAFT Okay let's try +5 decimal 7 plus 0 plus 0 8 decimal 0 3 0 decimal 0 2 7 decimal 4 5 decimal 7 0 0 2 3 plus 5 point 5 9 0 and plus 1 point 1 0 164 by 160.

CAPCOM Roger TK, that's good readback and I have some delta's on the onorbit RCS burn card, if you're ready.

SPACECRAFT Okay, we're going to do this with reference to the checklist procedure for execution. Or did you want us to not do that?

CAPCOM That's affirmative TK there are 2 changes, 1 in the crossfeed valve during the interconnect. We'd like the left OMS A crossfeed valve open and leave the B crossfeed valve in GPC. That's from the problem we were having before, over.

SPACECRAFT Okay, understand. You want to use the A crossfeed valve and the B to the left OMS will make in the GPC.

CAPCOM Roger TK, and the B valve should already be in GPC.

SPACECRAFT That's affirmative, and just make sure I'm on the right track with you. It's functional, but because of the way it doesn't cut off, we're just gonna leave it there unless we need it.

CAPCOM That's correct TK. Columbia, Houston, 45 seconds to LOS. The PAYCOM on last request requested a power status pad on the log updates book and we'd like to get that down from you

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next states pass coming up at 4 plus 51, over.

SPACECRAFT Okay, I can hardly hear that guy so I'll go look and see if I can find it.

CAPCOM Roger.

PAO Mission Control Houston 2 days 4 hours 49 minutes mission elapsed time we passed out of range of the Hawaii tracking station. We'll reacquire for a brief pass through the western edge of the tracking stations in the western United States in about a minute and a half.

CAPCOM Columbia, Houston, through Buckhorn for 3 minutes, over.

SPACECRAFT Okay, Columbia, would you like for me to read you the pad?

CAPCOM Roger, Columbia.

END OF TAPE

CAPCOM Roger, Columbia

SPACECRAFT Okay, 6 5 2 8 5 0 4 5 6 5 2 8 6 5 0 4 0 6 0 2 8 6 5
0 3 5 to 6 0 2 8 6 5 0 3 0 at 2 days 4 hours and 52 minutes and
there are fluctuations in the third set of readings on all which
go up and make them, oh I'd say, 50 to 100 percent higher spikes.

CAPCOM Roger TK, we copy. 40 seconds left in this pass.
Botswana will be next at 5 plus 31 and we see tank, water tank C
filling up you can expect your alert in about half an hour, and
at that time reopen the tank B inlet, over.

SPACECRAFT Okay, we'll open tank B when we get the alert on
Charlie.

CAPCOM Roger that.

PAC Mission Control Houston 2 days 4 hours 56 minutes
mission elapsed time. During that short pass over the fringes of
the western tracking stations, the western United States the crew
read back to the ground the results of the IMU alignment that had
just occurred. We have a long period of loss of signal here as
Columbia passes down through the Pacific and out over South
America and without hitting any of the tracking stations along
there until we come to Botswana in Southern Africa in about 34
minutes. At 2 days 4 hours 56 minutes mission elapsed time this
is Mission Control Houston. Mission Control Houston 2 days 5
hours 31 minutes mission elapsed time we're about to pass within
range of the Botswana tracking station here in about 20 seconds,
Columbia on orbit number 36, this is Mission Control Houston.

CAPCOM Columbia, Houston, through Botswana for 7 minutes,
over.

SPACECRAFT Hello there, loud and clear.

CAPCOM And you're the same.

SPACECRAFT Okay, we're maneuvering the attitude now George.

CAPCOM Okay, we copy, we've got nothing for you this pass.

SPACECRAFT Okay, do you need any data from the IMU alignment?

CAPCOM That's affirmative TK.

SPACECRAFT What do you need, the torquing angles and time?
Or just the time or what?

CAPCOM We'd like to get it all, I guess, TK.

SPACECRAFT Okay stars 5 1 and 2 2, as advertised, point 0 1 is

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the error. IMU number 1 that'll all be a decimal point in front of these numbers as I read them to you +2 5, +0 7, -0 2. IMU number 2 -0 3, +0 0, +1 0. IMU number 3 +0 6, -0 7, -1 0. Execution time 2 days 04 11 15.

CAPCOM Okay TK we copy, thank you.

SPACECRAFT Okay, you also had asked me earlier about where the elevators were, and I remember we looked right after we finished a lot of that RMS stuff and it looked like they were, if anything the outboard port elevon had moved up a little bit. Later looked to me like both the inboard elevons, okay I just got the water message you warned me about I'll take care of it, looked to me like both inboard elevons were full up now, but it looks like the outboard elevons are both come up just a little bit.

CAPCOM Roger TK, we copy.

SPACECRAFT Okay, and we got one other that it looks to me like the aft starboard and the port forward ...

END OF TAPE

SPACECRAFT ... forward payload bay flood lights are probably not working as - and the same thing looks true of the forward bulkhead. That arrangement sounds like maybe I got a common - common circuit somewhere.

CAPCOM Okay, thank you. Columbia, Houston. T. K., before we came on shift you asked Brewster to remind you to get some comments on the RCS jet stern interaction test now. You'd like to get that now if you've got the time.

SPACECRAFT Okay. Just a second, I'll do that, one of the things that was kind of interesting when did you get the chance to file all those doublets and pulses let you identify what's really characteristic and what isn't. One of the things I hadn't expected was that everyone of those pulses is two pulses and it fires - you hear or feel which ever it is that's appropriate. The - it goes bang bang when it starts or it stops, you get a bang. So maybe what you're getting is a solenoids rather than the firing but when you see the plume door I guess the piece of data that makes we wonder about that is when I (garble) kind of pulse (garble) also. It'll be 1 and then followed by another. Even when you put in a single pulse and I'll make some notes on all that stuff for detail but it was kinda of interesting to see it wasn't a single clean pulse. Some of it turned out to be nice single pulses but others perhaps because of the jet configuraticns didn't give us that at all.

CAPCOM Okay, we copy all of that, thank you.

SPACECRAFT The ones that I seem to remember causing the most difference between pulses and a two pulses and single pulse was in the roll (garble).

CAPCOM Okay, we copy. Columbia, Houston. We're 1 minute from LOS at Botswana. We'll be with you through IOS in about 1 minute (garble) over.

SPACECRAFT Okay.

CAPCOM Columbia, Houston. Through IOS for 6-1/2 minutes. Standing by.

SPACECRAFT Okay. George, separate subject that is switch, flipped over here and took a look at the nitrogen pressure in the OMS and it looks like the left OMS nitrogen is a little bit lower than it was. As I remembered it at the completion of our burns on day 1.

CAPCOM Roger, T. K., we copy. We'll look into it.

SPACECRAFT George, you don't want (garble) for this I understand. Am I correct?

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CAPCOM That's correct. We'll do it in flow down.

SPACECRAFT Houston, do you have any trouble (garble) .14, .09, and a .05.

CAPCOM Roger, T. K., looks good to us right now.

SPACECRAFT Okay.

CAPCOM Columbia, Houston. We're 30 seconds to LOS. Looks like a good burn. Guam is next at 6+04.

SPACECRAFT Okay.

PAO Mission Control Houston. 2 days 5 hours 47 minutes mission elapsed time. Crew just completed about a 22 second reaction control system burn which adjusted the orbit slightly to improve the orbital geometry so that the end of mission crossrange is more in line with what the crew was trained for. That adjustment was done with the reaction control system and was about a 22 second burn occurred completed just about 3 minutes ago. Columbia just past out of range of the Indian Ocean station and will be reacquiring in about

END OF TAPE

PAO And we'll be reacquiring in about 16 minutes. As we pass over Guam. 2 days 5 hours 48 minutes mission elapsed time. This is Mission Control Houston. Mission Control Houston, 2 days 6 hours 4 minutes mission elapsed time. We're within range of the Guam tracking station 5-1/2 minutes, over. Crew is just now beginning their meal period scheduled in the crew activity plan. Okay. We have about a 5 minute pass here at Guam. This is Mission Control Houston.

SPACECRAFT Are you still there?

CAPCOM That's affirmative, Hank you're loud and clear.

SPACECRAFT Okay, you can tell Owen that starting up about like 5 minutes ago there will be some data on the tape for me and also for T. K., he's just starting to record his.

CAPCOM Okay, Hank, we copy. One thing for us you can do. We missed the tire pressure readouts over the last state pass. If you could turn those on for a little bit here over Guam, that would help out.

SPACECRAFT Okay, I'll go back and do that.

CAPCOM Okay, thanks. And Columbia, we also see your DPS configuration, looks good and go for the item 48.

SPACECRAFT Okay, thank you.

CAPCOM Columbia, Houston. We're 1 minute to LOS. Hawaii will be next at 6+17. Hope you are enjoying your dinner and T. K. for information the N2 pressure on the left OMS has decreased as a result of cool down. The right N2 pressure has also decreased a little bit, that's no worry. Over.

SPACECRAFT Okay, hey those are good words, thank you.

CAPCOM Roger, we'll see you in Hawaii. And Columbia going over the hill. We've got good tire pressure data, thank you.

SPACECRAFT Okay, I'll take them out.

PAO Mission Control Houston. 2 days 6 hours 10 minutes mission elapsed time. They just passed out of range of the Guam tracking station and we have a about a 7 minute loss of signal period here before we reacquire over Hawaii. Crew is scheduled to be beginning their meal period and at this point of the day, the activities tail off to primarily some housekeeping activities, fuel cell purges, and that sort of thing, and they get into their presleep activity at the beginning of orbit 38 which is occurs in about an hour or an hour and 15 or 20 minutes. There is a little bit less than 2 hours remaining in

the time the crew is scheduled to be awake. 2 days 6 hours 11 minutes mission elapsed time. This is Mission Control Houston. Mission Control Houston. We're passing over the Hawaii tracking station.

CAPCOM Hawaii for 8 minutes, over.

SPACECRAFT Hello Houston loud and clear.

CAPCOM Roger, and you're the same. Columbia, Houston. For your information we had an error on the ground. We were not recording voice and haven't been since about MET of about 3 hours and 30 minutes. We'll start recording again after this Hawaii pass though and if you want to get some comments on you can do it after that. Sorry about that, it was our error.

PAO Mission Control Houston, 2 days 6 hours 20 minutes mission elapsed time. Ground controllers and Mission Control and thermal experts have studied in - indications that they're getting from the spacecraft as to the possible continued presence of water on the underside tiles and have decided to go to a bottom sun attitude tonight to be sure that they have baked all the water out of the tiles. Have avoided any possible problems on entry. That message will probably be relayed up to the crew on this pass or perhaps the next one. That attitude will be held during the night. They are currently over the Hawaii tracking station at this time. 2 days 6 hours 21 minutes mission elapsed time. This is Mission Control Houston.

CAPCOM Columbia, Houston. 3 minutes left this pass. We've got a long LOS coming up and I've got one comment to get up to you, over.

SPACECRAFT Go ahead.

CAPCOM Roger, T. K. We just got some information on the ground. We're seeing some anomalies readings in our DFI ...

END OF TAPE

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CAPCOM Coming up, I've got one comment to get up to you, over.

SPACECRAFT Go ahead.

CAPCOM Roger, T. K. we just got some information on the ground, we're seeing some anomalous readings in the DFI that lead us to believe that we may not have gotten all the water baked out of the tiles on the bottom of the Orbiter. So we'll be planning on going to the bottom-sun attitude tonight. And, we'll get that attitude up to you on the next pass, over.

SPACECRAFT Okay. Is that the venting kind of stuff? Or have you got some temperature data your looking at?

CAPCOM Roger T. K. it's temperature data we're looking at.

SPACECRAFT Okay, well we'll be here.

CAPCOM Columbia, Houston, we're 1 minute to LOS. Botswana is next at 7 +06, and hope your enjoying your dinner, over.

SPACECRAFT Okay, well we'll get to it.

PAO Mission Control Houston, 2 days 6 hours 26 minutes, Mission Elapsed Time. Columbia is currently on orbit number 37 and is just past out of range of the Hawaii tracking station. They have a fairly long loss of signal period here, and we're going to be skipping out of the edges of the range of the Santiago tracking station and we'll not reacquire again until we hit Botswana over Southern Africa in about 40 minutes. Here in this last pass over Hawaii, the Flight Controllers relayed up to the crew information that thermal experts had decided that it would be a good idea to go to the bottom-sun attitude again tonight, cause of data they had seen indicated there may still be some water present in the tiles on the underside, and to avoid any potential problems they'll go ahead and go bottom-sun tonight. 2 days 6 hours 27 minutes, Mission Elapsed Time, this is Mission Control Houston.

PAO Mission Control Houston, 2 days 6 hours 47 minutes, Mission Elapsed Time. Columbia is passing just over the edge of the Santiago Chile tracking station, there may be a slight opportunity here for a few seconds of communication. That's a very low elevation pass, and we don't expect any at this time. This is Mission Control Houston.

PAO Mission Control Houston, 2 days 7 hours 6 minutes, Mission Elapsed Time. Columbia is on orbit number 37, and we're about to pass within range of the tracking station at Botswana in Southern Africa. Crew is running just a few minutes behind the timeline and should be finishing up their meal about now. STS-4

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Primarily some housekeeping activities related at the end of they are day, their only about an hour away from the beginning of their scheduled sleep period. They have a fuel cell purge to do, and some documentation and then a little bit of other work before they can turn in this evening and attempts are being made to have their activities wrapped up through ...

CAPCOM ...Botswana for 4 1/2 minutes.

SPACECRAFT Hi there.

CAPCOM Hi T. K. your loud and clear. I've got a bottom-sun attitude to read up to you, if your ready to copy.

SPACECRAFT Be with you in about 10 seconds.

CAPCOM Okay.

SPACECRAFT Okay, I'm all yours.

CAPCOM Roger T. K. we'd like you to maneuver to bottom-sun, and the attitude is roll 310.4, pitch 233.0, and yaw 58.8, would like you to use DAP Alpha 1 for both the maneuver and the attitude hold, it's about an 8 minute maneuver, and we'd like to be in bottom-sun before sunrise, that comes up in about 20 minutes, over.

SPACECRAFT Okay, I copy, be in bottom-sun at sunrise and the attitude is 310.4, 233.0, 58.8, using DAP Alpha 1, and we're on our way.

CAPCOM Okay, copy that.

END OF TAPE

SPACECRAFT Okay George, that's started, anything else?

CAPCOM Roger TK I've got a couple of tag-up items for you. First one we'd like to know if you're still using your HP AOS LOS program? If we start messing with the flight plan we may need that, over.

SPACECRAFT I have been using the calculators just as we said we would. The AOS LOS I've been using for that and for map updates and it has done rather well, you know it's got a power, I figure if it's within the nearest minute, that's fine. But it does that for us. The prompting programs, well we've sort of altered the days enough so that the prompting programs haven't had a good workout, but I've had a number of instances of that program's timer halting. I'm going to switch to the other calculator tonight and try tomorrow. But, that's sort of where I stand on those.

CAPCOM Okay, we copy that. Another thing, for information there will be no SM checkpoint required tonight. And one other question we have, we noticed an S76 COMM blurred. We've seen a few of those and one of them we think might have been a real camera overtemp. Can you comment on that. over.

SPACECRAFT Yes sir, I'm sorry. In fact, most all but one of them, that I'm aware of, were associated with our run in the VTR. Every time we try to run that thing, we get those messages. There was one camera overtemp and that was during one of our morning RMS sessions and I believe that it was camera ...

CAPCOM Columbia, we're approaching LOS, we'll pick you up next at IOS at 7 plus 14. Columbia, Houston, through IOS for 9 minutes, over.

SPACECRAFT Okay sir, I don't know if I caught you as you were over the hill, that was camera delta that had the overtemp.

CAPCOM Okay, thanks

SPACECRAFT 45 degrees.

CAPCOM Okay TK thank you, we copy camera delta on 45 degrees. One other message for you. The OPS recorder will be running from MET 7:30 to 7:50. We plan on dumping at Hawaii at 7 plus 52 unless you would like a little longer then we could extend and dump at Santiago at 8 + 20, over.

SPACECRAFT Why don't you just shoot for Santiago. I tell you, there just hasn't been a chance to stop and collect your thoughts all day. We finally took time off for dinner and that's the first break we've had, so it's going to take me a few minutes to keep from rambling.

CAPCOM Okay TK, we'll do that. The only anomalies we're really tracking right now were the problems you had with the end effector and we'll get you up a note on that and the payload bay lights that you have reported down and we're checking those. Nothing that we found, seen on the ground, that we haven't told you about, over.

SPACECRAFT Okay, well I tell you, I sure appreciate all your help today. It was, it got kind of hectic there for awhile, but all seemed to come out pretty good and we're going to muddle along, we've done a few things like playing with your suction cup shoes and some other things. By the middle of tomorrow I think we're gonna have our act together.

CAPCOM Columbia, Houston, TK you know we had this as our toughest day, we think you guys really did a super job. We got everything we planned plus a lot more done today.

SPACECRAFT Okay, I'll summarize where I think we are and tell you what we're doing, and who knows what we might get done tomorrow. Thought maybe you might offer our friends as we go out with a little (garble) and help them out.

CAPCOM Roger, and TK could you give us a little more information on the lights. Did they all fail at once, or was one of them working, any details you can fill in.

SPACECRAFT I tell you, I'll have to go back and look at them individually. We turned them on and both of us had commented on boy, it sure isn't very bright. So when it came time to secure stuff we said, hey let's turn them off one at a time and see if there's anybody that isn't carrying their weight. We found that there was no apparent change in illumination when we turned those 3 I gave you off. We'll go back and check them individually.

CAPCOM Okay, we copy, there's no rush on that.

SPACECRAFT Okay, Hank said he's going to do that now and if we heard something about it to amplify it, we'll summarize it.

CAPCOM Okay thank you, we'd appreciate that. Columbia, Houston, a couple of cleanup items. You're state vectors still no-go. We'll get that up on the teleprinter when it is, and you have a go for the item 48 to clear up the

END OF TAPE

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SPACECRAFT to amplify it we will summarize it.

CAPCOM Okay, thank you, we'd appreciate that.

CAPCOM Columbia, Houston, couple of clean up items do. Your state vector is still no go, we'll get that up on the teleprinter when it is. And you have a go for the item 48, clear up the cam lights and the air lock.

SPACECRAFT Oh, thank you, forgot all about it.

CAPCOM And Columbia, Houston, your state vector is good for contingency for the next five orbits. And with that my slate is clean here, and we've got nothing else for you.

SPACECRAFT Okay, well that's mighty good.

SPACECRAFT Houston, Columbia?

CAPCOM Go ahead, Columbia.

SPACECRAFT The pilot was greatly relieved to see that tonight all that told him to do was go to sleep, and didn't have a stowing. Mr. Colt's has been at it again. That's right Mike.

CAPCOM It was well received, T.K.

CAPCOM Columbia, Houston, we're 40 seconds to LOS, Guam will be next at 7:44, and we'll wait for your call.

SPACECRAFT Okay, thank you.

PAO This is Shuttle Mission Control, at 2 days, 7 hours, 26 minutes. Had loss of signal through the Indian Ocean station, there's not a lot of dialogue during that pass, reflecting the successful nature of the mission to this point. Loss of signal period now, and we will acquire again in 17 minutes. Columbia on its 38th orbit of the Earth. The Ivory Team of flight controllers is now arriving in the control center and tagging up with the off going flight team. On coming flight director is John T. Cox. Looking forward to the change of shift briefing with off going flight director Chuck Lewis and the Bronze Team. That press conference, change of shift debriefing scheduled for 6:30 p.m. central time. And at this point, no reason to expect there'll be a change in that time. If a change seems apparent we'll certainly notify you as quickly as we have that information. On board Columbia, the crew is right on schedule, performing the fuel cell purge presently, where they force hydrogen and oxygen through the system to purge it of impurities and preclude the chance that the cantimation would inhibit the function of those electricity producing devices on board the vehicle. Also changing out the CO2 absorber on board

the vehicle which scrubs the air of impurities. Sleep period begins in about 41 minutes. And everything appears to be on schedule, on time, and nominal aboard Columbia tonight. At 2 days, 7 hours, 28 minutes, this is Mission Control, Houston.

PAYCOM Sunnyvale, Houston com tech, air to ground, 1.

CAPCOM Houston, Sunnyvale, I read you five by, on air to ground 1, do you copy the key.

PAYCOM That's affirm, you get good keying on air to ground 1.

CAPCOM Do you receive keying on air to ground 3, and UHF at the same time.

PAYCOM Yes I do.

CAPCOM Roger, want to go to 2.

PAYCOM Yeah, let's go to 2.

PAO Shuttle Mission control, 2 days, 7 hours, 33 minutes. It appears that the change of shift briefing with off going flight director Chuck Lewis will be delayed. It appears now that it'll be at 6:45 p.m. and we'll refine that time a little bit more and give more precise reading as it becomes available. Columbia on its 38th orbit of the Earth. Acquisition of signal in about 10 minutes, Shuttle Mission Control.

CAPCOM Columbia, Houston, 1 minute left on this last pass before the sleep period. 1 clean up item, we'd like an item 48 to the GNC computer.

End of tape.

CAPCOM cleanup item, we'd like an item 48 to the of GNC computer. We want to thank you guys for giving us a super days work and it looks like we sure have a super vehicle working for us today too. Get a good sleep, the ivory team is coming on to watch you through the night. Ron's team will be back with you tomorrow morning.

SPACECRAFT Okay sir, thanks an awful lot. We'll leave some notes on the tape recorder here shortly. Thank you very much, we'll see you tomorrow.

CAPCOM Okay, good night.

PAO This is Shuttle Mission Control, at 2 days, 8 hours, 8 minutes, we're about 11 minutes away from acquisition of signal through Santiago, Chile. We've just entered the crew's sleep period, now over. T.K. Mattingly and Hank Hartsfield have not been notorious for taking advantage of the opening of the window on the sleep period so, it's not inconceivable we may have some voice contact when they're through Santiago. Columbia on it's 38 orbit of the Earth, now on the bottom Sun attitude to attempt to cook out some of the moisture that the thermal protection system on the bottom of the vehicle may have absorbed during the thunderstorm while on the pad at Kennedy Space Center in advance of the launch. The transducers on the under side of the vehicle have not reported any increase in these temperatures yet, but those transducers are buried pretty close to the surface of the vehicle and well beneath the thermal protection system tiles on the underside so it'll take a little while before those increased temperatures begin to show up on the data boards here in Mission Control Center. 10 minutes away from acquisition of signal through Santiago, Chile. Mission elapsed time 2 days, 8 hours, 9 minutes, this is Shuttle Mission Control.

PAO This is Shuttle Mission Control, 2 days, 8 hours, 26 minutes, just had a loss of signal through the Santiago, Chile station, we're waiting on voice contact with the crew. They're 15 minutes into their sleep period. Data downlink, data received and transmitted to the control center here indicates the vehicle systems are performing nominally. The thermal data on the underside of the vehicle which is now in a bottom Sun attitude indicates temperatures are beginning to come up just modestly and it'll probably be quite some time before the underside of the vehicle is cooked sufficiently to indicate a substantial increase in those temperatures. Loss of signal now for about 20 minutes, as the vehicle goes up across the South Atlantic and across the South African Continent. There'll be a reacquisition of signal in about 24 minutes through the Indian Ocean station. Columbia on it's 39th orbit of the Earth at 2 days, 8 hours, 27 minutes this is Shuttle Mission Control.

PAO This is Shuttle Mission Control, 2 days, 8 hours,

41 minutes, Columbia on it's 39th orbit of the Earth which is just approaching the coast of South Africa, offgoing flight director, Chuck Lewis and Brian's team just left Mission Control Center for building 2 and the change of shift briefing with flight director and the media should occur pretty close to on time at 7:45, 6:45 p.m. Central time. This is Shuttle Mission Control.

PAO This is Shuttle Mission Control, at 2 days, 9 hours 26 minutes Columbia on it's 39th orbit of the Earth and just came across the tracking site at Guam, downlink data indicates systems onboard are continuing to perform nominally. One hour, 15 minutes into the crew's sleep period and all continue to look good onboard Columbia. 2 days, 9 hours, 26 minutes, this is Shuttle Mission Control.

PAO This is Shuttle Mission Control, at 2 days, 10 hours, 6 minutes. Columbia in it's 40th orbit of the Earth just crossed the tip of South America, now coming up across the South Atlantic Ocean, 2 hours into the crew's sleep period and no communication and no indication that there's any activity onboard Columbia. In advance of the sleep period the Mission Control team updated the TAMBU's moves, or the table maintenance buffer updates, which have the effect of increasing the tolerances of the onboard caution and warning alarm systems so that there would not be any inadvertent alarms to disturb the sleep.

END OF TAPE

PAO the effect of increasing the tolerances of the onboard caution and warning alarm system so that there would not be any advertent alarms to disturb the sleep of the crew. They've indicates everything onboard the vehicle. Flight control team going over the anomaly log and planning out tomorrow's activities and refining the timeline a little bit. At 2 days, 10 hours, 7 minutes, this is Mission Control, Houston.

PAO Shuttle Mission Control, 2 days, 11 hours, 8 minutes, Columbia in its 40th orbit of the Earth. Data continues to indicate systems onboard performing nominally. The bottom sun attitude assumed by Columbia during the sleep period is beginning to stop the transducers on the underside of the vehicle and those temperature numbers are beginning to increase as are in a fact of heating up thermal protecting system in an attempt to burn out some of the water that maybe stored in those tiles. The vehicle's apogee continues to be a 163.6 nautical miles, and perigee 160.8 nautical miles, temperature onboard Columbia is 78 degrees and steady, and humidity in the cabin is 38 percent. This is Shuttle Mission Control.

PAO This is Shuttle Mission Control, all continues to be quiet onboard Columbia. The astronauts Ken Mattingly and Hank Hartsfield apparently passing a restful evening with a little over 3 hours remaining in the sleep period. Mission elapsed time now 2 days and 13 hours, this is Shuttle Mission Control.

PAO Shuttle Mission Control, all continues to be quiet onboard Columbia. All systems are continuing to perform flawlessly. Through the night the mission control team and the mission operations control center here in Houston have been refining the flight plan for Wednesday's activities to assure the accomplishment of the higher priority test objectives. The new flight plan data will be uplinked to the crew by teleprinter, after the wakeup. Just less than 2 hours remaining in the crew's sleep period at this point. Mission elapsed time, 2 days, 14 hours, 26 minutes, this is Mission Control, Houston.

PAO This is Shuttle Mission Control, members of the entry team of flight controllers have begun arriving in the mission operations control room in Houston, tanking up with the ascent team members in preparation for the handover from one crew to the next. One hour remains in the crew's sleep period. Columbia presently on its 43rd orbit of the Earth, just now passing over the ground station at Dakar sweeping across North Africa. Mission elapsed time, 2 days, 15 hours, 6 minutes, this is Shuttle Mission Control.

PAO This is Shuttle Control, at 2 days, 16 hours, mission elapsed time. Columbia is on orbit 43, down over the South Pacific Ocean. We're 9 and a half minutes away from crew wake up time. However, we will not have acquisition with

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Columbia for another 35 minutes. Next station being Dakar. In Mission Control center the flight control team headed by flight director Harold Drawn is succeeding the team directed by John Cox. There will be no change of shift briefing following this handover. No change of shift briefing at 2:30 a.m. central daylight time. The next change of shift will be following the shift which is now coming on duty, that estimated to be at 10:30 a.m. central daylight time. At 2 days 16 hours, 1 minute, mission elapsed time, this is Shuttle Control, Houston.

END OF TAPE

PAO Coming on duty, that estimated to be at 10:30 a.m. Central Daylight Time. At 2 days, 16 hours, 1 minute mission elapsed time and this is Shuttle Control, Houston.

PAO This is Shuttle Control at 2 days, 16 hours, 34 minutes mission elapsed time. Columbia began it's 44th orbit around the Earth a short time ago and is now about a minute away from acquisition through Dakar. Crew should have awoken 25 minutes ago. We have not been in contact since that time, this is our first opportunity to talk to them since wake up. We've completed the flight control team handover here in the Mission Control Center, flight director on this shift Harold Drawn. CAPCOMs are astronauts Bruster Shaw and Bob Stewart. We'll stand by for-air-to ground through Dakar.

That's why I tell you it's time to get up. We all saw the launch and it was just beautiful, everything went so smooth. They said it was a nominal liftoff and you know what that means. Well I know you're very busy and working very hard, but I know you're enjoying every minute of it. We all saw you and Ken before you entered the Columbia and you both looked good and looked rested. Well, I can't talk too long because I'm getting ready to go back up to school, I know you're busy, I just wanted to let you know that everyone's thinking of you all. You're all in our thoughts and prayers and we wish you the best. We look forward to seeing you Sunday and I'll be thinking about you and you're in all my thoughts and prayers, and you take care of yourself, Daddy. I love you very much. Bye, Bye. (Wake up music).

Hello daddy, if that didn't wake you up I don't know what will. Does it bring back memories of Saturday morning wake up calls? I know it does me. I know you're having a great time up there, and I wish I could be with you, maybe one of these days. I'm very pleased at how smooth the launch and flight are going. I knew you all could do it, and of course you know everyone is thinking about you, we're all very proud. Well y'all take care, and Godspeed to a safe landing, and I'll see you on the fourth, and Dad, I love you very much.

Good morning, Happy Anniversary. The liftoff was just spectacular. You looked good, I saw some video yesterday, everything's quiet on the home front. The only problems we've encountered is doing this wakeup tape. I would have let Mathew bark a couple of barks, but she's busy eating her Puppy Chow. Take care and we'll see you on Sunday. I love you.

SPACECRAFT Hello, Houston, you still there?

PAO You bet we are.

SPACECRAFT That was a mighty nice greetings this morning. How

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about passing my love to my family and ask my wife if she wants to try for 25 more?

CAPCOM Okay, we're sure do that Hank.

SPACECRAFT Just getting started around here or try to incorporate all the messages in the CAP while Ken's cleaning up a little bit and (garble) I'll start getting breakfast started.

CAPCOM Okay, that sounds good. Message 28 and 29 and 30 are current. Message 29 is your CAP update as you see and it is quite extensive. There are a couple of things that we're going to ask you to do fairly quickly this morning, and interconnect, OMS to RCS and a maneuver for a gas release attitude, supply water dump and a fuel cell purge. Those coming right off the bat, then you'll have a little bit of break to continue implementing your CAP changes and your fuel cell purge can be done auto versus manual as called out in the CAP. Over.

SPACECRAFT Okay, and I noticed that some of these things are called out time critical, I guess you want those done right at the time indicated. Is that correct?

CAPCOM That's correct Henry.

END OF TAPE

SPACECRAFT (garble and I noticed that some of these things are called out time critical. I guess you want those done right at the time indicated. Is that correct?

CAPCOM That's correct Henry. And Columbia, Houston, to try and keep you advised of the overall plan, we're going to spend today in bottom sun and then we're going to go to tail sun for the rest of the mission eventually after spending tonight in PTC with a little bit of PTC then prior to entry. Today is going to be pretty heavy as you can see by your CAP update, but the rest of the days should be a little bit lighter, probably give you a chance to get some of your shopping list items in.

SPACECRAFT Okay. Thank you Lewis.

PAO This is Shuttle Control. We've got a short break here between Dakar and Madrid of a few seconds. We'll stand by, have a little bit of overlapping coverage through Madrid.

CAPCOM Columbia, Houston, we're going LOS. We'll see you through Yarragadee at 17:15.

SPACECRAFT Okay. We'll see you then.

PAO This is Shuttle Control. Columbia has moved out of range of Madrid now. Next acquisition through Yarragadee in 29 and 1/2 minutes. Today is Hank Hartfield's wedding anniversary and on this first air/ground pass of the day, he received taped messages from his two daughters and his wife. Columbia will stay in bottom sun attitude today to, in case there's any moisture left in the tiles, this will help continue to bake that out. Today is a full schedule for the continuous flow electrophoresis experiment. There will be some additional activities with the induced environmental contamination experiment, however, that experiment will not be used in conjunction with the remote manipulator system today. And there's considerable activity with the tactical air navigation system today using tack end stations in the United States, Mexico, Australia, and Africa in tests to determine whether that system might be helpful for on-orbit navigation. As time allows, the crew will also attempt to troubleshoot the getaway special. The time set out in today's flight plan for that activity is 2 days, 19 hours, 35 minutes. At 2 days, 16 hours, 48 minutes Mission Elapsed Time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 2 days, 17 hours, 14 minutes Mission Elapsed Time. Columbia is about 30 seconds away from a short pass at Yarragadee.

CAPCOM Columbi, Houston through Yarragadee for 4 minutes. Standing by. Columbia, Houston, we're 30 seconds LOS. We'll have a short pass through Orroral in a couple of

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minutes. We'll call you then.

SPACECRAFT Okay.

PAO This is Shuttle Control. Yarragadee has loss of signal. Columbia's track on this orbit just skirts the edge of the Orroral acquisition range. We may or may not be able to get communications through that station. We'll stand by and see. At 2 days, 17 hours, 20 minutes Mission Elapsed Time, this is Shuttle Control, Houston.

CAPCOM Columbia, Houston through Orroral for about a minute. You're 5 by.

CAPCOM Columbia, Houston, we're going LOS. Stateside next on the hour and a reminder, the fuel cell purge should be done prior to the gas release.

SPACECRAFT Okay.

END OF TAPE

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PART THREE

NET 04:19;20 to END OF MISSION

CAPCOM Columbia, Houston, 30 seconds LOS, see you at MILA at 50.

SPACECRAFT Okay, sir, see you then.

PAO This is Mission Control, Houston. Loss of signal through the two Australia stations, on orbit 77. 30 minutes across the Pacific again to the states, during which time we will likely get a television downlink from Ken Mattingly's activities in the airlock as he tries on the shuttle spacesuit for the first time in space. Also the crew were given siting data for a tropical storm Carlota, which is out in the central Pacific, south of Hawaii. At day 4, 19 hours, 20 minutes, Mission Control, Houston.

PAO This is Mission Control, Houston. 20 seconds before acquisition through Merritt Island Launch Area. We're hopeful of some downlink television from Columbia showing Ken Mattingly in his EMU demonstration in the airlock. Should have acquisition now.

CAPCOM Columbia, Houston, with you through MILA and Bermuda for 12 minutes, standing by for a go for TV.

SPACECRAFT Okay, are y'all ready?

CAPCOM We're ready. And we've got a picture.

SPACECRAFT (garble), Okay, T.K We're on T.V. Okay, Brewster, I just wanted to show what the middeck valve looked like. I've switched over to the middeck camera now, and you should have 10.

CAPCOM Roger, we've got a good picture of him.

SPACECRAFT Houston, Columbia, I tried to get that NOSL site, but there wasn't much there. Attitude of the spacecraft was all wrong. Looked at that coord, I did take a short shot at a few thunderstorms I saw popping in the distance, but I'm not sure that I got much.

CAPCOM Okay, Hank, thanks for trying.

SPACECRAFT Yes sir, are you reading T.K?

CAPCOM Negative, we're getting no voice.

SPACECRAFT I had the wrong clip. Houston, T.K.'s talking to me on 2968, well I'm talking to him on 2968, and he's talking. We're in EVA configuration on UHF, so you might want to reconfigure UHF so you can hear him. And also, he would like for the docs to check and see if they're getting biomed on him.

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CAPCOM Roger. Columbia, Houston, we'd like you to go 2597 on the Orbiter and mode B on the FMU.

SPACECRAFT Okay, Ken, he'd like you to go to mode B and I'm going to switch to 2597. Okay Ken. How do you read?

CAPCOM We heard you that time, try again.

SPACECRAFT Hi ranger. Okay, I'm 2597. Houston, we went to that configuration, he couldn't talk to me so he's in mode A, and I'm on 2597. (garble), Columbia.

CAPCOM We ready you five by, and it was our mistake on the configuration. We don't have enough time left in the T.V. pass to reconfigure.

SPACECRAFT Okay.

CAPCOM We got great video of the suit demo through, and we appreciate your setting

SPACECRAFT I tried to show you earlier that when you get that extra suit out of the locker and get everything out of the way, there's quite a bit of junk in the middeck just to clear the access to the airlock.

CAPCOM Roger, we enjoyed that picture, we were afraid somebody had an accident there for a few minutes.

SPACECRAFT (laughter)

CAPCOM Columbia, Houston, we've lost the picture now, we have you for about 5 more minutes through Bermuda.

SPACECRAFT Your times up. (garble)

CAPCOM Roger.

SPACECRAFT (garble)

CAPCOM Columbia, Houston, we're getting negative on the biomed.

SPACECRAFT There seeing no biomed.

CAPCOM Roger.

END OF TAPE

SPACECRAFT (garble)

CAPCOM Roger.

SPACECRAFT (garble)

CAPCOM Columbia, Houston, we're getting a negative on the biomed.

SPACECRAFT They're seeing no biomed.

CAPCOM Roger.

SPACECRAFT 10 seconds to the burn. Go ahead. I am through. That's the last one. Ken, can you give me about 2 seconds to clean this burner up?

CAPCOM Columbia, Houston, we're 20 seconds LOS. We'll see you at Dakar at 06 and the burns we've seen have looked good.

SPACECRAFT Okay, sir. See you then. I keep forgetting to push my button. Does that help?

CAPCOM Columbia, Houston, with you at Dakar for about 8 minutes.

SPACECRAFT Brewster, read you loud and clear.

CAPCOM Roger. And Hank, if you want to try the biomed here, we'd like for you to check a rotary switch on panel R10.

SPACECRAFT Okay, they the biomed switch.

CAPCOM Roger. It should be channel 1 to EVA if it's not already there.

SPACECRAFT Okay. Could that be an EVA 1, or channel 1, is that what you want (garble)

CAPCOM Affirmative. Channel 1 to EVA. And Hank, we now have biomed. Thank you.

SPACECRAFT (garble) got biomed now. Okay, Ken just put his helmet on and (garble) now and is about to come loose from the mounts.

CAPCOM Roger. Copy, and we'd be very interested in his comments later on.

SPACECRAFT Okay. (garble).

CAPCOM Columbia, Houston, we've got a couple of switches

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for you to throw if you want to try a ground to air, air to ground COMM check here.

SPACECRAFT Go ahead.

CAPCOM We'd like for you to put Orbiter back in 2968 and then set some switches on panel A1.

SPACECRAFT Okay.

CAPCOM Okay. Panel A1, bottom row, like for you to go air to ground 1 to TR and air to air TR and put the EMU in bravo.

SPACECRAFT Okay. Say those again, Roy. I'm up at A1.

CAPCOM Roger. Bottom row, air to ground 1 to TR, air to air to TR and put the EMU in bravo.

SPACECRAFT Okay. I'm ready for you to go to Bravo. I should put the Orbiter on 2968?

CAPCOM Affirmative.

SPACECRAFT How do you read, Ken? Loud and clear. How me? Loud and clear. And all that noise has gone away or something. I don't know what we did.

CAPCOM Columbia, Houston, T.K., we hear you 5 by.

SPACECRAFT You do? How's the magic machine? Okay, and all the COMM sounds great here and I'm at the point where I would now come down and get ready to close up the (garble) on the inside. We take the duct out but for today's exercise, we won't do that. And, I guess it's appropriate to follow down our procedures and I'm going to stay on the umbilical rather than go to the EMU. An interesting comment that might surprise folks, the dimension between my heels and my shoulders doesn't seem to have changed a bit. This is a perfect suit fit. I could do anything with it. Right now I'm only at half a PSI.

CAPCOM Break, Break. Columbia, Houston, Columbia, Houston, we're about 30 seconds LOS and we'll see you at Indian Ocean at 26 and Hank, if you could prep the panel C3 PCM switch to high sample please.

END OF TAPE

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SPACECRAFT - - do anything with it. Right now, I'm only at half of PSI

CAPCOM Break break Columbia, Houston, we're about 30 seconds to LOS. We'll see you at Indian Ocean at 26. Hank if you could put the panel C3 PCM switch to high sample please.

SPACECRAFT Okay, I'll do that. My watch timer went off and I didn't hear it. At this point I depress the valve, and do a leak check.

CAPCOM Columbia, Houston, with you through Indian Ocean for 7 and 1/2 minutes. Columbia, Houston, how do you read, over?

SPACECRAFT (garble).

CAPCOM Columbia, Houston, how do you read, over? Columbia, Houston, you're unreadable. Columbia, Houston, if you copy we are a uhf-only site. We need you to go back to the simplex on the uhf.

SPACECRAFT (garble). Houston, Columbia, how do you read?

CAPCOM Okay Hank, we copy but you're weak.

SPACECRAFT Okay Ken and I are using the EVA mode, that's the only way we can talk to each other, or at least that's what we're using to talk with each other. Do you need something important at this site?

CAPCOM Negative, we have nothing important. We do have one switch on R1, if you could catch it right quick.

SPACECRAFT Go ahead.

CAPCOM Roger, we'd like to take the H2 tank 3 alpha heaters to OFF.

SPACECRAFT H2 tank 3 alpha is OFF.

CAPCOM Roger, thank you and we'll be standing by. You can hear me can't you?

SPACECRAFT We're hearing all your calls.

CAPCOM Roger, we'll be standing by. Columbia, Houston, we're 45 seconds LOS. We'll see you at Yarragadee at 41, and we would like for you to take the VFI recorders PCM switch to low sample.

SPACECRAFT Okay we'll do.

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CAPCOM Columbia, Houston, with you through Yarragadee for 8 and 1/2 minutes. We're standing by, be advised this is a uhf-only site also.

SPACECRAFT (garble) read you loud and clear.

CAPCOM Roger, we copy you. Columbia, Houston, we're about 30 seconds to LOS. We'll see you at Orroral in 1 minute.

SPACECRAFT (garble) okay keep going, yeah, the what (garble)

CAPCOM Columbia, Houston, with you at Orroral for a minute and 1/2.

SPACECRAFT Okay, loud and clear.

CAPCOM Roger

SPACECRAFT (garble) what EMU doff (garble) a close one where is it. What are you talking about? Oh oh, I used it out of the bottle here. Okay. Now we're taken it to open. Okay. There it is Main A.

CAPCOM Columbia, Houston, 10 seconds to LOS. We'll see you at the states in 19.

SPACECRAFT Okay, see you then. Okay, there it is - - it is

END OF TAPE

SPACECRAFT Okay, see you then. Okay. It is.... It is ...

PAO This is Mission Control Houston. Crew of Columbia now nearing the end of the demonstration of the Shuttle spacesuit in the airlock and also the RCS thermal soakback test and should start their lunch meal shortly. Next station will be Buckhorn, beg your pardon, yeah, Buckhorn in 24 minutes. We'll return at that time. This is Mission Control Houston at 4 days 20 hours 55 minutes. Mission Control Houston, we have acquisition through Buckhorn at this time.

CAPCOM Columbia, Houston with you through the states.

SPACECRAFT Hello there, loud and clear.

CAPCOM Your 5 by as well, Henry.

CAPCOM Columbia, Houston. We're 20 seconds LOS and we'll be down for about a minute and a half. Pick you up through Mila.

SPACECRAFT Okay, Brewster see you then.

CAPCOM Columbia Houston. (garble).

SPACECRAFT Yes sir, loud and clear.

CAPCOM Columbia, Houston. 8 minutes left in this pass. I have three flight notes at your convenience.

SPACECRAFT Okay, standby 1.

CAPCOM Roger.

SPACECRAFT Okay, go ahead.

CAPCOM Roger, Henry. First of all a switch on panel A1.

SPACECRAFT Okay, Columbia.

CAPCOM Roger, Henry. First of all a switch on panel A1.

SPACECRAFT Okay, go ahead.

CAPCOM Bottom of the panel, air to ground 1 to off.

SPACECRAFT Okay, that's done.

CAPCOM Okay, a little explanation of the reconfiguration of the DFI PCM recorders. We're trying to save tape. We have a requirement to be in high sample the last 10 hours of tail to sun. Also for the thermal soakback and since we've made those two non-coincident any longer we need to try and save tape so

that's why I'm messing around with the DFI recorder.

SPACECRAFT Okay, I just (garble) one switch did you have me do something with the recorder?

CAPCOM No sir. We did earlier though and I just wanted you to understand why.

SPACECRAFT Okay, I understand.

CAPCOM Also we're ready now to configure to PCS system number 1 plus put the N2 system to reg inlet to close on L2 and that's called out in your CAP update at the time of 4 days 16 hours 30 minutes.

SPACECRAFT Okay, I'll do that next.

CAPCOM And finally, we have another NOSL opportunity for you over West Africa.

SPACECRAFT Okay, about what time is that?

CAPCOM That's in about 15 minutes.

SPACECRAFT Okay, they're looking for it

CAPCOM Okay, the exact time is 21 hours 48 minutes 15 seconds. The latitude is 10 degrees north, longitude 15.1 west, use 1 magazine and it's a daylight pass.

SPACECRAFT Okay, got it.

CAPCOM And that's all we have for now, sir.

SPACECRAFT Okay, thank you roger.

CAPCOM You bet.

END OF TAPE

CAPCOM Use one magazine and it's a daylight pass.

SPACECRAFT Okay, got it.

CAPCOM And that's all we have for now sir.

SPACECRAFT Okay, thank you Roger.

CAPCOM You bet.

CAPCOM Columbia, Houston, one more note.

SPACECRAFT Go ahead.

CAPCOM Okay Henry, we've seen some hydraulic temperatures in the belly of the vehicle that are cooling off a little faster than we thought, and it means that we're going to have to terminate the tail-to-sun attitude this afternoon after we do the jet tests. We'll be going at that time to a bottom-sun again, and probably staying in that attitude until we go PTC the night before deorbit. Consequently, we'd like to go to high sample of the DFI PCM recorder at this time.

SPACECRAFT Well, that's a quick change of plans.

SPACECRAFT Okay, you got high sample.

CAPCOM Thank you sir.

CAPCOM Columbia, Houston. Dakar next at 42.

SPACECRAFT Okay, see you then.

CAPCOM Columbia, Houston, through Dakar for 9 minutes, standing by.

SPACECRAFT Okay loud and clear.

CAPCOM Roger.

SPACECRAFT Houston, you ready for an IECM cycle?

CAPCOM That's affirmative, we're ready.

SPACECRAFT Okay, going to position 1, ON.

CAPCOM Copy.

SPACECRAFT On to position 2, MARK.

CAPCOM Okay Henry, that looked good to us, nominal procedures.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, Botswana on the hour.

SPACECRAFT Alright, Botswana on the hour.

SPACECRAFT Brewster, could you give me some clarification on what you want me to do as post EVA ops, sir? (garble) I wasn't sure the message you sent me to couple of post EVA recharge things and, the only thing I can see that maybe you wanted to do was take the lithium out in case it was wet, the battery shows it used one percent of it's charge at most. Oxygen is reading about 720.

CAPCOM T. K. a recharge is not required.

SPACECRAFT Okay. Is it alright to leave the lithium in there?

CAPCOM That's affirm T. K. you can leave it in.

SPACECRAFT Okay, we'll have it all buttoned up in just a few minutes here.

CAPCOM Okay, sounds good.

PAO This is Shuttle Mission Control at 4 days 21 hours 56 minutes. Columbia on it's 79th orbit. Just had Loss Of Signal through Dakar and Ascension Island tracking stations. Chuck Lewis on the Bronze Team of Flight Controllers reported in the mission operations control room and our tagging up the control team on duty, in relief of Flight Director Harold Draughon, the change of shift briefing with Mr. Draughon will occur at 9:00 a.m. central time, in Bldg 2 room 135. This is Shuttle Mission Control.

PAO This is Mission Control Houston, 4 days 22 hours, have contact with the vehicle momentarily over Botswana. Onboard Columbia now the crew is setting up in preparation for a gas release test involving the induced environmental contamination monitor.

CAPCOM Columbia, Houston, for 3 minutes.

SPACECRAFT (garble) loud and clear.

CAPCOM Have you five by Henry, I have one update to your CAP when you have a moment, no hurry.

END OF TAPE

CAPCOM Columbia, Houston, Yarragadee at 18.

SPACECRAFT Okay, Houston, see you then.

CAPCOM Columbia, Houston, through Yarragadee for 8 minutes.

SPACECRAFT Okay, Houston loud and clear.

CAPCOM Roger.

CAPCOM Columbia, Houston, do you intend to utilize the Hawaii pass for any TV VTR downlink?

SPACECRAFT (garble) have we got any (garble)

SPACECRAFT How far away is that Brewster?

CAPCOM That's coming up at 44, about 25 minutes away.

SPACECRAFT Okay, we got a little piece of VTR I think we'd like to show you. Remember this star occultation we were telling you about where the night horizon atmosphere appears to be a lot higher than you see in the daytime? We'd like to send that down and also show you a sun fetus seen by the TV camera.

CAPCOM Okay that sounds great, we'll look forward to seeing it.

CAPCOM And Henry, I have one switch request for you on panel C3 if you have a moment.

SPACECRAFT Go ahead, I'm scooting up there.

CAPCOM Okay, DFI PCM low sample.

SPACECRAFT Okay, set it at low sample.

CAPCOM Okay, folks are working frantically down here trying to figure out a way to salvage the thermal attitudes and maintain the budget on the tape and that's why we're switching back and forth so much. We should have a decision after the IMU align this evening or this afternoon as to how we're going to proceed for the evening.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, Hawaii at 44. Looking forward to the show.

SPACECRAFT Okay, see you there.

CAPCOM Roger.

PAO Shuttle Mission Control, 4 days 22 hours 26 minutes. Have Loss Of Signal through Yarragadee Australia, acquire again through Hawaii in 17 minutes. Columbia Pilot Hank Hartsfield indicated there'd be a VTR dump at that time of some video recorded earlier of star oculation with the horizon and sunset as seen from Columbia. Meanwhile, here in the Mission Control Center Flight Director Chuck Lewis is pulling the members of his flight control team the Bronze Team assuring themselves that everyone has a complete understanding of situations onboard the vehicle and in preparation for the day of crew activities ahead. At 4 days 22 hours 27 minutes, this is Shuttle Mission Control.

PAO This is Shuttle Mission Control, 4 days 22 hours 43 minutes. We've had change of shift in the Mission Control Center. Flight now under the control of Flight Director Chuck Lewis. Counsel communicator will be Michael Coats. Expecting change of shift briefing with off going Flight Director Harold Draughon to occur at 9 o'clock central time, Bldg 2 room 135. Have contact momentarily through Hawaii, expect downlink video of Earth sunrise and star oculation as seen by Columbia.

CAPCOM Columbia, Houston, through Hawaii for 7 minutes, over.

SPACECRAFT Okay, loud and clear.

CAPCOM Roger Henry, this pass we're gonna teleprinter up the first of your entry flight data file deltas, they are minimal at this time due to the good shape of the vehicle. We'll finish those tomorrow morning for your review in the afternoon tomorrow.

SPACECRAFT Okay, sir. Thank you.

CAPCOM And the Crystal Team is leaving now, Bronze Team is coming on and we've enjoyed working with you and we're going to stay around and watch your TV.

SPACECRAFT Okay, Brewster can you tell me what time sunrise is at our present location?

CAPCOM 5 minutes and 40 seconds from now.

SPACECRAFT Okay, I thought maybe I'd get you a live one.

END OF TAPE

SPACECRAFT Yeah, I thought maybe I'd get a live one. I guess I won't quite make it. I'm ready to give you some downlinks if you are ready to take it.

CAPCOM We're ready T. K. and you have 6-1/2 minutes left in the pass so you might make that.

SPACECRAFT Well, we're going to try. When you have signal I start.

CAPCOM Roger, we're ready T. K. Okay, we have good picture here.

SPACECRAFT Okay, I just lost mine. I -- you must have dumped some reconfigurations on me. Anyhow, what I'm looking at there is a picture taken the other night that has stars, there's a little balls you see up on the right hand side of the screen. That's the earth by moonlight on the left hand side and the darkband that closest the the left hand side is part of the vehicle structure. The darkband that runs down, catty corner from the 3rd away to upper left down to about the middle of the bottom is the Earth's atmosphere and those big white blobs that are called stars are cutting through and there are 2 stars just penetrating the white white line in the upper corner of the picture. Other stars and if you watch them, they keep on going and they will eventually be occulted as they go down through the earth's actual disk. Knowing you'll look at it with a naked eye and see this, the first thing you see is a bright line that stands out away from the Earth and that looks like the Earth's limb. And then you start noticing that that sure is strange, it's stars seem to set or rise across the Earth's surface. And then you watch it a little more and that line is much more distinct and look like it's higher above the Earth's surface than the daytime atmosphere. And you see those 2 little stars now are just about to be occulted by the Earth's limb. You'll think that I think we come up here in a few seconds. Those 2 stars were occulted. When we get down here a little bit further, I think you'll start to see some thunderstorms that show up on the horizon in there. They're too far away to see very clearly as items but when they flash in the night, they're rather impressive at the large volume of area that is covered. That's not what's causing the flicker right now. Just a second, we shifted the tapes. And here comes - is this in color, do you know?

CAPCOM That's affirmative, T. K. We have it in color.

SPACECRAFT Okay, and just a second. You should be getting a ... Okay, lets stop and shift over to camera delta. Pardon me, make it - we're going to us a flight deck camera and go alive with it.

PAO Mission Control, Houston. This next photo will be

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live from Columbia. Earlier scenes having been video taped to downlinked. The loop by the horizon is being ...

CAPCOM And Columbia we're getting live TV. Looks like we looking at the horizon here.

SPACECRAFT Okay, do you have any color on it?

CAPCOM That's affirmative. And Columbia, roger. We don't have a whole lot of color down here, a little bit.

SPACECRAFT Okay, the (garble) that was going to happen I'm going to try a couple of settings here as you suggested and see what happens with it. See if I can bring the colors out better. The scene that you really should be seeing is a total bandwidth which confers to your screne. Has a very bright light blue mark next to the Earth's limb and it has an orange surface and the sun is just about to pop up and it's going to overwhelm most everything and there's a very light blue surface on the outside. It's really a beautiful color for you to see. And it's not always the same. Okay watch it. Yeah, take it down for it ...

END OF TAPE

SPACECRAFT and take it down before we burn it. Okay, I guess we're going to get a bright sun right smack in your eyes, so I'll turn that thing off. Okay, and all of a sudden it gets very bright and what you see is a variation that's sometimes the red area goes up from the surface, and when it's, particularly at sunset you'll see an orange arc that covers the limb of the Earth that's illuminated, and then the atmosphere above it, is a very vivid orange, with a streak of blue over the top. And when you look toward the poles instead of being arcs which are consyntric with the Earth's limb, they tend to flare away from it, and I haven't figured out whether that's an optical illusion through our geometry or if there's actually a difference in where the layers stack up. But the sunsets and sunrise do not look the same whether you're looking in the plane of the orbit, the plane of the ecliptic, or towards the poles of the Earth. And we've tried to catch it several ways, we may have it on 16 mm film.

CAPCOM Roger, T. K. We're going LOS. We'll talk to you in 2 minutes over the states here.

SPACECRAFT Okay.

PAO Mission Control Houston. 4 days 22 hours 52 minutes. Loss of signal through Hawaii reacquiring in about 2 minutes through Buckhorn. During that pass the payloads officer Jerry Renacrude reported to flight controller Chuck Lewis that the induced environmental contamination monitor gas release to ask ... had been completed onboard Columbia. During that pass we got downlink video narrated by mission commander T. K. Mattingly of the appearance of the stars over the Earth's horizon at night and live video of sunrise as seen from Columbia as it comes up over the Hawaii Islands. Still some video stored onboard of the recorded sunset scene that we may anticipate downlink later on. We'll reacquire again in about a minute. Columbia is on it's 80th orbit of the Earth as the mission elapsed time 4 days 22 hours 53 minutes. This is Mission Control Houston.

CAPCOM And Columbia Houston. With you for 19 minutes through the states and the Bronze team would like to formally wish you a good day.

SPACECRAFT Okay, thank you very much. Things are going pretty good so far, I think. Spacecraft seems to be in good shape.

CAPCOM Roger, and be advised that Sunnyvale PAYCOM would like payload status report sometime after 23:10 on this pass. You'll need the orbit ops checklist and the photo checklist.

SPACECRAFT Okay.

PAO This is Mission Control Houston. Columbia presently over the Gulf of Mexico, almost directly over Houston,

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in fact on orbit number 80. Mission Elapsed Time 4 days 23 hours 4 minutes. Mission Commander T. K. Mattingly is most probably sending up the treadmill at this time in preparation for an exercise period with the treadmill designed by astronaut Dr. Bill Thornton which although they have mechanical problems with it earlier in the flight. They - jury rigged some repairs to it and have it again operational. The off-going flight director, Hal Draughon has left mission control on route to building 2 in that change of shift briefing should begin shortly in building 2, room 135. Still in acquisition of signal period over the continental United States, this is Shuttle Mission Control.

CAPCOM And Columbia, Houston. We see your primary RJD's on, I'd get them off if we could and be advised the gas release looked very good to us this time.

SPACECRAFT Okay, thank you. Well that wasn't it.

CAPCOM And Columbia, Houston. We have about 3-1/2 minutes
...

END OF TAPE

CAPCOM And Columbia Houston, we have about 3-1/2 minutes left in this pass. We'd like to hand you over to the Sunnyvale PAYCOM at this time for the payload status report.

SPACECRAFT Okay.

PAYCOM Columbia, this is Sunnyvale on air to ground 1. How do you read?

SPACECRAFT Loud and clear, Sunnyvale.

PAYCOM Roger, Columbia, we'd like to get a status of line 3 alpha and 3 bravo in your bravo oscar tab.

SPACECRAFT Hold on. Okay they're both on.

PAYCOM Roger, I understand. Both off, o-f-f.

SPACECRAFT They just now both came on, o-n.

PAYCOM Roger, I understand.

PAYCOM And Columbia, we'd like you to turn to your cab PTV 01 page 2-2 in the photo TV checklist.

SPACECRAFT Okay, go ahead.

PAYCOM And refer to the second line of the scene description. Two activities are mentioned there. We've been running some operations over the past 10 minutes and we'd like to see if you noticed the first activity during that period.

SPACECRAFT Well, I haven't really been monitoring it but I'll look and see.

PAYCOM Columbia, Sunnyvale. If haven't been able to verify it by now that means you probably can't see it.

SPACECRAFT Okay, at this point, it says since you called, we have not verified any at that - at that line at all.

PAYCOM Roger I understand Columbia. Now I'll turn you back to Houston, thank you very much.

CAPCOM And Columbia, Houston. We're with you for another 50 seconds. Just a reminder you got a PMC coming up at Ascension at 23:22.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston. We're going LOS. We'll talk to you through Dakar at 23:19.

SPACECRAFT Okay, see you then.

PAO Shuttle Mission Control. Momentarily at 4 days 23 hours 19 minutes. We'll have acquired signal for 5 minutes through Dakar.

CAPCOM Columbia, Houston. We're with you through Dakar and Ascension for 10 minutes, over.

SPACECRAFT Loud and clear.

CAPCOM Roger, read you loud and clear. And Columbia Houston. We're with you for 4 more minutes through Ascension.

SPACECRAFT Okay, loud and clear.

CAPCOM Roger, Hank. In order to deplete the cryo tanks 3 and 4 H2 tanks 3 and 4 for the DTO tomorrow, we'd like you to get a switch back on All like the cryo H2 tanks 4 heater bravo to auto.

SPACECRAFT H2 bravo at auto on tank 4.

CAPCOM Roger that, Hank. And Columbia, Houston. We're 30 seconds to LOS. We just sent up a state vector update for your information and we'll talk to you at Botswana at 23+33 and we got a couple of notes concerning the RMS today. We'd like to give you at that time.

SPACECRAFT Okay, I'll be ready.

CAPCOM And Columbia, Houston. With you through Botswana for 8 minutes, over.

SPACECRAFT Loud and clear.

CAPCOM Roger, Hank. We read you loud and clear. We've got a few notes to pass up when you're ready. And Columbia, Houston, we'll need the PDRS ops checklist. We got a couple of changes to that.

SPACECRAFT The page?

CAPCOM Roger, Hank. In the PDRS ops checklist on page FS1-4. Under the section GNC 20 DAP configuration change DAP A13, we'd like to add a step, rotation discrete rate vernier item 3+0.3. And on page FS1-5, on the second to last line of the test sequence following A auto vernier, where it says pause 30 seconds, we'd like to make that pause 60 seconds.

END OF TAPE

CAPCOM And the rationale here is to minimize the attitude deviations from our thermal attitude, this will give us a faster maneuver rate back to the attitude and more time to get back to the attitude.

SPACECRAFT A test operation there, which pause (garble) make 60, there's about 3 of them there.

CAPCOM Roger Hank, that applies to all of them.

SPACECRAFT Going to make them all 60 second pauses.

CAPCOM Okay, I misunderstood you there Hank, just the last pause down at the bottom of the page, under A auto vernier where it says DAP rates the next one say pause 30 seconds, we'd like to pause 60 seconds.

SPACECRAFT Let's go back to the first page over then, cause I didn't get that. Where it says, change DAP to A13 and you changed something, what was it?

CAPCOM Okay, we'd like you to add, rotation discrete rate vernier, item 3 to 0.3. All we're doing is changing DAP A13 to 0.3 from 0.2.

SPACECRAFT Okay, I got it. Anything else?

CAPCOM Roger that Hank, a little bit more amplification there at the end of your 60 seconds on those tests don't wait, go ahead and continue on with the test. Note on the RMS power up and check out, based on our present RMS temperatures, you can expect an encoder check alarm when the RMS select switch is placed in the port position. These are start up (garble) and you can ignore them. Go ahead and reset the alarm with an item 12 and an item 11 on spec 94, continue ops.

SPACECRAFT Okay.

CAPCOM And one more note for you Hank, we have a request at the crew's convenience if we do terminate the tail-sun attitude today or tonight, we'd like you to get some more theodolite data for us. This will provide some mid body deflection data for the tail-sun attitude. We'd like you to use the theodolite set up and activation procedure on page FS 4-2 of the orbit ops checklist, using only the forward starboard and port aft flood lights. Use the theodolite target pad on page FS 4-7, target groups A and then only the longeron targets in group E. And we estimate it will take you about 20 minutes to do this.

SPACECRAFT Okay, we're not going to bother the doors. You just want to shoot the longerons and get a 0 reading on the hand rail.

CAPCOM That's affirmative Hank.

CAPCOM And Columbia, Houston, we're 30 seconds to LOS, we'll talk to you through Yarraquadee at 23 plus 54.

SPACECRAFT Okay, we'll see you there.

PAO This is Mission Control Houston, 4 days 23 hours 54 minutes. Columbia on it's 80th orbit. Acquire signal in about 20 seconds through Yarraquadee. The flight crew just recently completed it's Private Medical Conference. And the flight surgeon reports that both crewmembers are in good health, that they've taken no medication since yesterday's report. Both are eating and sleeping well. And reporting there getting about 6 hours sleep. They got about 6 hours sleep last night. The--

CAPCOM And Columbia, Houston, with you through Yarraquadee for 7 minutes, over.

SPACECRAFT Okay, loud and clear.

CAPCOM Roger Hank, we read you loud and clear.

PAO This is Mission Control Houston, we're coming up on the fifth anniversary of the launch of STS-4. Mission Elapsed Time now 5 days even.

CAPCOM And Columbia, Houston, we're 30 seconds to LOS. We'll talk to you again through Guam at 0 plus 08. And next time somebody's on the flight deck we'd appreciate if you'd get the bio med switch on panel R10, channel 1 to the MS position, please.

SPACECRAFT Okay, that's where it is. (garble)

CAPCOM Understand channel 1 is in the MS position now.

SPACECRAFT Negative. It was in PS, I thought it was in MS.

CAPCOM Okay, thank you Hank.

END OF TAPE

PAO Shuttle Mission Control mission elapsed time 5 days 2 minutes. We'll acquire signal in about 6 minutes to Guam, and at this time onboard Columbia pilot Hank Hartsfield is changing out batteries in the wireless headsets that the crew uses. And we'll be getting ready to powerup the remote manipulator system for some operations of the payload deployment retrieval system, which will be occurring forthcoming.

CAPCOM And Columbia, Houston, with you through Guam for 4 minutes, over.

SPACECRAFT Loud and clear Houston.

CAPCOM Read you loud and clear Hank. And Columbia, Houston, we'd like to get a couple switches on R1 if somebody's up on the flight deck please.

SPACECRAFT Go ahead.

CAPCOM Okay TK, we'd like cryo O2 and H2 tank 3 heaters bravo to OFF. And Columbia, Houston, brief rationale on that, the hydraulic 1 line is only a few inches from the H2 tank 3 line and we think if we stop the flow out of tank 3, we may be able to keep that hydraulic line 1 temperature from decreasing any further.

SPACECRAFT Okay, that makes sense. I got oxygen and hydrogen tank number 3 B heaters are OFF, so essentially we have all the heaters on (garble) both hydrogen and oxygen now.

CAPCOM That's affirmative TK, we turned off the O2 just to keep the O2 and H2 tanks together.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, we're going LOS. We'll talk to you again through Hawaii at 0 plus 19.

SPACECRAFT Okay.

Houston Commtch Buckhorn Commtch air to ground 2.

Loud and clear, how me?

You're the same. Stand by for (garble) modulation.

Roger.

Houston 1 2 3 4 5 6 7 8 9 0 9 8 7 6 5 4 3 2 1 test

Copy 5 by 100 percent keen.

2. Houston Commtch, Buckhorn Commtch air to ground

Stand by 1.

PAO Mission Control Houston 5 days 18 minutes. About a minute away from acquisition of signal through Hawaii. We should hear a report from Pilot Hank Hartsfield on his progress in powering up the remote manipulator system and checking out that payload deployment and retrieval system for this morning's operations. RMS operations this morning will include the survey of Columbia's radiators along the sides of the payload bay door areas to investigate some bubbles that have formed on the surface of those radiators, and they will be using the RMS elbow camera to inspect those areas. Also they'll be doing some handling tests with the RMS, and some unloaded tests to understand and evaluate the interaction between the deployed unloaded RMS and the Columbia's reaction control system jets. We should have voice contact with Columbia momentarily on it's 81st orbit of the Earth mission elapsed time 5 days 20 minutes. This is Mission Control Houston.

CAPCOM And Columbia, Houston, we're with you through Hawaii for 8 minutes.

SPACECRAFT Okay loud and clear.

CAPCOM Roger, read you loud and clear Hank. And Columbia, Houston, we're listening through the states for 8 minutes.

END OF TAPE

SPACECRAFT Okay, Houston, thank you.

PAO Shuttle Mission Control. The RMS systems officer Arthur Schmidt has reported to the flight director that his data shows that Columbia Pilot Hank Hartsfield has completed the survey of the port side radiator and that he is now turning the attention of the cameras to the starboard side radiators. Once again looking for the bubbles which have appeared on the radiator systems onboard the vehicle. Columbia on orbit 81 approaching the west coast of the search. Shuttle Mission Control your RMS systems officer reports to the flight director, Columbia Pilot Hank Hartsfield has completed the radiator survey and is now moving to the RMS checkout procedures to accomplish the handling test objective. Had loss of signal and will reacquire in about 8 minutes through Mila, Florida. Columbia now in it's 81st orbit just approaching Gulf of Mexico and mission elapsed time is now 5 days 39 minutes, this is Shuttle Mission Control. Shuttle Mission Control at 5 days 41 minutes. The RMS system's officer reports that Hank Hartsfield is moving briskly through the handling checklist for the remote manipulator system. Reminds the flight director that the upcoming task of the interaction between the remote manipulator system and interaction control system jets is one that must be performed during daylight in order to get good images on the documentary cameras onboard the Columbia. This should be the last flight of Columbia in which the remote manipulator systems officer will be a position here in mission control center. RMS will not be flown on flight 5 and 6 and on flight 7 the remote manipulator system will be a function of the RMU systems officer, RMU standing for remote manipulator systems mechanical system and upper stages system. The RMU officer is represented in the MOCR for the present flight for the first time having principal responsibilities for payload bay doors, mechanical systems, hydraulics and auxiliary power units. Reacquire signal again in about 4 minutes at 5 days 42 minutes this is Mission Control Houston.

CAPCOM And Columbia, Houston. We're going LOS 30 seconds. We'll talk to you through Ascension at 5 by.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston. With you through Ascension for 6 minutes, over.

SPACECRAFT Okay, loud and clear.

CAPCOM And Hank, we'd like to verify that you did a -X THCN maneuver on page PS1-10.

SPACECRAFT That's affirmative.

CAPCOM Thank you.

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SPACECRAFT Made - made a false start in the plus (garble)
Reset it and then, it then went (garble).

CAPCOM Okay, thank you, Hank. We saw the false start and then we lost data. And Columbia, Houston. We're 20 seconds to LOS. We'll talk to you at Botswana at 1+10 and just to remind you that the TRCS arm interaction test will have to be done in daylight so that the DACS can record the data.

SPACECRAFT Okay, I understand that.

PAO Shuttle Mission Control will reacquire signal again in 3-1/2 minutes. The vehicle is in daylight presently but we'll cross the terminator in the darkness in about 9 minutes which means we, there's enough time to ...

END OF TAPE

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PAO ..not enough time to complete the manipulator development, remote manipulate system interaction test with the reaction control system test, they'll have to do that, on the other side of the terminator which they will encounter west of Hawaii about the Central Pacific in about 50 minutes from now. At 5 days 1 hour 7 minutes, this is Shuttle Mission Control.

CAPCOM And Columbia, Houston, standing by through Botswana for 7 and 1/2 minutes.

SPACECRAFT Okay.

SPACECRAFT Okay and can you tell us your best guess on sunrise, sunset times this pass?

CAPCOM Stand by.

CAPCOM And Columbia, Houston, sunset should be in 1 hour and 18 minutes, that's 1 plus 18, then sunrise will be 1 plus 54.

SPACECRAFT Okay, thank you.

PAO Shuttle Mission Control, the CAPCOM Mike Coats reported the sunset at 1 plus 18, which does not mean 1 hour and 18 minutes from now, it means Mission Elapsed Time of 5 days 1 hour and 18 minutes, which is just a few minutes away. Similarly, sunrise at 1 plus 54, reflects Mission Elapsed Time of 5 days 1 hour 54 minutes. And Mission Commander Ken Mattingly interested in those times in order to budget the RMS RCS interaction tests on this rev. Mission Elapsed Time now 5 days 1 hour 12 minutes. This is Mission Control, Houston.

CAPCOM And Columbia, Houston, we have a minute and a half before LOS, we need to zero the OMS RCS counter on spec 23. That'll be an item 66 cued, item 7X cued, and item 6X cued again.

SPACECRAFT Okay, got that.

CAPCOM Roger T. K. that zeros our counter here on the ground here, and we need that before the interaction test.

SPACECRAFT Okay, and we're going to have to wait for sunrise.

CAPCOM Understand.

CAPCOM And Columbia, Houston, we're going LOS in 30 seconds, we'll talk to you through Guam at 1 plus 42.

SPACECRAFT Okay.

PAO This is Shuttle Mission Control at 5 days 1 hour 18 minutes, we've had Loss Of Signal. We'll reacquire again in 24

minutes through Guam. The CAPCOM Michael Coats advised the crew to zero of their OMS RCS, or Orbital Maneuvering System Reaction Control System counters onboard the vehicle and read up the procedures for doing that which is going to have the effect of enabling the flight controllers here in the Mission Control room to measure propellant consumption, as those jet firings consume propellants from storage areas onboard the vehicle. Mission Elapsed Time now 5 days 1 hour 19 minutes, this is Mission Control, Houston.

CAPCOM And Columbia, Houston, with you through Guam for 8 minutes, standing by.

SPACECRAFT Okay, we read you loud and clear, and we got a question, T. K. will talk to you.

CAPCOM Roger, go ahead.

SPACECRAFT Okay Mike, on the detailed part of your new and revised upgraded version of the CAP. That looks like about 50147 were you turned critical this thing of doing our unloaded arm test. Assume time critical in this case applies not to the time but rather the desire to have it in daylight. A second thing is when I read the jet set up it reads to me like you want to deselect F3U and then redeselect it at the end of the test, however, that doesn't make any sense to me and F3U is not currently deselected.

CAPCOM Roger, stand by T. K.

SPACECRAFT Okay.

SPACECRAFT If I garbled the transmission, I'm sorry, if you'll read it over you'll understand what I'm saying.

CAPCOM Roger T. K. we understood your question here.

CAPCOM And Columbia, Houston, what we desire T. K. is that you leave F3U selected for the interaction test and deselected after the test is over.

SPACECRAFT Well Mike, the problem is, am I supposed to have F3U deselected right now? The end of the interaction test or the hot fire thing, the last step on that thing said reset all the jets, we just looked back to see if we had missed something.

CAPCOM Roger, we're checking on it again T. K.

CAPCOM And Columbia, Houston, we think we found the confusion factor here. At 1955 in the flight, day six CAP update, there was a call to perform step 3 and 4 for the forward RCS thermal soakback, ETO 41207, and apparently you went ahead

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and did step 5 of which is reconfigure the nominal, which deselected F3U. And we need to, or reselected F3U, and we need to select it for this interaction test.

SPACECRAFT (garble), let me see if I can play it back Mike. We erred in doing step 5 on the soakback test and since we're about 15 minutes from going into the deselect mode we'll just press on. I'll deselect the others if appropriate. And at the end of this we'll deselect again, just trying to remember what we might have done and in between we have done those two maneuvers to go to the IECM, the gas release thing. So you - -

END OF TAPE

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SPACECRAFT you ought to be aware, we may have done that out of configuration.

CAPCOM Roger Tk, we're already looking at that. And Columbia, Houston, we're 30 seconds to LOS. We'll talk to you in Hawaii, and we're all set up now for the test, just deselect F3U after this test.

SPACECRAFT Okay.

PAO This is Shuttle Mission Control at 5 days 1 hour 52 minutes. Vehicle's just approaching the terminator, crossing into daylight, and anticipate they'll begin the RCS RMS interaction tests, which are designed to better understand the relationship between the firing of those reaction control systems jets, and the amount of torque or twang it imposes on an extended remote manipulator system, or the electromechanical arm. The dialogue through the Guam station had to do with the configuration of reaction control system jets and the misunderstanding on the deselection of when those forward RCS jets. Columbia on it's 82nd orbit, we'll acquire signal again at Hawaii in about 3 and 1/2 minutes. At 5 days 1 hour 53 minutes this is Mission Control Houston.

CAPCOM And Columbia, Houston, we're standing by through Hawaii for 7 and 1/2 minutes.

SPACECRAFT Okay, we're about to get our last of the singularity points, and then we'll end the coupling test.

CAPCOM Roger TK. And Columbia, Houston, we're going LOS, we'll be with you again in 2 minutes through the states.

SPACECRAFT Okay sir.

CAPCOM And Columbia, Houston, with you again for 7 minutes through the states.

SPACECRAFT Okay, we just finished run number 1 Mike.

CAPCOM Roger, copy TK.

SPACECRAFT We're enjoying this, the old arm most definitely moves around when you do this.

CAPCOM Roger, we copy.

SPACECRAFT I tell you when you, the next time somebody goes through life deciding to fly tail sun and do a lot of things looking in the payload bay, you'd better think long and hard about whether you really want to have a deadband that's greater than 1 or 2 degrees.

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PAO Mission Control Houston. T. K. Mattingly's remarks pertaining to the discomfort the crew experiences while looking out the aft crew station windows into the payload bay which, during the tail sun attitude has the effect of having to look directly into the sunlight, and of course, producing some discomfort.

CAPCOM And Columbia, Houston, we're going LOS in 30 seconds. Talk to you through Ascension 2 plus 3 6.

SPACECRAFT Okay, (garble) completing on test 3.

CAPCOM Roger, we copy.

PAO This is Mission Control Houston, about 4 minutes away from acquisition of signal at 5 days 2 hours 14 minutes. Orbital parameters are currently apogee of 178.5 nautical miles, perigee of 159.2 nautical miles. Humidity onboard the vehicle in the flight deck is 36% and steady. Cabin temperature is 80 degrees and steady. Columbia on orbit 32, reacquire signal in about 3 minutes, this is Shuttle Mission Control.

END OF TAPE

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CAPCOM And Columbia, Houston with you through Ascension for 2-1/2 minutes.

SPACECRAFT Okay, loud and clear.

CAPCOM Roger, read you loud and clear.

SPACECRAFT Unless we forget it Mike, we decided we ought rerun the test keys number 4 and when we got the - to start test number 5, we had an end of film light in all the cameras just as we started and we elected to go ahead and run it with the VTR going and take a chance that maybe there was some film left in there.

CAPCOM Okay, we copy that T. K.

SPACECRAFT And Mike, can you give us a warning on the water dump - what we're going to have there so we can go ahead and get a leg up on some of these things?

CAPCOM Okay, T. K. What we'd like is to dump tank bravo to 15 percent and take about 1 hour.

SPACECRAFT Okay, that's bravo to 15 percent and let me tell one other we did during the burn. We had the oms tank, the right oms tank in the helium isolated. So during the false test ... got a little tank pressure and I elected not to repressurize the tank now. We only have 1 more firing to go. And so it's low and I have not repressed it in case you guys are making a PVT calculation. And we can repress it whenever it is convenient.

CAPCOM Roger, we copy, T. K. And Columbia, Houston, we're going to go LOS here in a few seconds. You can go ahead and repress the right oms and appreciate the thoughtfulness there in waiting to repress that one. And we'll have a NOSL opportunity for you at Botswana at 2+46.

SPACECRAFT Okay, based on what I saw last night, late at night over Africa there was an awful lot of stuff. Maybe we'll get a chance to do that. Our problem today has been lack of attitude, compatibility with our opportunities.

CAPCOM Roger, understand, T. K.

PAO These communications, Shuttle Mission Control, these communications still coming through the tracking station at Ascension Island even though the elevation is less than 1 degree meaning that the line of site for Columbia from that tracking station is just under 1 degree over the horizon. We will reacquire again in 4 minutes through Botswana and CAPCOM, Michael Coats indicated there would be some opportunity for some night/day optical sensing survey lightning data takes during that overflight. Columbia's in tail sun attitude and some of the

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temperature extremes being reported by transducers located on the various sections of the booster, there on the vehicle, indicate the range of temperatures experienced in that kind of attitude as one might suspect the highest temperature reported by any of the transducers on the aft end of the vehicle and the report by the transducer located - situated in the vicinity of the oms pod thrust chamber where we are receiving a reading of 112 degrees fahrenheit at the other extreme in the nose of Columbia we have a couple of transducers one of which shows a 21 degrees, the other one shows 16 degrees fahrenheit. The coldest of any temperatures being reported by the transducers is shown on the starboard side the fuselage just above the wing where we get a reading of minus 55 degrees below zero. 55 degrees below zero fahrenheit. Acquisition signal 2-1/2 minutes through Botswana at 5 days 2 hours 44 minutes this is Mission Control Houston.

END OF TAPE

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CAPCOM And Columbia, Houston, with you through Botswana for 7 and 1/2 minutes, over.

SPACECRAFT Okay sir.

CAPCOM And TK, we've got a NOSL opportunity for you when you're ready to copy.

SPACECRAFT Give me till Monday. Go ahead, I got paper out.

CAPCOM Roger, you've got a thunderstorm system off the west coast of Columbia, just south of Panama. It'll be northeast of your groundtrack at MET 3 hours and 52 minutes. The center of the storm system is 4 degrees north latitude, 81 degrees west latitude. It'll be daytime, and one magazine would be good.

SPACECRAFT Okay. You know, one of the things, I've taken several rolls of film on powering cue, and some of the power is on, but in the daytime it's very hard for me to tell if that's the kind of stuff that's of interest, or if we're just getting lots white pretty cloud pictures. At least at night I can tell there's activity, and from seeing areas of transitions from day to night, you can't just see if the big clouds have some lightning in them, it doesn't look to me like. I was wondering where you wanted us to expend our efforts.

CAPCOM Okay, we'll talk about that a little bit, and get back to you.

SPACECRAFT It's not bad, it's just that I don't want to just shoot it for the sake of shooting it, without getting some meaningful information.

CAPCOM Understand.

SPACECRAFT And Mike, I don't know if you copied the comment I made the other day that neither Hank nor I have been able to hear any tones from the detector. I checked the detector against the CRT and it's working. At least when I point it at the CRT I can hear the sounds, but when I was pointing it right smack at what had to be a huge thunderstorm and saw it in the viewfinder, I still got no tones, and I just assume that it's a long distance, and it probably is a little too weak. Just because it's visible doesn't mean it's good enough.

CAPCOM Roger, we copy.

PAO This is Mission Control Houston. That detector which T. K. Mattingly was making reference to is an instrument onboard the vehicle, with the purpose of assisting the crew in identify centers of electrical activity which might be productive for the night optical sensing of lightning experiment. Mission

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elapsed time 5 days 2 hours 49 minutes this is Mission Control Houston.

CAPCOM And Columbia, Houston, we're 30 seconds from LOS. We'll talk to you again through Guam at 3 plus 18.

SPACECRAFT Okay see you then.

PAO This is Mission Control Houston at 5 days 3 hours 14 minutes. Columbia on it's 83rd orbit of the Earth 4 minutes away from acquisition of signal through Guam. At this point in the crew activity plan Columbia's Pilot Henry Hartsfield is performing a water dump, purging the vehicle of the water produced as an artifact of the interaction of hydrogen and oxygen in the fuel cells as those 2 substances move across a common membrane and produce electricity. They also produce potable water, and the accumulation of that water needs to be dumped from time to time. It's expelled from the vehicle through a heated T-shaped valve heated in order to preclude the formation of ice on that valve, facilitate the flow of water through it, and the valve is T-shaped in order to evacuate water in both directions, in opposite directions simultaneously, so as to neutralize any thrust affect it might have. Additionally, the crew is approaching it's evening meal timeline, it's actually dinner for the crew, and they are, in fact, about 3 and 1/2 hours away from sleep time. And they will - -

END OF TAPE

PAO ...away from sleep time and they will eat an evening meal with the anticipation of sunrise as they approach the terminator almost directly over Guam. We'll have acquisition signal with the crew in about 2-1/2 minutes at 5 days 13 hours - at 5 days 3 hours 16 minutes, this is Mission Control Houston.

CAPCOM And Columbia, Houston. With you through Guam for 7 minutes.

SPACECRAFT Okay, Houston, loud and clear.

CAPCOM Roger, read you loud and clear.

SPACECRAFT Hank, did you guys ever decide whether you'd like light colored clouds or dark color clouds?

CAPCOM Roger, T. K. They'd like to go ahead and get this NOSL opportunity you noted, in the daytime.

SPACECRAFT We'll do that but for those things that are targets and opportunity here, do they have a druther?

CAPCOM Roger, we're still checking on it.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston. We understand that the NOSL opportunities at night are preferable but they would like to get the daytime one as well.

SPACECRAFT Okay. Fine.

CAPCOM And Columbia, Houston, we're 30 seconds to LOS. We'll talk to you again through Hawaii at 3+32.

SPACECRAFT Okay.

CAPCOM Columbia, Houston with you through Hawaii for 7-1/2 minutes.

SPACECRAFT Okay, read you loud and clear.

CAPCOM Read you loud and clear, Hank. And Columbia, Houston, we're 30 seconds from a long LOS here. We'll talk to you again at Botswana at 4+22 and just for your information, T. K., we did see 4 short pulses on jet F3U this morning but it was not a major impact of thermal VTO.

SPACECRAFT Okay, that's good news.

CAPCOM Roger, Hank. And we'll talk to you later.

PAO This is Mission Control Houston. The vehicle's

on it's 83rd orbit of the Earth. Presently just had loss of signal through Hawaii. In the flight plan - flight path now takes us down (garble) across the South America continent and we miss all the main land United States tracking stations and will not acquire signal from Columbia again until it's almost halfway around the world from it's present position. In 40 minutes we'll have contact again through Botswana. At 5 days, 3 hours 42 minutes, this is Mission Control Houston.

CAPCOM Okay.

PAO This is Mission Control Houston. We're approaching acquisition signal through Botswana. Flight control team has made the decision to stay in the tail sun attitude overnight. There was some consideration of braking attitude in order to preclude of being extremely low temperatures in the vicinity of hydraulic line supporting the nose gear system. Temperatures on that system around that hydraulic are stabilized and so there won't be a need to break the sun tail attitude to compensate for that. Looking also at the 30 second reaction control systems burn, thermal soakback test that we may yet perform before the end of the day. About 2 hours 20 minutes before the crew begins a sleep period now. We'll have acquisition of signal momentarily after a long 40 minute LOS, mission elapsed time, 5 days ...

END OF TAPE

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PAO - - mission elapsed time 5 days 4 hours 20 minutes
this is Mission Control Houston.

CAPCOM And Columbia, Houston, with you through Botswana
for 7 minutes, over.

SPACECRAFT Okay, loud and clear Houston.

CAPCOM Roger Hank, we read you loud and clear, and we've
got another NOSL opportunity we'd like to talk to you about if
you've got some time.

SPACECRAFT Okay, go ahead.

CAPCOM Okay Hank, this is an interesting opportunity.
We're not sure it fits in too well, it's up to you whether you
can get to it. There's a typhoon, typhoon test in the South
China Sea just south of Hong Kong approaching the coast. It
comes at an MET of 4 plus 4 9. Not too long from now. It's a
night/day transition and no grating is required. That's at a
latitude of 17 degrees north, 110 degrees east, and it's up to
you whether you can get it. It comes during your IMU maneuver
and so forth, so it may not be possible, but we'd like to pass it
on to you anyway.

SPACECRAFT Okay, if we can get a chance, we'll try to take a
look.

CAPCOM And Columbia, Houston, we've got a few more notes
for you here when you've got a chance to copy.

SPACECRAFT Okay, go ahead.

CAPCOM Okay Hank, the cryo configuration for sleep
tonight, you can go to it right now, on panel All we'd like the
O2 and H2 tank 4 heaters bravo to OFF.

SPACECRAFT 2 tank 4 bravo heaters OFF on tank, is that right?

CAPCOM That's right. Tank 4 H2 and O2 heaters bravo to
OFF.

SPACECRAFT There's no heaters now on tank 4.

CAPCOM That's correct Hank, and as a matter of
information, we'd like you to stay in the tail sun attitude
tonight with a 10th of a degree deadband, which is what you've
got now. And we have a suggestion to help us during the, for
your crew summary dump tonight, we'd like to request that you
turn off one CRT when you start your summary, and then when
you're completed with your summary turn off another CRT, and
that'll give us exact times to look for on the tape.

SPACECRAFT Okay, very clever. Now, you're really locking in on it, we'll try that.

CAPCOM Okay, we may have missed just a little bit last night, so we think this will really lock it in. And Columbia, Houston, we're just curious, have you been sleeping with the shades up on the aft windows?

SPACECRAFT That's affirmative.

CAPCOM Roger, we copy you're affirmative.

SPACECRAFT TK's been sleeping on the aft flight deck, and I've been sleeping in the middeck.

CAPCOM Roger, we copy that Hank. And Columbia, Houston, we've got a short LOS here of about a minute. Talk to you through IOS.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, with you through IOS for 8 minutes.

SPACECRAFT Okay, loud and clear.

CAPCOM Roger Hank, we read you loud and clear, and we're just curious if you have a chance to, if you could elaborate on how you been sleeping, as to constraints and so forth.

SPACECRAFT I've been sleeping in that sleep restraint every night, been sleeping like a log. That's the greatest thing going. We have it stringing up to the lockers, I think it's on row 43. I hook it in the top locker, down in the bottom locker and flow into it.

CAPCOM Okay, copy.

SPACECRAFT Houston, can you see the angles?

CAPCOM Roger Hank, we got all that on telemetry here. We don't need the IMU results, thank you.

SPACECRAFT Hello Mike, can you have somebody find out where the urine collection screen is located - the spare?

CAPCOM Roger, we're checking on that Hank.

SPACECRAFT We can't seem to find the thing. The cue card said it's in MF57 (garble) we didn't find it there.

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CAPCOM Okay, we'll check it.

END OF TAPE

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CAPCOM And Columbia, Houston. Hank, you might try looking for that in the MF71 Charlie. That's our next best guess.

SPACECRAFT MF71 Charlie. And this MAP here says you want the B deadband to be 1.0 and I thought you briefed me earlier it was going to be at (garble) .1 deadband.

CAPCOM Roger, Hank. You're correct. We'd like you to stay in .1 deadband.

SPACECRAFT Okay.

CAPCOM And that's bravo 2 DAP, Hank.

SPACECRAFT What's that. Is there any reason why I can't go back to tail sun now?

CAPCOM Go ahead, Hank. You can go back to tail sun right now.

SPACECRAFT These things, anything marked time critical. I don't understand that.

CAPCOM Roger, Hank. That's sort of a not later than time critical thing.

SPACECRAFT Okay. (garble) contact.

CAPCOM And Columbia, Houston. We're 30 seconds to LOS. We'll talk to you through Guam at 4+56.

SPACECRAFT Okay, and you want me to go ahead with this fire?

CAPCOM Roger, Hank. Say again on your last transmission.

SPACECRAFT Yeah, there's a forward RCS thermal soakback one engine fire here scheduled at 4:48 for a 5 o'clock fire.

CAPCOM Roger, Hank. You're go for that one. And Columbia, Houston with you through Guam for 4 minutes, over.

SPACECRAFT Houston, loud and clear.

CAPCOM Roger, Hank. We read you loud and clear.

PAO Mission Control Houston, propulsion systems engineers reported to the flight director ...

CAPCOM Columbia Houston. We're 20 seconds to LOS. We'll talk to you through Hawaii at 08.

SPACECRAFT Okay.

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CAPCOM And Columbia, Houston. We saw the burn, looked good.

SPACECRAFT Okay.

PAO This is Mission Control Houston. Once again the propulsion systems engineer, William Gurstameyer reported to the flight director that he ...

SPACECRAFT You still there?

CAPCOM That's affirmative, Hank.

SPACECRAFT Do you want the PCM back to high sample or low sample after 10 minuces?

CAPCOM Back to high sample.

SPACECRAFT Okay.

PAO This is Mission Control Houston. Houston again had the advantage of a little unexpected commentary of air to ground, beyond what we thought we would be able to acquire during that pass over Guam. The propulsion systems engineer, William Gurstameyer reported to the flight director that he was able to see and afirm that the crew had accomplished the forward RCS jet 30 second firing saw the firing test concluded and reported that it appeared to be a good test and we subsequently had loss of signal through Guam. We'll reacquire again in about 6 minutes, through Hawaii as Columbia accomplishes orbit 84 of the Earth. About 1 hour and a half away from the crew sleep period. Hour and a half away from the crew sleep period they'll begin presleep activity fairly soon which involves stowing some gear and configuring cabin lighting and window shades. Mission Elapsed Time now 5 days 5 hours 3 minutes, this is Mission Control Houston.

CAPCOM And Columbia, Houston, with you through Hawaii for 8 minutes, over.

SPACECRAFT Loud and clear, Houston.

CAPCOM Roger, Hank, you're loud and clear.

CAPCOM And Columbia, Houston. Hank, did you find that spare urine screen? We can search some more if you didn't.

SPACECRAFT Yes, it was right where you said.

CAPCOM Okay, thank you.

END OF TAPE

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CAPCOM Hank did you find that spare urine screen, we can search some more if you didn't.

SPACECRAFT Yes, it was right where you said.

CAPCOM Okay, thank you.

SPACECRAFT I don't know about you, but I sure had a hard time, in fact I still haven't found what it's listed under in the stowage list.

CAPCOM Yes, we can understand that, T. K.

CAPCOM And Columbia, Houston, we need the strain gauges on the tire pressure.

SPACECRAFT Okay, we'll get them. Do we still have a go for the item 48s?

CAPCOM Roger Hank, your go for item 48s.

CAPCOM And Columbia, Houston, we can give you a quick summary of our plans for tomorrow right now if you'd like or we can wait till Botswana at 5 plus 58.

SPACECRAFT Why don't we wait till Botswana Mike?

CAPCOM Okay Hank, we'll do that.

CAPCOM And Columbia, Houston, we'd like you to go back to DAP Bravo.

SPACECRAFT Thank you transition, copy.

CAPCOM Roger that Hank.

CAPCOM And Columbia, Houston, you can turn the strain gauges off, we got the tire pressure, thank you.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, we're 40 seconds to LOS, we'll talk to you through Santiago at 36, and we saw the item 48 to your GNC machine, we didn't see it to the SM machine.

SPACECRAFT Thought I got it, but let me to it again?

CAPCOM Okay Hank, we'll talk to you at Santiago at 5 plus 36.

SPACECRAFT Okay sir, thank you.

PAO Mission Control Houston, we have loss of signal thorough Hawaii on orbit 84. We acquire again in about 20 minutes through Santiago Chile. The EECOM systems officer reported to the flight director that the crew was performing an auto purge of the fuel cells onboard the vehicle which is accomplished by increasing hydrogen and oxygen and forcing them through the system at a higher rate of flow to purge it of contaminants which might inhibit the production of electricity while they fly those systems. Mission Elapsed Time now 5 days 5 hours 17 minutes, this is Mission Control, Houston.

CAPCOM And Columbia, Houston, with you through Santiago for 4 minutes, over.

SPACECRAFT Alright sir.

CAPCOM And we read you loud and clear T. K.

CAPCOM And Columbia, Houston, if you haven't done the theodolite readings already you can go ahead and drop that for tonight. We'll get it tomorrow.

SPACECRAFT I think we thought that was if we lost tail-sun. You want them now? We can do it.

CAPCOM That's a negative T. K. we'd like to skip it today then, and do it tomorrow after we leave tail-sun. And you've got it figured out.

SPACECRAFT Okay. Sorry, we misunderstood.

CAPCOM No, you understood correctly, you had it psyched out just right, we would like to do it after we leave tail-sun.

CAPCOM And Columbia, Houston, we're going through a short keyhole, we'll be with you in about 30 seconds.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, we're about 50 seconds to an LOS, we plan a short tag up here at Botswana if it's okay with you, and we're taking orders down here for Petey's Barbeque tomorrow at lunch if you guys want anything.

SPACECRAFT Oh, I think we can probably think of something.

CAPCOM Roger.

SPACECRAFT Okay, what's the time at Botswana, so we can be ready.

CAPCOM Okay, T. K. we should be through Botswana at 5 plus

58.

SPACECRAFT Okay, we'll try to be on time.

SPACECRAFT Mr. Newton and the laws of physics willing.

PAO This is Mission Control Houston, we're 16 minutes away from acquiring signal through Ascension Island on orbit 84 about a little less than an hour away from crew's sleep and the crew's been pretty close to the timeline throughout the day so no reason to expect that we will go beyond their sleep period, that there should get then bedded down on time tonight. Mission Elapsed Time now 5 days 5 hours 42 minutes, this is Mission Control, Houston.

END OF TAPE

PAO - - 42 minutes this is Mission Control Houston. Mission Control Houston 5 days 5 hours 57 minutes mission elapsed time, Columbia is about to pass within range of the tracking station at Botswana on orbit number 84. We're about 45 minutes away from the scheduled crew period today. Standing by for reacquisition of signal with Columbia.

CAPCOM And Columbia, Houston, with you for 5 and 1/2 minutes through Botswana, over.

SPACECRAFT Be right with you.

CAPCOM Roger. Okay our tentative plans for tomorrow, right now we plan on the normal wakeup time. We plan to delete the LIA test, we're looking to do the FCS checkout in the morning, and right now we're planning on using APC 1. We want to do the cabin free water inspection, after that, followed by the forward RCS 2 jet thermal soakback, that's DTO 41206. And then we'd like to do the theodolite measurements, with groups A and E again. We're trying to work in 3 hours of free time in the afternoon for your stowage and entry review, and we're looking at working in a NAV base stability test with your IMU alignment at the end of the day. Questions?

SPACECRAFT Do theodolite settings for which groups?

CAPCOM Roger, that's groups alpha and echo.

SPACECRAFT Okay, so you're gonna delete the LIA, you're gonna do the FCS checkout in the morning on APU 1 probably. We had no free water last time I looked, can I look tonight and set satisfy that.

CAPCOM Roger, standby TK.

SPACECRAFT Then you're gonna do a forward RCS soakback, and some theodolite measurements, a NAV base stability test, which I thought we got into the other day, didn't we?

CAPCOM Roger TK, and we needed a second one to finish up that DTO.

SPACECRAFT Okay, and what are some of the other things that we didn't get done then? You don't have your stratification test on here, or the TACAN tracking.

CAPCOM Roger and except for those things, the day is pretty nominal TK, which means we'll be doing that stratification test at 15 percent.

SPACECRAFT Oh, I understand now, okay. These are deltas to the nominal.

CAPCOM That's affirmative, and we'll be making a couple changes to the stratification test, and they'll be up on your teleprinter then.

SPACECRAFT Okay, now I'm with you, so just give me one more time the, when do we start preentry stowage and things like that?

CAPCOM Roger TK, if you look in your CAP then where it talks about starting the payload bay door performance at 0050, at 6 days 0 hours and 50 minutes. Now that's when we plan to have your stowage review.

SPACECRAFT And how many hours have you allocated now? I'm asking these questions not with respect to the regular flight plan, but with whatever mod you've added to it.

CAPCOM Roger TK, we're looking at about 3 hours, plus an hour for the meal there.

SPACECRAFT Okay, I think we can hack that. Probably started cleaning up a little bit. Did you see the mess we had this morning Mike?

CAPCOM Roger, didn't look that bad to us.

SPACECRAFT (Laughter) I don't think the mean free path between objects couldn't have been more than a foot and a half.

CAPCOM And Columbia, Houston, we're about 30 seconds to short LOS, and we'll talk to you through Indian Ocean at 6 plus 6 minutes.

SPACECRAFT Okay.

END OF TAPE

CAPCOM And Columbia, Houston. We're about 30 seconds to short LOS. We'll talk to you through Indian Ocean at 6+6 minutes.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston. We're with you through Indian Ocean for 9 minutes, over.

SPACECRAFT Okay. We were just talking about it. We thought we'd give you a nightly summary. We (garble) would be telling you how much of the flight plan we did and didn't do, then you probably wouldn't see it all. But then we've gone to the real time flight plan. You know as much about it as we do and I think we did everything that you sent up to us today. In terms of extra there's nothing (garble) that you can check off your log book. We have looked at everything on that list of questions you gave us in some degree and we think it was some ideas. We have not been able to get - haven't been able get our ideas all down in ink because there hasn't been time to even talk to the tape recorder. But, we have looked at it all and we've taken I hope a representative (garble) of TV and 16 mm to help illustrate the points we wanted to make. So I guess the only thing we can say about the log is I like the everything else was a planned activity and minimized anything that (garble) doesn't have to be done so we can start getting our, I want to get together our spacecraft tidied up and start mentally thinking about what we're going to do on entry date.

CAPCOM Roger that, T. K. I understand.

SPACECRAFT Mike, you still there?

CAPCOM That's affirmative, T. K.

SPACECRAFT Tell ya, I don't know how long you have to fly in this thing to, ah, quit being amazed by it and impressed with what it does, but it sure is a lot longer than a week. It is really remarkable the way it operates and the characteristics you have. A lot of the little things that you never thought of and it's just really been a fascinating couple of days. You're gonna really love it.

CAPCOM Ah, roger. We copy that T. K. it's a remarkable flying machine. And Columbia, Houston. It's okay to do that free water inspection tonight if you like.

SPACECRAFT Okay, I'll do that in the next 5 minutes. I'm standing almost on top of it.

CAPCOM Okay, a couple of more items for you. You're state vector is good for the next 5 revs anyway. We're still tracking

it after your last RCS burn. We think it's going to be okay for next Edwards. And we'll update that on the teleprinter. For you information, you're up to 175 miles now.

SPACECRAFT Every little bit counts.

CAPCOM And Columbia, Houston. If you're up on the flight deck there you can take the PCM recorder to low sample on panel C3.

SPACECRAFT Okay, Henry's on his way. Sorry, Mike.

CAPCOM Roger, Columbia. What we need was that the PCM recorder to low sample on panel C3.

SPACECRAFT Thought I just did that

CAPCOM Okay, thank you, Hank.

SPACECRAFT Okay, Mike, you still there?

CAPCOM That's affirmative, T. K.

SPACECRAFT Dry as a bone.

CAPCOM Roger, we copy that. Dry as a bone. And Columbia, Houston, we got about a minute and a half left in this pass and we'd like to say goodnight from the Bronze team, And we got one more shift with you tomorrow. We'll be turning it over to the Granite team. We don't plan to call you again tonight unless you call us. If you think of anything you want to put on your summary, tonight we'll be looking at the fault messages here, your CRT off will be the start time and second one - the last one off will be the stop time. And Columbia, Houston. We're 30 seconds from LOS. Have a goodnight.

SPACECRAFT Okay, sir, thank you.

PAO Mission Control Houston. 5 days 6 hours 15 minutes mission elapsed time. Columbia has just passed out range of the Indian Ocean station and beginning orbit number 85. Be another chance of communicating with the crew in about 20 minutes although flight controllers from the Bronze team just bid the crew goodnight and said that they would not try and contact them again. If the crew had any need to relay a message to the ground they could give them a call. Bronze team of flight controllers is going offshift here in Mission Control and being replaced by the Granite team and the offgoing ...

END OF TAPE

CAPCOM And Columbia, Houston, we're 30 seconds from LOS. Have a good night.

SPACECRAFT Okay, sir. thank you.

PAO Mission Control Houston. 5 days 6 hours 15 minutes, mission elapsed time. Columbia's just passed out of range of the Indian Ocean station and beginning orbit number 85. Be another chance of communicating with the crew in about 20 minutes although flight controllers from the Bronze team just bid the crew goodnight and said that they would not try and contact them again. If the crew had any need to relay a message to the ground they could give them a call. Bronze team of flight controllers is going offshift here at mission control and being replaced by the Granite team and the offgoing flight director Chuck Lewis is scheduled for a change of shift briefing currently scheduled for approximately 5:00 pm central daylight time in building 2. At 5 days 6 hours 16 minutes mission elapsed time. This is Mission Control Houston. Mission Control Houston. 5 days 6 hours 35 minutes mission elapsed time. We're about to pass within range of the Guam tracking station for a brief pass of about 4 minutes. This is Mission Control Houston.

PAYCOM Voice control Guam 695.

PAO Mission Control Houston, 5 days 6 hours 40 minutes mission elapsed time. Columbia's on orbit number 85 and about 4 minutes away from passing over the Hawaii tracking station. We don't expect any communication with the crew at that time unless they have something to really relay down to us. Currently scheduled to have the change of shift briefing with offgoing bronze team flight director Chuck Lewis at approximately 5 pm central daylight time, building 2 room 135. Repeating that schedule for approximately 5 p.m central daylight time. 5 days 6 hours 41 minutes mission elapsed time. This is Mission Control Houston.

PAO This is Mission Control Houston, 5 days 6 hours 53 minutes mission elapsed time. Just passed out of range at the Hawaii tracking station on orbit number 85. Offgoing flight director Chuck Lewis of the bronze team has just left the mission control room and is on his way to the change of shift briefing in building 2. That briefing should begin in about 8 minutes or so. 5 days 6 hours 53 minutes mission elapsed time, this is Mission Control Houston. Mission Control Houston, 5 days 7 hours 11 minutes mission elapsed time. Passing within range of the Santiago, Chile tracking station for about a 6 minute pass. It's possible we may have some communication between the spacecraft and the ground on this particular pass. The flight controllers had some information they've discovered they would like to relay up to the crew and their observing to see if the crew is still active so that they don't interrupt them after they've already

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tried to settle down to try to get to sleep tonight. Since we are about half an hour into the scheduled the crew sleep time. At 5 days 7 hours 12 minutes mission elapsed time. This is Mission Control Houston.

CAPCOM Columbia, Houston, how copy?

SPACECRAFT Fine, how are you?

CAPCOM Okay, sorry to bother you while you're doing your work tonight but we have observed that either B in cryo tank 1 H2 tank 1 is failed. Correction, that's H2 tank 2 heater B is failed. What we would like to do is have you set up the switches tonight such that we can use some of at H2 and also reduce the possibility of waking you up in case one of the other heaters fails. So if you would, we'd like both B heaters off in tanks 1 and tank 2H2 and both A heaters check them at auto.

SPACECRAFT Okay, let me check that. Okay, Dave what I got is hydrogen tank 1 and 2, the B heaters are off and the A heaters are auto. The oxygen tanks have A in auto.

CAPCOM Okay, that configuration looks good for us tonight and we hope we don't have to talk to you again, although we enjoyed it.

SPACECRAFT Okay, sure appreciate you guys watching the store while were playing, thank you.

CAPCOM Roger, bye.

SPACECRAFT Bye.

PAO Mission Control Houston, 5 days 7 hours 17 minutes mission elapsed time. Columbia's just passed out of range of the Santiago tracking station where we had a brief exchange of words here with the ground controllers in mission control regarding switch configurations for heaters on the cryogenic tanks. Ground controllers noticed a problem with the heater on tank 2 of the hydrogen tank, cryo tank, and the crew was advised to set the switches in the configuration that would keep the system in the proper shape during the night. Crew is once again bid a goodnight and the spacecraft is on it's last leg of orbit number 85, 5 days 7 hours 18 minutes mission elapsed time, this is Mission Control Houston.

END OF TAPE

PAO Mission Control Houston, 5 days, 9 hours, 8 minutes mission elapsed time. Space Shuttle Columbia is now passing within range of the Ascension Island tracking station on the last leg of orbit number 86. Crew has been asleep for some time now after TK Mattingly, Shuttle Commander, left a rather lengthy report of the day's activities on the tape recorder for ground controllers to view this evening. The crew has about five and a half hours remaining in the sleep period and they'll be getting up about 12:30 or so a.m. Central Daylight Time and to begin their Saturday, the day before entry. Columbia's currently in a slightly elliptical orbit with an apogee of 177.5 nautical miles and a perigee of 160 nautical miles. Crew is experiencing a rather cozy 80 degree cabin temperature with a humidity of 35%. Flight controllers here in Mission Control are continuing to assemble the teleprinter messages and plan the crew's activities for tomorrow. At 5 days, 9 hours, 10 minutes mission elapsed time, this is Mission Control, Houston.

PAO This is Mission Control Houston, at 5 days, 9 hours, 47 minutes mission elapsed time, Columbia is currently within range of the Guam tracking station and data is coming down from the spacecraft. Flight controllers here in Mission Control are observing the systems onboard and Flight Director John Cox has noted, called around the room for the status on all systems and every thing appears to be going well at the present time. The vehicle is on orbit number 87 and about to swing down over the Pacific Ocean, will be within range of the Guam station for about 5 minutes here and then it will be about another 35 minutes before we reacquire over Santiago, South America. Columbia is currently in a slightly elliptical orbit 175.8 nautical mile apogee and a perigee of 159.5 nautical miles, taking 1 hour 30 minutes and 52 seconds to circle the Earth each time. Crew has 4 hours and 51 minutes remaining in their sleep period. They're do to get up about 12:40 a.m. Central Daylight Time to begin their activities on the 7th day of onorbit. 5 days, 9 hours, 48 minutes mission elapsed time, this is Mission Control Houston.

END OF TAPE

PAO Mission Control, Houston, 5 days, 12 hours Mission Elapsed Time. Columbia is currently passing within range of the Santiago, Chile Tracking Station on orbit number 88. This is about a 2-1/2 minute pass. Data coming down from the spacecraft indicates that all systems appear to be functioning normally and the spacecraft is in an orbit of 175.1 nautical miles by 159.9 nautical miles, taking 1 hour and 30 minutes and 51 seconds to circle the Earth. Crew has about 2-1/2 hours remaining in their sleep period. They are scheduled to get up at about 12:40 a.m. Central Daylight Time to begin their 7th day of on-orbit operations. Saturday will primarily be a day of preparing for re-entry, will include the Flight Control System checkout. There will also be a Forward Reaction Control System thermal soakback test and a test of the Power Reactant Supply and Distribution System. Consumables onboard the spacecraft continue to look good. At 5 days, 12 hours, and 2 minutes Mission Elapsed Time, this is Mission Control, Houston.

PAO Mission Control, Houston, 5 days, 13 hours, 3 minutes Mission Elapsed Time. Spacecraft Columbia is on orbit number 89 of the Earth. It's about an hour and 36 minutes before the crew is scheduled to wake up and the first opportunity to talk to the crew will probably be in a little more than 2 hours after they pass over the Dakar Tracking Station, and that will be on orbit number 91. Crew's day on Saturday is fairly busy. They have some activities planned including a Flight Control, a Flight Reaction Control System thermal soakback test checkout, testing the Power Reactant Supply and Distribution System, and checking out the Flight Control System. That's a typical day before entry activity. Operations of the payload bay doors have been deleted. Columbia's orbit right now is about a 176 nautical miles by 159 nautical miles. At 5 days, 13 hours, 4 minutes Mission Elapsed Time. This is Mission Control, Houston.

PAO Mission Control, Houston, 5 days, 13 hours, 10 minutes Mission Elapsed Time. The Change-of-Shift Briefing currently scheduled for 1:00 a.m. Central Daylight Time here at the Johnson Space Center with off going Flight Director of the Granite Team, John Cox, may be cancelled. We're considering cancelling that scheduled briefing for lack of interest. We'll make that decision and announce it in about 30 minutes. This is Mission Control, Houston.

PAO Mission Control, Houston, 5 days, 13 hours, 38 minutes Mission Elapsed Time. Columbia is on the last portion of orbit number 89 and just about to pass over the coastline of South America. Crew has about an hour left remaining in their sleep period. Flight controllers here in Mission Control are continuing to review the teleprinter messages which will be going up to the crew shortly, describe their day's activities for them in some detail. The Change-of-Shift Press Conference which was scheduled for 1:00 a.m. Central Daylight Time with off going

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Granite Team Flight Director, John Cox, has been cancelled. Repeating that, briefing, the Change-of-Shift Press Conference with off going Granite Team Flight Director, John Cox, has been cancelled due to lack of press interest. At 5 days, 13 hours, 39 minutes Mission Elapsed Time, this is Mission Control, Houston.

END OF TAPE

PAO At 5 days, 13 hours, 39 minutes, mission elapsed time, this is Mission Control, Houston.

PAO This is Shuttle Control, at 5 days, 14 hours, 40 minutes, mission elapsed time. Columbia's alarm clock should be sounding now. This is the time for astronauts Mattingly and Hartsfield to wake up. Mission Control won't be greeting them for another 49 minutes, when Columbia reaches Dakar, the next tracking station. This is Shuttle Control.

PAO This is Shuttle Control at 5 days, 15 hours, 28 minutes, mission elapsed time. Columbia is on orbit 91 and approaching acquisition through the Dakar tracking station, this is the first pass of the day. We'll be greeting the crew for the first time today. In the mission control center, the Crystal Team headed by Harold Draughn has relieved the Granite Team. CAPCOM's on this shift are Brewster Shaw and Roy Bridges. We'll standby for the Dakar pass.

SPACECRAFT And good morning to you, too.

CAPCOM Good morning, T.K., how are you today?

SPACECRAFT Just fine, sir. What's going on?

CAPCOM Well, first of all I have to apologize for the quality of those recordings. They come from a long way back. We hope that you and Hank recognize them.

SPACECRAFT (laughter) trying to find an answer for that.

CAPCOM Well, we can discuss it during the debriefing, I guess.

SPACECRAFT That's a good plan.

CAPCOM Actually those who are sent to you folks from your brothers of Delta Tau Delta and Delta Chi, respectively.

SPACECRAFT Well, that's mighty nice, thank you.

CAPCOM And we assume that the first two pages of the CAP got onboard last pass, and the rest of it's coming up. The CAP summary we think we'll get about MILA, next pass.

SPACECRAFT Didn't we tell you the teleprinter broke last night?

CAPCOM Well, enjoy your day then.

SPACECRAFT Okay, yeah, we got them. I have a quick question, Brewster, the first

CAPCOM About a MILA next pass.

SPACECRAFT Didn't we tell you the teleprinter broke last night.

CAPCOM Well enjoy your day then.

SPACECRAFT Enjoy the day. Yeah, we got them. One quick question, Brewster, the first item at 15:40 refers us to the weather (garble) checklist page 5-2 and I haven't message 53B that said the pages 4 and 5 I assume that you really want us to operate from that (garble) procedure on message 53B, is that correct?

CAPCOM That's affirmative, Hank. And Columbia, Houston, we are looking at a fuel cell message you got, we see nothing wrong with the fuel cell and we'd like to confirm it with the TCE.

SPACECRAFT Brewster, we think we (garble). We don't see anything to look at either.

CAPCOM Okay.

SPACECRAFT Fuel cell three was (garble) at the time and, at least it was when I got over there, I notice now that fuel cell 3 instead of being off scale high that the O2 flow is dropped down on the limits, (garble) it's still way too high, but it's not off the scale anymore.

CAPCOM We copy.

PAO This is Shuttle Control, Dakar has lost of signal but we'll get a little bit of overlapping coverage through Madrid.

CAPCOM Yeah, FCS checkout, we'll be using (garble)

PAO We'll continue to standby.

SPACECRAFT (garble) see you number one.

CAPCOM Columbia, Houston, the data shows you're well up on the step this morning and we'll see you at Yarraçadee at 16:07.

SPACECRAFT Okay.

PAO This is Shuttle Control, Columbia has moved out of range at Madrid now. Next station is Yarraçadee in 28 minutes. Music played up to the crew at Dakar where their college faternity songs, the Delta Tau Delta Fraternity for TK Mattingly, Delta Chi for Hank Hartsfield. At 5 days, 15 hours, 39 minutes

mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 5 days 16 hours, 6 minutes mission elapsed time. Columbia is approaching acquisition through Yarragadee.

CAPCOM Columbia, Houston, through Yarragadee for 5 minutes.

SPACECRAFT Go ahead, sir.

CAPCOM 5 by.

SPACECRAFT During the mist of all this it probably sounds like a trivial question, but are we scheduled for some TV today and if so, what time do you currently have us scheduled for?

CAPCOM Yes we do have some options, standby I'll get the exact time.

CAPCOM T.K. the only one we have scheduled at this time is a VTR playback at MILA at 5 days, 20 hours, 2 minutes, that about 4 hours from now, over.

SPACECRAFT Okay and do you know what, how long that one is?

CAPCOM Standby, we'll check.

CAPCOM T.K. that's on rev 94 and that pass is about 8 minutes long.

SPACECRAFT Okay and what is the sunrise out on the west coast, can you answer that?

CAPCOM Standby, we'll check. T.K., sunrise for that pass is 20 hours, 0 minutes, 17 seconds. So it's about 20 or 30 seconds prior to AOS MILA.

SPACECRAFT Okay that's after, after we cross the west coast. Alright we'll plan on starting with VTR then. How's the weather over the U.S. today, just a broad brush treatment, we have relatively clear skys or is it getting cloudy.

CAPCOM Standby, one, we'll check, we haven't had our weather brief yet.

SPACECRAFT (garble) look out the window but it's dark.

CAPCOM Right. T.K. we think the weather's going to be pretty good, mostly clear.

END OF TAPE

SPACECRAFT (garble), just a broad brush treatment. Have we got relatively clear skies, or is it getting crowded?

CAPCOM Stand by one. We'll check. We haven't had our weather brief yet.

SPACECRAFT (garble) look out the window, but it's dark.

CAPCOM Right. T.K., we think the weather is going to be pretty good, mostly clear.

SPACECRAFT Yeah, that was my impression, and I'll do whatever fits in your schedule 'cause, so far, I haven't been able to simulate a master picture of the day yet, but I would rather, instead of doing VTR, I'd rather use live from coast to coast. If we, but we'd have to move it back later in the day in order to do that, so that's my druthers. I'll take this period if we can't do that and whatever your call is is fine. No big deal as long as I know about it.

CAPCOM Okay. T.K., we copy that and we have no problem at all with the moving the TV around a little bit, however you think it's going to work out best for you folks.

SPACECRAFT If we could get one of those revs that runs, you know you only have a few revs that run up over the states, if we can get one of those when it's daylight of one coast to the other, I'd prefer that, otherwise I've got a tape I saved from early in the mission, but without a recorder to play it back and screen it, I'd have a little trouble with it.

CAPCOM Okay. Copy that and we'll continue to look for the sunrise times and compare them to your revs and see what we can work out and help you out there, and over Orroral, we'll have the CAP summary coming up to you on the teleprinter which should help you out with the overall picture.

SPACECRAFT Thank you, sir.

CAPCOM And we're 15 seconds LOS. Orroral is next at 15.

SPACECRAFT See you then.

PAO This is Shuttle Control. Columbia is out of range at Yarraqadee. About a minute and a half of no signal and then we'll reacquire at Orroral Valley. We'll stand by.

CAPCOM Columbia, Houston, through Orroral Valley for 4 minutes.

SPACECRAFT Houston, loud and clear.

CAPCOM We have you too, Hank.

SPACECRAFT Brewster, are you there?

CAPCOM Yes, sir.

SPACECRAFT We have a picture we'll bring back and, we're not sure who to dedicate it to, but if it comes out, it's a picture of Hank with today's update floating through the middeck and it makes a rather impressive roll of paper.

CAPCOM Yes, sir. We'd figure that that would get us within field goal range.

SPACECRAFT All right. That sounds like a winner. Obviously, (garble)

CAPCOM Well, we figured that we had a hundred yards of paper and we're on about the 30 yard line and going in.

SPACECRAFT I thought you were going to amend our summary at the end of the day, that we had enough consumables for the remainder of the flight plus extension, except we would have to be coming in early because we'd run out of teleprinter paper.

CAPCOM That is a concern.

CAPCOM And Columbia, Houston, we'll see you over MILA at 51.

SPACECRAFT Okay.

PAO This is Shuttle Control. Columbia is out of range at Orroral now. Next acquisition through Merritt Island in 31 minutes. Considerable biplay at Orroral over the length of the crew activity plan update this morning. It's about 10 pages which equates to about 10 feet of teleprinter paper. At 5 days, 16 hours, 21 minutes Mission Elapsed Time. This is Shuttle Control, Houston.

PAO This is Shuttle Control at 5 days, 16 hours, 50 minutes Mission Elapsed Time. The Merritt Island Station is about to acquire Columbia. Crew should be in the Flight Control System checkout as we get AOS at MILA.

CAPCOM Columbia, Houston, with you through MILA. We have a keyhold coming up in 25 seconds that'll last about a minute.

SPACECRAFT Okay. We have you loud and clear.

END OF TAPE

PAO system checkout as we get AOS at MILA.

CAPCOM Columbia, Houston, with you through MILA. We have a keyhole coming up in 25 seconds. That'll last about a minute.

SPACECRAFT Okay, we have you loud and clear.

CAPCOM And we'll take this time to look at your configuration.

SPACECRAFT (garble)

CAPCOM We're going in the keyhole, Hank, we'll pick you up in a minute.

CAPCOM Columbia, Houston, we're back with you and ready to go.

SPACECRAFT Okay, got you loud and clear. I already started to tell you is when we brought up the system, through (garble) configuration, water quantity in tank was reading 77 percent. And when I turn into more supply on the, pressure went down, in the tank, and the quantity came up to a hundred percent.

CAPCOM Okay, we copy, thank you.

SPACECRAFT Go for APU start?

CAPCOM That's affirmative.

SPACECRAFT Over.

PAO APU number 1 is being used for this test. It has started at normal speed and

CAPCOM Columbia, Houston, could you verify the DFI PCM recorders and continuous record?

SPACECRAFT Thank you, Brewster.

CAPCOM Yes sir.

SPACECRAFT Everything looking okay to you, Houston?

CAPCOM Yes it does so far, Hank, looks good.

SPACECRAFT Okay, Houston, we have a go for shutdown?

CAPCOM That's affirmative, Hank. You're go for APU shutdown and post shutdown. We'd like all 3 of the hydraulic circ pumps to GPC.

SPACECRAFT Okay, thank you. (garble)

CAPCOM Columbia, Houston, we're 30 seconds LOS, Dakar at 07 and part 1 looked real good to us.

SPACECRAFT Okay. You really can feel those old valves drip, that's pretty impressive.

CAPCOM Copy that. And T.K., in part 2 when you finish with the tacans, leave them in TR.

SPACECRAFT Wilco.

PAO This is Shuttle Control, Bermuda has loss of signal with Columbia. Dakar will acquire in about 3 and a half minutes. There is some overlapping coverage on this orbit at Madrid. First part of the flight control checkout going very well. At 5 days, 17 hours, 4 minutes, mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle control, at 5 days, 17 hours, 6 minutes, mission elapsed time. Standing by for acquisition through Dakar.

CAPCOM Columbia, Houston, with you through Dakar.

SPACECRAFT (garble) Just finished the century test.

CAPCOM Copy. Columbia, Houston, we'd like the DFI recorders in low sample, please, to conservatate.

SPACECRAFT I believe it is, Brewster. At least the switch is.

CAPCOM Thank you, T.K.

SPACECRAFT Brewster? Do you have an indication contrary of that,

CAPCOM We're looking, Hank. Columbia, Houston, Indian Ocean at 25.

SPACECRAFT Okay, see you there. Houston, we had lights on both radar altimeters when we checked them out. Forgot to tell you that.

CAPCOM We copy, T.K., thank you.

PAO This is Shuttle Control, Madrid has loss of signal. Next station is the Indian Ocean Station in 10 minutes. Crew continuing to conduct the flight control system checkout. Checking flight control surfaces and instruments. Preparatory to...
END OF TAPE.

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PAO This is Shuttle Control, Madrid has lost of signal. Next station is the Indian Ocean station in 10 minutes. Crew continuing to conduct the flight control system checkout, checking flight control surfaces and instruments preparatory to entry and landing tomorrow at 5 days, 17 hours, 15 minutes mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 5 days, 17 hours, 24 minutes mission elapsed time, Columbia will be within range of the Indian Ocean station shortly.

CAPCOM Columbia, Houston, with you at Indian Ocean for 8 minutes.

SPACECRAFT I'm clear.

CAPCOM And be advised, T.K., the radar altimeter bite is nominal during that check and no further action required.

SPACECRAFT Roger, just had a note here to be sure to tell you, I forgot to tell you at the time.

CAPCOM Roger.

SPACECRAFT Houston, we're ready to go back to D2 unless you have something here you want to look at.

CAPCOM Roger standby I'll let you know. Columbia, Houston, we'd like for you to stay in OP say until about 17:45 so we can get the tacan test over Australia.

SPACECRAFT Okay, good call, thank you.

CAPCOM And Columbia, Houston, we made a mistake on that time, the time to go out of OP state is 17:58.

SPACECRAFT 17:58?

CAPCOM Affirmative.

CAPCOM Columbia, Houston, 30 seconds LOS see you Yarragadee at 41.

SPACECRAFT Alright, sir.

PAO This is Shuttle Control, Columbia's out of range of the Indian Ocean station moving toward acquisition through Yarragadee in 7 minutes. 5 days, 17 hours, 34 minutes mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 5 days, 17 hours, 40 minutes mission elapsed time. Columbia's coming up on

acquisition through Yarragadee on orbit 92.

CAPCOM Columbia, Houston, with you through Yarragadee for eight and a half minutes.

SPACECRAFT Okay and up.

CAPCOM You're a lot clearer. Columbia, Houston, we're going to lose you for about a minute until you get into Orroral.

SPACECRAFT Okay see you then.

CAPCOM Columbia, Houston, with you in Orroral for five and a half minutes.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, 30 seconds LOS, see you at MILA at 6.

SPACECRAFT Okay see you then. We got

PAO This is Shuttle Control. Orroral has loss of signal. Next acquisition at Merritt Island in 30 minutes. At 5 days, 17 hours, 56 minutes mission elapsed time, this is Shuttle Control Houston.

PAO This is Shuttle Control at 5 days, 18 hours, 25 minutes mission elapsed time. We're standing by for acquisition through Merritt Island.

CAPCOM Columbia, Houston, with you over the States for 12 minutes.

SPACECRAFT Okay, loud and clear.

CAPCOM Okay, you're 5 by and we're standing by.

SPACECRAFT Houston, Columbia

CAPCOM Go ahead.

SPACECRAFT Got the right onboard elevon temp under sump pump number 2, system 2 (garble) off and on here.

CAPCOM Roger, copy we're checking.

SPACECRAFT It indicates (garble)

END OF TAPE

SPACECRAFT Houston, Columbia.

CAPCOM Go ahead.

SPACECRAFT Got the right out board elevon temp under circ pump number 2. System 2 is triggering the alert off and on here.

CAPCOM Roger. We copy. We're checking.

SPACECRAFT It's indicating, looks like from between minus 10 to minus 11.

CAPCOM Roger.

CAPCOM Columbia, Houston, to correct the temp problem on system 2, we'd like for you take circ pump number 2 to manual on for 1 minute, and then back to GPC and we'll work on something to fix that.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, we need you to leave the circ pump on for a little longer. We'll give you a call when to turn it back to GPC.

SPACECRAFT Okay. Thank you. I was just about to turn it off.

CAPCOM And, Columbia, we would like the IMU align results when you have a minute.

SPACECRAFT Okay. The (garble) was .01, star 17 to 20. Starting with IMU 1, minus 01, plus 01, plus 04. Minus 09, minus 04, plus 01. Plus 02, minus 06, plus 05. And they were parked at 5 days, 18 hours, 13 minutes, 24 seconds.

CAPCOM (garble) copy.

CAPCOM Columbia, Houston, we're ready for circ pump number 2 to GPC.

SPACECRAFT Okay. You got it, Roy.

CAPCOM Roger, Hank, and for your information, we would like for you to modify DAP B2 for the rest of the day to show a 1 degree deadband to save propellant, and we'll give you a reminder later.

SPACECRAFT Okay. You want me to change DAP B now to 1 degree, and we're presently on DAP A.

CAPCOM Right. Just when you go back to B2, we would like you to set the deadband to 1 degree.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, we're 20 seconds LOS. See you at Dakar at 42.

SPACECRAFT Okay. See you then.

PAO This is Shuttle Control. Bermuda has loss of signal. Columbia moving out over the Atlantic Ocean. Dakar is next tracking station in 3 minutes. Columbia now on orbit number 93 at 5 days, 18 hours, 39 minutes Mission Elapsed Time. This is Shuttle Control, Houston.

PAO This is Shuttle Control at 5 days, 18 hours, 41 minutes Mission Elapsed Time. Dakar is about to acquire Columbia.

CAPCOM Columbia, Houston, with you at Dakar for about 7 minutes.

SPACECRAFT Okay, and I didn't get you the (garble) last night. Do you want them now?

CAPCOM Columbia, Houston, we'd like to wait until Orroral and we'll give you a reminder.

SPACECRAFT Okay, just so I understand about the PRSD, if we get an alert on the cryo, prior to 19:50, what are we to do? Turn the heaters back on or just (garble). How should I do this?

CAPCOM Okay. Stand by and we'll check on that.

CAPCOM Columbia, Houston, in answer to your question, Hank, on the PRSD test, if you get the alert earlier, we would like for you to go ahead and do the test that's scheduled at 19:50. So as soon as you get the alert, start the test.

SPACECRAFT Okay. Thank you.

CAPCOM Columbia, Houston, 30 seconds LOS. We'll see you at Indian Ocean at 19:01.

SPACECRAFT Okay.

PAO This is Shuttle Control. Columbia has moved out of range of Dakar on a track that takes it southeast across Africa toward the Indian Ocean Station, the next tracking station in 10-1/2 minutes. At 5 days, 18 hours, 50 minutes Mission Elapsed Time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 5 days, 19 hours. The Indian Ocean Station will acquire Columbia shortly. END OF TAPE

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PAO ...5 days, 18 hours, 50 minutes Mission Elapsed Time. This is Shuttle Control, Houston.

PAO This is Shuttle Control at 5 days, 19 hours. The Indian Ocean Station will acquire Columbia shortly.

CAPCOM Columbia, Houston, through Indian Ocean for 8 minutes.

SPACECRAFT Loud and clear, Houston.

CAPCOM You're 5 by as well, Hank.

SPACECRAFT Keep on trying to get to APU fuel pump valve cooled off.

CAPCOM Stand by one.

CAPCOM Roger, Hank. We're go for that.

SPACECRAFT Okay.

CAPCOM Henry?

SPACECRAFT Go ahead.

CAPCOM Yeah, we're looking at the data here, rates on the vehicle and what's so, what...and so forth. We're wondering if you could ask T.K. if he'd get it run a little faster.

SPACECRAFT (garble). He just now finished up.

CAPCOM Well shoot, I guess we just missed it then.

CAPCOM Columbia, Houston, we'll see you at Yarragadee at 17.

SPACECRAFT One seven. See you there.

PAO This is Shuttle Control. The Indian Ocean Station has loss of signal with Columbia. Next station is Yarragadee in 6 minutes. It's 5 days, 19 hours, 11 minutes Mission Elapsed Time. This is Shuttle Control, Houston.

PAO This is Shuttle Control at 5 days, 19 hours, 16 minutes Mission Elapsed Time. Columbia approaching acquisition through Yarragadee.

CAPCOM Columbia, Houston, through Yarragadee for 8 minutes.

SPACECRAFT Loud and clear, Houston.

CAPCOM Roger.

CAPCOM Columbia, Houston, I have some more information relative to your TV option for today.

SPACECRAFT Yes sir.

CAPCOM T.K., it turns out that sunrise on the west coast is a little bit different than what we told you, and it's 21 hours and 43 minutes. The first pass that would give you daylight all the way across would be orbit 96, and on orbit 96 we could support TV through both Goldstone and MILA, and the timeframe of those passes would have you involved in the theodolite sitings, but that could be shifted to one way or the other to accommodate it if you wanted to use that particular timeframe. And your ground track would come in over Baha, California and skirt across south of the Rio Grande until you cut through the bottom tip of Texas and out over the Gulf and the Carribean over Puerto Rico.

SPACECRAFT Could you give us the ascending node for that so that and look at it on the map here real quick?

CAPCOM Stand by. We'll get it.

SPACECRAFT Brewster, I think we've got it sorted out here. You're talking about 2 revs from now and I presume you picked that one because it wasn't daylight on the rev before it. Is that correct?

CAPCOM That's affirm, T.K. We're just providing this to you as an option. It's your call when you want to do it, and the ascending node is 16114 for that particular rev, 96.

SPACECRAFT 161, okay. All right, what about the rev in between there?

CAPCOM Okay, we'll (garble) we're going to have a short cut out here. I'll get back with you over Orroral.

SPACECRAFT Thank you.

CAPCOM Columbia, Houston, back with you.

SPACECRAFT Okay. I think we had some confusion there. (garble) ready for, ...are we Orroral now?

CAPCOM Yes sir.

SPACECRAFT Are you ready for the (garble) measurements?

CAPCOM Go ahead. And, T.K., for the rev in between, rev

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95, the ascending node is at 17535 west. Over.

SPACECRAFT Somewhere, we got something that we got ourselves
out of sync here. If you said 1, ascending node is 1

END OF TAPE

CAPCOM And T.K. for the REV in between, REV 95, the ascending node is that 17535 west, over.

SPACECRAFT Somewhere we got something that we got ourselves out of sync here. If you said, sending note is 161, talking about east or west?

CAPCOM Okay, for 96, REV 96, it's 161 east.

SPACECRAFT Okay.

CAPCOM And for 95 it's 175, west.

SPACECRAFT Okay, hang on a second.

CAPCOM T.K., we're 1 minute, LOS now. What I understand right now though is that you do not plan any T.V. for this upcoming MIIA pass. Is that correct?

SPACECRAFT That's correct, sir.

CAPCOM Okay, then we'll talk about 95 or 96 or anything else later. For your information, the orbit 95 pass over the States, looks like it's the same one that you showed us that good coverage of the other day. And we'll see you over the States at 57.

SPACECRAFT Okay.

PAO This is Shuttle Control, Orroral Valley has loss of signal. Next acquisition through Buckhorn in 26 and a half minutes. The crew still determining when they would like to provide the television pass. Seems to be either orbit 95 or 96, the decision has not yet been made. Columbia now on orbit 93, but will begin orbit 94 prior to acquisition at Buckhorn. At 5 days, 19 hours, 31 minutes, mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control, at 5 days, 19 hours, 56 minutes, mission elapsed time. Buckhorn will acquire Columbia in about 30 seconds.

CAPCOM Columbia, Houston, with you through Buckhorn.

SPACECRAFT Okay. Just about to start our PRSD rotation.

CAPCOM Copy, we're standing by. Columbia, Houston?

SPACECRAFT Go ahead.

CAPCOM T.K., do you intend to start the maneuver now?

SPACECRAFT That's affirm.

CAPCOM Hold off on that, please. I think we have a misunderstanding, standby. T.K., which maneuver is that you're going to do now? I think we're confused.

SPACECRAFT On page 2-3, flight supplement on the Orbit OPS Checklist. We're about to do the pitch rotation. I've got the tank 4 powered up, and I thought that's where we were going to do our stratification stuff.

CAPCOM T.K., we want you to hold off. We think that you've gotten ahead of us a bit. We're not ready for the stratification maneuver test yet.

SPACECRAFT Okay, tell me what you want then.

CAPCOM Okay, standby a moment. We're going to have a short LOS here, and we'll get right back to you to try and clear this up.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, over.

SPACECRAFT Go ahead.

CAPCOM Okay, T.K., we see that you have in the DAP loaded, or in the universal pointing display, loaded a maneuver back to tail sun. We'd like you to accomplish that maneuver now. The stratification test, doesn't come for a couple of hours. I think we misled you before, when we told you to go ahead with the steps that are called out at time 1950. Those steps are just the power up, the maneuver doesn't come for a couple more hours. And we'll get back with you on that.

SPACECRAFT Okay, Hank showed me a place later, but I, okay, alright.

CAPCOM Yeah, I'm sorry. I think we didn't make that clear to you.

SPACECRAFT I'm glad you caught it.

CAPCOM Columbia, Houston, we see that the star tracker shutters are commanded open. We'd like those to go back to auto please.

SPACECRAFT Sure, Just as soon as I get that stuff.

CAPCOM Okay.

END OF TAPE

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CAPCOM Hi, I think we didn't make that clear to you.

SPACECRAFT I'm glad you caught it.

CAPCOM Columbia, Houston, we see that the star tracker shutters are commanded open, we'd like those to go back to auto please.

SPACECRAFT (garble)

CAPCOM Okay

SPACECRAFT Okay, Brewster we're back sync now.

CAPCOM Yes, sir.

SPACECRAFT Okay, sorry about the confussion. Is it okay if I go ahead and do the theodolite sitings now?

CAPCOM Standby one. T.K., that's affirmative you may go ahead with the theodolite sitings at this time and in the mean time we'd like to get the primary RJD drivers off.

SPACECRAFT Okay got you. Do you want me to make sure that the rest of the configuration is what you want. Do you want tank 4 to be (garble)

CAPCOM That's correct, T.K.

SPACECRAFT Okay.

CAPCOM Columbia Houston, T.K. are you configured for voice record?

SPACECRAFT You mean the on voice, sir?

CAPCOM That's right, yes.

SPACECRAFT Going on. It's on now.

CAPCOM Thank you.

SPACECRAFT Want it on?

CAPCOM Yes we do, please.

SPACECRAFT Okay, what do you want?

CAPCOM Channel one to air to ground one, channel two to ICOM A.

SPACECRAFT Alright.

CAPCOM Thank you, sir. Columbia, Houston, we have a NOSL target over Western Africa, do you think you'll have the time?

SPACECRAFT Okay, I expect so.

CAPCOM Okay, let me know when you're ready to copy.

SPACECRAFT Go ahead.

CAPCOM Okay, the data start is, 5 days, 20 hours, 20 minutes, latitude is 18 north, longitude 15 west, use one magazine, it's a day siting and there's thunderstorms over western Africa. Over

SPACECRAFT Okay. Got that, I got one last night, shot about a magazine's worth on that, they ought to be pretty useful.

CAPCOM That's good news and we're a minute LOS, Dakar is next.

SPACECRAFT Okay.

CAPCOM Now we'll see you there at 18 after.

SPACECRAFT Okay.

PAO This is Shuttle Control, Columbia is beyond Bermuda's range now. Next station, Dakar, in two and a half minutes. A NOSL target was passed up to Ken Mattingly, lightning and thunderstorms over western Africa, he will attempt to get photography of that. He reported they shot about one magazine last night, another NOSL target opportunity. We're about two minutes away from Dakar, we'll standby for acquisition there.

CAPCOM Columbia, Houston, Dakar for 8 minutes.

SPACECRAFT Okay we think we must be coming up on the area now, can't use landmarks. It's all overcasted.

CAPCOM Copy

SPACECRAFT Okay Brewster, I took that, and the coord that you gave me readily identifiable, and they had clear skys. Off shore there was some here type build up and some on shore to the south, it looked like it was dissipated. Like several hours ago they might have been a fairly extensive coverage but there really isn't anything now. I went and took some pictures of the clouds that were here, but doesn't look like a very active, a very.

CAPCOM Okay, T.K., we appreciate you looking.

SPACECRAFT Okay I bet you five at night you see a lot of lightning activity in this part of Africa where I really wouldn't have expect it and this is also the part where the dust is blowing out of the deserts fill the atmosphere and really obscures it. And I don't know what the surface

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visibility is.

END OF TAPE

SPACECRAFT ...a lot of lightning activity in this part of Africa where I really wouldn't have expected it, and this is also the part where the dust that's blowing out of the deserts fill the atmosphere and really obscures it. I don't know what the surface visibility is, but just from looking down, it's very noticeably obscured and when you look out over an area of, yep I'm sure it must be 500 miles at least, it is all very subdued as a result of the, I presume blowing sand. It must come up to a fairly high altitude. Maybe that gives you enough particles to give you static electricity. I don't know.

CAPCOM Okay. Thanks a lot for your comments.

SPACECRAFT I guess we never got back to resolving what we're going to do about that TV pass, Brewster.

CAPCOM Okay. We're listening.

SPACECRAFT If it's no big deal for you folks, how about this next REV? I've lost track of the numbers. It looks like the ascending nose about 176. That's west.

CAPCOM Okay, that's right. We had it 175 west.

SPACECRAFT Okay, is that one convenient for you?

CAPCOM Sure, if that will satisfy your purposes of the window that will be fine with us. And we can get some both at Goldstone and Mila.

SPACECRAFT Okay, we'll be standingby and we'll be taking it live from the spacecraft. So we'll switch between the flight deck and the middeck camera.

CAPCOM Okay, fine and the time we have for the Goldstone acquisition is 21 hours and 31 minutes, and we are 30 seconds LOS, Indian Ocean is next at 39.

SPACECRAFT Alright sir, thank you very much.

CAPCOM See you there.

PAO This is Shuttle Control, Columbia Houston has passed out of range at Dakar. Ken Mattingly unable to find any thunderstorms or lightning activity over western Africa, speculates that, that condition had disapated, he did take some photography of the cloud formations in the area. And they have decided on television pass over the United States on Orbit 95, that's this next pass over the United States, with television at both the Goldstone and Mila stations. Columbia's next station is the Indian Ocean station in 10 1/2 minutes. At 5 days 20 hours 28 minutes this is Shuttle Control, Houston.

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CAPCOM Columbia, Houston with you at Indian Ocean for about 4 minutes.

SPACECRAFT Okay, loud and clear.

CAPCOM Roger, you're 5 by. Columbia, Houston 30 seconds LOS, Yarragadee is next at 53.

SPACECRAFT Okay, Tom see you there.

PAO This is Shuttle Control. The Indian Ocean stations has lost signal with Columbia. Next acquisition through Yarragadee in 9 minutes. At 5 days 20 hours 44 minutes Mission Elapsed Time this is Shuttle Control, Houston. This is Shuttle Control at 5 days 20 hours 52 minutes Mission Elapsed Time. Columbia will be within range of the Yarragadee station shortly.

CAPCOM Columbia, Houston with you at Yarragadee for 8 1/2 minutes. Columbia, Houston with you through Yarragadee for 7 1/2 minutes.

SPACECRAFT Hello, Houston loud and clear.

CAPCOM Roger, you're 5 by. Columbia, Houston now 30 seconds LOS we'll be seeing you at Hawaii at 20. For your information we will be shipping you an updated CAP for those activities between 2200 and 2305 at Hawaii.

SPACECRAFT Okay, and for our planning purposes the time I've got for us to be ready to come on warm with the video is 2130 and do you have a keyhole in that coverage or what's the total time I should expect?

CAPCOM Okay there's about a 1 minutes keyhole.

END OF TAPE

CAPCOM between 2200 and 2305 at Hawaii.

SPACECRAFT Okay, and for our plan purposes the time I've got for us to be ready to come on line with the video is 2130 and do you have a keyhole in that coverage, or what's the total time I should expect?

CAPCOM Okay, there's about a 1 minute keyhole, you'll get about 5 minutes of coverage of 1 minute keyhole, and then about 10 more minutes.

PAO This is Shuttle Control, Columbia has moved out of range at Yarragadee. The spacecraft's now over the central part of Australia. Coming up on the end of orbit 94, and the beginning of orbit 95. Columbia will enter orbit 95 shortly before acquisition at Hawaii in 17 minutes. And during the pass over the continental United States during this orbit we'll have television from Columbia. It will be live out the window, earth viewing television. Columbia now in an orbit of 175 by 160 nautical miles with an orbital period of 1 hour 30 minutes 51 seconds. At 5 days 21 hours 3 minutes Mission Elapsed Time, this is Shuttle Control, Houston.

CAPCOM Columbia, Houston, with you at Hawaii for 6 minutes.

PAO This is Shuttle Control, Columbia's in a keyhole, it'll be another 30 seconds before we have acquisition through Hawaii again.

SPACECRAFT Okay sir, do you have something for us?

CAPCOM Columbia, Houston, negative. We're standing by.

SPACECRAFT Okay, Roy did you, could you tell me the times that I ask you about? I didn't copy them.

CAPCOM Okay, I'm sorry T. K. looks like we'll be over Goldstone at 2131 and that'll be about a 5 minute pass, we'll have a one minute break in coverage, and then we'll have 10 minutes through Mila.

SPACECRAFT Okay, that's fine.

CAPCOM And the CAP update message I mentioned that we would ship you at Hawaii, we had a problem with the site, we'll send it to you at Goldstone, and we're also shipping up the last of the deorbit switch list, entry switch list changes.

SPACECRAFT Very good. You guys get a gold star.

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CAPCOM Columbia, Houston, 30 seconds LOS, see you at Buckhorn at 30.

SPACECRAFT Okay.

PAO This is Shuttle Control. Hawaii has Loss Of Signal, next station Buckhorn in 3 minutes. And then we'll have Goldstone in 4 minutes and we should be getting television at Goldstone. At 5 days 21 hours 27 minutes Mission Elapsed Time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 5 days 21 hours 29 minutes, we're standing by for Columbia's pass over the continental United States on it's 95th orbit. Sunrise occurs about 1 minute before Goldstone acquisition. We'll stand by.

CAPCOM Columbia, Houston, with you through Buckhorn and Mila for 19 minutes, then we're standing by for your go on the TV.

SPACECRAFT Okay, can you hold off just a second? We're waiting for a good sunrise to occur here. And, appreciate Roy, if you would tell me when you have downlink, tell me when we have like 15 seconds to go before your break transition and then when it's reestablish.

CAPCOM Will do T. K.

SPACECRAFT Houston, how do you the PLT?

CAPCOM Read you five by.

SPACECRAFT Yep. Okay Houston, are you getting our downlink now?

END OF TAPE

SPACECRAFT Houston, how do you read the BLT?

CAPCOM Read you five by.

SPACECRAFT Yep, okay Houston are you getting our downlink now?

CAPCOM Negative, we're standing by for your go.

SPACECRAFT Okay, I'm ready. I just haven't activated it yet.

CAPCOM Okay, we have a downlink. And we have a good picture TK.

SPACECRAFT Okay go. Hank go ahead. Okay folks, Ken and I have talked it over and, you know we've been up here having all the fun here flying the spacecraft, but you know it takes a lot of things coming together just right to make a spaceflight good. It's not done by the men that, and or the women in the future, that fly these things. You get a lot of help from down there. We've been trying to tell you guys what we see up here, it's very difficult to describe, and your work has contributed to making the flight a success so far. You also have to have a good spacecraft, and I feel like we've got one of the best spacecraft flying that, in fact in my mind, it's the best spacecraft that ever has flown. It's really been cooperating with us, and our hats are really off to the people who built this spacecraft and made it work. Our hats are off to all you folks, people down there that have worked to keep us up here, and keep the flight going so smoothly, and we just wanted to let you know how much we appreciate it. We also appreciate the effort, and the work of all the American people who have made all this possible. We'd like to dedicate this hour of this transmission to the people of America.

CAPCOM Columbia, Houston, thank you very much for those very nice words. (garble)

(music)

SPACECRAFT During the last week, we've had many opportunities to observe all the United States as being the (garble) around the world like the clouds, the open seas and hills. We have worked together with a very awesome and powerful way. We wish there was some way that we could have all of you come up and join us to appreciate how beautiful this is. But we realize that can't be done just yet, one day when we have a space station we'll be able to bring more people up, and we'll have more of an opportunity to pursue this.

CAPCOM Columbia, Houston, 15 seconds to the loss of signal. And we have lost signal on the TV Columbia.

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SPACECRAFT Okay, we'll be back with you in a bit. (garble)
kept cutting in or out on the music a little.

END OF TAPE

CAPCOM -- Columbia.

SPACECRAFT Okay, we'll be back with you in a little bit. Now if you could cut in and out on the music a little.

CAPCOM Columbia, Houston we have a picture.

SPACECRAFT Okay, we are starting to come over the (garble). Okay, there's Houston as we come out across the Gulf, (garble) over towards New Orleans. And there's an awful of people that put this spacecraft together, and every day we've been more and more impressed with the magnificence of the technology and the design that has made it work. And the capability that is necessary to make this all happen. Probably the most important thing is that no technology can work without the people and proper planning cooperation. And truly a program of the magnificence and size of this one more and more (garble) of the people. Those of us of Columbia 4 would like to dedicate the (garble) view. We hope you can see them with just one half of the clarity and the beauty of what you can see from Orbit. With a little imagination we hope that you can join it with us. We're coming up now on Florida. (Music).

CAPCOM Okay standby, Hank.

SPACECRAFT Just a minute (garble). Have you got it?

CAPCOM Your're on Hank. (garble) (Music).

SPACECRAFT From Columbia 4 to all of you thanks, and look forward to a happy birthday tomorrow. Okay it's off Hank. Let me turn the radio off.

CAPCOM Columbia, Houston we've lost the downlink we want to thank you for a great show.

SPACECRAFT Okay.

END OF TAPE

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CAPCOM Columbia, Houston. We've lost the downlink. We want to thank you for a great show.

SPACECRAFT Okay. Houston, Columbia.

CAPCOM Go ahead, Columbia.

SPACECRAFT How about if we type up the deadband while we take our theodolite sightings. It'll take us about 10 minutes to do that and get the Sun out of our eyes.

CAPCOM Columbia, Houston, you're go.

SPACECRAFT I thank you.

CAPCOM And Columbia, Houston, you're CAP update message 67 bravo should be onboard now.

SPACECRAFT Okay, when does it first become effective?

CAPCOM Roger, the first activity is at 2200 at Ascension, however, we noticed that the O2 tank 4 count limits are perhaps going to be reached earlier than the expected time of 2225, so you may want to get the message out and have it handy.

SPACECRAFT Okay, you can really tell, I had turn all the lights on to get the loads off it. They were, really it makes a difference in the cockpit temperature. I'll bet it's gone up 15 degrees.

CAPCOM Columbia, Houston, we're 30 seconds LOS. We'll see you at Dakar at 5 4.

SPACECRAFT Okay.

PAO This is Shuttle Control. Bermuda has loss of signal, 3 and 1/2 minutes away from acquisition through Dakar. Here in the Mission Control the crystal team is handing over to the bronze team lead by Flight Director Chuck Lewis. The crystal Flight Director Harold Draughon estimates his change of shift briefing for 8:30 am Central Daylight Time in Room 135 at the JSC Newcenter. Change of shift news briefing with Flight Director Harold Draughon at 8:30 am Central Daylight Time. At 5 days 21 hours 51 minutes mission elapsed time this is Shuttle Control Houston.

CAPCOM Columbia, Houston, with you through Dakar for 6 minutes and a reminder you will have a private medical conference at Ascension.

SPACECRAFT Yea, hey, you guys might take a look at this tail sun attitude we think it's important. I think over the last

couple of days we've been using the same attitude but the sun's moved.

CAPCOM Roger sir. Columbia, Houston, I have a flight note for you, if you have a second.

SPACECRAFT Okay, go ahead.

CAPCOM Roger, regarding the tank test. When you get the temp alert, the O2 temp alert, we need you to turn the O2 tank 4 heater OFF, and then go to your message 67 bravo and follow it and complete the DTO right after you get the alert, and then go ahead and do the reconfig.

SPACECRAFT Oops, you lost me that time. Oh, 67 bravo is the name of this substitute message.

CAPCOM That's affirmative TK.

SPACECRAFT Okay, and as I understand what you're trying to get across here is that we may get, we may expel the tank and start getting high temperatures, and if we do, you want me to take the heaters OFF, and then go ahead and complete the rest of the DTO.

CAPCOM That's affirmative.

SPACECRAFT Okay.

CAPCOM And TK, one further clarification. If, for some reason, you do not get the message early, go ahead and do the rest of the DTO at the published time of 2225.

SPACECRAFT Okay, yeah I understand. This is what to do in the event that we're interrupted with a warning. You would like to go ahead and do your stratification measurements at that point instead of waiting.

CAPCOM That's affirmative.

SPACECRAFT Okay. Looks like it's gonna be a close race.

CAPCOM Apparently.

END OF TAPE

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CAPCOM Columbia, Houston 1 minute to handover for your PMC and be advised we are going to try to get you a better tail-to-sun attitude as soon as we finish this tank stratification test.

SPACECRAFT Okay it's no big deal to us, I just noted that apparently the sun's moved and if you want to we can dress it up. It's no problem for us.

CAPCOM Roger, we would like you to wait until after the tank test and then we will get you something better.

SPACECRAFT Okay.

PAO This is Mission Control, Houston at 5 days 22 hours 1 minute. Processing data through Ascension now, this pass has been reserved for private medical conference between the crew and the flight surgeon here in the Mission Control Center. The Flight Director Chuck Lewis, and the bronze team of flight controllers have tagged up here in the Mission Control Center and debriefing with the off going team for a handover will be the baring - unexpected and unlikely event, this would be the final shift by the bronze team and Chuck Lewis as the Flight Director for STS-4. The Harold Draughon change of shift briefing is scheduled for 8:30 am. central time in the JSC news center building 2 room 135. At 5 days 22 hours 2 minutes this is Mission Control, Houston.

CAPCOM Columbia, Houston we're 15 seconds to LOS see you at Botswana at 11.

SPACECRAFT Okay, see you there.

CAPCOM Columbia, Houston through Botswana for 5 minutes.

SPACECRAFT Houston, loud and clear. Houston, Columbia the (garble) here shows 15%, quantity. I show 11 and 7 onboard. Do you want us to wait until (garble) 1's out or go ahead and do it now?

CAPCOM Standby 1. We'd like you to wait and do it on time T.K.

SPACECRAFT Okay.

CAPCOM Columbia, Houston we're going LOS. And the crystal team is signing off see you at Yarragadee with the bronze.

SPACECRAFT Okay, see you tomorrow.

CAPCOM Yes sir, we're looking forward to it.

PAO This is Mission Control, Houston handover has

occurred in the mission operations control room. Flight Director Chucl Lewis now in place and the CAPCOM will be Astronaut George Nelson. We will have acquisition of signal momentarily, Columbia on Orbit 96, the crew, at this juncture in the crew activity plan is doing a PRSD checkout Power Reactant Supply and Distribution System and voice contact should be coming up momentarily at 5 days 22 hours 29 minutes, this is Shuttle Mission Control.

CAPCOM Columbia, Houston the bronze team is with you through Yarragadee for 7 1/2 minutes.

SPACECRAFT Hello there bronze team, how are you doing today?

CAPCOM Just fine Columbia looking forward to the day.

SPACECRAFT Okay, we're just about passed about 50 degrees on our way back to zero on the PRSD test.

CAPCOM Okay, thanks.

SPACECRAFT (garble) started up and those temperatures really dropped and O2 and H2 tanks when we started up here.

CAPCOM Roger.

SPACECRAFT Houston, do you want the theodolite readings?

CAPCOM Standby 1. Columbia, Houston, Hank you don't need to read those down just copy them down in the book and we'll look at them on the ground.

SPACECRAFT Okay, sir. We have completed that.

CAPCOM Roger. Columbia, Houston 30 seconds to LOS. Hawaii is next at 2255, and if you're not using the (garble) ADI, we'd like to get the mode switched to LVLH so we can watch it on the ground. Over.

PAO This is Shuttle Mission Control, had a loss of signal through Yarragadee of the theodolite readings mentioned by the crew are some optical instrument readings using a surveyors instrument and targets on the payload bay doors to measure deflection. PRSD Power Reactant Supply and Distribution Systems checkout relates to the fuel cell, cryo and storage system onboard the vehicle. We'll have a long LOS of about 17 minutes before we reacquire at Hawaii, Columbia on Orbit 96, Mission Elapsed Time 5 days 22 hours 39 minutes this is Mission Control, Houston.

END OF TAPE

CAPCOM Columbia, Houston, through Hawaii for 8 minutes, over.

SPACECRAFT Loud and clear Houston.

CAPCOM Roger, your the same.

CAPCOM Columbia, Houston, we see you reconfigured back to nominal after the burn, we'd like to go ahead and deselect the forward jets from the orbit ops checklist page FS-55, and leave them off until after the meal period at 6 days 3 hours and 15 minutes, over.

CAPCOM Columbia, Houston, we're 30 seconds to a 2 minute LOS, states at 2305.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, we're with you through the states for 17 minutes.

SPACECRAFT Hello Houston, Columbia.

CAPCOM Loud and clear, Columbia.

SPACECRAFT Here I see (garble) PCM recorders at low sample at 2355, and it just says after the forward RCS test, I assume, is that number of minutes afterward or something like that or just at this time close enough?

CAPCOM Columbia, your ahead of us once again, T. K. we'd like to leave that PCM recorder in high sample till we go out of the tail-sun, over.

SPACECRAFT Alright.

SPACECRAFT Houston, Columbia again.

CAPCOM Go ahead Columbia.

SPACECRAFT Okay, planning for this TACAN tracking thing, as I read it, I still need a start time, and a DAP change time from you. And the AOS/LOS is kind of nice to know, but not necessary.

CAPCOM Roger, Columbia, we're reviewing that teleprinter for that right now, and we'll have that up to you shortly.

SPACECRAFT Okay, that's just 2 numbers, why don't you just tell them to me? Your going to wear that machine out. And I've got all the yellow paper, I can go into the business selling telegrams when we get home.

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CAPCOM Roger Columbia, they'll be a few other changes in that procedure, I can read it up to you if you like.

SPACECRAFT It's your call, I thought you were just going to send me the times. (garble) the numbers that come out of the teleprinter, top of the number is sometimes hard to read and it's easy to get one wrong.

CAPCOM Okay Columbia, I can read this up to you. It's fairly short, if you want to get the orbit ops checklist on page FS-32.

SPACECRAFT All set, go ahead.

CAPCOM Roger T. K. and step 1 the next to the last line, we'll change that to DAP A AUTO VERN, over.

SPACECRAFT Okay, we changed the VERN that was crossed out to NORM back to VERN.

CAPCOM That's right. And step 2, the start time is 6 days 0 hours 26:34.

SPACECRAFT 600:26:34.

CAPCOM Roger. We'd also like to delete the pen and ink that says when current tracking maneuver complete, continue in step 2.

SPACECRAFT Okay, what do you do then if you don't, do you go ahead and press on without waiting? Is that the idea?

CAPCOM That's affirmative T. K.

SPACECRAFT Okay.

CAPCOM And T. K. again in step 2, the third, the 2 changes to the DAP right below the GNC 20 DAP config call out.

SPACECRAFT Roger.

CAPCOM DAP A rote discrete norm is 1.3.

SPACECRAFT Okay, 1.4 becomes 1.3.

CAPCOM Roger, and 3 lines down, the DAP B rote discrete rate NORM goes to 0.3 by 0.4.

SPACECRAFT Gotcha.

END OF TAPE

SPACECRAFT ...becomes 1.3.

CAPCOM Roger, and 3 lines down, the DAP B rate discrete rate NORM, goes to 0.3 vice 0.4

SPACECRAFT Gotcha.

CAPCOM Roger, over on the next page, the AOS/LOS times, the AOS, sight AOS is 0 hours 23 minutes, at 0:28:24 we go to B AUTO NORM, sight LOS is 0 hours 32.

SPACECRAFT Okay, 0.3, 0:28:24 and 0:32.

CAPCOM And T. K. down in step 4, the change to DAP back to A AUTO VERN. And then we'll go ahead and turn the primary drivers off.

SPACECRAFT Okay, gotcha.

CAPCOM Okay, and one more, we're down where the GNC 20 DAP config is, we'd like to configure DAP to A1, and Bravo 2, and that's the modified Bravo 2.

SPACECRAFT That's modified to have 1 degree deadband, right?

CAPCOM That's affirmative.

SPACECRAFT Okay, we gotcha.

CAPCOM Okay, and that's it.

SPACECRAFT Alright.

CAPCOM And T. K. one mistake I made, back on step 4 there, where we changed the DAP that should be B AUTO NORM, instead of A AUTO NORM, and it should be B AUTO VERNIER.

SPACECRAFT Up here in the beginning of step 1?

CAPCOM Negative, on step 4, the second line under the GNC universal pointing should be DAP B AUTO VERN.

SPACECRAFT Okay, now I see what your talking about, sure.

CAPCOM Okay, I think we got it right this time.

CAPCOM And Columbia, Houston, we see the pressure on the right OMS down a little bit, we'd like to repress the right OMS using the B leg, over.

SPACECRAFT You'd like to repress the right OMS using the Bravo opening would you like to do that now?

CAPCOM That's affirmative, if it's convenient.

SPACECRAFT Okay, now is as good a time as any.

CAPCOM Okay.

SPACECRAFT Okay, it's repressed and back and closed.

CAPCOM Roger, it looks good to us, thank you.

SPACECRAFT George, looking ahead, we've got a little extra room here, we can go ahead and start cleaning up for, I was just trying to remember which things we haven't done, the only one that comes to me off the top of my head is we didn't get that aft COAS CAL, which we might can do if you wanted it out of one of these tail-sun attitudes, it looks to me like there's a star over head generally with a small roll angle we could probably find something.

CAPCOM Roger T. K. we'll look into that. It's a good idea.

CAPCOM And Columbia, we're nearing a LOS here. And Ascension will be the next pass coming up in 10 minutes at 32.

SPACECRAFT Okay.

PAO This is Mission Control Houston, Columbia passing through a keyhole in the tracking pattern right now. On orbit 96, the crew staying pretty close to the timeline, timeline activities onboard right now, they're doing some theodolite readings along the longerons and some targets on the payload bay doors to measure deflection. The numbers that CAPCOM George Nelson read up to Mission Commander T. K. Mattingly were some commands, changing commands to Columbia's digital auto pilot. At Mission Elapsed Time, 5 days 23 hours 24 minutes, this is Mission Control Houston.

CAPCOM Columbia, Houston, T. K. if you're still with us, it looks like the COAS CAL needs to be done in conjunction with an IMU alignment to satisfy the DTO, so we won't be doing that today, over.

SPACECRAFT Okay. (garble)

CAPCOM And T. K. you're breaking up now, going to LOS.

END OF TAPE

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CAPCOM --over.

SPACECRAFT Okay. (garble)

CAPCOM And T.K. you're breaking up now going LOS. We'll see you at Ascension at 33. Columbia, Houston's with you through Ascension for 8.

SPACECRAFT Loud and clear.

CAPCOM You're the same. Columbia, Houston 40 seconds to LOS. Botswana is next at 2345.

SPACECRAFT Okay, we'll see you then.

CAPCOM Columbia, Houston with you through Botswana for 8 1/2.

SPACECRAFT Okay.

CAPCOM Columbia, Houston have one note to read up to you it doesn't require you taking any data. Just for your information if you're ready to copy.

SPACECRAFT Okay, go ahead George.

CAPCOM Okay we're gonna try and get some realtime data here to investigate the loss of 2 FES case that we've got on the books. That's going to involve from MET 2 hours and 20 minutes to 4 hours and 22 minutes running an ATCS hydraulic interaction test to evaluate the heat sink capacity of the hydraulic system in the hydraulic freon heat exchanger. At 2 hours 20 minutes we're gonna send up a TMBU to run circ pumps 2 and 3 and a timer mode 1 minute off and 60 minutes on sequentially. Then at 4 hours 25 minutes you guys will terminate the circ pumps with the hydraulic thermal conditioning terminate that's done in the CAP there. So we'd like for you to make sure to get that on time and it should get us some good data.

SPACECRAFT You guys are getting more and more clever. Let me make a note so I don't forget that one. Where does it normally get terminated?

CAPCOM Yeah, we'd like you to do it at nominal time and that's 4 hours and 25 minutes.

SPACECRAFT Okay. And if we see something funny in the temperature we'll know why. Thank you.

CAPCOM Roger, that. And Columbia, Houston, one other thing, it would give us a little more data if when we do

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terminate the circ pumps ops you'd get an elevon position readout for us.

SPACECRAFT Okay, just out of curiosity. I've been watching those things, and the outboard started to go back towards trail, now the starboard outboard is oh, it was just about a trail maybe up to 5 degrees or so, and now it's up maybe 10. Starboard inboard is now close to full. Port inboard is up full and port outboard looks like it's a trail.

CAPCOM Okay, thank you. Columbia, Houston 20 seconds to LOS. Yarragadee is next at 0+6.

SPACECRAFT Okay.

PAO This is Mission Control, Houston we'll be out of voice contact for about 12 minutes, this is Mission Elapsed Time 5 days 23 hours 54 minutes. This is Mission Control, Houston the Mission Elapsed Time clocks just moments away from cycling to 6 days even. Columbia on its 96th orbit of the earth. Onboard the vehicle now mission Commander T.K. Mattingly would be working with a food freezer system which is being flight tested during this mission, and will be put in a water container under the freezer and recording the time it takes for that food to solidify. And the pilot Hank Hartsfield will be doing some payload activities cycling some switches on the monodisperse latex reactor experiment, and a little work associated with the Get Away Special which would be the Get Away Special Experiment is going to be left on during entry, contrary to what the nominal crew activity plan indicates about turning that experiment off, it will infact be left on. We will have acquisition of signal

END OF TAPE

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PAO - - and during entry contrary to what the nominal crew activity plan indicates about turning that experiment off. It will, in fact, be left on. We will have acquisition of signal through Yarragadee in just under 7 minutes. Mission elapsed time now 6 days even. This is Mission Control Houston.

CAPCOM Columbia, Houston, through Yarragadee for 5 minutes.

SPACECRAFT Loud and clear Houston.

CAPCOM You're the same. Columbia, Houston, I've got a NOSL pad for you, if you're interested.

SPACECRAFT Say again.

CAPCOM Roger, we've got a NOSL opportunity coming up over Venezuela on this rev. If you're interested, I'll read it up.

SPACECRAFT What general time is it coming?

CAPCOM It's 0 hours and 56 minutes.

SPACECRAFT Okay.

CAPCOM Roger, is that all you need?

SPACECRAFT Go ahead.

CAPCOM Okay, it's latitude 12 degrees north, 77 degrees west. It'll be a daytime pass, and they're requesting one magazine.

SPACECRAFT Okay, and that time was about 56?

CAPCOM That's affirmative, and we're going LOS now. Guam will be next at 0 plus 18.

SPACECRAFT Okay.

PAO This is Mission Control Houston at 6 days 18 minutes, we'll have voice contact momentarily through Guam on orbit 97.

CAPCOM Columbia, Houston, through Guam for 7 and 1/2.

SPACECRAFT Okay sir.

CAPCOM You're loud and clear. Columbia, Houston, we're 1 minute to LOS. Hawaii is next at 0 plus 31, and we have the tire pressure data now, you're go to get the strain gauges off.

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SPACECRAFT Okay, and what station is this we're tracking?

CAPCOM Roger sir, it's Wake Island.

SPACECRAFT Ah.

CAPCOM And Columbia, we show you're locked up and bearing already.

CAPCOM And Columbia, Houston, through Hawaii for 8 minutes.

SPACECRAFT Okay.

PAO This is Shuttle Mission Control, now have acquisition of signal through Hawaii momentarily. Mission elapsed time is 6 days 32 minutes on orbit 97.

CAPCOM Columbia, Houston, we see you got the G23 OMS RCS message, you can ignore that.

SPACECRAFT Okay, I'll do that.

PAO This is Mission Control Houston. Columbia is out of range right now, right in between tracking stations coverage from Hawaii and Buckhorn, reacquire in about a minute and 1/2, guidance - -

CAPCOM - - a short LOS, we'll see you over the states in 41.

SPACECRAFT Okay.

PAO That call by CAPCOM George Nelson in the blind. Guidance Systems Officer reported to the Flight Director that they've got good azimuth data from the TACAN test, going on with the vehicle now, and they're gonna take a little harder look at the data to verify, or to determine the quality of the ranging information provided through the TACAN system. Flight surgeon indicated that as a product of the private medical conference held recently with the crew, that the crew is in fact, in good health and no medical problems were reported. We will reacquire signal about a half a minute through Buckhorn. Columbia on orbit 97 mission elapsed time 6 days 41 minutes this is Mission Control Houston.

END OF TAPE

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PAO -- about a half a minute through Buckhorn.
Columbia on orbit 97 Mission Elapsed Time, 6 day 41 minutes this
is Mission Control, Houston.

CAPCOM Columbia, Houston back with you through the States.

SPACECRAFT Okay, sir.

CAPCOM Columbia, Houston 10 seconds to a 1 minute LOS over
the States.

SPACECRAFT Okay.

CAPCOM Columbia, Houston back with you through Mila for 6
minutes.

SPACECRAFT Hi, Houston.

CAPCOM Loud and clear. Columbia, Houston we're 50 seconds
to LOS. Ascension is next at 1+11, and I've got the water dump
numbers for you that's the last thing we owe you, so that we can
have minimum communications here while you're trying to do the
cabin stow. We'd like to dump tank Bravo to 0%, over.

SPACECRAFT Okay, that's Bravo to 0%.

CAPCOM Roger, and that dumps and little light to make up
for D tank, Hank.

PAO Shuttle Mission Control you had loss of signal.
Reacquire again in about 14 minutes. All, obviously very quiet
onboard the vehicle as the crew is involved in a variety of
activities the pilot Hank Hartsfield during that pass was
involved in a meal preparation taking some of the Columbia food
stuffs onboard, and activating the food warmer in preparation for
the meal period which is still about 1 hour and 15 minutes
away. And the crew also involved in entry planning taking the
uplink revisions to the crew activity plan that have been
teleprinted up to the vehicle and incorporating those in the
crew's onboard flight data file. And updating the CRT stored
information and otherwise making preparations now for our entry
day tomorrow. And the vehicle on orbit #97 presently reacquire
signal in about 13 minutes through Ascension Island. At 6 days 0
hours 59 minutes, this is Mission Control Houston.

CAPCOM Columbia, Houston with you through Ascension for 6
1/2 standing by.

SPACECRAFT Okay, thank you sir.

CAPCOM Columbia, Houston we're 1 minute to LOS. Botswana
is next at 1+21. In order to avoid a water dump tomorrow

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morning, we'd like you to continue the dump you've got going to get tank A down to 85%, over.

SPACECRAFT Okay, tank A to 85.

CAPCOM Roger.

PAO Mission Control, Houston, CAPCOM George Nelson talking to Columbia pilot Henry Hartsfield about the water dump the water being the product of the interaction of hydrogen and oxygen on the, which probably the fuel cells as those 2 substances move across a membrane and the fuel cell producing electricity, it produces water as a by product that water accumulates and it needs to be dumped periodically. The water dump being performed this afternoon will preclude the necessity of doing that again tomorrow morning before entry. All continues to be very quiet onboard Columbia, as the crew accomplishes some entry planning in advance of the deorbit day tomorrow. We'll acquire signal again in 3 minutes through Botswana. Mission Elapsed Time 6 days 1 hour 19 minutes, this is Mission Control, Houston.

END OF TAPE

PAO -- the deorbit day tomorrow. We'll acquire signal again again in 3 minutes through Botswana. Mission Elapsed Time, 6 days 1 hour 19 minutes this is Mission Control, Houston.

CAPCOM Columbia, Houston standing by through Botswana for 7 1/2.

SPACECRAFT Okay, loud and clear.

CAPCOM You're the same.

SPACECRAFT (garble)

CAPCOM Columbia, Houston 1 minutes and a half left this pass. A couple of notes of information, we looked at a playback of the TACAN tracking test results. We had all 3 TACANs locked on from 300 miles before the pass to 400 miles after, so we got real good data on that, over.

SPACECRAFT Okay, thank you. You guys did good work on that.

CAPCOM Okay, thank's, you guys did good work on that one. The next one is some good news on that teleprinter. The flight directors have just reported to me that they plan on donating a dollar for every foot of teleprinter paper that we've used onboard. And our latest tally shows that we've used about 250 feet, and that will go towards the post flight gathering we've got planned on Wednesday.

SPACECRAFT Outstanding.

CAPCOM And Columbia, we're 30 seconds to LOS. Guam is next at 1+53.

SPACECRAFT \$1.75.

PAO This is Mission Control, Houston at a long LOS period acquire in about 18 minutes through Guam. Things continue to be quiet onboard Columbia and the crew finishing up it's entry planning and updating crew activity plans and computer memory onboard Columbia, and performing some stowage activities, putting away checklists and flight data file documentation again in advance of it entry day activities tomorrow morning in preparation for those coming up in the meal period in about 45 minutes. The evening meal, the dinner meal for the crew. Mission Elapsed Time now, 6 days 1 hour 36 minutes, this is Mission Control, Houston.

CAPCOM Columbia, Houston through Guam for 8 minutes.

SPACECRAFT Alright. Looks like you guys are running up your bill again.

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CAPCOM Roger, that. T.K. this is a TPR describing our nominal entry plans coming up.

SPACECRAFT Okay. You're very weak this time.

CAPCOM Okay, how's that? And Columbia, Houston the teleprinter coming up is our plans for the nominal entry.

SPACECRAFT Okay, I copy. You're still weak George, but I copy you.

CAPCOM Roger, that. And Columbia, Houston I have another NOSL opportunity for you coming up over Central America this pass, in about 25 minutes if you would like to copy.

SPACECRAFT Okay. Is this gonna be at nighttime or daytime? must be daytime again.

CAPCOM That's affirmative.

SPACECRAFT Boy, I tell you looking out the window I don't think you're going to see an awful lot. But we'll be glad to take pictures of it, but there isn't much there.

CAPCOM Roger, we copy. There is a tropical storm Carlotta on the west side of Central America, at 2 hours 22 minutes we'd like you to start, they would like you to use 3 magazines on this one. And the coordinates are 19 north, and 115 west, over.

SPACECRAFT 19 north, and 116 west, just a second. Okay, and where are we're gonna be with respect of that? Our ground track looks like it's a, lost track of the REV. Are we going to be over that coordinate or one REV off?

CAPCOM Roger, Columbia you should be right over the disturbance at that time.

SPACECRAFT Okay, we'll certainly give it a try.

END OF TAPE

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CAPCOM Roger Columbia, you should be right over the disturbance of that time.

SPACECRAFT Okay, we'll certainly give it a try.

CAPCOM Okay, thank you.

CAPCOM And Columbia, we see your primary RJDs on, if somebody's on the flight deck, we'd like to get those off.

SPACECRAFT Oh, your right, thank you.

CAPCOM And Columbia, it's Big Brother again, for tomorrow morning, we're planning on delaying our wake up call for an hour and a half because we of the one rev slip on the deorbit.

SPACECRAFT Okay, so what time does that make it?

CAPCOM Your on 1600 T. K.

SPACECRAFT Okay, I always did like getting up in the afternoon.

CAPCOM Roger that.

SPACECRAFT (garble) he's not so grouchy.

CAPCOM We concur Hank.

SPACECRAFT I'll take your name rank and social security number.

SPACECRAFT He was fine this morning until I told him it was only 3 o'clock am in Houston.

CAPCOM Roger that Hank.

CAPCOM Columbia, Hawaii's next at 2 plus 08.

SPACECRAFT Okay.

PAO This is Mission Control Houston, once again they had a lot of dialog during that pass, we've had a loss of signal through Guam, acquire again in 6 minutes through the Hawaii tracking station. During that pass, the crew was advised of the thunderstorm in the Pacific area which would be a good target for the NOSL, Night/Day Optical Sensing of Lightning experiment. The RJD that Mission Commander T. K. Mattingly was instructed to turn off is a Reaction Jet Driver, the controls for which are located in the flight deck upstairs in Columbia. Hawaii tracking station coming up in 3 and 1/2 minutes. At 6 days 2 hours 3 minutes, this is Mission Control, Houston.

CAPCOM Columbia, Houston, through Hawaii for 8.

SPACECRAFT Loud and clear.

CAPCOM And your the same.

CAPCOM Columbia, Houston, if there's someone on the flight deck we see cryo tank 4, oxygen tank is depleted as far as we want to get it, so we'd like to get cryo 02 tank 4 heater Bravo to OFF.

SPACECRAFT Thank you.

CAPCOM Roger.

SPACECRAFT It's off. I passed that point 30 minutes ago.

SPACECRAFT (garble)

CAPCOM Columbia, Houston, on that 02 tank, we think there's a slight chance that you'll get a temperature overshoot that'll take you above the FDA limit, it's no concern.

SPACECRAFT Okay, thank you.

CAPCOM Roger.

SPACECRAFT (garble)

CAPCOM Columbia, Houston, 20 seconds to LOS, the states are next in 3 minutes.

SPACECRAFT Okay.

PAO This is Shuttle Mission Control, the EECOM reported to the Flight Director during that period that the crew had completed the water dump from the fuel cells. The dump being accomplished through a heated T shaped valve on the vehicle, heated to keep the water from icing in the 100 degree below zero temperatures on the exterior of the surface of the vehicle. And the heated nozzle precludes a chance that ice would form and clog the nozzle preventing the dump, and T shaped in order to neutralize thrust, it dissolves water in such a manner that it exists the vehicle in opposite directions and neutralizes any thrust affects that might have otherwise ...

END OF TAPE

PAO - - that ice would form and clog the nozzle preventing the dump and T-shaped in order to neutralize thrust. It expels the water in such a manner that it exits the vehicle in opposite directions, and neutralizes any thrust affects it might have otherwise had. Reacquire signal again in a minute and a half through Buckhorn. At mission elapsed time 6 days 2 hours 17 minutes this is Shuttle Mission Control.

CAPCOM Columbia, Houston, through Buckhorn for 5 minutes.

SPACECRAFT Loud and clear.

CAPCOM You're the same. Columbia, Houston, 40 seconds LOS, Botswana will be next at 2 plus 58.

SPACECRAFT Okay, and we did see that storm, it appeared to have a well-defined eye, believe it or not, even though its just a storm not a hurricane.

CAPCOM Roger that Hank, thanks a lot.

PAO This is Mission Control Houston nearing one of our longer loss of signal periods for about 35 minutes before we reacquire through Ascension Island. Hank Hartsfield reporting an apparently good data take for the night optical sensing of lightning experiment in a storm over the Pacific area which was reported to him earlier in this orbit. We're on rev 98 mission elapsed time 6 days 2 hours 24 minutes this is Mission Control Houston. This is Mission Control Houston, less than a minute away from acquisition of signal through Botswana on orbit 99 concluding a long LOS of more than half an hour since we last heard from Columbia. Meal time onboard, the crew activity plan has this period budgeted, 1 hour period budgeted, as the evening meal for the crew. Mission elapsed time 6 days 2 hours 58 minutes this is Mission Control Houston.

CAPCOM Columbia, Houston, standing by through Botswana for 8 minutes.

SPACECRAFT Okay George.

CAPCOM And you're loud and clear.

SPACECRAFT Don't realize what a pig pen you've been through till you have to pick it all up.

CAPCOM Roger that. Columbia, Houston, very short LOS before we pick up Indian Ocean.

SPACECRAFT Hello Houston.

CAPCOM And Columbia, through IOS for 6 and 1/2.

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SPACECRAFT Okay.

CAPCOM Columbia, Houston, 30 seconds to LOS. Guam is next at 3 plus 31.

PAO Mission Control Houston we're loss of signal through Indian Ocean station. Acquire again in 16 minutes through Guam. Obviously very quiet pass, mission Commander T. K. Mattingly's only remarks having to do with the experience of stowing all the material that they'd collected over the past 6 days in orbit. Mission elapsed time 6 days 3 hours 15 minutes this is Mission Control Houston.

CAPCOM Columbia, Houston, through Guam for 6 minutes.

SPACECRAFT Loud and clear.

CAPCOM Roger, and you're loud and clear. Columbia, Houston, you have a go to reselect the forward jets, we've got all our data from the soakback tests, and the teleprinter coming up is weather data.

SPACECRAFT Okay sir, thank you.

CAPCOM Roger.

END OF TAPE

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CAPCOM ..the soakback test and the teleprinter coming up is weather data.

SPACECRAFT Okay sir, thank you.

CAPCOM Roger.

CAPCOM Columbia, Houston, 30 seconds LOS, Hawaii is next at 3 plus 44.

SPACECRAFT Okay.

PAO Mission Control Houston, on orbit number 100. 6 minutes of loss of signal here before we pick up at Hawaii again, Mission Elapsed Time 6 days 3 hours 38 minutes.

CAPCOM Columbia, Houston, standing by through Hawaii for 8 and 1/2.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, a couple of short items. On the CAP update we sent up, there's one item that's out of place, just a reminder that the payload post ops documentation is coming up at 4 hours and 10 minutes, and that's a no later than time, over.

SPACECRAFT We have just discovered that, and are in the process of doing it, thanks for catching that, we just happened to stumble on it.

CAPCOM Roger that, and one other item, after you start the maneuver to the nav base facility attitude number 1, we'd like to get a star tracker self test on both star trackers, over.

SPACECRAFT Okay, would you like to see that now?

CAPCOM Columbia, Roger T. K. we can go ahead and see that now.

SPACECRAFT Well we're going to have to wait for darkness, on this attitude, I don't, well let me see maybe I can get the the doors open. Looks to me like my Y trackers going to be stuck on the horizon. I don't think we'll make it now George, I'll have to wait till we get a better geometry.

CAPCOM Roger T. K. we concur.

CAPCOM Columbia, Houston, 1 minute to LOS. A long 40 minute LOS, Botswana will be next at 4 plus 34.

SPACECRAFT Okay.

PAO This is Mission Control Houston, we've had loss of signal through Hawaii on orbit 99. Have a long LOS period of over 40 minutes until we acquire again halfway around the world at Botswana. We are still in a period where the crew is performing some cabin stowage and housekeeping activities. Accordingly the very modest amount of dialog between the air and the ground are in these passes. At 6 days 3 hours 53 minutes, this is Mission Control Houston.

PAO This is Mission Control Houston, in about a minute we're going to break this long LOS of over 40 minutes, and pick up voice acquisition with the crew through Botswana, on orbit number 100. Don't really expect a lot of dialog between the crew and CAPCOM, had a lot of activities to clean up before the end of the day, and the hope is to get the crew to bed on time tonight. And give them a good nights rest to make sure they're refreshed for the critical entry day activities tomorrow morning. About 2 hours remaining till the crew's sleep period begins. I expect voice contact momentarily, Mission Elapsed Time is 6 days 4 hours 33 minutes, this is Shuttle Mission Control.

CAPCOM Columbia, Houston, through Botswana for 6 and 1/2.

SPACECRAFT Alright sir, coming up on the first nav stars, and we'll start the self test.

CAPCOM Okay, we copy.

CAPCOM Columbia, Houston, we're 20 seconds to a 1 minute LOS before IOS.

PAO This is Mission Control Houston, we're in a brief LOS period between Botswana and Indian Ocean. Flight Director Chuck Lewis has just gone around the room to check with his flight controllers to see if anyone has any open items for the crew, before they begin the sleep period and received assurances from each of his team members that...

END OF TAPE

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PAO - Botswana and Indian Ocean. Flight Director Chuck Lewis has just gone around the room to check with his flight controllers to see if anyone has any open items for the crew before they begin the sleep period, and received assurances from each of his team members that he has a healthy vehicle on his hands, and that everything looks good for the evening. Columbia on 100th orbit of the Earth mission elapsed time 6 days 4 hours 41 minutes this is Mission Control Houston.

CAPCOM Columbia, Houston, through IOS for 9 minutes. Columbia, Houston, through Indian Ocean for 8 minutes. Columbia, Houston through Indian Ocean for 6 and 1/2 minutes. Columbia, Houston, how do you read?

Cut in voice Houston COMMTEC air to ground 2. Cut in voice Houston COMMTEC air to ground 2. Cut in voice Houston COMMTEC air to ground 3.

Loud and clear, how me?

Loud and clear, cut it through please.

IOS, Houston COMMTEC, uhf how do you read?

Read you five by Houston.

Req, go ahead and remote it, CAPCOM will uplink.

Roger.

CAPCOM Columbia, Houston, through Indian Ocean for 4 minutes, how do you read?

SPACECRAFT Loud and clear.

CAPCOM Roger, you're the same, we had a ground COMM problem. I'd like to hand you over to Sunnyvale PAYCOM for a short pass, there are no flight data file required.

SPACECRAFT Okay.

PAYCOM Columbia, this is Sunnyvale, how do you read?

SPACECRAFT Loud and clear, would you stand by just a second please? Okay Sunnyvale, go ahead.

PAYCOM Roger Columbia, we've got a 2-part final message real quick here. First, we would like a verification that during TAB echo the LEDs for RF switch to umbilical did illuminate.

SPACECRAFT We haven't gotten to that one yet.

PAYCOM Okay, that's no impact right now. Sometime, at your convenience, go ahead and downlink it to the CAPCOM, if

those umbilical LEDs do light. And more importantly, finally all of us here at Sunnyvale want to thank both of you for all your special efforts over the past few days, and we especially want to congratulate you on a job well done. We think that this mission has been a great success in opening a new era, and we're looking forward to many missions in the future.

SPACECRAFT All right sir, I know we certainly share that feeling. We'd like to work with you again. You guys do good work, and know you've had some disappointments but, hopefully some success too.

PAYCOM Yes sir, that is

SPACECRAFT when we get back.

PAYCOM Yes sir, that is very true, and thank you again sir. Sunnyvale out.

CAPCOM Columbia, Houston, a minute and 1/2 left this pass.

SPACECRAFT Okay.

CAPCOM And Columbia, just in case you've got some time, there is another tropical storm named Val that you'll be passing just north of at 5 plus 02.

SPACECRAFT Okay, 5 plus 02 and you want to give me some coordinates so I can know where to look?

CAPCOM Roger, the coordinates will be 107 east, 20 north.

SPACECRAFT Okay, and where is that with respect to my groundtrack, if I don't get to it before then?

CAPCOM Be just a little south of your groundtrack, TK.

SPACECRAFT Okay, thank you.

CAPCOM Roger, and one more thing, for the S-band tracking test that's coming up, the Hawaii AOS is at 5 plus 20, and we'd like to have you start the roll maneuver sometime prior to that, over.

SPACECRAFT Okay, we'll do that. You mean start the faster roll rate?

CAPCOM That's affirmative. And another reminder, we'd like you to stay on 259.7.

SPACECRAFT Okay, that's a good roll. We'll talk to you in the spin.

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CAPCOM Roger, and Guam is next at 5 plus 09.

END OF TAPE

SPACECRAFT Okay, that's good call, we'll talk to you in a spin.

CAPCOM Roger, and Guam is next at 5 plus 09.

CAPCOM Go ahead.

PAO This is Mission Control Houston, that last call from Columbia, just abbreviated as we left range of the Indian Ocean station, we'll be out of contact for about 17 minutes before we pick up again through Guam. Mission Elapsed Time 6 days 4 hours 52 minutes. This is Shuttle Mission Control.

PAO This is Mission Control Houston, we're less than a minute away from reacquisition of signal through Guam, pretty brief pass, apparently low elevation less than 3 degrees off the horizon and they'll be a keyhole in here. And they have a fairly long acquisition period through Hawaii and the next station of about 8 minutes. We're about an hour and a half away from the sleep period. And Mission Elapsed Time is 6 days 5 hours 9 minutes. Voice contact momentarily with Columbia, this is Mission Control Houston.

CAPCOM Columbia, Houston, through Guam for 3 minutes.

SPACECRAFT Okay.

SPACECRAFT We may have messed you up, we went ahead and got our antennas set up for the rotation test.

CAPCOM Okay, we copy that.

SPACECRAFT George, we had a positive completion off the tabs Echo and Foxtrot, (garble) anything? In fact we had to pull them out to do that.

CAPCOM Roger Columbia, we copy that. And Columbia, be advised you're now on your hundreth orbit after going 2 and 1/4 million miles.

SPACECRAFT Yep, don't even have to change the oil.

CAPCOM Columbia, Houston, we're 30 seconds to LOS, Hawaii is next at 5 plus 20, and we'll be doing some talking over Hawaii just to help us nail down the UHF antenna pattern.

SPACECRAFT Okay, want us to talk back? Maybe I should say respond.

CAPCOM Roger, we'd like some talkback also.

PAO This is Mission Control Houston, we're LOS again, we'll pick up Hawaii in 7 minutes and they'll be some more dialog than we've become accustomed to here in recent hours as we do some S-Band antenna testing and the INCO has asked for some discussion between CAPCOM and Columbia in order to more precisely affect this antenna test. Mission Elapsed Time is 6 days 5 hours 14 minutes, this is Shuttle Mission Control.

PAO This is Mission Control Houston, we're about a minute away from acquisition of signal through the Hawaii tracking station and again they'll probably be considerably more communication between Columbia and the CAPCOM on this pass, as we do some S-Band and UHF antenna checks as part of a flight test objective. Purpose of the FTO on this one is to determine actual antenna patterns in a true onorbit dynamic environment. And the data required from this flight is used to substantiate data acquired on the earlier 3 shuttle mission operations. Mission Elapsed Time, 6 days 5 hours 20 minutes, this is Mission Control, Houston.

CAPCOM Columbia, Houston, through Hawaii for 8 minutes, over.

SPACECRAFT Okay, we're with you.

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CAPCOM Roger T. K. one note for you. We've got H2 tank 4 down to less than 3 percent, and we're ready to get the bravo heaters off on H2 tank 4.

END OF TAPE

SPACECRAFT Okay we're with you.

CAPCOM Roger TK, one note for you. We've got H2 tank 4 down to less than 3 percent, and we're ready to get the bravo heaters off on H2 tank 4.

SPACECRAFT That's done.

CAPCOM Okay, thank you.

SPACECRAFT It's not often you get to do barrel rolls through the sky. I guess this is what all that T38 flying was about.

CAPCOM Roger that. And TK, looking for topics of conversation, we know that Hank was sleeping in the sleep restraint. There was some discussion here about, wondering where the CDR was spending the night.

SPACECRAFT Well, it was suggested I might try the WCS or NAV bay 3B. Then I decided to just sleep on the flight deck. I was gonna move around but, I thought it was so nice, I just decided to stay where I was. I just lay down flat behind the seats and I tried it with or without a sleeping bag, and I've never tied the bag down, I just crawl in it more for thermal control than anything else. And I just found that I just go in there and lay down and go to sleep, and it works like a champ. You can really do good sleeping up here. The only problem on the flight deck, is you got to remember to close the windows here, you're tempted to get up every 10 minutes and look.

CAPCOM Roger, we copy all that TK, thanks. And Columbia, we're sending you a new state vector.

SPACECRAFT Okay. And you send a state vector to us now George, do we have to add a turn for the call?

CAPCOM Say again TK, we didn't catch that.

SPACECRAFT If you send me one now, do I have to add a (garble) term or something to take out (garble).

CAPCOM We're thinking about that TK.

SPACECRAFT Then you guys are really bored. Hey, you sent an update on the elevons, it looks like a 0 for starboard elevon, while the starboard outboard looks like it's almost all the way up and the right inboard is not quite that high, but it's a good 25 or 30 degrees up, the left inboard is all the way up and I can't see the right, the left outboard, I imagine it's down somewhere.

CAPCOM Okay Hank, thanks we appreciate that.

SPACECRAFT All right George, we looked for your NOSL opportunity, unfortunately that was, if we're in the right place in the sky our nose was high and the ground just happened to be right under the belly. We certainly never saw anything at all.

CAPCOM Okay TK, we copy that. And TK we're wondering if you're planning on a summary message tonight after presleep.

SPACECRAFT Well sir, I think we've done everything. We are faced, what I think, was an excellent way of handling the day. You gave us a lot of quiet time there at the end. We are stowed. The only things we have out are things we're gonna use in the morning, like food warmers and sleep stations, and all the rest of it right down to the cue cards are set up, and we're gonna get up in the morning ready to go to work, and I think this is really the, that's the way to end it up. That's a good plan.

CAPCOM Roger, we copy all that, and don't forget you get an hour and a half extra sleep tomorrow.

SPACECRAFT Okay. What is our official get up time, I'll set my clock to that.

CAPCOM Roger, it'll be 1600 MET.

SPACECRAFT Okay, this is your last shift then, isn't it?

CAPCOM That's affirmative.

SPACECRAFT All right, we're right overhead Hawaii now. I'm looking down, and just happened to look out the window and there's an old volcano staring up at us, and the whole island - -

CAPCOM Roger, we copy that.

SPACECRAFT George, are you guys hurting for, do you need some kind of transmission from the spacecraft in order to conduct your test?

CAPCOM We've got a minute and 1/2 left this pass TK, and we've got plenty on that, thanks, we saw you go all the way around once.

SPACECRAFT Okay

END OF TAPE

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SPACECRAFT George, are you guys hurting for, do you need some kind of transmission from the Spacecraft in order to conduct your test?

CAPCOM We got a minute and a half left this pass, T. K. and we got plenty on that, thanks, we saw you go all the way around once.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston, Santiago is next at 5 plus 47.

SPACECRAFT Okay.

SPACECRAFT Do you want to give us the time to terminate this?

CAPCOM And Columbia, you can terminate any time.

SPACECRAFT Okay.

PAO This is Mission Control Houston, we've had Loss of Signal through Hawaii, pick up Santiago in about 18 minutes. Concluding that test of S-Band and UHF antenna patterns, the flight test objective called, performance of S-Band TM and FM as well as UHF voice communication operations using a single antenna for each system while rolling the spacecraft and that accounts for T. K. Mattingly's remarks about barrel rolls and reference to T-38 flying, the vestibular training that they've done prelaunch, where they took the T-38's up and did aerobatic maneuvers to condition their inner ears, and Major Mattingly's several remarks are pleasantly referring to that T-38 flying as being conditioning for the rolls which they performed during that antenna test over Hawaii. And the EECOM reported that they got their good communication through one entire revolution of the Spacecraft and that could be marked up as another successful flight test objective performed. Columbia pilot Hank Hartsfield radioing down that call, his observations of the elevon positions, on the vehicle as a product of movement caused by cycling the circ pumps in earlier tests which have the effect of moving the elevons around, and he of course was reporting those positions. Crew now involved in pre-sleep activity, we're just about an hour away from beginning the sleep period on orbit 100. And about 16 minutes from reacquisition of signal. Mission Elapsed Time, 6 days 5 hours 31 minutes, this is Mission Control Houston.

PAO This is Mission Control Houston, coming up on acquisition of signal through Santiago Chile, on orbit number 100. Flight Director John T. Cox, and his team of flight controllers the Granite Team tagged up in the Mission Control Center, going through the debriefing process and we'll be ready

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to assume flight control of STS-4 in a few more moments. Looking to a change of shift briefing with off-going Flight Director Chuck Lewis. To continue Chuck Lewis's change of shift briefing, we believe it's going to occur at 5:30 pm central time

CAPCOM Through Santiago for 5 and 1/2.

CAPCOM Columbia, Houston, you're go for the item 48s in both major functions.

CAPCOM And Columbia, Houston, on the S-Band test over Hawaii we saw 2 full revolutions of the vehicle and had a range of 40 to 50 DB's, we got a real good data on that.

CAPCOM Columbia, we're 30 seconds to LOS, IOS is our next real pass that'll be at 6:18, get about 30 seconds through Botswana before that.

PAO This is Mission Control Houston, acquisition of signal again in 17 minutes through Indian Ocean. Apart from a very low elevation pass, very briefly by Botswana, the next real opportunity to talk to the crew will be at Indian Ocean station in 17 minutes. The Change of shift briefing with Flight Director Chuck Lewis will occur at 5:30 pm central time in the JSC newscenter Bldg 2, room 135. Flight Director Chuck Lewis just went around the room pulling all the flight controllers to verify that the, each of the systems specialist is go for sleep and each indicated that they indeed were and we've got a healthy machine that's not going to need any input from the crew and that we can look forward to the sleep period without any

END OF TAPE

PAO -- around the room pulling all the flight controllers to verify that each of the systems specialist is go for sleep and each indicated that they indeed were, and we've got a healthy machine that's not going to need any input from the crew, and that we can look forward to the sleep period without any major instructions to the flight crew. Sleep period begins in 45 minutes, Mission Elapsed Time 6 days 5 hours 54 minutes this is Mission Control, Houston. Mission Control, Houston standing by for acquisition of signal through the Indian Ocean Station.

CAPCOM Columbia, Houston through Indian Ocean for 7 1/2. Columbia, Houston through Indian Ocean for 7 minutes.

SPACECRAFT We're here sir.

CAPCOM Roger, that T.K. I've 2 pieces of information your state vector is good for the next 5 REVs and since we're tight on PCM recorder tape we want to verify that, that DFI PCM recorder is low sample, over.

SPACECRAFT Okay let me go check. Good catch, it was in high, we put it in low.

CAPCOM Okay, thank you.

SPACECRAFT (garble).

CAPCOM Negative.

SPACECRAFT Hello Houston, Columbia.

CAPCOM Roger, T.K. standing by.

SPACECRAFT Hey, we're gonna turn all the lights off here, and see what we can see in the dark so, do you need anything before I do that? Because I want be able to move around very easily.

CAPCOM Roger, T.K. we copy that. We've got nothing for you now.

SPACECRAFT Okay, sir.

CAPCOM Columbia, Houston this will be the last pass for the bronze team on STS-4. It has really been an outstanding mission, and we're looking forward to seeing you on runway tomorrow morning and back in Houston tomorrow afternoon. From the bronze flight Chuck Lewis and backup flight Randy Stone, Mike and myself and the entire bronze MOCR team, it sure was a pleasure and we're proud to have worked such a solid bird and such a professional crew. T.K. and Hank we'll go flying with you guys anytime.

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SPACECRAFT We'll take you up on that soon. You guys were super, I really appreciate all your help, and I think we owe you a few beer's when we get back.

CAPCOM Roger, sir, and we'll take you up on that.

SPACECRAFT From Hank, good night.

CAPCOM And Columbia, 40 seconds to this LOS. We don't intend to give you any more comm tonight. If you need us the next pass is Guama at 6+45. Get a good night sleep and a good entry tomorrow.

SPACECRAFT Okay.

PAO Mission Control, Houston 6 days 6 hours 26 minutes Mission Elapsed Time. Columbia has just passed out of range of the Indian Ocean station on the beginning of Orbit #101. About 19 minutes or so before we reacquire signal with the vehicle over the Guam tracking station. CAPCOM George Nelson signed off for the evening and the flight on behalf of the bronze team Flight Director Chuck Lewis and his people. This should be the last pass for the voice communication with the crew unless there is some special items that come up or the crew has any need to talk with the flight controllers. About 12 minutes away from the scheduled crew sleep time. 6 days 6 hours 27 minutes Mission Elapsed Time this is Mission Control, Houston.

END OF TAPE

PAO Mission Control Houston 6 days, 7 hours, 14 minutes mission elapsed time. Columbia on orbit number 101 swinging out over the Pacific, about 9 minutes away from passing over the ground station at Santiago and flight controllers at Mission Control will see the data coming down from the Spacecraft, observe the conditions of the systems at that time, everything continues to look good. The crew is in, currently is in the scheduled sleep period, although its doubtful that they're asleep quite this early, they are gonna sleep about an hour and a half later in the morning. Off going flight director Chuck Lewis from the Bronze team will be arriving shortly at building 2 for the change of shift press conference, which we believe will begin as scheduled at approximately 5:30. 6 days, 7 hours, 15 minutes, mission elapsed time, this is Mission Control Houston.

PAO Mission Control Houston, 6 days, 9 hours, 6 minutes mission elapsed time. Columbia's just passed out of range of the Santiago, Chile tracking station and data was coming down from the Spacecraft. Flight controllers here in Mission Control had determined that systems on board the vehicle continue to function well. Crew has about 6 hours and 53 minutes remaining in their scheduled sleep period before they get up to begin entry preparations tomorrow morning. They'll be allowed to sleep in about an extra one and a half because we're coming in a rev later than was planned, in the crew activity planned. Columbia is on the last portion of number 102, out over South America, will be passing within a range of the next tracking station at Ascension in about 6 hours, 6 minutes and 45 seconds. 6 days, 9 hours, 7 minutes mission elapsed time, this is Mission Control Houston.

PAO This is Mission Control Houston at 6 days, 10 hours, 3 minutes mission elapsed time. Spacecraft Columbia is within range of the Guam tracking station on orbit number 103. Crew is asleep now and have been for a few hours, have about almost 6 hours remaining in their sleep period, get to sleep in an hour and a half late in the morning, due to the fact that we're coming in one orbit later than we originally schedule in the crew activity plan. Tomorrow is entry day, crew will fire the OMS engines to slow the Spacecraft down at about 10:10 a.m. Central Daylight time and deorbit burn will reduce the Spacecraft velocity by 308 feet per second bringing it in from it's current orbit of 175 by 160 nautical miles. Blackout during entry will begin at 10:42 a.m. Central Daylight time and end at 10:56, touchdown on the concrete runway at Edwards Airforce Base, California is estimated for 11:10 a.m. Central Daylight time. At the end of this 7 day flight, Columbia will have covered an estimated 2,922,000 statute miles. Crew is currently scheduled to be greeted by President and Mrs. Reagan as they step down from the Spacecraft tomorrow. 6 days, 10 hours, 5 minutes mission elapsed time, this is Mission Control Houston.

PAO Mission Control Houston, 6 days, 11 hours, 42

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minutes mission elapsed time. Columbia has just passed out of the range of the Guam tracking station and data coming down from the Spacecraft indicates all systems are in good shape at this time. Flight Controllers here in Mission Control are currently reviewing updates to the crew activity plan, which will be shipped up via the teleprinter and will be ready for the crew when they start their day in a little over 4 hours. The Granite team of Flight Controllers currently on station here in Mission Control is in their last shift during STS-4 and they're looking forward to getting off duty here and, in the morning watching the Columbia come in, scheduled for it's landing at about 11:10 a.m. Central Daylight time on the dry, probably the concrete runway at Edwards Air Force Base. At 6 days, 11 hours, 43 minutes mission elapsed time, this is Mission Control Houston.

END OF TAPE

PAO daylight time on the, probably the concrete runway at Edwards Air Force Base. At 6 days, 11 hours, 43 minutes, mission elapsed time, this is Mission Control, Houston.

PAO Mission Control, Houston, 6 days, 12 hours, 4 minutes, mission elapsed time. All is quiet aboard the spacecraft, Columbia at this hour. And Mission Control, the flight controllers are preparing the telprinter messages to go up to the crew, listing Sunday's activities, preparation for deorbit and entry and landing at Edwards Air Force Base about 11:10 central daylight time tomorrow morning. The previously scheduled change of shift briefing or press conference for the early morning hour Sunday, with the offgoing Granite Team, flight director, John Cox, maybe cancelled. Considering cancelling that briefing for lack of press interest, and we'll announce that decision in about 30 minutes. 6 days, 12 hours, 5 minutes, mission elapsed time, this is Mission Control, Houston.

PAO Mission Control, Houston, 6 days, 13 hours, 7 minutes, mission elapsed time. Spacecraft Columbia is currently on orbit number 105. Crew has almost 3 hours remaining in the sleep period. We're about an hour away from the next pass over a ground tracking station where flight controllers will see data from the spacecraft, but everything has been going well up to now throughout the night. Systems onboard continue to function normally. Just a reminder that the change of shift press conference with the offgoing Granite flight director, Granite Team flight director, John Cox, scheduled for the early morning hours, Sunday morning has been cancelled due to lack of interest. That briefing again has been cancelled. 6 days, 13 hours, 8 minutes, mission elapsed time, this is Mission Control, Houston.

CAPCOM Columbia, Houston.

SPACECRAFT Good morning, sir.

CAPCOM We know you're not up yet, T.K., but we wanted to get a word a to you. We do not want you to purge fuel cell number 1 when you do your fuel cell purge this morning. We've seen the TCE go transient low on us several times, and we just as soon not purge that one this morning. We'll see you at IOS for wakeup.

SPACECRAFT Thank you.

PAO This is Shuttle Control at 6 days, 16 hours, mission elapsed time. This is wakeup time aboard Columbia. And Mission Control Center will give them a call in about 2 minutes 40 seconds at the Indian Ocean station. There has been an antenna failure at IOS, problem in moving the antenna, but we expect to get some communications there. CAPCOM, Brewster Shaw,

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did talk to the crew briefly at Bermuda on this pass, asking them not to purge the fuel cell on schedule, that transient had been noticed on the ground and preferred not to purge that cell prior to entry. That call came about 30 minutes before the official wakeup time. The Mission Control center is properly decorated for this Independence Day, American flags at the consoles and a helium balloon decorated with stars and stripes tattered to the capcom console. Also it appears to be a paper version of an Uncle Sam's hat setting on top of the CAPCOM console. We should be coming up on acquisition through the Indian Ocean station shortly, we'll standby.

PAO This is Shuttle Control, we are receiving S-band telemetry downlink through the Indian Ocean station. The antenna failure, so far, has prohibited UHF uplink voice.

END OF TAPE

PAO This is Shuttle Control we are receiving S-Band telemetry downlink through the Indian Ocean station. The antenna failure so far is prohibited UHF uplink voice. We'll continue to standby.

PAO This is Shuttle Control. Columbia's out of range of the Indian Ocean station now. No success with voice communications there because of antenna problem at the tracking station, we did receive telemetry from the vehicle. Next acquisition through Yarragadee in eight and a half minutes. Columbia is in orbit number 107, at 6 days, 16 hours, 9 minutes mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 6 days, 16 hours, 17 minutes mission elapsed time. Shuttle coming up on acquisition through Yarragadee. (Wakeup music - This is my Country).

SPACECRAFT Good morning again.

CAPCOM Good morning, Columbia, Houston with you through Yarragadee for 4 more minutes.

SPACECRAFT Alright sir, we're finishing our (garble). Maybe you can tell me (garble).

CAPCOM You're breaking up, T.K., say again please.

SPACECRAFT When we took the gas sample, got a little vacuated bottle, it took one deep breath and coughed.

CAPCOM Standby one. We're looking into that, T.K., in the meantime I've got a couple of quick notes for you.

SPACECRAFT Go

CAPCOM Roger sir, there's a possibility of getting some stars of opportunity this morning. So we'd like you to cycle the shutters on the star trackers through manual open and back to auto and ensure they're in star track mode, and do a spec 21 and resume and we'll see if we can get the stars.

END OF TAPE

SPACECRAFT (Garble) Go.

CAPCOM Roger, sir. There's a possibility of getting some stars of opportunity this morning, so we'd like you to cycle the shutters on the star trackers through manual open and back to auto and insure they're in star track mode and do a spec 21 and resume and we'll see if we can get some stars.

SPACECRAFT Okay. What else?

CAPCOM We'd like to turn off the tacans and let them cool down a little bit and then we'll turn them back on at the normal time in the Deorbit Prep.

SPACECRAFT Okay. Sorry about that. What else?

CAPCOM Okay. I have a CRT timer if you're ready to copy.

SPACECRAFT Go ahead.

CAPCOM Roger. Item 17 plus 00 plus 10, plus 00. Over.

SPACECRAFT Already set. Thank you.

CAPCOM Okay. You're way ahead of us. And, T.K., on the gas sample, the only suggestion we can offer is to confirm that the small knob is tight and other than that we don't think we can help you out.

SPACECRAFT I was just pulling your chain. We figure that if we don't smell them, whoever comes in will.

CAPCOM I guess we're a little slow this morning.

CAPCOM And Columbia, Houston, if you've not already done the water dump this morning, you do not need to do so. There's no water dump required.

SPACECRAFT Okay. Thank you.

CAPCOM Columbia, Houston, we're going to have a minute break in COMM. We'll see you over Orroral.

SPACECRAFT Okay. See you then.

CAPCOM Columbia, Houston, with you for 5 more minutes.

SPACECRAFT Okay. Loud and clear.

CAPCOM You're 5 by as well.

CAPCOM Columbia, Houston, we see both star trackers were

target suppressed. After you get in darkness, we'd like you to cycle the shutters, and we'll see you over the states at 17:02.

SPACECRAFT Okay, Brewster. We'll do it.

CAPCOM Roger. See you then.

PAO This is Shuttle Control. Orroral Valley has loss of signal now. Next acquisition is through Merritt Island in 30 minutes. Ignition clock is now counting. We're 7 hours, 37 minutes away from the deorbit maneuver. At 6 days, 16 hours, 32 minutes Mission Elapsed Time. This is Shuttle Control, Houston.

PAO This is Shuttle Control. It's 6 days, 17 hours, 2 minutes Mission Elapsed Time. Columbia is in orbit 108 coming up on acquisition through Merritt Island, Florida.

CAPCOM Columbia, Houston, through the states for 11 minutes. Standing by.

SPACECRAFT Loud and clear, Brewster.

CAPCOM Roger.

SPACECRAFT Listen, we got a question on the call out for the vacuum vent nozzle heater, getting that turned off early. If we do that now, does that prevent us from using any of the facilities.

CAPCOM Stand by. We'll find out.

CAPCOM Henry, the answer to your question is yes, it will prevent that and you can wait until later to do it and we'll give you a reminder before seat ingress.

SPACECRAFT Okay. Would you do that please?

CAPCOM You bet.

CAPCOM Columbia, Houston, we see good star data in the table. You may torque on those stars and then go to tail sun at your convenience.

SPACECRAFT Did you say we got stars on table and clear to torque now?

CAPCOM That's affirmative.

SPACECRAFT Do you have (garble)?

CAPCOM Yes. We have them.

CAPCOM Columbia, Houston, in order to keep the sun out of your eyes, if you refer to page 4-130 of the CAP and use that

tail sun attitude, it would help you out.

SPACECRAFT Okay. Page 4-130. Wilco.

CAPCOM Columbia, Houston, Dakar at 18.

SPACECRAFT Okay. See you then.

PAO This is Shuttle Control. Bermuda has loss of signal. Columbia will next be acquired at Dakar in 4 minutes...

END OF TAPE

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CAPCOM Columbia, Houston, Dakar at 18.

SPACECRAFT Okay see you there.

PAO This is Shuttle Control, Bermuda has loss of signal. Columbia will next be acquired at Dakar in 4 minutes they'll be overlapping coverage at the Madrid station. At 6 days, 17 hours, 15 minutes mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 6 days, 17 hours, 18 minutes mission elapsed time. Dakar will acquire Columbia shortly.

CAPCOM Columbia, Houston, for 5 minutes.

SPACECRAFT Loud and clear.

CAPCOM Roger. Columbia, Houston, we're 20 seconds LOS. Indian Ocean is next at 37.

SPACECRAFT Okay see you there.

PAO This is Shuttle Control, loss of signal through Dakar and Madrid. Columbia now moving down across Africa towards acquisition at the Indian Ocean station in twelve and a half minutes. At 6 days, 17 hours, 25 minutes mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 6 days, 17 hours, 37 minutes mission elapsed time. Columbia coming up on acquisition through the Indian Ocean station.

CAPCOM Columbia, Houston, with you through Indian Ocean for 8 minutes.

CAPCOM Columbia Houston with you through Indian Ocean for 7 minutes.

CAPCOM Columbia, Houston, how do you read? Over.

SPACECRAFT Hello there.

CAPCOM Roger, you're five by. We're having some antenna problems at Indian Ocean, just wanted to make sure we had good call.

SPACECRAFT Okay. Sure my (garble) get up early.

CAPCOM Yes, sir. Columbia, Houston, we're 30 seconds LOS see you at Yarragadee at 53.

SPACECRAFT Okay

PAO This is Shuttle Control, Indian Ocean station had loss of signal. Next acquisition through Yarragadee in 6 minutes. At 6 days, 17 hours, 47 minutes mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 6 days, 17 hours, 52 minutes. Columbia about 20 seconds away from acquisition through Yarragadee.

CAPCOM Columbia Houston with you through Yarragadee for 9 minutes.

SPACECRAFT Loud and clear.

CAPCOM Roger, you're loud and clear, we're standing by.

SPACECRAFT Just getting a bite of breakfast now.

CAPCOM That's a great idea. Columbia Houston, 30 seconds LOS we'll pick you up in about a minute over Orroral.

SPACECRAFT Okay see you there.

CAPCOM Columbia Houston with you through Orroral for 5 minutes.

SPACECRAFT Okay, what's the (garble)

CAPCOM Roger, we're sending you two teleprinter messages, 71 Charlie and 77 Delta, that's for your Entry Checklist updates and deorbit updates. They're not too extensive and we think that's the end of it.

SPACECRAFT Okay, it's the last night.

CAPCOM Columbia Houston 30 seconds LOS see you over the States at 37.

SPACECRAFT Okay.

PAO This is Shuttle Control, Columbia's out of range of Orroral now, coming up over the Pacific Ocean toward acquisition Merritt Island in 29 minutes. Crew having breakfast aboard Columbia at the present time. At 6 days, 18 hours 8 minutes mission elapsed time, this is Shuttle Control, Houston.

END OF TAPE

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PAO but acquisition through Merritt Island in 29 minutes. Crew having breakfast aboard Columbia at the present time. At 6 days, 18 hours, 8 minutes, mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control, at 6 days, 18 hours, 37 minutes, mission elapsed time. Columbia is about to be acquired through Merritt Island.

CAPCOM Columbia, Houston, with you over the states for 12 minutes.

SPACECRAFT Alright, loud and clear.

CAPCOM Roger, You're five by.

SPACECRAFT Houston Columbia?

CAPCOM Go ahead.

SPACECRAFT Okay to go ahead and get the OEX power on now so we can put our CAPS away?

CAPCOM Affirmative.

SPACECRAFT Okay. And Columbia?

CAPCOM Go ahead.

SPACECRAFT We've misplaced message, 6 Charlie. Had something to do with the post landing change of the checklist. Could you read that to us, please?

CAPCOM That's affirmative. I'll read it to you over Dakar, if that's okay. We have about 1 minute to LOS here and we'll be at Dakar at 54.

SPACECRAFT Okay, that'll be fine.

CAPCOM And if it's convenient, I have one switch for you on panel R12?

SPACECRAFT Okay, I'm about right there.

CAPCOM Okay, we'd like for you to take fuel cell 1 purge valve to GPC.

SPACECRAFT (garble)

CAPCOM Thank you.

SPACECRAFT (garble)

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CAPCOM Roger, fuel cell 1 purge valve to GPC.

SPACECRAFT Thank you.

CAPCOM See you at Dakar at 5 4.

SPACECRAFT We had that off so we wouldn't purge, a fuel cell 1 when we did the purge.

CAPCOM Roger, it's just a clean up item that we missed and I forgot to remind you of.

PAO This is Shuttle Control, Columbia has moved out of range at Bermuda. Out over the mid Atlantic, next station Dakar in 2 and a half minutes. At 6 days, 18 hours, 51 minutes mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control, Columbia's around 30 seconds away from acquisition through Dakar.

CAPCOM Columbia, Houston, with you through Dakar for 8 minutes, and we are resending teleprinter message 6 Charlie at Dakar.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, 30 seconds LOS, see you at Indian Ocean at 1 3.

SPACECRAFT Okay.

PAO This is Shuttle Control, loss of signal at Dakar, next acquisition through the Indian Ocean station in 10 and a half minutes. We're 5 hours, 6 minutes, 53 seconds away from deorbit ignition. At 6 days, 19 hours, 3 minutes, mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 6 days, 19 hours, 13 minutes. Columbia about 20 seconds away from acquisition through the Indian Ocean station.

CAPCOM Columbia, Houston, with you at Indian Ocean for 7 and 1 half minutes.

CAPCOM Columbia, Houston, with you through Indian Ocean for 6 minutes.

SPACECRAFT Okay, loud and clear.

CAPCOM Roger, you're loud and clear. Columbia, Houston, 30 seconds LOS, see you at Yarragadee at 2 9.

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SPACECRAFT Okay.

PAO This is Shuttle Control, Columbia is beyond the range of Indian Ocean station, now. Next acquisition through Yarragadee in 7 minutes. At 6 days, 19 hours, 22 minutes, mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 6 days, 19 hours, 28 minutes, mission elapsed time. Columbia approaching acquisition through Yarragadee.

END OF TAPE

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PAO This is Shuttle Control at 6 days, 19 hours, 28 minutes Mission Elapsed Time. Columbia approaching acquisition through Yarragadee.

CAPCOM Columbia, Houston, with you through Yarragadee for 8-1/2 minutes.

SPACECRAFT Okay. Loud and clear.

CAPCOM Roger. You're loud and clear.

CAPCOM Columbia, Houston, 15 seconds LOS. See you at Orroral in 1 minute.

SPACECRAFT (garble).

CAPCOM Columbia, Houston, at Orroral for 2 minutes.

SPACECRAFT (Garble).

CAPCOM And Columbia, I have the MET times for your IMU attitude align maneuver and top sun maneuver if you want to mark up your Deorbit Prep now, or I can hold them til later.

SPACECRAFT Stand by a second, I'll get it.

CAPCOM Roger.

SPACECRAFT Okay, Roy, I'm ready.

CAPCOM Roger, and T.K., are you on the flight deck?

SPACECRAFT That's affirm.

CAPCOM Roger. Could you first put on panel L2 the high load duct heater to A/B? I'm sorry, that's on panel L1.

SPACECRAFT Got it.

CAPCOM Okay. On page 315 of your Deorbit Prep, the time for your auto maneuver to the IMU attitude is MET 6 days, 21 minutes, ...21 hours and 23 minutes.

SPACECRAFT Okay. I just got my page here. The time is...

CAPCOM Six days, 21 hours, 23 minutes, and the next page, 6 days (garble).

SPACECRAFT (garble). Is that the initiate time you're putting down there?

CAPCOM That's affirmative, and we'll see you at Buckhorn

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at 07.

SPACECRAFT Alright.

PAO Orroral has loss of signal. Columbia is near the
end of orbit 109. Will begin orbit 110 before we next acquire at
the Buckhorn, California Station in 25 minutes. Four hours, 27
minutes away from deorbit ignition. At 6 days, 19 hours, 42
minutes Mission Elapsed Time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 6 days, 20 hours, 6
minutes Mission Elapsed Time. Columbia is about 20 seconds away
from acquisition through Buckhorn.

CAPCOM Columbia, Houston, with you through Buckhorn for 6
minutes.

SPACECRAFT Okay. Loud and clear.

CAPCOM Roger. You're 5 by.

CAPCOM Columbia, Houston, you have a go for payload bay
door closing.

SPACECRAFT Okay, sir. Thank you.

CAPCOM And, Columbia, if you have a moment if anybody is
on the flight deck, I have one switch on panel L1.

SPACECRAFT Okay.

CAPCOM I need the high load duct heater to A.

SPACECRAFT Duct heater to A.

CAPCOM Affirmative.

SPACECRAFT (garble).

CAPCOM Columbia, Houston, we're 30 seconds LOS. Pick you
up at MILA in about a minute.

SPACECRAFT Okay. Talk to you there.

CAPCOM Columbia, Houston, back with you through MILA for
12 minutes.

SPACECRAFT Okay. Loud and clear.

CAPCOM Roger, and you're loud and clear.

SPACECRAFT I'll have to copy that IMU attitude you handed

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down, maneuver time.

CAPCOM Roger. Hank, on page 315, middle of the page.

SPACECRAFT Ready.

CAPCOM Okay, 6 days, 21 hours, 23 minutes.

SPACECRAFT Those attitudes still good?

CAPCOM Affirmative. And Hank, on the next page, 317, the middle of the page, I'll give you your too sun attitude maneuver time if you like.

SPACECRAFT Okay.

CAPCOM Okay. Six days, 21 hours, 51 minutes.

SPACECRAFT Okay, 6 days, 21, 51. That attitude, I guess, is still good.

END OF FILE

SPACECRAFT Okay.

CAPCOM Okay, 6 days, 21 hours, 51 minutes.

SPACECRAFT Okay, 6 days, 21, 51. Attitude, I guess, is still good.

CAPCOM That's affirmative. Columbia, Houston, and Hank, if you finish the IMU alignment and you want to go to top sun attitude earlier than the time I gave you, that would be okay.

SPACECRAFT Okay, Roy, thank you.

CAPCOM Columbia, Houston, Hank, we've noticed that the time typed in is a little off. It should be 6 days, 21 hours, and 23 minutes.

SPACECRAFT Thank you, Roy.

CAPCOM Roger, 6 days, 21 hours, and 23 minutes for the IMU attitude.

SPACECRAFT Okay, I must have copied it wrong.

CAPCOM Maybe I read it wrong, sorry about that. Columbia, Houston, 30 seconds LOS, Dakar is next at 29.

SPACECRAFT Okay, sir, thank you.

PAO This is Shuttle Control, Bermuda has loss of signal. Next station is Dakar in 2 and a half minutes. Columbia has a go for payload bay door closing. That activity will begin in approximately 30 minutes. Scheduled to start on this orbit down near Botswana LOS. We'll standby for Dakar acquisition.

CAPCOM Columbia, Houston, with you at Dakar for 9 minutes.

SPACECRAFT Clear.

CAPCOM And you're loud and clear. Columbia, Houston, 30 seconds LOS, Botswana's next at 49.

SPACECRAFT Okay, we're waiting. Got 1 suited, and 1 halfway.

CAPCOM Great, looks like you're running right on the line then.

SPACECRAFT A little slow on the suiting, but we'll get caught up here.

PAO This is Shuttle Control, Dakar has loss of signal. Botswana next in 9 minutes. The crew in the process of

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donning pressure suits for reentry. Shortly we'll be start closing the payload bay doors. Flight director Harold Draughn has decided to delay runway designation until Guam, after the deorbit ignition. Crosswinds on runway 17 are right at the 10 knot level, which is below low point that's desired. They are forecast to be at that same level at landing time. However, he prefers to wait to Guam to get observed velocities of winds rather than forecast, get actual observe velocities. If the winds meet the crosswinds criteria, we'll go to runway 17. If they do not, we'll go to the hard surface concrete runway, 22. That decision will be made at Guam, after deorbit. We're 3 hours, 28 minutes from deorbit ignition. At 6 days, 20 hours, 41 minutes, mission elapsed time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 6 days, 20 hours, 47 minutes, mission elapsed time. Columbia approaching acquisition through Botswana.

CAPCOM Columbia, Houston, with you at Botswana for about 30 seconds. Yarraquadee is next at 05.

END OF TAPE

CAPCOM Columbia, Houston, with you at Botswana for about 30 seconds. Yarragadee is next at 05.

PAO Loss of signal at Botswana, Yarragadee is next in 15 minutes. At 6 days 20 hours 50 minutes mission elapsed time this is Shuttle Control Houston. This is Shuttle Control at 6 days 21 hours 5 minutes mission elapsed time. Shuttle coming up on acquisition at Yarragadee.

CAPCOM Columbia, Houston, through Yarragadee for 8 and 1/2 minutes.

SPACECRAFT Hello there.

CAPCOM And we hear you five by TK.

SPACECRAFT Okay, just to make everybody feel good, we got the port door closed, forward and aft locked. Just waiting to bring the starboard in on time.

CAPCOM Well that's good news, we're not surprised, but we're happy it worked out nominally.

SPACECRAFT I knew you wouldn't be surprised. We weren't either. And we got 2 suited guys floating around, and we're just seating here waiting for the times to move onto the next step.

CAPCOM Great.

SPACECRAFT Hello Houston, Columbia.

CAPCOM Go ahead. Columbia, Houston, go ahead. Columbia, Houston, how do you read?

SPACECRAFT Read you loud and clear now Roy. I just closed the starboard door, and it went nominal. I closed, well let me try it one more time here - -

CAPCOM TK, we're 55 seconds LOS.

SPACECRAFT Okay, and we're in good shape.

CAPCOM Roger, we'll see you at Hawaii at 3 1.

PAO This is Shuttle Control. Yarragadee has loss of signal. Next station is Hawaii in 17 and 1/2 minutes. Commander T. K. Mattingly reporting the payload bay door closing going fine. Those doors now closed. Both crewmen suited, at 6 days 21 hours 14 minutes mission elapsed time this is Shuttle Control Houston. This is Shuttle Control, flight dynamics officer Willis Bolk has generated some later entry lapse time predictions. The deorbit time remains the same, 7 days 10 minutes, entry interface

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7 days 40 minutes 23 seconds, at a velocity of 24,438 feet per second, and altitude of 411,273 feet and a range the landing sight of 3,815 miles. Begin blackout at 7 days 42 minutes 42 seconds at a velocity of 24,532 feet per second, and altitude of 327,947 feet, and range to go of 3,276 miles. End blackout at 7 days 56 minutes 44 seconds at a velocity of 12,269 feet per second, altitude 175,275 feet, range to go 496 miles, and touchdown at 7 days 1 hours 11 minutes. This plot is targeted for runway 22 if a decision is made to go to 17, the landing time could change by as much as 1 minute by the reports.

END OF TAPE

PAO We're a little over 2 minutes away from acquisition through Hawaii, we'll stand by for that pass.

PAO This is Shuttle Control at 6 days 21 hours 31 minutes, Mission Elapsed Time. Hawaii should be acquiring Columbia any minute.

CAPCOM Columbia, Houston, with you through Hawaii for 7 minutes.

SPACECRAFT Hello there.

PAO This is Shuttle Control, telemetry shows that both doors are closed and latched.

SPACECRAFT (garble) can hear it, now it does.

CAPCOM Columbia, Houston, if it's convenient for one of you, we'd like a GNC spec 1 for variable parameters.

SPACECRAFT Okay, as soon as we finish alignment, you got it.

CAPCOM Okay, thank you.

SPACECRAFT You see the angles, Houston?

CAPCOM Stand by one. We have the angles Hank, and they look good.

SPACECRAFT Okay. CRT 3.

CAPCOM Thank you Hank.

CAPCOM Columbia, Houston, the CRT is yours.

SPACECRAFT Okay sir, thank you. (garble) do you want to torque these.

CAPCOM Negative.

SPACECRAFT Trying to (garble) Houston, disregard.

CAPCOM Copy.

CAPCOM Columbia, Houston, see you over the states at 42, we'll have the pads and the deorbit burn flight rules for you.

SPACECRAFT Okay.

PAO This is Shuttle Control, Hawaii has Loss Of Signal. Buckhorn will pick up Columbia in less than a minute, we'll stand by.

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CAPCOM Columbia, Houston, with you through the states for 19 minutes.

SPACECRAFT Loud and clear.

CAPCOM Roger.

SPACECRAFT Houston, you ready to read some pads?

CAPCOM Yes sir, which one would you like first?

SPACECRAFT Got the del pad ready.

CAPCOM Okay, the del pad follows, burn attitude 155 130 345, 177 HP all balls, 308.8, 252, propellant all balls 200 left OMS HP 118, 123 85 10 20 69 29, dump to 0 percent ox, XCG 1093.3, -0.5, over.

SPACECRAFT Okay, I copy 155 130 345 177 all balls, 308.8, 252 all balls, 2 minutes, 118 123 85 10 20 69 29, (garble) ox to 0, 1093.3, -0.5.

CAPCOM That's a good read back Henry, continuing inertial attitude 186 001 029, left 000, Guam AOS EI -10, LOS EI -4. Altimeter 2997, 00 44 35 11 400, left hand turn Edwards, 22 at 50K, 255 at 20, 250 at 40, 225 at 50, 225 at 40, 255

END OF TAPE

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CAPCOM Left hand turn, Edwards 2-2 at 50K, 255 at 20, 250 at 40, 225 at 50, 225 at 40, 255 at 20, on the surface, 255 at 06, APU start 2 then 1, over.

SPACECRAFT Okay, 186, 001, 029 all balls. CI-10, EI-4, 2997004435, 11400, left turn Edwards 22, 255 at 20, 250 at 40, 225 at 50, 225 at 40, 255 at 20, 255 at 6, ALT PU start sequence 2 then 1.

CAPCOM That's good readback and maneuver pad next.

SPACECRAFT Okay, go ahead.

CAPCOM Roger. Oms both TV roll, 180 + 0.3, -5.7, +5.7, 218581, 007, 0010 all balls. CI is 14879 -0.5998, 065.832, 124.237 propellant is all balls, pic 7 is not applicable.

SPACECRAFT Okay, I have both engines 180 + 0.3, -5.7, +5.7, 218581, 007, 0010 all balls. 14879, -.5998, 65.832, 124.237 all balls, the rest is A.

CAPCOM Good readback. Burn attitude follows. 155, 130, 345, 3816, 2729 delta v total, 0308.8, TGO 0252, VGO x +0297.59, y all balls, z +082.61, HA is 177, HP all balls, over.

SPACECRAFT 155, 130, 345, 3816, 2729, 308.8, 2 minutes 52 seconds, +297.59, all balls, +082.61, 177 by 0.

CAPCOM Roger, that's a good readback and we can go over the deorbiter burn flight rules if you like.

SPACECRAFT Sure, I'd like to clarify those things which constitute (garble) after ignition. Okay, Brewster it's pre TIG where we got the one orbit call I presume, only the 1 day rules apply.

CAPCOM That's affirmative, T. K. Pre TIG under 1 day. X's go, X's go after APU hydraulics. DPS redundant set, BSS 2 av bay fans in bay 2, 2 main buses, IMU dilemma, 2 IMU's, 2 AA's and RGA's, 4 BFS, port payload bay door limits, under oms propellant
--

SPACECRAFT You're cutting out there, Houston.

CAPCOM Okay, stand by 1. Okay, T. K. I'll pick up at under the MEC ...

SPACECRAFT I followed you up. I'm through IMU dilemma.

CAPCOM Okay, fine. Next x under 2 IMU's, then 2 AA's and RGA's, and that's for the BFS, under the MEC line under oms propellant tank, del pads last burn card and ignition. Neither

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engine ignites. Then under aft PCS for propellant leak after Ascension, over.

SPACECRAFT Okay, so the new x's are put in my card from the one we had before starting from the top of the APU hydraulics gets an x?

CAPCOM That's affirm.

SPACECRAFT I added one for 2 AA and RGA's.

CAPCOM That's affirm.

SPACECRAFT I added one for propellant tank values use for no ignition. And a propellant leak after Ascension.

END OF TAPE

CAPCOM Over.

SPACECRAFT Okay, so the new X's I put in my card from the one we had before, starting from the top on the APU hydraulic gets an X.

CAPCOM That's affirm.

SPACECRAFT I added one for 2 AAs and RGAs.

CAPCOM That's affirm.

SPACECRAFT Added one for the propellant tanks and IUs for a no ignition, and a propellant leak after Ascension.

CAPCOM That's correct, and there are no new X's under the post TIG column.

SPACECRAFT Okay sir, thank you very much. What would you think about going to OPS 3?

CAPCOM You are go for OPS 3. Columbia, Houston, the forward RCS leak message is F5L, and it's just cooling down, no action required.

SPACECRAFT Okay, I closed the manifold, do you want me to open it back up?

CAPCOM No, leave it closed. Columbia, Houston, see you at Dakar at 0 7.

SPACECRAFT Okay.

PAO This is Shuttle Control, Columbia has moved out of range of the Bermuda station. Next acquisition through Dakar in 5 minutes, and there will be overlapping coverage through the Ascension Island station. Columbia's crew has a go to transition to OPS 3. That's the deorbit and entry computer program onboard, and CAPCOM Brewster Shaw on this long pass over the continental United States passed up information the crew needs for the deorbit maneuver. That maneuver will utilize both OMS engines. A 2 minute duration burn with a delta V, or change in velocity of 308.8 feet per second. It's a retrograde burn resulting orbit targeted is 177 by 0 nautical miles. Columbia's 2 hours 6 and 1/2 minutes away from the deorbit burn. At 6 days 22 hours 3 minutes mission elapsed time this is Shuttle Control Houston. This is Shuttle Control at 6 days 22 hours 7 minutes mission elapsed time. Columbia coming up on acquisition through Dakar now.

CAPCOM Columbia, Houston, through Dakar and Ascension for 10 minutes.

SPACECRAFT Okay sir.

CAPCOM And configure AOS.

SPACECRAFT Got it.

CAPCOM Columbia, Houston, we'd like to configure AOS please.

SPACECRAFT Okay, configure AOS or LOS?

CAPCOM AOS, as in alpha.

SPACECRAFT Okay, you got it.

CAPCOM Thank you. Columbia, Houston, Botswana at 2 1, and configure LOS.

SPACECRAFT Okay sir.

PAO This is Shuttle Control, Ascension has loss of signal with Columbia, next acquisition through Botswana in 2 and 1/2 minutes.

CAPCOM Columbia, Houston, for 8 minutes.

SPACECRAFT Okay, - Columbia.

CAPCOM Go ahead.

SPACECRAFT Okay, I just wanted to switch (garble) on the back end and back on panel R13, the payload bay door talkback is barberpole, is that somehow connected with the fact that we'd powered it off, the power to that thing with - was SPEC 202, OPS 202?

CAPCOM Standby one.

SPACECRAFT My picture list said it should indicate closed.

CAPCOM We're checking. Columbia, Houston, we're 20 seconds LOS, we'll pick you up at Yarragadee at 4 1, and have an answer for you.

SPACECRAFT Okay.

PAO This is Shuttle Control, Botswana has loss of signal, next acquisition through Yarragadee in 12 minutes.

END OF TAPE

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CAPCOM Columbia, Houston, we're 20 seconds LOS, we'll pick you up at Yarragadee at 41 and have an answer for you.

SPACECRAFT Okay.

PAO This is Shuttle Control, Botswana has Loss Of Signal, next acquisition through Yarragadee in 12 minutes. The crew right on the timeline in deorbit preparations, deorbit maneuver scheduled 1 hour 40 minutes from this time. At 6 days 22 hours 30 minutes Mission Elapsed Time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 6 days 22 hours 41 minutes Mission Elapsed Time. Columbia coming within range of the Yarragadee station now.

CAPCOM Columbia, Houston, through Yarragadee for 7 minutes, over.

SPACECRAFT Okay, we're climbing in the seats now Brewster.

CAPCOM Okay, T. K. we copy, the last time we looked at the doors everything looked nominal to us, we think they're all latched up and closed. If you want to check a CRT display it's on BFS SM 63.

CAPCOM Columbia, Houston, Guam at 56.

SPACECRAFT Okay, see you there.

CAPCOM Roger.

PAO This is Shuttle Control. Columbia out of range at Yarragadee, moving toward acquisition through the Guam station in 6 and 1/2 minutes. Ken Mattingly and Hank Hartsfield in the seats now reviewing the deorbit procedures. We have a report from the Dryden Flight Research facility in California, the landing site for Columbia. As of 6:30 am, Pacific daylight time, the estimate was that 67,000 vehicles and 305,000 people had assembled to view Columbia's landing. That's as of 6:30 am that that big a crowd had assembled. Columbia now 1 hour and 19 minutes away from deorbit. Guam in about 5 minutes, at 6 days 22 hours 50 minutes Mission Elapsed Time, this is Shuttle Control, Houston.

PAO This is Shuttle Control at 6 days 22 hours 55 minutes Mission Elapsed Time. Columbia about 15 seconds away from acquisition through Guam. Columbia will begin orbit number 112 during this pass at Guam.

CAPCOM Columbia, Houston, through Guam for 3 minutes, configure AOS.

SPACECRAFT Loud and clear.

CAPCOM Roger.

CAPCOM Columbia, Houston, fuel cell 1 is in good shape, but we're going to send some TMBUS to keep you from getting further alarms.

SPACECRAFT Okay, I appreciate that, we had had a few hits on that x and temp.

CAPCOM Roger.

CAPCOM Columbia, Houston, Hawaii at 07 configure LOS.

SPACECRAFT Okay, Brewster.

NASA 946, Houston.

NASA 946 Houston 946, over.

CAPCOM Read you five by go ahead.

NASA 946 Here is a wind update, the surface winds are still pretty low, we were unable to get those. 2000 ft winds, 24022, 7000 ft, 22924, 10,000 24032, 15000 24338, 20,000 23244, 25000 23043, 30,000 255 at 35, at 35,000 240 at 34, and those are in true and they're above ground level.

CAPCOM Copy.

NASA 946 We made one pass at runway 22, they made us level off 5000 ft because of the traffic, the (garble) are not on, the MLS was working okay, both channel 92 and 111 are working fine.

CAPCOM Copy.

END OF TAPE

SPACECRAFT Copy.

NASA 946 We made one, pass as runway 22. They made us wave off at 5000 feet because of the traffic. The papies are not on, the bellows is working on okay. Both channel 92 and 111 are working fine.

CAPCOM Copy.

NASA 946 The thing about the winds that you have to take into account is 1000 fast winds. While we measured on takeoff but you can't really believe, that 300 foot winds are reading 260 at 17 a thousand footers 260 at 20, 2000 footers 240 at 22, 3000 footers 255 at 17 even though the surface wind is very low. The - looks like you got effective wind component head wind of maybe 15 knots which is good.

CAPCOM Okay, we copied that.

NASA 946 The weather is clear. It's clear out to the mountains and it's clear up in the upper valley or upper by Bakers Field, there is a fault bank over on the other side - as usual, in the LA Basin.

CAPCOM Roger.

NASA 946 The only clouds that are - which are of no consequence are east of us.

CAPCOM Roger.

NASA 946 Going to check in Charlie and see if we can get the papies turned on. Maybe it's just an oversite.

CAPCOM Roger, we copy that. And we assume you're going to make a pass to 17?

NASA 946 That's affirm. There's a lot of 30 or 40 airplanes out here and we're sort of weaving in our way around them.

CAPCOM Roger, we understand.

PAO This is Shuttle Control. That was chief astronaut John Young flying NASA 946, one of the Shuttle training aircraft. A gulfstream 2 ...

CAPCOM and I'll talk to you again in about 30 minutes after the CONUS pass.

NASA 946 Okay, we haven't gotten any surface winds off the from the people on the ground there, out of on the lakebed.

CAPCOM Okay, we copy that. We show the winds coming up a little bit after sunrise about 5 knots.

NASA 946 Okay, what winds are you getting down there now?

CAPCOM The anemometer winds taken into coordinates for runway 17 where were 5 on the head and 5 across.

NASA 946 Okay.

CAPCOM And at touchdown, -2 1/2 the last we got were 220 at 7.

NASA 946 Rog.

PAO This is Shuttle Control. That was John Young first report after shooting a landing approach in the Shuttle training aircraft on runway 22. He'll continue to shoot approaches on both 22 and 17 and we'll update ...

NASA 946 546, we'll get back with you here on the next run, thank you.

CAPCOM Roger. We have AOS with Columbia in 2-1/2 minutes.

NASA 946 (garble).

PAO Young will give the Mission Control Center here in Houston, updates on weather and winds on both runways. That information will be incorporated into a decision whether we'll try for crosswind landing. We're getting here in the Control Center now in Houston a television picture from Dryden Flight Research Facility the convoy is underway moving out into position for a runway 22 landing. Columbia is on orbit 112, a minute and a half away from acquisition through Hawaii. This is the last scheduled full orbit of the Earth for Columbia on this mission. Deorbit coming 1 minute and 1 hour 3 minutes 42 seconds from this time. Columbia's about 1 minute away from acquisition in Hawaii. We'll standby for that.

CAPCOM Columbia, Houston. Hawaii for 8 minutes. Configure AOS.

SPACECRAFT Hello there.

CAPCOM Columbia, Houston. Buckhorn at 17 and T. K. we're still planning on runway 22 although we are watching the winds closely and we would go to 17 no later than Guam if they pickup for the crosswind.

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SPACECRAFT Okay, it's your call. We're ...

END OF TAPE

CAPCOM Columbia, Houston, Buckhorn at 17, and TK we're still planning on runway 22, although we are watching the winds closely, and we would go to 17 no later than Guam, if they pick up for the crosswind.

SPACECRAFT Okay, it's your call, we're flexible.

CAPCOM Roger sir, the Edwards weather is clear now, it's a beautiful day out there, and we're keeping a close eye on the winds.

SPACECRAFT Okay, your timeline is working like a champ sir, thank you.

CAPCOM Roger.

PAO This is Shuttle Control, we're still getting telemetry data through Hawaii. Buckhorn acquisition in just over a minute, we'll continue to stand by for Buckhorn. CAPCOM Brewster Shaw has informed the crew that primary runway at this time is 22, but that we are continuing to watch the winds, we'll make a decision no later than Guam on the next pass.

CAPCOM Columbia, Houston, through the states, configure AOS. Columbia, Houston, through the states, configure AOS.

SPACECRAFT All right sir.

SPACECRAFT Houston (garble) and clear a COMM check.

CAPCOM Five by.

SPACECRAFT Okay sir, - approximately 5 or 6 minutes. Houston you're ready for a prestart check.

CAPCOM That's affirmative Hank.

SPACECRAFT Okay, I got 3 gray.

CAPCOM Henry, it looks good to us.

SPACECRAFT Okay, thank you.

NASA 946 NASA at 946 is setting up for runway 22, and we're about 3 minutes to high (garble)

CAPCOM NASA 946 clear UHF.

SPACECRAFT Houston, you ready for a gimbal check?

CAPCOM That's affirmative.

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NASA 946 Houston, radio check please.

CAPCOM Loud and clear. Columbia, Houston, we're going in to handover, we'll see you in a minute.

SPACECRAFT Okay sir.

CAPCOM Columbia, Houston, for 7 more minutes.

SPACECRAFT Okay, loud and clear.

CAPCOM Roger. Columbia, Houston, the gimbal check looked good on both primary and secondary.

SPACECRAFT Okay sir, thank you.

CAPCOM Columbia, Houston, you're go to load your targets.

SPACECRAFT Roger.

PAO This is Shuttle Control, the television monitors in the newscenter now have a picture of the crowd at Dryden Flight Research Facility so far. This is Shuttle Control, the estimate that Dryden now is 88,000 vehicles and 403,000 people.

CAPCOM Columbia, Houston, the target solutions look good to us in both machines.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, Ascension at 4 7, configure LOS.

SPACECRAFT Okay.

PAO This is Shuttle Control. Columbia is out of range at Bermuda, next station Ascension Island in 12 minutes. All the prestart conditions for the auxiliary power units look good. Those are the units that power the hydraulic system on Columbia, for lowering landing gear, for moving the flight control surfaces. APU 2 will be started at deorbit ignition -5 minutes. APUs 1 and 3 at entry interface -13 minutes.

END OF TAPE

PAO APU number 2 will be started at deorbit ignition -5 minutes, APUs 1 and 3 at entry interface -13 minutes.

CAPCOM NASA 946, Houston.

PAO This is Shuttle Control, we'll recap the deorbit burn numbers.

CAPCOM NASA 946, Houston.

PAO The deorbit burn will be a retrograde maneuver using both OMS engines. Del velocity of 308.8 ft per second, the burn time of 2.52 minutes, that maneuver scheduled to occur in about 32 and 1/2 minutes from now, be just after the Botswana LOS. Columbia will be over the Indian Ocean out of view of any tracking station at the time of that maneuver. And our next contact with Columbia after the deorbit maneuver will be Guam. Columbia's 9 minutes away from acquisition at Ascension Island. We'll stand by for any further any conversation for 20..

CAPCOM NASA 946, Houston, over.

PAO The CAPCOM here in the control center and NASA 946 at Dryden. At 6 days 23 hours 38 minutes Mission Elapsed Time, this is Shuttle Control, Houston.

CAPCOM NASA 946, Houston.

NASA 946 Houston, 946, over.

CAPCOM Read you five by John, go ahead.

NASA 946 Roger, we see a little high surface winds, but they're not enough to satisfy the cross wind DTO apparently.

CAPCOM Okay, we copy that and the readings we're getting are going up a little bit but we agree they are not high enough yet.

NASA 946 Okay.

CAPCOM Have you been able to make a approach to 22 down to the surface?

NASA 946 Roger, we did, we landed 2,760 ft down on runway at 196 knots in auto reflare and it was control air speed to 286 knots at 2,500 ft, so I think that'll fit up fairly closely with our pad.

CAPCOM Yes sir that looks good. Did you note any shears or anything like that?

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NASA 946 No, we sure didn't, it's very calm out here.

CAPCOM Okay, that's good news.

NASA 946 Gonna make one more pass to it and take a look though. They still don't have the PAPA's on last run.

CAPCOM Okay, we copy that.

CAPCOM NASA 946, Houston.

NASA 946 Go ahead.

CAPCOM Roger, we'll be talking to Columbia in about 4 minutes, and we'll call you about 8:15 your time.

NASA 946 Okay.

PAO This is Shuttle Control, that was another report from astronaut John Young in the Shuttle Training aircraft, flying landing approaches. From that conversation, it does not appear probable that we will try for crosswinds. We'll make that decision at Guam. For now, we will plan for runway 22.

PAO This is Shuttle Control, the PAPA lights referred to by John Young, are precision approach position approach indicators.

PAO This is Shuttle Control at 6 days 23 hours 46 minutes Mission Elapsed Time. Columbia's about 30 seconds away from acquisition through Ascension Island.

CAPCOM Columbia, Houston, for 6 minutes, configure AOS.

SPACECRAFT You've got it.

CAPCOM Thank you sir, we're going to send you a new state vector over Ascension and when it's on and secure, we'll give you load for the --.

CAPCOM Columbia, Houston, the new state vectors are onboard, reload the targets.

PAO This is Shuttle Control here in the Mission Control Center, Flight Director Harold Draughon is polling his flight controllers for a go-no-go decision on the deorbit burn.

END OF TAPE

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CAPCOM Columbia, Houston, the new state vectors are onboard. Reload the target.

PAO This is Shuttle Control here in the mission control center. Flight Director Harold Draughon is polling his flight controllers for a GO/NO GO decision on the deorbit burn.

CAPCOM Columbia, Houston. We'd like to see the vent doors closed before we give you a go for the burn.

SPACECRAFT Okay, we're just waiting for you to call. Here it comes. You've got it.

CAPCOM Columbia, Houston, vent doors look good. You are GO for deorbit burn.

SPACECRAFT Roger.

CAPCOM Columbia, Houston. Botswana at 57 configure LOS.

SPACECRAFT Okay, sir.

PAO This is Shuttle Control. Ascension has loss of signal. Botswana is next in 2 minutes 40 seconds. We'll standby. This is Shuttle Control. 6 days 23 hours 57 minutes mission elapsed time. Botswana should acquire Columbia momentarily.

CAPCOM Columbia, Houston for 7 minutes.

SPACECRAFT Alright.

CAPCOM Columbia, Houston. Have a good burn. We'll see you at Guam at 30.

SPACECRAFT Alright sir. We're starting number 2.

CAPCOM Roger.

SPACECRAFT Test looking good.

PAO This is Shuttle Control. Botswana has loss of signal. Next acquisition through Guam in 24-1/2 minutes. Columbia's 4 minutes 10 seconds away from the deorbit maneuver. We'll get a report on that burn at Guam. At 7 days 6 minutes mission elapsed time, this is Shuttle Control Houston.

CAPCOM NASA 946, Houston. NASA 946, Houston.

NASA 946 NASA 946, go ahead Brewster.

CAPCOM Roger, we're standing by.

NASA 946 We just made another pass to 22. The PAPA lights are now on. The most right outboard one is dimmer than the other two when the white light is on.

CAPCOM Copy that.

NASA 946 It has a dim out the right outboard one is dim and I don't know if you need to tell T. K. that or not.

CAPCOM Okay.

NASA 946 Wind has picked up just a little bit. Tower is calling 230 at 10. I don't know what you guys are reading down there on the surface, but it doesn't look like it's picked up very much. May pick up a little more in the time that - between now and time they come out of blackout my guess is, but it probably won't pick up 2 or 3 knots.

CAPCOM We copy.

NASA 946 There are no turbulence at all associated with any of this, repeat on the weather of the San Fernando Valley is clear as a bell over to the LA Basin is where the clouds the low level clouds are and they go all the way out to the coast. It looks like over by Oxnard, Point Magoo and Vandenburg up that direction. They look like there might be a little cloudy up there but you really can't tell from here. It might be able to see the ground through the mountains up there.

CAPCOM We copy.

NASA 946 The only thing you can really say about the weather around here today is it's beautiful.

CAPCOM Roger, we copy that. Looks that way on the TV and we think we're going to go to 22.

NASA 946 Okay.

PAO This is Shuttle Control. The president's helicopter is now landing at Dryden Flight Research Center. And chase and photo T38's are taxiing out to take off at Dryden. Pilot in the chase plane today are astronauts Guy Gardner and Jerry Ross. In the photo T38's Charles R. Justice, a JSC aircraft operations pilot and Clarence Pete Stanley, a photographer from JSC photo technology division.

END OF TAPE

CAPCOM - - see you again in about 40 past.

SPACECRAFT Okay 45.

PAO This is Shuttle Control at 7 days 29 minutes mission elapsed time. Columbia's about 30 seconds away from acquisition through Guam. We'll stand by for a report on the deorbit burn.

CAPCOM Columbia, Houston, through Guam for 6 minutes configure AOS.

SPACECRAFT You got it.

CAPCOM All 3 APUS look good.

SPACECRAFT Thank you sir.

PAO This is Shuttle Control we're showing a perigee of 0.8 nautical miles, so the burn was obviously very good. This is Shuttle Control Columbia will land on runway 22. 7 and 1/2 minutes from entry interface. Shuttle Control all systems aboard Columbia look very good.

CAPCOM Columbia, Houston, no delta T required. You are go for maneuvers, all systems look good.

SPACECRAFT Columbia roger.

CAPCOM Columbia, Houston, 30 seconds LOS, check wideband mission to continuous. We'll see you over the states, have a good downhill trip. The winds are 230 at 10 on the surface.

SPACECRAFT All right sir, thank you.

CAPCOM And configure LOS.

SPACECRAFT Wilco.

PAO This is Shuttle Control, Guam has loss of signal now with Columbia, Columbia committed to enter the Earth's atmosphere in 3 minutes 3 seconds. We may have a short bit of acquisition through Hawaii in about 9 and 1/2 minutes. It's possible that we'll get 1 minute's worth of acquisition time there, and we'll stand by to see whether we do or not. Touchdown clock showing 32 minutes 10 seconds to touchdown on runway 22.

CAPCOM NASA 913, Houston, radio check.

NASA 913 Loud and clear Houston, chase.

CAPCOM Read you five by Guy.

NASA 913 Still, is that firm now it's 22.

CAPCOM That's affirmative.

NASA 913 Got you.

CAPCOM NASA 946, Houston.

NASA 946 946 go.

CAPCOM Roger sir, do you have any further updates?

NASA 946 No, we're just about to make a pass to 22, we'll let you know if anything's different.

CAPCOM Okay, we're AOS in 8 minutes.

NASA 946 Okay, the last pass the MLS was working just fine.

CAPCOM We copy.

PAO This is Shuttle Control. President and Mrs. Reagan have arrived at the Dryden Flight Research Facility and are now in route to a viewing area. Shuttle Control Columbia should be entering the Earth's atmosphere now. This is Shuttle Control at 7 days 46 minutes mission elapsed time. Columbia's about a minute away from possible acquisition through Hawaii, we'll stand by and see if we're able to get any communications there. The spacecraft entered the Earth's atmosphere 6 minutes ago. Predicted landing time 7 days 1 hour 11 minutes, 11 minutes after the hour. This is Shuttle Control at 7 days 48 minutes mission elapsed time, apparently we'll get no contact through Hawaii, we did see some radar contact, but no voice communication, or telemetry.

END OF TAPE

PAO This is Shuttle Control at 7 days 48 minutes mission elapsed time. Apparently we'll get no contact through Hawaii. We did see some radar contact but no voice communication or telemetry. Columbia now on the track which will take it across the California coast between Santa Barbara and Ventura. Crossing just a few miles south of Carpenter Ria.

EDWARDS NASA 946, Edwards.

PAO Track then goes up just south of Ohi across the Condor Sanctuary over Lake Hughes almost over the town of Fairmont. Goes just north of Lancaster and then a left turn into runway 22.

NASA 946 NASA 946 go ahead.

EDWARDS Roger, John. Did you get to make the approach to 22?

NASA 946 That's affirmative. Everything is still nominal if you normalize the touchdown airspeed - normalize touchdown we're 3000 feet down the runway.

CAPCOM Okay, we copy that, thank you.

PAO We expect acquisition with Columbia in about 7-1/2 minutes. We have a report now from the Dryden Flight Research Facility.

DRYDEN This is NASA Dryden Landing Control. Everything is in readiness to meet the Columbia when it touches down on runway 22. Approximately 2 hours ago the recovery and servicing convoy moved to its site along the runway. Once parked, the cooling and air conditioning equipment was activated. The technicians who will make this first inspection of the spacecrafts at a final briefing and began putting on checking out their spacesuits which will protect them in case of any propellant leaks. Scape stands for self contained atmospheric protective assemble. The convoy is made up of a number of vehicles. The dinosaur type trucks are called the Orbiter Purge Transportor and the Orbiter Cooling Transportor. The purge vehicle will be used to flow humidified cool air through the cargo bay and remove any explosive or toxic fumes. The coolant vehicle provides freon through the Orbiter's cooling system to carry away residual heat from electronic equipment. The convoy is led by a convoy commanders vehicle and includes the vans for spacesuits support umbilical access to the vehicles and the cool access vehicle which is a logo light room. As soon as the astronauts have indicated wheel stop, the spacesuit attained will inspect the Orbiter visually and use sniffers to determine if there is any evidence of propellant leaks in the area. The purge and cooling trucks will stay about 400 feet downwind until the hazardous gas detection system has

determined it's fate. President Reagan and the first lady and their party are in place to watch the landing. They are with astronauts Joe Engle, Capt. Bob Crippen, Gordon Fullerton, and Jack Lousma. Following the landing, they'll leave the runway to wait for the astronauts to complete their checklist, placing Columbia in a safe condition. Everything in place here at NASA's Dryden.

PAO This is Shuttle Control. We're about 2-1/2 minutes away from expected acquisition with Columbia. Touchdown clock showing 14 minutes 50 seconds to touchdown.

NASA 946 Houston, 946. We're still landing at 3000 feet down the runway.

CAPCOM Okay, that sounds good, John. We're 14 minutes from touchdown and we'll be leaving free.

NASA 946 (garble).

PAO This is Shuttle Control. We have a C band radar contact at 183,000 feet. Mach 13.

CAPCOM Chase, Houston. Standby for a mark at 12.

CHASE Chase, Roger.

CAPCOM Chase, Houston. Mark 12.

CHASE Chase copy.

PAO That was a mach 12 call to chase. That call helps him. Fido says Columbia is 10 miles high, slightly south of groundtrack. Control looks solid.

CAPCOM Columbia, Houston. Configure AOS.

SPACECRAFT You got it.

PAO The camera from Santa Anannis Peak has a visual on Columbia now. Altitude's 164,000 feet, mach 10.

END OF TAPE

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CAPCOM Houston, configure AOS

SPACECRAFT We got it.

PAO The camera from Santa Anannis peak has a visual on Columbia now. Altitude's a 164,000 ft, Mach 10, range to go is 153 miles.

CAPCOM Columbia, Houston, you're 20 miles high on energy, slightly south of ground track, nav is good.

SPACECRAFT Okay. Is the state good for the POP4

CAPCOM That's affirmative T. K. you are go.

SPACECRAFT Understand go.

PAO And that was a go for the push-over pull-up maneuver. The crew conducting a series of aerodynamic maneuvers. 150,000 ft now, Mach 8, 279. Range is 263 miles.

CAPCOM Columbia, Houston, take TACAN.

SPACECRAFT Okay sir, put it in.

PAO Columbia now utilizing the Tactical Air Navigation System. 138,000 ft, Mach 7.3, 230 miles to go. Columbia 10 miles high on energy and converging now.

CAPCOM Columbia, Houston, 10 high on energy and converging, check body flap.

SPACECRAFT Thank you sir.

PAO 126,000 ft, Mach 6.3, range to go 185.

CAPCOM Columbia, Houston, disregard the evap out.

SPACECRAFT Okay I understand, disregard (garble).

PAO Columbia is over the Channel Islands now...

SPACECRAFT be advised your transmissions are very garbled.

PAO Approaching the coast at 112,000 ft, Mach 4.7, energy has converged now. 106,000 ft Mach 4, range to go 110 miles. Columbia systems in the control looking good.

CAPCOM Columbia, Houston, positive seats, energy is converged.

SPACECRAFT Okay, said positive seats, energy good. Your radio

is almost unusable.

PAO Columbia is at 93,000 ft now at an altitude where the ejection seats could be used if necessary. Mach 3, 75 miles to go.

CAPCOM Columbia, Houston, take air data.

PAO 85,000 ft, Mach 2.6, range 62 miles.

CAPCOM Columbia, Houston, we'd like a pass to BFS transfer.

SPACECRAFT Roger.

PAO Columbia's crew still conducting the maneuvers to aerodynamic data. 72,000 ft, Mach 1.8 44 miles to go. The Dryden long range camera has acquired Columbia, at 69,000 ft, Mach 1.6, 39 miles to go. Columbia now about 5 minutes from touchdown, at 61,000 ft, Mach 1.3.

SPACECRAFT Roger ...

CAPCOM Columbia, Houston, cameras.

PAO Columbia in Mach 1.1 now at 51,000 ft, range 27 miles. Mach .9 at 44,000 ft, range 23 miles.

CAPCOM Columbia, Houston, 42,000 ft approaching the hack.

SPACECRAFT Roger.

PAO Columbia touching the head in alignment circle now. We'll shortly be starting a left turn into the runway. 33,000 ft, airspeed 258 knots.

SPACECRAFT (garbled)

END OF TAPE

PAO Columbia touching the head in alignment circle now, will shortly be starting a left turn into the runway, 33,000 feet, airspeed 258 knots.

(garble) coming aboard on the right.

SPACECRAFT Good show.

PAO 28,000 feet.

CAPCOM Columbia, Houston, surface winds 240 at 12.

Houston, could you find another transmission path?

PAO 20,000 feet at 286 knots - 18,000 feet now.

CAPCOM TK surface winds 240 at 12.

SPACECRAFT Thank you.

PAO Columbia turning in to a head in, lined up with the runway now - 14,000 feet at airspeed 264.

SPACECRAFT Roger.

PAO Columbia on final and looking very good, 12,000 feet, 9600 feet 282 knots, into autoland guidance now. Columbia will stay in autoland guidance until 2500 feet. Ken Mattingly will take over at 2500 feet for the landing. 280 knots at 4200 feet.

NASA 3,000. You're coming - gear down

PAO Gear's down and locked.

NASA Outstanding.

PAO Shuttle Control here, the unofficial landing time 7 days 1 hour 9 minutes 40 seconds. To repeat, the unofficial landing time 7 days 1 hour 9 minutes 40 seconds.

CAPCOM Columbia, Houston, if you get a cabin or PP 02 message, disregard.

SPACECRAFT Okay, we got a couple of those.

CAPCOM Columbia, Houston, welcome back to Earth, that was beautiful.

SPACECRAFT That's quite all right.

PAO This is Shuttle Control, the convoy is approaching

Columbia now.

SPACECRAFT Houston, Columbia, how do you read?

CAPCOM Read you five by Columbia, how me?

SPACECRAFT Okay, we're, I'm on the wireless now, and Hank's gonna be coming up in just a minute. We'll be proceeding with our activities.

CAPCOM Roger.

PAO Shuttle Control, the crew is safing the OMS pods and RCS systems. After that's been completed the convoy will be able to approach the vehicle.

SPACECRAFT Convoy 1, this is Columbia, OMS RCS safing is complete.

CAPCOM Roger. Columbia, Houston, you're go for the load test when you're ready.

SPACECRAFT Roger.

CAPCOM Columbia, Houston, TK we would like for you to do the I1 switch configurations on the middle of page 5-6 prior to the load test.

SPACECRAFT All right.

PAO This is Shuttle Control, the RMU officer here observed the load test, that's the test of the hydraulic system involves moving the control surfaces around. Ground crewmen are using sniffers around the thrusters on Columbia now, checking whether there are any leaks in those systems

END OF TAPE

PAO . .ground crewmen are using sniffers around the thrusters on Columbia now checking whether there are any leaks in those systems.

SPACECRAFT Houston, load test complete.

CAPCOM Roger, copy Columbia.

CAPCOM Columbia, Houston, you're go for the DPS transition.

SPACECRAFT Okay, Houston, thank you.

PAO Shuttle Control, the DPS transition puts Columbia's computers in a post-landing program configuration.

CAPCOM If does not, we'll want you to mode it to halt and then back to run.

SPACECRAFT Wilco.

PAO Shuttle Control, the next operation for the crew in this powerdown is to reposition the Space Shuttle main engines in a down position.

CAPCOM Columbia, Houston, check hydraulic main pump press 3 to normal before doing the SSME repositioning.

SPACECRAFT Got you.

SPACECRAFT Okay Houston, BFS won't PRO to ops, you want to go ahead and take it to off and bring it back up?

CAPCOM That's affirmative T. K. mode it to halt and then back to run.

SPACECRAFT Houston, I have a go for APU shut down?

CAPCOM Stand by.

CAPCOM Columbia, Houston, you're go for APU shutdown, be advised hydraulic circ pump operation is not required.

SPACECRAFT Okay, you say no circ pumps.

CAPCOM Affirmative.

SPACECRAFT Houston, APU hydraulic shut down complete.

CAPCOM Roger.

CAPCOM Columbia, Houston, request DFI PCM recorder to high

sample.

SPACECRAFT Got it.

SPACECRAFT Convoy 1, the APU shutdown's complete.

SPACECRAFT Houston, I'm standing by for your call on purge doors.

CAPCOM Columbia, Houston, stand by on the vent door purge positioning. On panel R2, we need the APU control switches, 3 of them to OFF.

CAPCOM Columbia, Houston, go for vent door purge positioning.

SPACECRAFT Okay.

PAO Shuttle Control here, the convoy commander's reported to Flight Director Harold Draughon that the hatch is now open. Ground crewmen are now attaching the cooling unit to Columbia. The Flight Director has advised the convoy commander that Columbia's in a staple position.

CAPCOM Columbia, Houston, you can ignore the thermal APU message.

SPACECRAFT Disregard?

CAPCOM Affirmative, disregard.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, we'd like for you to execute the ammonia boiler deactivation procedure on page 5-18.

SPACECRAFT Let me get to it. Say again that page number Roy.

CAPCOM Page 5-18.

SPACECRAFT 5-18.

CAPCOM And be advised Columbia we sent a teleprinter message to delete the first three steps of that. You want to just start by turning the ammonia boiler A to Off and advise if you got the rest of the teleprinter message.

SPACECRAFT Okay, Roy, we're getting a (garble) in here now, we got Lauren in and I'm going let him run that, I'm in that back station here.

CAPCOM Columbia, Houston, Hank we would like to have you

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turn the ammonia boiler off first.

CONVOY Houston, Columbia's change crew's aboard.

CAPCOM Roger, Lauren you're loud and clear.

CONVOY And I just want to reaffirm with you that the ammonia boiler is off.

CAPCOM Roger, and Lauren, we would like for you to complete the rest of that procedure on panel D1, water loop pump

END OF TAPE

CAPCOM Roger, and Lauren, we would like for you to complete the rest of that procedure on panel L1, Waterloo pump number 1 to OFF.

CONVOY Okay, pump 1 coming OFF.

CAPCOM And we would like for you to take the Freon flow proportional valves both of them to interchanger.

CONVOY Roger. And we have talk back.

CAPCOM Roger.

PAO This is Shuttle Control. The convoy commander has confirmed purge now.

CONVOY And Houston, Columbia. I'll proceed with LOU activation if you're ready.

CAPCOM Roger, proceed.

CONVOY Roger.

CAPCOM Columbia, Houston. Lauren, when you get to panel A12, let me know. I have a couple of other switches for you.

CONVOY Roger. Lauren activation is done and on to page 5-17.

CAPCOM Roger.

CONVOY And Houston, Columbia. I'm ready for panel A12 now.

CAPCOM Roger, on the bottom row, I'd like for you to take the hydraulic heaters, bravo position, 4 of them to OFF.

CONVOY (garble). And those are off. I understand the rest of the procedure is written.

CAPCOM Affirmative.

CONVOY And Houston, Columbia proceeding with RCS oms heaters power down.

CAPCOM Roger.

CONVOY And Houston, Columbia. Complete with page 5-17.

CAPCOM Roger. Columbia, Houston. You need to turn off 1 switch on panel R1, payload primary main C to off.

CONVOY Roger. That's complete.

PAO This is Shuttle Control. Presidential party is enroute to Columbia. We expect the crew to be leaving Columbia shortly and meet with President and Mrs. Reagan. Take a short inspection tour of the vehicle and the crew will depart for medical examination. This is Shuttle Control. Step ladder is in place in the mission control center for the tradition hanging of the crew patch on the wall of the mission operations control room. This ceremony signifies successful completion of another space flight. That hanging of the plaque will take place after the crew leaves Columbia. The President, First Lady and astronaut Joe Engle are approaching the ramp to Columbia now. Crew should be emerging shortly. Here they come now down the ladder. (Clapping) Crew has a hat with their patch on it for the President.

END OF TAPE

PAO Crew has a hat with their patch on it for the President. The President and Mrs. Reagan now departing for further ceremonies at Dryden. The crew entering their transfer van to proceed to the medical examination. Greeting the President and first lady there along with Joe Engle, just before they departed was George Abbey, Director of Flight Operations at the Johnson Space Center. He and the crew of Columbia are now making a walkaround inspection of the vehicle. Here in the Mission Control room the world map has been replaced with a slide depicting the Mission Control Center patch, and patches from all 4 of the orbital flight tests of Columbia. And the plaque now being hung on the wall of this mission operations control room, the STS-4 crew patch.

It's now final 6 alpha.

PAO And control of Columbia now passes to the Dryden Flight Research Center from Mission Operations Control in Houston.

DRYDEN (garble) to begin it's taxi. Senior pilot F. Fulton of the Dryden Flight Research Facility is the pilot of the 747. We would once again like to request that anyone on the press tower that does not belong there, does not have a camera please remove yourself. We just a few too many people on that press tower. We ask you unless you have photographic equipment, please remove yourself down to the ground area. We'd like to thank you for your indulgence this afternoon, this morning, it seems like afternoon to many of us, and I'm sure to many of you. Immediately following the takeoff of the 747 with the Challenger on top, Pilot Fulton will circle the area moving over the general viewing sight on the east side of the lake, then come from my left to right over the lake, dip the wings in a Presidential salute, and then fly to the Johnson Space Center at Ellington Air Force Base in Texas. Following an overnight stop, and a very gala reception for the STS-4 crew, the Challenger atop the 747 will depart tomorrow morning for the Kennedy Space Center in Florida. Then on July 15th or 16, the Columbia will be mated to the 747 and it will depart for the Kennedy Space Center with a midpoint stop at Dias Air Force Base. (garble) more music from the United States Navy Band. (music)

END OF TAPE

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(Music). Just been informed that the President and Mrs. Reagan and the other guests will be arriving at the platform just moments after 11:00. And I'm also happy to announce that you will all be live on nation wide television, on ABC. So thank you very much for your indulgence. Lt. Pages has graciously accepted an invitation to play a few more melody's here, before 11:00. So Lt. Pages, you're on stage again. Thank you.

BAND (Music).

Ladies and gentlemen, in just a few moments President Reagan and Mrs. Reagan will be here with the astronauts. At this time I take my leave. Thank you for being such a great group out here. And we'll see you next mission. Thank you.

Ladies and gentlemen, the President of the United States, and Mrs. Reagan, and Astronauts Mattingly, and Hartsfield. (Music).

Thank you very much. Good morning. Good morning ladies and gentlemen. It's my pleasure to welcome you here, on this very happy special day, for America. And it is indeed a very special day for the Nation's Space Program. Mr. President in your inaugural address, you reminded us that it is time we realize that we are too great a nation to limit ourselves to small dreams. And then you - -

END OF TAPE

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JAN 25

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